THE PROFIT CENTRE RIGHT AT YOUR DOORSTEP

INDUSTRIAL LAND FOR LEASE

NO	AREA	DISTANCE FROM J.BAHRU	SIZE (HECTARES)	STILL AVAILABLE FOR LEASE (HECTARES)	LAND TENURE	STATUS OF DEVELOPMENT	TYPE OF INDUSTRIES PREFERRED
1	TAMPOI GUDANG INDUSTRIAL PARK	36 KM	1451	402	OPTIONAL 30+30 YEARS OR 60 YEARS	READY FOR OCCUPATION	HEAVY/MEDIUM/LIGHT INDUSTRIES
2	SENAI IV INDUSTRIAL PARK	32 KM	124	60	OPTIONAL 30+30 YEARS OR 60 YEARS	READY FOR OCCUPATION	MEDIUM/LIGHT INDUSTRIES
3	BUKIT PASIR INDUSTRIAL PARK	220 KM	38	10	60 YEARS	READY FOR OCCUPATION	MEDIUM/LIGHT INDUSTRIES
4	TAN GADING INDUSTRIAL PARK	117 KM	124	40	60 YEARS	READY FOR OCCUPATION	MEDIUM/LIGHT INDUSTRIES
5	MENGKIBOL INDUSTRIAL PARK	100 KM	72	30	60 YEARS	READY FOR OCCUPATION	MEDIUM/LIGHT INDUSTRIES
6	TANJUNG LANGSAT INDUSTRIAL COMPLEX	40 KM	1909	1889	OPTIONAL 30+30 YEARS OR 60 YEARS	UNDER CONSTRUCTION (OPEN FOR BOOKING)	SEA RELATED/HEAVY/ MEDIUM/LIGHT INDUSTRIES
7	TEBRAU IV INDUSTRIAL PARK	16 KM	40	10	OPTIONAL 30+30 YEARS OR 60 YEARS	UNDER CONSTRUCTION (OPEN FOR BOOKING)	MEDIUM/LIGHT INDUSTRIES
8	SUNGAI RENGGAM INDUSTRIAL PARK	60 KM	81	81	60 YEARS	CONSTRUCTION COMMENCE IN EARLY 1995 (OPEN FOR BOOKING)	MEDIUM/LIGHT INDUSTRIES
9	JOHOR TECHNOLOGY PARK	23 KM	190	190	60 YEARS	CONSTRUCTION COMMENCE IN 1995 (OPEN FOR BOOKING)	HITECH INDUSTRIES R & D CENTRES
10	MERSING INDUSTRIAL PARK	134 KM	34	34	60 YEARS	CONSTRUCTION COMMENCE IN 1995 (OPEN FOR BOOKING)	MEDIUM/LIGHT INDUSTRIES

JOHOR...North of Singapore, is today the most lucrative investment destination in the region.

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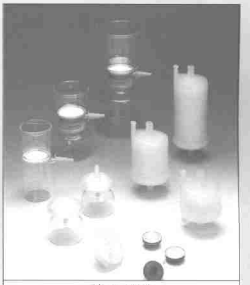

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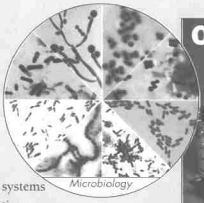
- Heavy metal screening

Filtration Processes

- Cartridge and membrane filters
- Lab and production scale systems
- Ultrafiltration units



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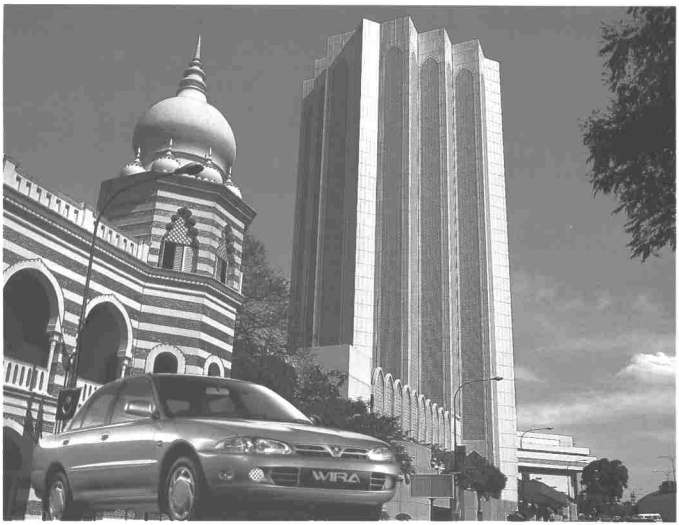
The company that makes the fastest moving car in British history isn't American, European or Japanese.



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Putri Zanina Megat Zainuddin *(Project Development Manager)*

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Malaysian Industrial Development Authority (MIDA) *(Lembaga Kemajuan Perindustrian Malaysia)*
Grd, 3rd - 6th Flrs, Wisma Damansara, Jalan Semantan, P.O.Box 10618, 50720 Kuala Lumpur, Malaysia
Tel: *603 - 255 36 33* Telex: *MIDA MA 307 52* Fax: *603 - 255 79 70*

MIDA is a division of MITI, the Ministry of International Trade & Industry *(Kementerian Perdagangan Antarabangsa & Industri)*
Block 10, Government Offices Complex, Jalan Duta, 50622 Kuala Lumpur, Malaysia.
Tel: *603 - 254 00 33/60 22/80 44* Telex: *DAGANG MA 306 34, 280 17* Fax: *603 - 255 08 27*

The Ministry of Science, Technology and the Environment *(Kementerian Sains, Teknologi & Alam Sekitar)*
14th Floor, Wisma Sime Darby, Jalan Raja Laut, 50662 Kuala Lumpur, Malaysia
Tel: *603 - 293 89 55* Fax: *603 - 293 60 06*

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Views on R&D

Research & Development should be viewed as normal and compulsory investment which could bring profits in the long term.

We cannot remain as a user of other people's technology. Our competitiveness, resilience and position in this world depends on our capability to think more creatively.

Without investment in R & D, Malaysian companies would not be able to be independent in the future and would continue to depend on foreign technology which would decrease our competitiveness.

Without continued technological expansion, many manufacturing companies that wanted to maintain their competitiveness would have to spend repeatedly to obtain the latest technology and this would reduce the competitiveness of their products.

On the other hand, if technological development is a result of their own R & D, royalties would not become a burden and supremacy of the products would be recognised.

Nearly all the things we use were invented and produced in temperate countries for people in a different culture from those in the tropics. By giving attention to the needs of tropical weather and Malaysian culture, we could adapt the products we use daily.

After adapting, there would be a huge market for the products in other tropical countries and among people with the same culture as ours, for instance Muslims.

Malaysian scientists and researchers are already well-known. They have obtained many successes in the agricultural field.

There is no mystery in the field of research and the ability was not a gift for a certain race of people only and anybody could do it as long as they persist.

The Government is determined to produce scientists and technologists for R & D activities at a ratio of 1,000 for every 1 million people by the year 2000.

Excerpts from speeches by

Datuk Seri Dr Mahathir Mohamad,

Prime Minister of Malaysia

Economic analysts have predicted that East Asia would not be able to sustain its industrial growth since the sector was still restricted by borrowed technology.

This is why industries should improve R & D to give the country a competitive edge.

Firms should invest in critical areas of R & D now because with greater challenges ahead, there is a need for effective positioning of the country's industries and manpower to maximise their strengths and minimise their weaknesses.

We need to develop our capabilities and knowledge quickly if we want to stay ahead and advance to the next stage of industrialisation that will involve value-added production instead of just assembling or sub-contracting.

The corporate sector must realise that unless they set aside more funds to develop new technologies, we will forever be at the mercy of foreign companies which are in possession of these technologies.

Excerpts from speeches by

Datuk Seri Anwar Ibrahim,

Deputy Prime Minister of Malaysia

Research & Development activities are needed to propel the nation forward into industrialised status.

R&D can increase quality of goods and services, improve the management of operations as well as enhance the competitiveness of the goods and services.

R&D can no longer be carried out at random but must be done in a systematic way which will benefit consumers.

The competitive edge of Malaysian-made goods in the international market will hinge on continued R&D in view of the opening up of world trade.

Quality control and innovativeness can only be achieved through on-going R&D efforts.

Excerpts from speeches by

Dato' Seri Rafidah Aziz,
Minister of International Trade and Industry

Public sector R&D will be restructured under the 7th Malaysia Plan to enhance the nation's technological level.

Four strategies have been identified - joint R&D with the private sector, joint R&D among institutions, comprehensive approach in management and competitive bidding in securing funds for R&D.

The Ministry has identified areas to be given a boost - these are the new emerging technologies in electronics, telecommunications, aerospace, pharmaceuticals, information technology, environmental sciences and energy.

It is imperative that Malaysia now develops knowledge-based rather than labour-intensive industries as labour costs have increased.

From the RM1 billion allocated for R&D in the 5th and 6th Malaysia Plans, 241 R&D projects have been identified as having potential for commercialisation.

Excerpts from speeches by

Datuk Law Hieng Ding,
Minister of Science, Technology and Environment

In line with the Government's efforts to promote the development of high technological, high value-added and capital intensive industries, industrialists should also increase investment in R&D.

In an era of rapid technological changes, Malaysia can ill afford to stay still or complacent. We need to remain continuously dynamic, competitive and versatile.

Our labour force's skill, productivity and quality of products are our cutting edge in attracting high technology.

Excerpts from speeches by

Tan Sri Datuk Zainal Abidin Sulong,
MIDA Chairman

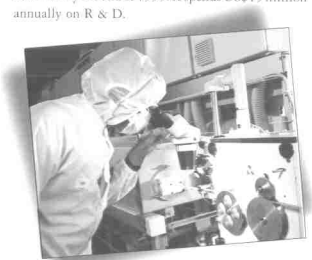
THE STATE OF RESEARCH & DEVELOPMENT IN MALAYSIA

In order for Malaysia to become an industrialised nation by the year 2020, it is widely recognised that its Research & Development facilities must progress in tandem with the massive investments made in the manufacturing sector. Otherwise, Malaysia will continue using imported technology and the lack of indigenous inventions and innovations will sooner or later hinder its progress. Both the Government and the private sector have taken cognizance of this and have already made inroads into the stratospheric world of Research & Development. Many investors are pleasantly surprised by the wide range of R & D facilities available in Malaysia....

One of the largest hitech investors in Malaysia is **Intel Corporation**, the US electronics giant, which has production and R & D facilities in its factory in Penang.

Its R & D Centre is now designing 8 and 16 bit Very Large Scale Integrated Circuit micro-controllers for broad market applications.

It has 70 engineers at present and plans to have 200 by the end of 1995. It spends US$15 million annually on R & D.



Hewlett Packard's engineers work closely with R & D teams in San Jose, where the company's American headquarters is based, not only in product development but also in undertaking process responsibilities including equipment purchasing.

In the next few years,the Malaysian R & D centre will contribute about 25 per cent to its total world wide Research and Development. At present, it has 122 engineers of whom 15% are engaged in R & D.

HP makes optoelectronic and communication products.

Meanwhile, HP has transferred its computer disk drive manufacturing facility from Bristol, England, to its plant in Penang, making it the only factory outside the United States to manufacture the product.

Komag USA (Malaysia) Sdn, the world's leading maker of hard disks, has an R & D facility in Penang employing 80 engineers which is working on thinner, lighter and cheaper hard disks with faster access time for broad applications.

Komag has invested another RM250 million to produce the new 500 megabyte 8.7-cm disk at the Penang plant, making Malaysia the third country in the world after the United States and Japan to manufacture the new hi-tech product.

Komag plans to turn its Penang plant into a regional manufacturing centre and the headquarters for its high-end products.

Motorola developed a walkie talkie for low-band VHF and UHF in its Malaysian R & D facility in Penang which was its first Asian R & D operations set up in 1976.

The centre also contributed to the development of the CT2 product enhancement programme for subscriber handsets and public base stations.

Its R & D activities include product design and development using advanced design tools such as robotic vision, CAD/CAM, radio signalling techniques and Autocad for tooling & design.

Motorola makes hybrid circuits, walkie talkies, cordless phones (CT2) and mobile radio products.

A Penang-based Malaysian company, **Eng Technology Holdings Berhad**, has been contracted to manufacture E-block rotor assemblies, a component of hard disk drives, for Quantum Corporation of USA.

Its subsidiary Eng Technologi Sdn Bhd was also contracted by Micropolis Corporation, a major high capacity disk drive maker in USA, to do research and development on two products.

German firm **Robert Bosch (M) Sdn Bhd** has invested heavily in R & D in its Penang factory.

The R & D facility is to design new car stereo components and electronics for controlling windshield wipers.

It has 32 engineers at present. Robert Bosch makes radios, car radios, flash control units and controls for car accessories.

Matsushita Air Conditioning Research & Development Centre Sdn Bhd *(Macrad)* was set up in 1992 to design air-conditioners. Macrad, which cost US$35 million to set up, employs 75 engineers at present.

The Technology Centre of Matsushita Industrial Corporation Sdn Bhd has developed precision die and mould technology which is good enough to manufacture moulded plastic parts for the production of split air conditioners in Japan.

Matsushita Television Company of Malaysia designed and developed the Top Dome range of television sets.

Perusahaan Otomobil Nasional *(Proton)*, the manufacturer of the Malaysian car Proton Saga, has invested US$48 million in South East Asia's most sophisticated R & D centre for automotive designing.

Situated in Shah Alam, Selangor, the centre has facilities for full-scale model making, Computer Aided Design/Computer Aided Manufacturing, component testing and emission testing.

It has 33 engineers and 40 designers fully involved in R & D and design work.

Solar Baby, the first electric car in Malaysia, will be marketed by the end of 1995.

The solar-assisted, electric-powered car will be manufactured and marketed by **Fima Corporation** in a joint-venture with British firm Frazer-Nash Research Ltd.

It will have a maximum speed of 70kmph and distance of 120km on a full charge.

A Malaysian joint-venture has entered into an agreement to manufacture electric cars using American technology.

UMW Corporation Sdn Bhd, **Perusahan Otomobil Nasional Bhd** and an American firm, **Electricar Inc** will initially manufacture electric cars based on Proton Wira cars.

Sony has opened its first Asian R & D Centre, its third outside Japan, in Bangi, Selangor. Its two other overseas R & D centres are in Britain and United States.

The R & D centre in Malaysia is to design new television sets and other audio-visual products. It has 30 engineers.

Sime Darby Berhad has invested in a Tyre Technology centre to facilitate the transfer of technology from **Sumitomo Rubber Industries** and pursue R & D on pattern design, compounding technology and usage of new materials.

The centre also provides R & D for the group's tyre factories in Malaysia and the Philippines.

Syarikat Telekom Malaysia's Telecommunications and Information Technology Institute will become a full-fledged institution of higher learning, the 10th to be given university status.

The institution will provide degree courses in telecommunications, Information Technology, integrated computing and broadcasting. The campus will also house STM's R & D Centre.

A Malaysian company, **Binariang Sdn Bhd**, will launch two Measat HS376 satellites built by by American aerospace giant Huges Space and Communications International Inc.

This will enable Malaysia to subscribe to direct-to-user services and obtain access to applications such as telephone, television, data transmission and business networks.

The first satellite will be launched by Arianespace on Dec 20, 1995. The second will be sent into orbit in July 1996.

Its footprint will cover India, Singapore, the Philippines, Thailand, Brunei, Indonesia, Vietnam, Kampuchea, Laos, Myanmar, Taiwan, Hong Kong and South China.

Malaysia has launched the Micro-Satellite Programme to design, engineer, build and launch its own spacecraft and send two satellites into orbit by the end of this decade.

Towards this end, it has set up the **Malaysian Space and Telecommunications Research Consortium (MAXSTAR)** comprising Binariang Sdn Bhd, Syarikat Telekom Malaysia Berhad, Space Science Studies Division, Malaysian Institute of Micro-Electronics, Universiti Sains Malaysia, Universiti Kebangsaan Malaysia, Universiti Teknologi Malaysia and Universiti Pertanian Malaysia.

The first micro-satellite will be launched by 1997. It will be for scientific and education ope-

rations and remote sensing, obtaining data for resource management, land use and protection of environment.

The second satellite will be capable of sophisticated applications including material and component testing and earth-based pollution monitoring.

Hitachi Electronic Products (M) Sdn Bhd has designed and developed Video Cassette Recorders in its R & D centre in Bangi, Malaysia

Sapura Holdings Group has produced the world's first voice-activated telephone in its R & D centre.

Sharp Corporation of Japan, through Sharp/Roxy Electronic Corporation Sdn Bhd, has invested in its largest TV manufacturing plant outside Japan.

It is investing RM100 million to build a R & D centre in Johor to design and develop new TV models.

Grundig (M) Sdn Bhd is spending US$1 million per annum on R & D to come up with new audio-visual and electronic products.

Its R & D activities include circuitry drawings, engineering and design, prototype production, testing and evaluation.

Its R & D centre was set up at a cost of US$16 million. Grundig makes radios, clock radios, cassette recorders and CD players.

Computer Resources Manufacturing has invested RM2 million in R & D to manufacture pocket hard disks.

These are portable discs which store up to 1 gigabyte of data compatible with IBM file servers, Personal Computers, notebooks and works with MS-DOS, Windows 3.1 and Novell Netware.

The National Oil Corporation, Petronas, spends US$20 million annually on R & D.

It is building a new Petroleum Research Institute in Bangi, Selangor, which will be the most sophisticated R & D centre in Malaysia.

Liasari Sdn Bhd, a Malaysian cosmetics firm, is using palm oil as a source for emullient esters, moisturisers and emulsifiers for skin-care products instead of the usual mineral oil, a petroleum by-product.

These palm oil extracts are biodegradable, replenishable and free of polycyclic aromatic hydrocarbons which are carcinogens.

The company developed its range of products with findings from research done by SIRIM (Standards and Industrial Research Institute of Malaysia) and PORIM (Palm Oil Research Institute of Malaysia).

Lam Soon (M) Berhad with two Japanese partners, **Nisshin Oil Mills Ltd** and **Mitsubishi Corporation**, have developed technology to ensure that edible palm oil will not solidify in cold temperatures.

The technology uses enzymes to produce high quality edible oil based on palm oil.

The product will be marketed in Japan first and later in the rest of the world.

Colgate-Palmolive (Malaysia) Sdn Bhd started its R&D operation in 1986 focussing on developing products tailored for Malaysia and the ASEAN region. In recent years, the company has tripled its annual technical investment and doubled the R&D staff.

The increased technical staff is designing and developing new detergent products and packaging using fast cycle time techniques, CAD, and other advanced sytems. As a result, AXION Gel for dish-washing was successfully launched in Malaysia and the Philippines in 1994.Colgate-Palmolive is Malaysia's largest maker of detergents and oral care products.

US-based business software company **Open Systems Holdings Corporation** has set up its first offshore R & D centre in Malaysia at a cost of RM5 million.

The company deals with Man-Trak Solutions, a fully-integrated solution system for manufacturing, distribution and accounting modules.

Tenaga Nasional Research & Development Sdn Bhd has signed a joint-venture with **Australian Microwave Technologies (South East Asia) Pte Ltd** to develop, manufacture and market microwave equipment in the areas of processing, heating and molecular separation.

The company will study the viability of molecular processing of palm oil extracts, sterilisation of sewage, extraction of solvents from toxic wastes and recycling engine oil.

Perwaja Steel Sdn Bhd has engaged the Standards and Industrial Research Institute of Malaysia to conduct a study on the production of iron powder from its waste products.

Research work has started on using a palm oil-based resin adhesive to make composite materials.

The **Forest Research Institute of Malaysia** and **Natural Polyol Technology** will make use of polyol, a polyurethane from oil palm seeds, to make the materials using palm and other wood fibres.

The Forest Research Institute of Malaysia has linked up with **Fletcher Challenge Ltd of New Zealand** in a R & D programme to multiply tropical wood species in plantations in Malaysia.

Technicians from FCL will share expertise and knowledge with their Malaysian counterparts in the five-year programme using the Acacia Hybrid.

In the meantime, the FRIM R & D division has also initiated projects to maximise utilisation of trees felled for timber.

The Rubber Research Institute of Malaysia *(RRIM)* is opening its doors to investors who need its expertise.

Investors can make use of RRIM's expertise in rubber cultivation, soil analysis, tapping techniques, usage of fertilisers and crop health.

RRIM also has testing facilities for rubber products such as condoms, tyres, gloves, seismic shock absorbers for bridges and skyscrapers, and vibration absorbers for industrial purposes.

The Veterinary Research Institute of the Veterinary Services Department has commercialised four findings by its biotechnologists.

These are vaccines for Aujesky's disease, swine fever, fowl pox and Newscastle disease which affect poultry, birds, pigs and other animals.

Remee Holdings Sdn Bhd has been licensed to manufacture the vaccines.

American airplane manufacturer, **McDonnell Douglas Corporation**, has proposed to set up a computer-aided design/computer-aided manufacturing (CAD/CAM) centre with SIRIM.

With this centre, SIRIM will go for full automation and will be equipped with a Stereo Lithography Programme for the manufacture of precision components and Laminated Object Manufacturing for the casting of big products.

An **Advanced Manufacturing Technology Centre**, built at a cost of RM8 million, will be opened in **SIRIM** in Shah Alam.

This is to help local engineers and scientists to conduct studies in advanced manufacturing techniques involving automation.

SIRIM will also set up an Advanced Materials Research Centre (AMREC) in the Kulim Hi-tech Industrial Park for R & D on advanced materials such as ceramics, composites and nano materials for aerospace and semi-conductor applications.

SIRIM has formed a joint-venture company called Sirim-Sime Technologies Sdn Bhd with **Sime Darby** to provide calibration and measurement services to the manufacturing sector.

It is planned to be a one-stop calibration centre for the local and Asean market.

In the 6th Malaysia Plan (1991-1995), the allocation for R&D was increased to RM600 million and collaboration with the private sector was encouraged in the fields of biotechnology, micro-electronics, information technology and advanced manufacturing technology

The Government has formed the **Malaysian Technology Development Corporation Sdn Bhd** to link researchers and innovators with venture capitalists and industrialists.

It is a joint venture between the Government and 14 Malaysian companies.

It has transferred more than 15 types of technology to the private sector through assisting the licensing of these to the companies.

Among the latest developments is the establishment of Malaysia Bio-Diognostics Research Sdn Bhd which is involved in producing a diagnostic kit on typhoid developed by Universiti Sains Malaysia.

MTDC is keen to develop three other projects - a new electroplating technology developed by **Universiti Teknologi Malaysia**, genetics research developed by Universiti Malaya and commercialisation of marine-based technology developed by **Universiti Malaya** and **Universiti Kebangsaan Malaysia**.

Universiti Malaya has opened a new Faculty of Computer Science and Information Technology. It will offer five new courses - Bachelors in Information Technology, Computer Science, Masters in Library and Information Science, Computer Science and Bachelors in Software Engineering.

Universiti Sains Malaysia will set up a space technology faculty. It is sending three lecturers to Huges Space and Communication Inc in the United States of America for training and internship.

A course on satellite and launch vehicle technology and applications will be available from the 1996/97 academic year. USM is also conducting research on a type of plastic based on palm oil which is biodegradable and environment-friendly.

Universiti Malaysia Sarawak has signed a Memorandum of Understanding with Sapura Holdings Sdn Bhd, Asia Pacific Institute of Information Technology and Otago University of New Zealand to cooperate in Research & Development activities and the training of its students in Information Technology.

Composite Technology Research Malaysia Sdn Bhd, **Composite Technology Development Corporation** and **Punca Wawasan Sdn Bhd** will set up an Advanced Composites Training Centre in Malacca to provide both aerospace and non-aerospace related training.

Cellular Communications Network Sdn Bhd *(CELCOM)* and **Universiti Utara Malaysia** have signed an agreement to share resources in various fields.

A subsidiary of CELCOM, Celcom Academy Sdn Bhd, will use the training and research facilities of the university while the college students will benefit from CELCOM's wide expertise in telecommunications.

A **Teaching University** is planned to be built in Pekan Selandar in Malacca to increase the number of graduate teachers in the country and meet the needs of education in future.

A Research & Development centre on education will be housed in the university.

IBM World Trade Corporation and **the Malaysian Institute of Microelectronic Systems *(MIMOS)*** will initiate collaborative Research & Development programmes in microelectronics and Information Technology.

MIMOS received a Power PC Development Kit to explore the development of applications relevant to Power PC technology.

Meanwhile, MIMOS will be building Malaysia's very own microchip plant at a cost of RM110 million to be functional by 1996. The factory will produce chips for domestic needs. MIMOS will also set up a Microelectronics Centre in the Kulim Hi-tech Industrial park. It is to be ready by 1997.

The Malaysian Industry Government Group for High Technology *(MIGHT)* is coming up with a master plan for Research & Development in telecommunications.

MIGHT is a joint initiative by the Government and the private sector. Among the companies involved are Telekom Malaysia Berhad, Technology Resources Industries Berhad, Electroscon Sdn Bhd, Pernec Corporation Sdn Bhd and Sapura.

A RM12 million **Robot and Automation Centre** will be built at the Universiti Sains Malaysia Branch in Perak, while a RM20 million **Science and Technology Centre** will be located in Ipoh.

Local companies can make use of the R & D facilities at the Robot and Automation Centre.

Malaysia's first Forensic **DNA *(Deoxyribonucleic Acid)* Laboratory** has opened in Petaling Jaya, Selangor, providing services to Government agencies and individuals.

The lab can identify individuals involved in criminal or paternity cases using samples from blood, semen, bones, saliva or hair.

Malaysia is the fourth country in Asia to have such facilities. The other countries are Japan, Hong Kong and Singapore.

Under the 7th Malaysia Plan, three more similar laboratories will be opened in Penang, Perak and Johore

IRPA - TOWARDS QUALITY R&D

During the 5th Malaysia Plan (5MP), the Government introduced the **IRPA (Intensification of Research in Priority Areas)** mechanism with the aim of ensuring selectivity and quality R&D activities in the public sector.

The mechanism, which comes under the purview of the National Council for Scientific Research and Development (MPKSN), was launched in 1988 with an allocation of RM400 million. This allocation was increased to RM600 million in the 6th Malaysia Plan (6MP).

Presently, a total of 31 institutions comprising eight institutions of higher learning, six statutory research institutions and seventeen governmental research institutions/departments receive fundings under the IRPA mechanism.

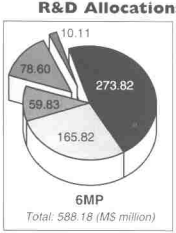
To further strengthen R & D activities, the MPKSN has approved three additional research institutions under the IRPA mechanism. They are Drainage and Irrigation Department, Department of Geological Survey and International Islamic University.

The five key sectors that receive IRPA funds are agriculture, industrial, medical , strategic and social science.

Social Science is a new sector and was constituted in the 6MP to cater for R&D programmes originally placed under the Agriculture and Strategic sectors. This sector is aimed at developing and coordinating R&D activities in social science in line with national priority areas.

MPKSN has established 5 IRPA Panels to coordinate, assess, monitor and determine priority areas in R&D in their respective sectors.

R&D Allocations for 6MP



For the 6MP, MPKSN endorsed and supported an allocation of RM588.18 million for 838 R&D programmes.

A major exercise undertaken by MPKSN during the period under review was the evaluation of R&D projects funded under the IRPA mechanism in the 5MP. The exercise, which was undertaken for the first time through 5 separate seminars, was crucial as it aimed to provide inputs on the progress and impact of projects funded, their relevance to meeting national priorities, the problems encountered by researchers and recommendations towards improving the IRPA mechanism.

AGRICULTURE SECTOR

The agriculture sector is an important sector of the national economy contributing 14.8 per cent to the overall GDP in 1994.

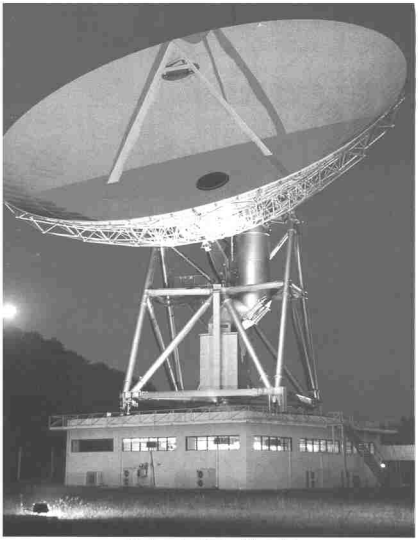
Agricultural R&D is focussed on increasing the productivity of traditional export crops and commodities. Equal attention would also be given to the development of new crops, including value-added products using better processes and techniques.

R&D in this sector included:

Production Research - maximising land/water use in farming system, agriculture, crops, livestock and fisheries, and forestry; increasing quality, productivity and efficiency in production of crops, livestock and fisheries; maintaining sustainable development of forest and aquatic resources; and quality improvement in pre-harvest, in-field handling/drying and in-field transportation.

Post-harvest Research - improving harvesting technology including harvesting, handling, drying, packaging storage and transportation; processing and product development; quality control and standards for consumer production and market acceptability.

Basic and Supportive Research - exploitation of new or untapped resources; biotechnology; agriculture engineering; water management; techno-economic and marketing research such as market intelligence, production economics and sociology, technology assessment and transfer.



Picture by courtesy of Telekom Malaysia Bhd

Agriculture Development & Environment Research - input studies (land development, agriculture practice, afforestation, drainage and irrigation), management of agriculture waste and residues and environment changes.

INDUSTRY SECTOR

The objective of the IRPA R&D in the industrial sector was to develop products, processes, services and technologies as well as to improve the efficiency and competitiveness of the local small and medium-scale industries.

The priority areas for the sector identified for the 6MP were as follows:

Product Design and Development - industrial and consumer products, machinery, instruments, building and structural materials.

Process Development - process studies, production process R&D and instrumentation and control.

Production Efficiency - improvement in manufacturing techniques, improvement in equipment, machinery and plant design, and production cost reduction.

Quality Improvement - quality management system, instrumentation and control, standards and testing.

Advanced/Enabling Technology Manufacturing System - automation, flexible manufacturing system and computer integrated manufacturing.

Some 175 R&D programmes from 16 research institutions and universities were funded under IRPA at a cost of RM165.82 million for the 6MP period.

Research conducted by various institutions covered the following technology areas:

Materials Technology - development and usage of metals, ceramics, plastics, polymer and composites for the local industry.

Manufacturing Technology - development of value-added products from local raw materials such as rubber, wood, minerals, palm oil, cocoa and food.

Chemical Technology - processing, modification and synthesis of rubber, palm oil, cocoa, tin, agricultural wastes as well as treatment and product recovery from agricultural and industrial wastes.

Information Technology and Microelectronics - development of computer software, telecommunications network, CAD/CAM, expert system, maintenance of equipment, instrumentation and information system.

Industrial biotechnology - microbial metal recovery from industrial and agricultural wastes.

MEDICAL SECTOR

R&D in the medical sector was to identify means to reduce the cost of medical care as well as the rate of morbidity and mortality besides finding market outlets for R&D products such as vaccines and diagnostic kits.

The priority areas are:

The management of existing technology on disease control such as diseases that spread through food and drinks, malnutrition, infertility and immunology.

Research on local ailments or diseases which were lacking in proper control such as vector borne diseases which are caused by viruses, bacteria and parasites, neurosis and other non-psychotic and neoplasmic diseases.

Research on non-infectious diseases such as heart ailments, breathing, accidents, drug abuse and metabolic interference.

Research on reducing morbidity and mortality rates and the control of less known ailments such as impairment of the endocrinal system, genetic disorders and degenerative diseases.

Research to fulfill the need for policy formulation and planning such as transmigration, effluent drug and health care.

Research on technological development such as biotechnology, computer technology and technology adaptation.

Research on toxicology

Four notable findings have been patented - an external bone fixer, a rapid diagnostic test for typhoid, an ultra sensitive immuno-assay method for thyroid and speech audio-metric recording in Malay.

STRATEGIC SECTOR

R&D in this sector is to intensify the development of the basic sciences which are central to the support of adaptive and enabling technologies.

R&D programmes were focussed on the following areas - Environment and Conservation, Energy, Computer Sciences/AI/CAD/CAM, Physical Sciences and Instrumentation, Chemical and Earth Sciences, Biological Sciences/Biotechnology, Natural Resources and Remote Sensing, and Materials Science.

SOCIAL SCIENCE SECTOR

Awareness of social and cultural needs in national technological development prompted the inclusion of a separate Social Science sector in the 6MP.

Programmes on R&D of socio-economic nature in the Agriculture, Industry, Medical and Strategic sectors were taken out together with their 6MP allocations to form the Social Science Sector with the aim of studying the socio-economic implications or impact of technological development in all sectors.

Under the 1994 IRPA programme, a total of 2,212 projects were undertaken. The number of projects carried out in each sector shows an overall increase except in Social Science which registered a drop of 25%. Nonetheless, its achievement rate increased from 47.6% to 57.4%.

The agricultural sector continued to attract the largest amount of funding of RM60.3 million with a total of 1,084 projects undertaken and 189 completed in 1994. Agro-industrial R & D projects were given priority.

This is followed by the industrial sector with allocation of RM30 million and 559 projects; strategic sector with 413 projects; medical with 207 projects and social with 35 projects.

The achievement rate of the industry sector showed a marked increase from 11.1% in 1993 to 26.9% in 1994.

Given the new thrust of the Government, efforts are being undertaken to forge international linkages and increase public and industry sector collaboration through the IRPA programme.

Such initiatives should lead to greater science and technology alignment with the national development needs and goals aimed at achieving a developed country status by the year 2020.

The National Council for Scientific Research & Development (MPKSN) is located at The Ministry of Science, Technology and the Environment, 14th Floor Wisma Sime Darby, Jalan Raja Laut, 50662 Kuala Lumpur, Malaysia Tel: 603 - 293 8955 Fax: 603 - 293 6006

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MALAYSIA AS A CENTRE FOR RESEARCH & DEVELOPMENT (R&D) AND SCIENCE & TECHNOLOGY (S&T)

The Vision

The attainment of industrialised country status to which Malaysia aspires by the year 2020 depends on a great extent on scientific advances, technological innovations and adaptations and their dissemination and commercial utilisation.

Experience in advanced countries have underlined the role of technology, technological changes and supportive institutions in making and maintaining world-competitive industries. A high priority is thus placed on the development of R&D and S&T in Malaysia. This is consistent with the Prime Minister Datuk Seri Dr Mahathir Mohamad's vision for Malaysia to be.. "an economy that is technologically proficient, fully able to adapt, innovate and invent, that is increasingly technology-intensive, moving in the direction of higher and higher levels of technology."

Prerequisites

Malaysia is an investor's haven where investment opportunities are plentiful and business prospects are bright. There are now immense investment opportunities in R&D and S&T. Malaysia offers:

- a well-developed industrial base that has set the stage for Malaysia to move into the era of high technology
- political stability
- well-developed and modern infrastructure and telecommunications facilities
- educated and skilled labour force
- sound monetary and economic policies
- efficient bureaucratic support and a welcoming attitude towards investors
- an advanced support services sector, and
- excellent social and recreational facilities

These are among the ingredients which have placed Malaysia ahead in industrial development in the region.

Incentives and Programmes for R & D

Various measures have been introduced to promote the development of technology and R & D activities.

Incentive package

A comprehensive fiscal incentives package among the best in the region has been introduced to promote hi-tech and R & D activities. At present, the incentive schemes for normal non-hitech pioneer projects are as follows:

Pioneer Status

Companies granted Pioneer Status will be given partial exemption from the payment of income tax. The current corporate tax rate is 30%. They will only have to pay tax on 30% of their statutory income. The period of tax exemption is 5 years.

Investment Tax Allowance

A company given Investment Tax Allowance will be granted an allowance of 60% in respect of qualifying capital expenditure incurred within 5 years from the date of approval of the project. The allowance can be utilised to set-off against 70% of the statutory income in the year of assessment.

Incentives for Hi-tech Industries

To promote the establishement of hi-tech industries in Malaysia, a special Pioneer Status/Investment Tax Allowance is granted i.e.

- Full income tax exemption (Pioneer Status) for a period of 5 years or Investment Tax Allowance of 60% on qualifying capital expenditure for 5 years for hi-tech projects. The Allowance can be offset against 100% of the statutory income for each assessment year.

Contract R&D

Full income tax exemption (Pioneer Status) for a period of 5 years or Investment Tax Allowance of 100% on qualifying capital expenditure incurred within a period of 10 years is granted to Contract Research and Development companies which provide R&D services in Malaysia to companies other than their related companies. The allowance will be granted at the statutory income level and abatement for each year of assessment will be limited to 70% of statutory income.

R&D for Associate Companies

Investment Tax Allowance of 100% on qualifying capital expenditure for a period of 10 years is granted for Research and Development companies which provide R&D services in Malaysia to their related companies i.e. holding/affiliate/associate companies or any other company. The allowance will be granted at the statutory income level and abatement for each year of assessment will be limited to 70% of statutory income.

In-house R&D

Investment Tax Allowance of 50% on qualifying capital expenditure related to R&D expenditure is granted for a period of 10 years for companies carrying out in-house research. The allowance will be granted at the statutory income level and abatement for each year of assessment will be limited to 70% of statutory income.

Other measures for promoting R&D include:

- Double deduction of expenditure, not being capital expenditure incurred on approved research projects undertaken by a company either in-house or contracted to research companies and institutions
- Double deduction of expenditure, not being capital expenditure incurred by companies for the use of services provided by approved research companies or institutes
- Double deduction for contributions in cash to approved research institute
- Capital allowances for plant and machinery used for purposes of approved research
- Exemption of import duty, excise duty and sales tax on equipment, machinery, raw materials and samples used for approved research projects and by research companies or institutions

- Industrial Building Allowance for buildings used for purposes of approved research projects and buildings used by approved research companies or institutions carrying out research

Other measures

In addition to the above, the following measures have been introduced:

- The establishment of the Intensification of Research in Priority Areas (IRPA) Fund in 1988 to provide financing for research in projects which have commercial potential under various programmes i.e. in agriculture, industries, medicine, strategic studies and social sciences, and in the development of new and emerging technologies, viz. manufacturing technology, microelectronics technology, biotechnology, information technology and advanced materials technology and energy. The Fund is designed to encourage Government-owned R & D agencies and universities with R & D facilities/capabilities to have greater linkages with the private sector
- The establishment of the Malaysian Technology Development Corporation (MTDC), a Government-industry joint-venture in 1992 to focus on the commercialisation of local research findings, introduction of strategic technologies to the country, and manufacture of products widely used as industrial inputs. In addition, MTDC acts as a catalyst to the development of venture-capital and as a centre for growing technology-based companies
- The establishment of the Malaysian Technology Park in 1988 to assist in the development of indigenous technologies and the commercialisation of R & D findings. Its main role is to support industrial entrepreneurship especially the growth of high technology industries, promote industrial competitiveness, encourage reverse engineering and accelerate technology and provide a vital link between industry, the Government, research and development, institutions and universities
- The launching of the Kulim Hi-tech Industrial Park for the development of high technology industries and R & D activities. The Park has two main objectives:
  - To be a centre of excellence for High Technology Industries and R & D, and
  - To be a centre of excellence for technology training for hi-tech industries to meet the needs of Malaysia and the region
- The launching of the Industrial Technical Assistance Fund (ITAF) in 1990 to provide financial assistance to small and medium-scale industries in the form of matching grants for consultancy studies, product development and design, quality and productivity improvements and market development
- The establishment in 1993 of the Malaysian Industry Government Group for High Technology (MIGHT), a Government-private sector initiative to exploit research and technology for new business opportunities. The setting up of MIGHT provides for a consultative approach to technology prospecting
- The launching of the Human Resource Development Fund (HRDF) which forms an integral part of the technology development programme. Programmes that develop personnel for product design and R & D work will be considered eligible for grants under the HRDF
- Relaxation of conditions for the employment of expatriates and foreign skilled workers related to R & D activities

New Measures

As the development of human resources is an integral part of technology development, a number of measures on human resource development have been announced recently to increase the number of skilled and semi-skilled labour. An integrated action plan will be implemented. This includes expanding and upgrading the capacity of existing industrial training institutes and the development of new polytechnics and industrial training institutes.

Incentives for Technology Training

In addition to the above, companies which establish technical or vocational institutes will be eligible for Investment Tax Allowance of 100% for 10 years while existing technical or vocational training institutes undertaking additional investments to upgrade equipment or expand their capacity are eligible for the same incentives.

Such institutions are also eligible for exemption of import duty on materials, machinery and equipment used for training.

Malaysia as R & D Centre

With high economic growth of above 8% in the past 7 years (8.5% in 1994), Malaysia has one of the highest growth rates in the Asean region and in the world. Malaysia is now ranked the 19th largest trading nation in the world and 3rd most competitive among non-OECD countries (17th if OECD countries are included). The manufacturing sector growth exceeds 10% annually. Manufacturing constituted 31.5% of GDP in 1993 while export earnings from manufactured goods comprised 77.5% of total exports. With a strong manufacturing base, Malaysia is in a position to offer the best advantage for a long term and profitable investment for R & D activities to meet her development needs and also to service the region, particularly ASEAN.

AFTA Creates Opportunities for R & D

Malaysia's location in the heart of South-east Asia presents an immense potential to investors to tap the growing Asean market, the newly emerging and fastest growing region in the world with overall annual growth of between 6-8%. The World Bank has forecast that East Asia, which includes Asean, will continue to register a high growth rate of about 7.1% annually until well past the year 2000.

The creation of AFTA - Asean Free Trade Area - will facilitate trade and investment flows in a more liberal market of 330 million people by the year 2003. Malaysia has been the major contributor to intra-Asean trade, contributing 27.7% (or US$22,162.1 million) of total intra-Asean trade of US$80,085.6 million in 1993. Exports to Asean constituted 27.9% of Malaysia's total exports and imports from Asean comprised 19.8% of Malaysia's total imports in 1993. The new and expanded market opportunites will encourage Malaysian manufacturers to set up new production capacities or expand local production capacities. Opportunities for the development of new products to cater to the needs of the Asean market as a whole would necessitate investment in R & D to come up with new products and processes.

It is the aspiration of Malaysia to become the centre of capital goods (machinery and equipment) in Asean, and this can only be achieved if high-technology and R & D become a focal point of Malaysia's industrial strategy for the future. The Government is taking positive steps. The private sector - Malaysians and foreign investors - must respond.

The move towards world trade liberalisation, the emergence of new market economies, and the globalisation of trade presents challenges to Malaysian manufacturers. They are expected to improve their productivity and efficiency while at the same time reducing costs to remain competitive. This can be achieved through technological upgrading by acquisition or absorption of new technology, innovation and R & D.

The Government on its part will continue to be forward looking and will undertake bold measures to support public and private sector investment in the development of technology and R& D activities in Malaysia

MIDA Headquarters

Malaysian Industrial Development Authority (MIDA), Wisma Damansara, Jalan Semantan, 50490 Kuala Lumpur, Malaysia *Tel:* 603 - 255 3633 *Telex* MA 30752 *Fax:* 603 - 255 7970

MIDA STATE OFFICES

Johor
Wisma LKN, Room 15.05, Level 15
49, Jalan Wong Ah Fook
80000 Johor Bahru, Johor
Tel: 07-2242550 Fax: 07-2242360

Kedah
8th Floor, Wisma PKNK
Jalan Sultan Badlishah
05000 Alor Setar, Kedah
Tel: 04-7313978 Fax: 04-7312439

Kelantan
5th Floor, Bangunan PKINK
Jalan Tengku Maharani Puteri
15000 Kota Bharu, Kelantan
Tel: 09-7483151 Fax: 09-7447294

Melaka
13th Floor, Bangunan Graha Maju
Lot 135, Jalan Graha Maju, 75300 Melaka
Tel: 06-2848034/2825711
Fax: 06-2853437

Negeri Sembilan
5th Floor, Block C, Wisma Negeri
70503 Seremban, Negeri Sembilan
Tel: 06-737795/ 722311 *ext* 399
Fax: 06-724695

Pahang
Suite 5, 11th Floor, Kompleks Teruntum
P.O. Box 178
25720 Kuantan
Pahang
Tel: 09-5137354 Fax: 09-5137333

Perak
2nd Floor, Wisma Wan Mohamed,
Jalan Panglima Bukit Gantang Wahab
P.O. Box 210
30720 Ipoh
Perak
Tel: 05-2539300 Fax: 05-2552661

Perlis
5th Floor, Bangunan KWSP
Jalan Bukit Lagi
01000 Kangar
Perlis
Tel: 04-9762864 Fax: 04-9767764

Penang
Unit 30.6, 30th Floor, Menara Komtar
Jalan Penang
10000 Pulau Pinang
Tel: 04-622025 Fax: 04-622014

Sabah
4th Floor, Bangunan Bank Negara
P.O. Box 11915
88821 Kota Kinabalu
Sabah
Tel: 088-211411 Fax: 088-211412

Sarawak
Room 404, 4th Floor, Bangunan Bank Negara
No. 147, Jalan Satok
P.O. Box 716
93714 Kuching
Sarawak
Tel: 082-254251/ 252375 Fax: 082-252375

Selangor
Lot 7.11, 7th Floor, Wisma MPSA
Persiaran Perbandaran
40675 Shah Alam, Selangor
Tel: 03-5505258 / 5594669
Fax: 03-5590708

Terengganu
1st Floor, Bangunan UMBC
Jalan Sultan Ismail
20200 Kuala Terengganu
Terengganu
Tel: 09-6227200 Fax: 09- 6232260

MIDA OVERSEAS OFFICES

UNITED STATES OF AMERICA

Los Angeles
Consul-Investment
Consulate General of Malaysia
(Investment Section)
350 South Figueroa Street, Suite 400
Los Angeles CA 90071
Tel: (213) 6212661 / 2686
Telex: 472 0501 MALA UI
Fax: (213) 6208659

Chicago
Director, MIDA
John Hancock Centre, Suite 3350
875 N. Michigan Ave. Chicago, IL 60611
Tel: (312) 7874552
Telex: 433 0368 MIDA UI
Fax: (312) 7874769

New York
Consul-Investment
Consulate-General of Malaysia
(Investment Section)
313 East, 43rd Street, New York, NY 10017
Tel: (212) 6872491 Fax: (212) 4908450

EUROPE

FRANCE
Director, MIDA
42 Avenue Kleber, 75116 Paris
Tel: 47276696 / 5689 / 5691
Telex: MIDA 642 672F
Fax: 47556375

GERMANY
Director, MIDA
6th Floor, Rolex Haus
Domproptz-ketzer Str. 1-9
D-50667 Cologne
Tel: (0221)124007 / 008
Fax: (0221) 136198

ITALY
Consul-Investment
Consulate of Malaysia (Investment Section)
4th Floor, Via Vittor Pisani, 31
20124 Milan
Tel: (02) 66984614 / 4647
Fax: (02) 66984749

SWEDEN
Economic Counsellor
Embassy of Malaysia
Karlavagen 37
P.O. Box 26053, 10041 Stockholm
Tel: 46-8-7917690/ 7917942 (DL)
Telex: 13416 MWAKIL S
Fax: 46-8-7918761

UNITED KINGDOM
Trade Commissioner (Investment), MIDA
17 Curzon Street, London W1Y 7FE
Tel: (071) 4930616
Fax: (071) 4938804

ASIA PACIFIC

AUSTRALIA
Consul-Investment
Consulate of Malaysia
11th Floor, R&W House,
92 Pitt Street
Sydney NSW 2000
Tel: (02) 2325737
Telex: TC SYD AA 26936
Fax: (02) 2234515

HONG KONG
Trade Commissioner (Investment)
Malaysian Commission (Investment Section)
24th Floor, Malaysia Building
47-50 Gloucester Road, Wanchai, Hong Kong
Tel: 25270921/9350
Fax: 28661148

JAPAN
Tokyo
Director, MIDA
2nd Floor, Nichiginmae, Kyodo Building
3-2-4 Nihombashi, Horigoku-cho
Chuo-ku, Tokyo 103
Tel: (03) 32793082
Fax: (03) 32461867

Osaka
Director, MIDA
3rd Floor, Takahashi Building, (Honkan)
5-9-3 Nishi-Tenma
Kita-ku, Osaka 530
Tel: (06) 3133121 / 3221
Fax: (06) 3133321

SOUTH KOREA
Counsellor Investment
Embassy of Malaysia (Investment Section)
4-1 Hannam-dong
Yongsan-ku, 140-210 Seoul
Tel: (02) 7953032 / 7980115
Telex: MAWAKIL K 27382
Fax: (02) 7922427

SINGAPORE
Trade Commissioner (Investment)
MIDA
5 Shenton Way
#26-05/07 UIC Building, Singapore 0106
Tel: (02) 2210155 / 0154
Fax: (02) 2254406

TAIWAN
Director (Investment)
Malaysian Friendship and Trade Centre
8th Floor, San Ho Plastics Building
102 Tun Hua North Road, Taipei
Tel: (02) 7132626 / 7186094
Telex: 21899 MAFTEC
Fax: (02) 5147581

Malaysian Trade Missions Overseas

ASIA

BANGKOK

Malaysian Trade Commissioner
Malaysian Trade Office
Embassy of Malaysia
Mezzanine Floor, South East Insurance Bldg
315, Silom Road, Bangkok 10500
Thailand
Tel: 66-2-2340289 *(DL)* / 2362816 / 2362803 / 2567605
Fax: 66-2-2362832
Telex: 22412 TCMALBK TH

BEIJING

Commercial Counsellor
Embassy of Malaysia
Commercial Section
13 Dongzhumenwai Dajie San Li Tun
100600 Beijing, P.R.C.
Tel: 86-1-5325031 *(DL)* / 322531 / 2 / 3, 5323640
Fax: 86-1-5323640
Telex: 22122 MAPEK CN
Cable: MALAWAKIL PEKING

DUBAI

Consulate General of Malaysia
110 Binsuloom Plaza, Al Rigga Road, Deira
Dubai, U.A.E.
P.O.Box 4598, Deira, U.A.E.
Tel: 971-4-287677 *(DL)* 285695 / 6
Fax: 971-4-239799
Telex: 47000 DAGMA EM
Cable: DAGANG DUBAI

HO CHI MINH CITY

Malaysian Trade Commission
Consulate of Malaysia
(Trade Commissioner's Office)
53 Ngoyen Dinh Chieu Street
5rd District, Ho Chi Minh City
Vietnam
Tel: 84-8 299023 / 231882
Fax: 84-8-299027
Telex: VT 813028 MALHCM

HONG KONG

Malaysian Trade Commissioner
Malaysian Commission, Trade Section
24th Floor, Malaysia Building
50 Gloucester Road
Wanchai, Hong Kong
Tel: 852-5-5270921
Fax: 852-2-8661148

JAKARTA

Malaysian Trade Commissioner
Embassy of Malaysia
Investment Section
Kamar 328B, 11th Floor
Jalan Gajah Mada No. 3-5
Jakarta 10130
Indonesia
Tel: 62-21-364225
Fax: 62-21-361156
Telex: 61445 MALAY IA
Cable: MALAWAKIL JAKARTA

JEDDAH

Malaysia Trade Commissioner
P.O. Box 20802
Jeddah 21465
Saudi Arabia
Tel: 966-2-6424481
Fax: 966-2-6420059
Telex: 605850 DAGANG SJ

KUWAIT

Malaysian Trade Commissioner
Embassy of Malaysia in Kuwait
No. 1, Street 70, Area 7, Faiha
P.O. Box 4105
Safat, Kuwait
Tel: 965-2546022 / 2546213 / 2546413
Fax: 965-2527749
Telex: WKLMLAY 22540 KT
Cable: WAKILMALAY KUWAIT

MANILA

Malaysian Trade Commissioner
Malaysian Trade Office
Embassy of Malaysia
107 Tordesilias Street
Salcedo Village, Makati
Metro Manila
Philippines
Tel: 63-2-8174581 to 85 / 8174551 to 53
Fax: 63-2-8163114
Telex: W355 EMBTC PN
Cable: MALAWAKIL MANILA

SEOUL

Malaysian Trade Commissioner
Embassy of Malaysia
4-1 Hannam-Dong
Yongsan-ku, Seoul
Republic of Korea
Tel: 82-2-7953210 *(DL)* 975-5032 / 9203, 794-7205 / 0349
Fax: 82-2-7927746
Telex: K 27382

SINGAPORE

Malaysian Trade Commissioner
Malaysian High Commission
#04-02 Orchard Plaza
150 Orchard Road
Singapore 0325
Tel: 02-2351605 / 2351534 / 2351510
Fax: 02-2350824
Telex: RS 55485 DAGMA
Cable: MALAWAKIL SINGAPORE

TOKYO

Commercial Counsellor
Embassy of Malaysia
Commercial Section
20-16, Nampeidai-Machi
Shibuya-Ku
Tokyo 150, Japan
Tel: 81-3-3476421*(DL)* / 34763840
Fax: 81-3-34764972
Telex: J 24221
Cable: MALAWAKIL TOKYO

AFRICA

NAIROBI

Malaysian Trade Commissioner
4th Floor, Eagle House
Kimathi Street
P.O. Box 48916
Nairobi, Kenya
Tel: 254 2-229724 / 229725
Fax: 254-2-340376
Telex: 22437 MGTN
Cable: PERDAGANGAN NAIROBI

AUSTRALIA

SYDNEY

Malaysian Trade Commissioner
Consulate of Malaysia
11th Floor, 92 Pitt Street
Sydney, N.S.W. 2000
Australia
Tel: 61-2-2311377
Fax: 61-2-2234515
Telex: TCSYD AA 26936
Cable: PERDAGANGAN SYDNEY

SOUTH AMERICA

CARACAS

Malaysian Trade Commissioner
Embassy of Malaysia Commercial Section
Centro Empresarial Eurobuild'ng
Piso 6, Oficinas F/G
Calle La Guairita
Chuao Caracas 1061
Venezuela Apartado
Postal: 65109 (Chuao)
Tel: 532-921011*(DL)* / 921144/921366/921433*ext.* 17*(TC)*
Fax: 582-921277
Telex: WAKIL VL 28012

SAO PAULO

Malaysian Trade Commissioner
Malaysian Commercial Office
Avenida, Paulista 1776
19 andar CEP: 01310
Sao Paulo, Brazil
Tel: 55-11-2852966 / 2852542
Fax: 55-11-2833903
Telex: 1137893 EMBA BR

NORTH AMERICA

LOS ANGELES

Malaysian Trade Commissioner
Consulate General of Malaysia
Commercial Section
350 South Figueroa Street Los Angeles
California 90071, U.S.A.
Tel: 1-213-6171000
Fax: 1-213-4858617
Telex: 4720504 MALA UI
Cable: MALAWAKIL LOS ANGELES

NEW YORK

Malaysian Trade Commissioner
Consulate General of Malaysia
Commercial Section
11th Floor, 630 Third Avenue
New York, NY 10017, U.S.A.
Tel: 1-212-6820252
Fax: 1-212-9831987, 5578156
Telex: TRAEMB 429720

WASHINGTON, D.C.

Counsellor (Economics)
Embassy of Malaysia
Commercial Section
2407 California Street
NW Washington
DC 20008, USA
Tel: 1-202-3282783 / 3282785
Fax: 1-202-332
Telex: (202) 440119

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Consul and Trade Commissioner
Consulate of Malaysia
80 Richmond Street West, Suite #905
Toronto, Ontario
Canada M5H 2A4
Tel: 1-416-8693886
Fax: 1-416-8693883
Telex: (06) 217825
Cable: DAGANG TOR

EUROPE

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Commercial Section
Embassy of Malaysia
414A Avenue de Tervuren
1150 Brussels
Tel: 32-2-7724283 *(DL)* / 32-2-7626767
Fax: 32-2-7712380
Telex: 26396 MALAY B

KOLN

Malaysia Trade Commissioner
Malaysian Trade Commission
6th Floor, Rolex Haus Domprost-Ketzer
Strasse, 1-9, D-50667 Koln
Germany
Tel: 49-221-124007/8
Fax: 49-221-136198

LONDON

Senior Trade Commissioner
Malaysian Trade Commission
17, Curzon Street
London W1Y 7FE
United Kingdom
Tel: 44-71-4997388 / 4995908
Fax: 44-71-4938804
Telex: 265193 MTCLON G

MILAN

Malaysian Trade Commissioner
Consulate of Malaysia (Investment Section)
4th Floor, Via Vittor Pisani, 31
20124 Milan
Italy
Tel: 39-2-66984614/ 66984647
Fax: 39-2-66984749

MOSCOW

Malaysian Trade Commissioner
Embassy of Malaysia
Mosfilmovskaya Ulitsa 50
Moscow, CIS
Tel: 70-95-1471514 / 23
Fax: 70-95-1471526
Telex: 413473 MALAY SU
Cable: MALAWAKIL MOSCOW

PARIS

Malaysian Trade Commissioner
Service Commercial
De L'Ambassade De Malaysia
2 Bls Rue Benouville
75116 Paris
France
Tel: 33-1-45531185
Fax: 33-1-47273460
Telex: 610848 F

STOCKHOLM

Malaysian Trade Commissioner
Embassy of Malaysia
Commercial Bureau
Karlavagen 37
P.O. Box 26053
10041 Stockholm
Sweden
Tel: 46-8-7917690/ 7917942 (DL)
Fax: 46-8-7918761
Telex: 13416 MWAKIL S

THE HAGUE

Commercial Counsellor
Embassy of Malaysia
Commercial Section
Rustenburgweg 2, 2517 KE
The Hague
The Netherlands
Tel: 31-70-3505855 / 3505383
Fax: 31-70-3504757
Telex: 33024 MALAY NL
Cable: MALAWAKIL DEN HAAG

VIENNA

Malaysian Trade Commissioner
Office of the Commissioner of Malaysia
Mariahilferstrasse 84/5
A-1070 Vienna
Austria
Tel: 43-222-939306 *(DL)* / 222-939185 / 939346
Telex: 135541 TCMAL
Fax: 43-222-939306

Foreign Embassies & High Commissions in Malaysia

Embassy of the Republic of Argentina
3, Jalan Semantan Dua
Damansara Heights
50490 Kuala Lumpur
Tel: 03-2550176 / 2552564
Fax: 03-2552706

Australian High Commission
6, Jalan Yap Kwan Seng
50450 Kuala Lumpur
Tel: 03-2423122 / 2423458

Austrian Embassy
7th Floor, MUI Plaza Building
Jalan P. Ramlee
50250 Kuala Lumpur
Tel: 03-2484277 / 2484359

High Commission of Bangladesh
204-1 Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2423271 / 2432505 / 2487940

Royal Embassy of Belgium
12 Lorong Yap Kwan Seng
50450 Kuala Lumpur
Tel: 03-2485733 / 2485864 / 2485991
Fax: 03-2431191

Embassy of the Federative Republic of Brazil
22 Persiaran Damansara Endah
Damansara Heights
50490 Kuala Lumpur
Tel: 03-2548020 / 2548607

British High Commission
185 Jalan Ampang
50450 Kuala Lumpur
Tel: *(Main Office)* 03-2482122 / 0730-1730
Consular Section: 03-2487122

High Commission of Brunei Darussalam
16th Floor, Plaza MBF
Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2612828 / 2612800 / 2612820

Canadian High Commission
7th Floor, Plaza MBF
172 Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2612000
Fax: 03-2613428

Embassy of Chile
Wisma Selangor Dredging
Tingkat 8, West Block
142-C Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2616203
Fax: 03-2616219

Embassy of the People's Republic of China
229 Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2428495 *(Protocol & Administration)*
2428685 / 2385936
Consular Office: 03-2428585
Fax: 03-2414552

Embassy of the Czech & Slovak Federal Republic
32 Jalan Mesra
Off Jalan Damai
55000 Kuala Lumpur
Tel: 03-2427185
Fax: 03-2412727

Royal Danish Embassy
22nd Floor, Bangunan Angkasa Raya
123 Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2416088
Fax: 03-2423732

Embassy of the Arab Republic of Egypt
28 Lingkung U Thant
Off Jalan U Thant
55000 Kuala Lumpur
Tel: 03-4568184 / 4573515

Embassy of the Republic of Fiji
Suite 203, 2nd Floor, Wisma Equity
150 Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2428422 / 2428470 / 2428471

Embassy of Finland
15th Floor, Plaza MBF
Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2611088 / 2611157 / 2611168
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Embassy of the Republic of France
192-196 Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2484122 / 2484235
Fax: 03-2489117

German Embassy
3 Jalan U Thant
55000 Kuala Lumpur
Tel: 03-2429606 / 2429825
Fax: 03-2413943

High Commission of India
20th Floor, West Block
Wisma Selangor Dredging
142C Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2617000 / 2617001 / 2617009

Embassy of the Republic of Indonesia
233 Jalan Tun Razak
50400 Kuala Lumpur
Tel: 03-9842011 / 9841151 / 9841228

Embassy of the Islamic Republic of Iran
5 Lorong Mayang
Off Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2427788 / 99 2420878

Embassy of the Republic of Iraq
2, Jalan Langgak Golf
55000 Kuala Lumpur
Tel: 03-2480555 / 2480650 / 2480721

Embassy of the Republic of Italy
99 Jalan U Thant
55000 Kuala Lumpur
Tel: 03-456122 / 4565228 / 4564371
Fax: 03-4573199

Embassy of Japan
11 Persiaran Stonor
50450 Kuala Lumpur
Tel: 03-2427044

Embassy of the Democratic People's Republic of Korea
52-A, Jalan Damai
55000 Kuala Lumpur
Tel: 03-2423297

Embassy of the Republic of Korea
22nd Floor, Wisma MCA
Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2623385 / 2624377
Fax: 03-2623108

Embassy of the State of Kuwait
229 Jalan Tun Razak
50400 Kuala Lumpur
Tel: 03-9846033

The People's Bureau of the Great Socialist People's Libyan Arab Jamahiriya
6 Jalan Madge
Off Jalan U Thant
55000 Kuala Lumpur
Tel: 03-2411035 / 2411158 / 2411293
Fax: 03-2413549

Mauritius High Commission
Suite ABC, 14th Floor
Bangunan Angkasa Raya, Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2431870 / 2431791
Fax: 03-2415115

Embassy of Mexico
c/o MiCasa Hotel Apartments
368B Jalan Tun Razak
50400 Kuala Lumpur
Tel: 03-2618833

Embassy of the Kingdom of Morocco
Peti 9, Wisma Selangor Dredging
7th Floor, East Block, 142-b Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2610701 / 2610705 / 2610708

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5, Taman U Thant Satu
55000 Kuala Lumpur
Tel: 03-2424085 / 2423863
Fax: 03-2480049

Royal Netherlands Embassy
4, Jalan Mesra
55000 Kuala Lumpur
Tel: 03-2421341 / 2426844
Fax: 03-2411959

New Zealand High Commission
193 Jalan Tun Razak
50400 Kuala Lumpur
Tel: 03-2486122 / 2486560
Fax: 03-2415094

Embassy of the Federal Republic of Nigeria
14, Jalan U Thant
55000 Kuala Lumpur
Tel: 03-2484355 / 2481526
Fax: 03-2484342
Telex: 20184

Royal Norwegian Embassy
11th Floor, Bangunan Angkasa Raya
Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2420144
Fax: 03-2441239

Embassy of the Sultanate of Oman
5A Jalan Mengkuang
Off Jalan Ru
55000 Kuala Lumpur
Tel: 03-4575101 / 4575170 / 4574107

High Commission for Pakistan
152 Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2418877 / 80
Fax: 03-2415958

Embassy of the State of Palestine
63 Jalan U Thant
55000 Kuala Lumpur
Tel: 03-4568905 / 4568906

Papua New Guinea High Commission
1 Lorong Ru Kedua
Off Jalan Ampang
55000 Kuala Lumpur
Tel: 03-4574202 / 4574203 / 4574204

Embassy of the
Republic of the Philippines
1 Changkat Kia Peng
50450 Kuala Lumpur
Tel: 03-2484233 / 2484682 / 2484654

Embassy of the Republic of Poland
495, 4½ Mile, Jalan Ampang
68000 Ampang
Tel: 03-4576733 / 4576719

Embassy of Romania
114 Jalan Damai
Off Jalan Ampang
55000 Kuala Lumpur
Tel: 03-2425172 / 2417454 / 2482065

Royal Embassy of Saudi Arabia
7 Jalan Kedondong
Off Jalan Ampang Hilir
55000 Kuala Lumpur
Tel: 03-4579825 / 4579831 / 4579433 / 4579748

High Commission of the
Republic of Singapore
209, Jalan Tun Razak
50400 Kuala Lumpur
Tel: 03-2616277 / 2616404 / 2616506
Fax: 03-2616343

Embassy of Spain
200 Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2428776 / 2484868 / 2484655
Fax: 03-2424582

High Commission of the Democratic Socialist Republic of Sri Lanka
2A Jalan Ampang Hilir
55000 Kuala Lumpur
Tel: 03-4510000 / 4519009

Embassy of the Republic of the Sudan
27 Jalan Ampang Hilir
55000 Kuala Lumpur
Tel: 03-4569104
Fax: 03-4568107

Embassy of Sweden
6th Floor, Bangunan Angkasa Raya
123 Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2485433 *(3 lines)*
Fax: 03-2486325

Embassy of Switzerland
16 Persiaran Madge
55000 Kuala Lumpur
Tel: 03-2480622 / 2480751
Fax: 03-2480935

Royal Thai Embassy
206 Jalan Ampang
50450 Kuala Lumpur
Tel: 03-2488222 / 2488420

Embassy of the Republic of Turkey
118 Jalan U Thant
55000 Kuala Lumpur
Tel: 03-4572225 / 4572227
Fax: 03-4575730

Embassy of the United States of America
376 Jalan Tun Razak
50400 Kuala Lumpur
Tel: 03-2489011

Embassy of the Socialist
Republic of Vietnam
4 Persiaran Stonor
50450 Kuala Lumpur
Tel: 03-2484036 / 2484534

Embassy of the Socialist Federal
Republic of Yugoslavia
Lot 300, 4 1/2 Mile, Jalan Ampang
68000 Kuala Lumpur
Tel: 03-4564561 / 4561087

United Nations Development Programme
Office of the Regional Representative
for Malaysia, Singapore and Brunei Darussalam,
Wisma UN Block C
Kompleks Pejabat Damansara
Jalan Dungun, Damansara Heights
50490 Kuala Lumpur
Tel: 03-2559122 / 2559133

ADVERTORIALS

KULIM HI-TECH INDUSTRIAL PARK

TWIN PILLARS OF EXCELLENCE

Malaysia's Kulim Hi-Tech Industrial Park will be Twin Centres of Excellence for
- **Sophisticated Manufacturing Processes and R&D**
- **Training of Highly-Skilled Manpower**

MALAYSIA is poised to enter the world of high technology and R & D. To spearhead this thrust into the era of high technology, the Federal Government in collaboration with the State Government of Kedah have launched the Kulim Hi-Tech Industrial Park, which is located in Kedah, a State in the northern part of peninsular Malaysia.

THE KULIM HI-TECH INDUSTRIAL PARK

The Kulim Hi-tech Industrial Park will be a fully-equipped integrated industrial park offering commercial, housing and re-creational amenities together with parcels of land allocated for hi-tech industries and R & D facilities.

The KHTP measures 1,448 hectares which will be developed as a catalyst for the restructuring of the presently labour-intensive industrial sector to one that is technology-oriented. It will also serve as a centre for training skilled labour to satisfy the needs of hi-tech industries.

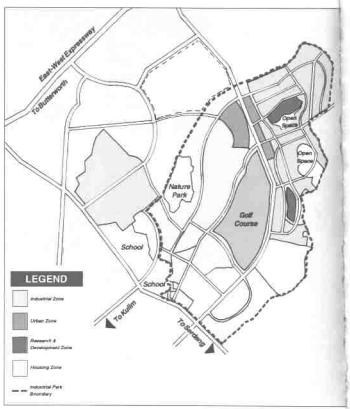
THE LOCATION

The KHTP is strategically located in the booming Northern Region of Malaysia near highways, international and national airports in Penang and Alor Setar and the international sea port in Penang, all a half hour drive from the Kulim Hi-tech Industrial Park along the Highway that is under construction.

The Northern Region, comprising the States of Perlis, Kedah and Penang, is home to 26 industrial estates manufacturing electrical and electronic components, non-metallic and rubber products, steel and cement. It has a ready pool of skilled workers familiar with high technology.

The Northern Region is part of the Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT), a concept which incorporates the Malaysian States of Kedah, Perlis, Penang and Perak, North Sumatra and the special territory of Acheh, and the Southern Thai provinces of Satun, Songkhla, Yala, Narathiwat and Pattani. The IMT-GT has a consumer base of 21 million.

The Northern Region has two universities - Universiti Sains Malaysia in Penang and Universiti Utara Malaysia in Kedah - which will provide highly-skilled manpower. The Northern Region also has a wide range of training institutions and vocational schools in Alor Setar, Sungei Petani, Penang and Perlis; an Industrial Skill and Management centre in Sungei Petani and an Industrial Training Institute in Jitra. There is also an industrial skill development centre on the island of Penang.



The KHTP will have six zones - Hi-tech Industrial Zone, Urban Zone, Housing Zone, Amenity Zone, R&D Zone and Institutional Zone.

THE INDUSTRIAL ZONE

The Industrial Zone covers 428 hectares with the first phase comprising 250 hectares which will feature Research & Development, administration and other supporting facilities.

Landscaped parks and green belts will enhance the beauty of the environment.

Site development of phase one has been completed.

THE RESEARCH & DEVELOPMENT ZONE

The first phase R & D block covers an area of 8.7 hectares while the second phase will be much larger at 28 hectares.

It is envisaged that a university/technical college will provide highly-trained professionals and scientists to undertake research while a polytechnic will be the main institution providing training in the sub-professional and technical fields.

In the Industrial Urban Town Centre will be a Skills Development Centre while a Technocentre will offer incubation facilities for researchers, laboratories, testing rooms, computer services, meeting/conference rooms, a convention centre and an information bank-cum-library.

An area of 30 acres has also been allocated for the establishment of a Software Park, which includes an Information Technology Centre to be operational by mid 1996.

THE URBAN ZONE

The Urban zone comprises three components - the Town Centre, Sub-centre and Neighbourhood Centre.

The Town Centre, which will be the commercial hub will encompass 101 hectares, featuring shophouses and offices plus an Urban Industrial Block. Facilities for cultural activities will also be featured.

THE HOUSING ZONE

Various types of houses will be built to meet the housing needs of the personnel employed in the KHTP.

Low and medium-cost terrace, semi-detached, bungalows, apartments and condominiums will be built.

Kulim Techno-City Sdn Bhd, a Kedah State Government/private sector joint venture company, will undertake the development of 500 shophouse units in the Urban Zone and 8,415 residential units in the Housing Zone. The entire development will be completed within five years.

THE AMENITY ZONE

This zone will provide for the leisure and recreational needs of the residents of the KHTP.

A Nature Park will be the major landmark as it will be sited at an existing hill that still retains its original vegetation. Green areas will account for 25 per cent of the KHTP's land usage.

Pedestrian pathways and cycling tracks will be prominent features.

A 27-hole championship standard golf course is being built. It will have an international clubhouse, bungalow lots, and service apartments/chalets.

Facilities for activities such as swimming, tennis and other sports will also be provided.

THE INSTITUTIONAL ZONE

This zone will comprise public facilities and institutional structures including a fire station, police station and other related facilities.

PROGRESS UPDATE

Work on the first phase of the KHTP, which include construction of roads, bridges, sewers, sewerage treatment works, water reticulation mains, telecommunications and electrical works, have already been completed.

Industrial Zone Phase One will have 33 factory lots ranging in size from 0.94 to 11.01 hectares. It will also include an 8.77-hectare site for Research & Development facilities and an 11.26-hectare site for an industrial and toxic waste storage plant.

Work has started on the development of the golf course. The first nine holes will be ready by the end of 1995.

A new 314-bed hospital to service the industrial park and the surrounding area has already started operating.

Reflecting a microcosm of what will be a city of the future will be six units of shop-houses and four units of ready-built factories scheduled for completion in May 1995.

THE FACILITIES

There will be:

- An industrial and toxic wastes storage plant
- Every factory will have **uninterrupted power supply** from two independent power sources. The total supply is designed to meet the projected demand of 157MVA.

  The main Sub-station (132/33/11kv) will supply 90 MVA X 2 in two stages. It is in turn fed by two 132kv transmission lines from Bukit Tengah and Bedong.
- State-of-the-art telecommunication systems utilising optical fibres and microwave radio linkages will be featured.

  The trunk optical line will connect the KHTP with Kuantan and Penang where linkages to the national and international networks will be established.

  A new repeater station for microwave transmission access, telephone exchange and teleport will be built for the projected 35,000 lines.
- Adequate water supply - three reservoirs will be built to meet the projected water supply demand of 79,000 cubic metres per day.

• THE INCENTIVES

Subsidised land price at RM7.50 (US$2.92*) per sq ft for R & D and manufacturing companies.

RM5 (US$1.95) per sq ft for companies setting up vocational education institutions. **These highly subsidised rates are only available for the first few companies.**

Leasehold for 60 years with option to renew for another 39 years

The Kulim Technology Park Corporation (KTPC) is prepared to build and rent premises to selected companies according to specifications with options to purchase. Selected companies may enter into a joint venture with KTPC.

(* US$1=RM2.56, March 1995)

ROADS

The new North-South Highway, which links Thailand to Singapore cutting through Peninsular Malaysia, passes through Kedah making it easily accessible to Thailand and Penang.

Construction of the East-West Highway i.e. a two-lane dual carriage way linking the KHTP to the Butterworth North Sea Port started in October 1994 and should be ready by June 1996.

AIRPORTS

There are international airports in Langkawi and Penang, and also an airport in Alor Setar.

RAIL

The railway line that runs from the north to the south of peninsular Malaysia passes through Butterworth and Alor Setar. This railway line is linked to the Thai railway network.

PORT

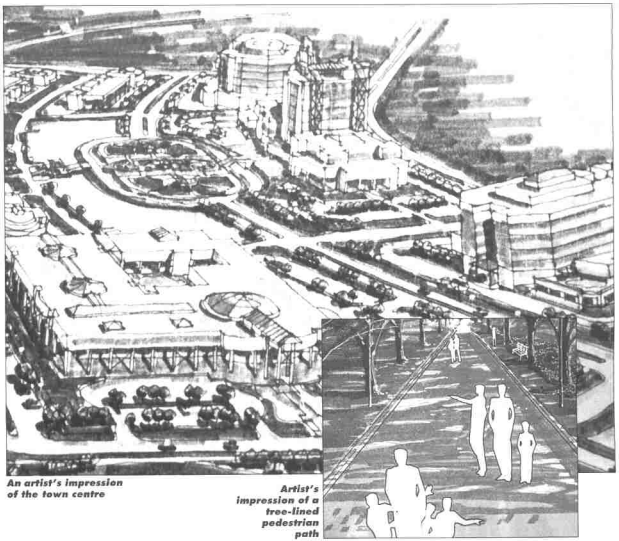
The KHTP will be served by the Butterworth North Sea Port about 25 km away. The Butterworth Wharves have two container berths, four break bulk berths and one vegetable oil (dolphin berth).

The Swettenham Pier on Penang island has two breakbulk berths while the Prai Bulk Cargo Terminal has two bulk berths and one inner berth. For all these facilities, there are no limitations on vessel size except for draught of harbour 10 M ACD.

• Contract R & D services

More than 90% of companies in South-East Asia lack knowledge and facilities for R & D and many may still be using obsolete methods of production. Investors setting up contract R&D operations can offer their expertise and services for design technology, materials technology or process technology.

* *Please refer to pages 16-19 for details of Federal Government incentives for hi-tech manufacturers and contract R&D services*



An artist's impression of the town centre

Artist's impression of a tree-lined pedestrian path

THE INVESTORS

The Kulim Hi-tech Industrial Park welcomes those in the following:

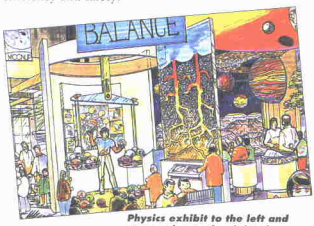
- ***Advanced electronics industries***
  Computers and peripherals, communication equipment, integrated circuit design, custom IC fabrication, microprocessor applications, computer software, alternative energy sources.
- ***Product testing & analysis services***
  Product performance, reliability testing, device failure and materials testing, product improvement and development, process development
- ***Manufacture of medical and scientific instruments***
  Electro medical instruments, scanners, analytical instruments, artificial organs, electron microscopes, spectrophotometers
- ***Manufacture of process control and automation equipment***
  Process control computers, process instrumentation, robotics automation systems, energy management systems, CNC machine tools, high pressure water cutting systems and vacuum generators. Other related services such as die casting and surface treatment processes.
- ***Optical and electro-optical applications***
  3-D photography, halography, optical lenses, laser chemistry, laser medical applications, fiber-optic communication
- ***Manufacture of optoelectronics***
  Optoelectronics system components such as optical disks and diodes and optical system components such as optical instruments and lenses.
- ***R & D in biotechnology***
  Genetic engineering, food research, antibiotics and cancer drugs.
- ***R&D in chemicals and biotechnology***
  Biochemicals, fine chemicals, pharmaceuticals and polymers.

Artist impression of an overhead Aquarium which measures 5 metres wide and 10 metres long

The building itself posseses many unique high-tech features which make it aesthetically appealing and functional. For instance, the building is capped by a 56-metre diameter geodesic dome constructed of green, translucent polycarbonate.

Besides blending well with the environment, the dome allows natural sunlight to filter into the building creating a natural ambience for the visitors. This dome together with the corrugated polycarbonate cladding on its exterior walls of the second and fourth levels give the building a spectacular appearance.

The interior of the building is just as innovative and impressive. It incorporates an Integrated Building Management System, the first Government building to have such *"intelligent"* features. Monitors and sensors regulate the air-conditioning, ventilation, security, fire-fighting and lighting systems. The internal environment is computer-controlled for optimum comfort, efficiency and safety.



Physics exhibit to the left and star station to the right of Pathways to Science gallery

Near the main building is a lake to provide a conducive environment for silent contemplation and meaningful reflections.

Nearer the main building is another unique concept - the *"Science Playground"* - which welcomes children to explore and discover for themselves the mysteries and wonders of science in an atmosphere of fun and games.

The atrium will have a distinctive Malaysian identity with the Perbadanan Kraftangan having done an excellent job decorating the area with elements of Malaysian culture such as huge kites and others. The message is clear - our rich heritage can co-exist with modern science and technology.

"Explainers", cheerfully wearing attractively-designed, multi-coloured labcoats decorated with scientific symbols, stand ready to assist visitors.

The *"explainers"* are trained to answer a question with another question to lead the visitor on a journey of discovery. This technique has proven to be highly effective in stimulating scientific curiosity - an essential element in science education.

The exhibition on the first two levels provides the main attraction of the National Science Centre. The exhibits are a blend of hands-on interactive exhibits, specialised environments, mini-theatres and experiential exhibits.

There will be a tunnel through which visitors must pass. This tunnel will be transparent with a freshwater overhead aquarium above measure 5 metres wide and 10 metres long. Visitors will be able to view the rich variety of tropical fishes found in Malaysian rivers and lakes.

Body System to the right with other exhibits to the left of Pathways to Science gallery

Telecommunication exhibits of Thinking Machine gallery

The visitor next enters the *"Environment Odyssey"* where leatherback turtles on a sandy beach welcome visitors. The scene of environmental destruction caused by indiscriminate deforestation impresses the visitor on the need for environmental conservation and the importance of science and technology in ensuring sustainable development for Malaysia.

Exiting the tunnel, the visitor turns left to the *"Pathways to Science"* gallery which deals with the basic principles of science covering the disciplines of Earth Science, Biology, Chemistry, Physics and Astronomy. Prominent exhibits include a cutaway section of the Earth, giant models of plant and animal cells, the *"Ocean Explorer"* which is a simulated submarine to take the visitor on an exploration trip to the deep sea, a Health Check-up area, a multi-screened video wall illustrating our body systems, a view of the Solar System and two mini-theatres equipped for special audio-visual effects.

A mannequin of a young boy holding the Wau Bulan (a Kelantanese kite) welcomes visitors to the *"Pathways to Discovery"* gallery which focusses on the process of the scientific method.

The exhibits demonstrate the five key areas of the scientific method, namely observation, hypothesis, data collection, experimentation and conclusion. The major exhibition areas are five interactive computer stations to illustrate the five key steps, a *"Bridge Building"* section exemplified by the famous Penang bridge and the *"Scientific Quest"* where visitors venture into an archaelogical dig in a cave environment.

Unlike the other galleries, the *"Children's Exploration Centre"* is open along the entire front and visitors can enter and exit at any point. This gallery caters for children from ages 4-12. Certain areas encourage parent and child interaction.

The *"Exploration Centre"* is the noisiest part of the gallery where the atmosphere is frequently punctuated with peals of laughter and screams of excitement of pre-school children.

They are having a terrific time playing with giant jigsaw puzzles, sticking colourful patterns on large magnetic boards or solving puzzles. Older children will be able to play with mechanical toys and electrical components, trying to take them apart and putting them back together again. This is an exercise in reverse engineering which will serve to motivate the youngsters.

Located in front of this gallery are the introductory exhibits *"Science Careers"*. By interacting with the three science career-oriented costumes, children are able to imagine themselves to be the type of scientist concerned.

At *"Space Lab"*, children manipulate control panels to help launch a rocket. The *"Amazing Maze"* houses a series of exhibits pertaining to human senses and anatomy.

Other exhibits nearby encompass the basic sciences of light, sound , electricity and magnetism. In the *"Submarine"* children are taken on a journey to the depths of the ocean through a video presentation. A series of hands-on exhibits dealing with and utilising water are also presented here.

The next stop is the *"TechnoMat"*, a section which shows the technology involved in the processing of our primary commodities such as petroleum, rubber, tin, timber, cocoa and palm oil. A section on emerging industries in the manufacturing sector will also be featured. The dominant exhibit is the Proton Saga symbolising Malaysian success in high technology manufacturing.

The visitor leaves with a better understanding of the role our industries play in promoting national development and the need to strike a healthy balance between industrialisation and the preservation of a sustainable living environment.

The *"Thinking Machines"* gallery takes the visitor to the world of communications. Visitors are able to trace the evolution of communication in the revolving theatre. This gallery helps to promote a better understanding of how computers, telecommunications and robotics make our lives easier and more efficient.

The *"Futureworld"* transports the visitor into the incredible and astonishing world of advanced technology and explains its impact on our lives. Advanced materials, fibre optics, superconductors, rockets and hypersonic planes will be showcased.

Proceeding on, the visitor enters the Hall of Fame of Malaysian Scientists where there will be three-dimensional portraits of prominent foreign and Malaysian scientists whose work has won accolades and contributed towards the advancement of science.

Creativity, innovation and invention are what the *"Inventor's Corner"* is all about. Inventions that transformed the world are exhibited here. So too are Malaysian inventions that achieved international success. This gallery also provides an avenue for Malaysian inventors to gauge the public response to their inventions and to receive valuable feedback to improve on them. Creativity is encouraged and promoted.

The National Science Center will also have facilities such as a cafetaria on the first level, a multi-purpose area on the fourth level, a gift shop, three workshops, three laboratories, a library, two auditoriums, a conference room, offices and a surau.

Many follow-up programmes such as demonstrations, workshops, lectures, courses, mobile science exhibits, science kits for schools, outdoor activities and outreach programmes will also be organised by the National Science Centre to keep alive the interest in science among the public.

Exhibits of Future World gallery

SHELL'S UNRIVALLED TECHNICAL EDGE

Sophisticated laboratory ensures Shell Malaysia's lead in the fuel and lubricants industry

Shell Malaysia has achieved another first with the setting up of a Product-Application-Development (PAD) laboratory, giving the petroleum giant the honour of having the first and only PAD laboratory operated by an oil marketing company in Malaysia.

The laboratory is specifically designed and configured to provide product application advice and technical services to customers to ensure that such products are scientifically used to increase their productivity and profitability.

Quality Performance

To ensure that the highest standards are met, the Shell PAD laboratory is run by a qualified chemist and received the Skim Akreditasi Makmal Malaysia (SAMM) accreditation by the Standards Industrial and Research Institute of Malaysia (SIRIM) in 1993. This accreditation is equivalent to ISO/IEC G 25, which is the highest quality award granted to laboratories in recognition of their competency in analysis, calibration and overall management.

A chemist conducting tests in the PAD laboratory

It compares favourably in terms of test performance with other laboratories in this region through periodical inter-lab correlation exercises as well as equipment calibration by SIRIM and other recognised bodies.

This is to ensure that the laboratory functions at maximum effectiveness at any time.

Innovative Techniques

The PAD laboratory offers real benefits to customers such as PULSE (Preventive-maintenance Utilising the Lubricants States in Equipment). This programme is designed to detect any impending failures of engineering components in advance.

This early warning diagnosis helps customers avoid costly unsheduled stoppages due to equipment breakdowns.

This equipment-maintenance programme offers a wide range of features such as physical characteristics, wear-metal contents in lubricants and diagnostic interpretations.

It also carries out quality tests on fuels, including petrol, diesel and Jet-A1 as well as bitumen. These tests help to ensure that only quality products meeting established control parameters are allowed in the market and that Shell products are competitive in terms of quality and technical excellence.

The laboratory is also fully equipped to perform in-house Jet-A1 recertification with state-of-the-art data analysis using a specially designed computer programme.

Customer Interface

The Shell PAD laboratory is managed by the Technical Department which together with a team of Technical Services Engineers covering the entire country provides the most extensive technical services to Shell's customers.

Test results are analysed and discussed with professionals of the Technical Department to provide total customer satisfaction.

The Shell PAD laboratory represents Shell's strong commitment to product quality and customer services in line with its corporate mission to be the *Customers' Number One Choice.*

It elevates customers' confidence in the use of Shell's wide array of scientifically designed products with unrivalled technical services.

Technovation Park in New Township

Innovative Development will Change the Image of Sungei Buloh

A new township will take shape just outside Kuala Lumpur which will dramatically change the landscape of Selangor by the early years of the 21st Century.

Called Pusat Baru Sungei Buloh, it will have a population of about 70,000 living in harmony with the environment.

A unique feature of the township, which is developed by PKNS (Perbadanan Kemajuan Negri Selangor), will be a Technovation Park that will be the focus of Research & Development activities featuring state-of-the-art facilities designed for the most sophisticated industries.

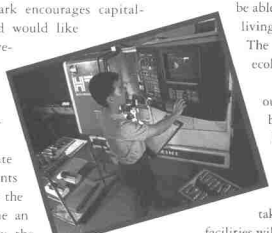
It is believed to be the first township in Malaysia to incorporate such a park for hi-tech activities. Non-polluting industries will be selected so that the residents will live in harmony with the environment.

In the Technovation (coined from the words 'Technology' and 'Innovation') Park, there will be four main components - high technology industries, supporting industries, handicraft industries and standard factory buildings.

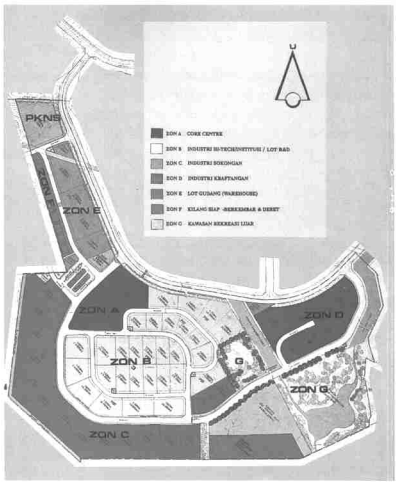
Industrial development will be divided into three categories - light industry, medium industry as well as godown or warehousing facilities. Only non-polluting value-added light and medium industries will be allowed to operate in the park.

Suitable industries include assembly plants for computers, television sets, radio and other electric and electronic products.

The Technovation Park encourages capital-intensive investment and would like leading companies to develop new products at the park and PKNS will tailor-make the facilities to suit their specific requirements.



The Park will also create employment for the residents of the township and boost the nation's efforts to become an industrialised country by the year 2020.



The township itself will be a model development for the 21st Century with ultra modern facilities and amenities.

As can be seen from the land usage plan, the emphasis will be on a garden concept whereby the residents will be able to enjoy the pleasures offered by nature while living in a modern and well-conceived settlement. The township will prove that development and ecological balance can co-exist in harmony.

Very little cutting of trees will be carried out during earthworks and replanting will be done wherever possible. Waterways will be retained instead of being filled in.

Of the township's 1,588.51 hectares, 43.5% or 688.12 hectares have been allocated for housing while the Technovation Park will take up 12.2% or 192.98 hectares. Recreational facilities will take up 502.23 hectares while 50.83 hectares have been allocated for commercial amenities.

Some 404 hectares of land will be handed to the Federal Government to be converted into a botanical garden. This garden will be multi-functional. Other than for the purpose of recreation, it will also be for scientific research and conservation of species. This will include a natural forest reserve, public exhibition area, an arboretum and a nursery.

There will also be space allocated for institutional and other types of development, making it a self-sustained township.

The Technovation Park is in line with the Government policy to make an information technology centre in the Klang Valley. PKNS is inviting multinational companies to site their plants in the township.

The township will be developed in two phases with the first scheduled to be completed by the middle of 1995.

The Pusat Bandar Sungei Buloh is located strategically between the current international airport at Subang and the North Klang Valley Expressway. It will lie between the km22 and km26 Jalan Subang-Sungei Buloh and km 20 Jalan Kepong-Kuala Selangor.

Currently, two trunk roads connect to the township. These are the Jalan Batu Tiga/Sungei Buloh and Jalan Kepong/Sungei Buloh. Another three alternative roads will be built which include linkages to the North Klang Valley Expressway as well as the merging of the Damansara Expressway to the North Klang Valley Expressway via the Bukit Lanjan Interchange.

Manufacturers investing in Technovation Park will find it even more convenient when the existing international airport in Subang is converted into a cargo port.

The township will have about 17,000 residential units ranging from low, medium-low, medium, medium-high, high-cost and luxury houses. Thus there will be a wide range of apartments, condominiums, bungalows, semi-detached and single- or double-storey link houses. A unique feature of the houses is that they will all have a minimum of three bedrooms. They will be of exciting and elegant new designs befitting the township's image as an ideal place to live in.

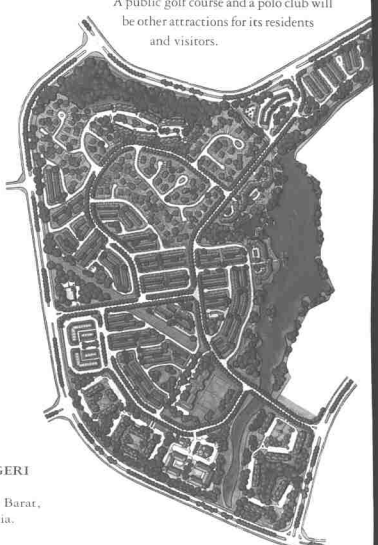
Emphasis will be placed on educational facilities - the township will have 12 national and religious primary schools, including two secondary schools. A public hospital, a mosque and cemetery will be included in the plan.

PKNS also has plans to build its own training centre for its own personnel. Private academic institutions will be encouraged to set up campuses in the township.

The commercial area will be the centre of activities in the township with provision for four-storey shophouses, complexes, office blocks, petrol stations, a mini post office, polyclinics, stalls, bus and taxi stations.

When completed, Pusat Bandar Sungei Buloh will change the image of Sungei Buloh, shunned for years as a leper's colony, forever.

A public golf course and a polo club will be other attractions for its residents and visitors.



PERBADANAN KEMAJUAN NEGERI SELANGOR
Head Office: Persiaran Barat, off Jalan Barat,
46505 Petaling Jaya, Selangor, Malaysia.
Tel: 03-7575066, 7572955, 7574144
Fax: 03-7576923, 7575250

Night scene of Johor Bahru

Get The Johor Advantage in Investment Opportunities

Pasir Gudang's Heavy Industrial Zone

JOHOR, which serves as the southern gateway to Malaysia occupying an area of 18,941 sq km, is one of the most developed states in Malaysia with well endowed natural resources. It is a major producer of commodities such as rubber, oil palm, pineapple, bananas and lowland tea.

The state is undergoing a transformation from agriculture to manufacturing activities. With its excellent location near to Singapore and the hub of South East Asia, it has established infrastructural support, adequate water and power supply, skilled labour and attractive incentives. The state is now poised to be one of the most developed and prosperous states in Malaysia.

With an average manufacturing sector growth rate of

more than 14% for the last 5 years, Johor is confident of achieving the status of a newly-industrialised state by the year 2005.

The Johor State Economic Development Corporation through its subsidiary JSEDC Technopark Sdn Bhd, has so far developed more than 20 industrial estates with a total of 2,573 hectares throughout Johor. Plans are afoot to open more new industrial estates and to expand the existing ones. For the next five years, 12 new industrial estates, totalling some 2,780 hectares will be opened, the largest being the Tanjung Langsat Industrial Complex and the Johor Technology Park.

The RM500 million Johor Technology Park, which will be fully equipped with various technological infrastructure needed by high technology industries, will be ready by the end of 1996.

Construction on the first phase of the 600-hectare park, which is located next to the Technology University of Malaysia (UTM) campus, will begin in September this year.

Tanjung Langsat, located east of Pasir Gudang, will soon inherit a magnificent industrial estate with the launching of an integrated industrial park project.

The 4,718 acres of industrial area will cater for heavy industries including steel and petrochemical industries. This is in line with the Government's aim to speed up industrialisation and encourage more value-added and down-stream industries.

The massive project will also have a total of 4,925 units of houses including 2,000 low-cost units.

With the needed manpower backup, the industrial site will be a self-contained area with the necessary infrastructure facilities, including a RM250 million deepwater port run by a private company.

Investors are welcome to look at the various incentives available in the State of Johor, Malaysia's most lucrative investment destination.

Petrochemical Industries: Symbol of Johor's economic success

Manufacturing Sector - The engine of growth for the decade

The Competitive E

Mesiniaga. Software Alliance Malaysia. QR Systems. VADS. IBM's alliances, in one form or another, continue to grow. Because now, more than ever before, IBM is positioned to help companies grow and compete effectively. At home and abroad.

Plaza IBM, headquarters of IBM Malaysia.

Each of the companies cited above represent some facet of IBM Malaysia's role as a provider of information technology, as an architect of business solutions, and as a promoter of local entrepreneurship and the development of local talent. Helping organizations develop a competitive edge.

Mesiniaga was formed more than a decade ago with a core group of IBMers handling the company's Office Products. The creation of a new company, staffed and managed by locals with only a minority IBM interest, was IBM's response to the challenge of the New Economic Policy. Today Mesiniaga ranks as a leader in the IT industry with 300 employees serving a much broader mission.

Software Alliance Malaysia is involved in high-end software development and systems integration.

VADS, a joint venture with Telekom Malaysia, the Employees Provident Fund (KWSP) and Permodalan Nasional Berhad, the investment holding arm of the government, is involved in developing and managing local and international networks serving different communities of users. MEDI*LINK, SUPPLY*LINK and GLOBAL*LINK are examples of value-added information networks that span the globe and provide professional groups as well as users in the retail, distribution and transportation sectors. 24-hour access to 750 cities in 90 countries. And the effort to add more services and connect more communities of users continues.

QR Systems is dedicated to helping their clients get the right quantity of the right products to their customers at the right place and at the right time while meeting all their expectations of quality. Their tool: EDI-based quick response solutions.

These four joint ventures as well as 18 business partners complement IBM's local staff of 350 highly skilled, highly trained professionals and many more experts, drawn as needed, from the corporation's worldwide network of offices and laboratories.

LAND, SEA and SKY

Whether on land, sailing the high seas or flying the open skies, the success enjoyed by IBM's customers in every major industry can be measured relative to their commitment to using information technology.

Bank Negara Malaysia, the nation's Central Bank, has invested in IBM 3890 Cheque Reader/Sorters since the early 1980s. The Bank demands the highest level of availability to support the activities of its Kuala Lumpur Automated Clearing House (KLACH) system which processes cheques to the value of hundreds of million ringgit everyday.

lge
TERNATIONALLY

Malayan Banking Berhad, Malaysia's largest bank uses an IBM ES/9000 system to support its 250 branches nationwide.

MAMPU, the Prime Minister's Department chose the Mesiniaga/IBM team to implement the Civil Service Link (CSL). This has made it possible for private companies and the public to access public information databases within government departments using multi-media technologies.

Malaysian International Shipping Corporation (MISC), the national shipping corporation, turned to IBM AS/400 systems to support the electronic communications network linking its representative offices, agents and brokers in 80 countries. That network is being set up and managed by VADS.

Malaysia Airlines has used IBM in many ways from implementing a far-flung reservations system to jointly developing a long term IT strategy to on-going management consulting.

"We believe–and our customers repeatedly demonstrate–that information technology is key to going global. At the same time global companies looking to invest in Malaysia want to know that they can find the kind of IT partner that is able to support their operations in a manner that is compatible with other more developed markets.

After more than 30 years of doing business in Malaysia, IBM is uniquely positioned to serve Malaysian companies looking outwards and foreign companies looking for ways to get in and establish themselves in this very dynamic environment."

Rodzlan Akib
General Manager
IBM Malaysia

NEW HORIZONS

Customized industry solutions and global networks are improving the competitiveness of local businesses and giving them access as well as the means to thrive in new markets.

But IBM is also engaged in a more long term effort to help realise the country's aspirations. That effort encompasses a variety of research and training projects with key institutes and universities. They include:

- **Malaysian Institute of Microelectronic Systems (MIMOS):** To explore the use of IBM PowerPC technology to produce components for the manufacturing sector
- **Universiti Pertanian Malaysia:** To conduct research into the local experience of Transformation Management and Information Technology

- **Universiti Teknologi Malaysia:** To support the development of CAD/CAM applications to serve local needs.
- **Universiti Kebangsaan Malaysia:** The setting up of the Business Advanced Technology Centre (BATC) provides state-of-the-art computer services for the manufacturing sector. Companies can take advantage of short courses offered by the Centre or use it as a partner in research addressing specific industry needs.

If you're looking for ways to extend your horizons through effective use of information technology, talk to us.

15th Floor, Plaza IBM, 1 Jalan Tun Mohd Fuad, Taman Tun Dr. Ismail, 60000 Kuala Lumpur, Malaysia.
• Tel: 7177788 • Fax: 7172188

IBM

THE YTL GROUP

THE MANY FACES OF INFRASTRUCTURE DEVELOPMENT

As one of Malaysia's leading Infrastructure Development companies, the YTL Group is playing its part in nation building. Founded just two years before Independence, our ability to gauge the country's needs has been fairly accurate. Our active and continuous participation in the advancement of the nation's infrastructure has helped us to build a historical record spanning four decades. We have learnt to grow in tandem with the country's tremendous social and economic development, adjusting and adapting relatively quickly to changing situations. With our diverse range of services, from Construction Contracting to Power Generation, we are well positioned to suit the stringent criteria of such a progressive country.

Construction Contracting Division

Our introduction into the construction business was in 1955 with projects such as ammunition depots and garrisons for the British Army. Answering the nation's call after Independence, we were deeply involved in setting up major military and police camps located strategically throughout the country to deter any factions threatening at the time.

After taking the necessary steps towards the safety of society and State, the Government turned its attention to the future. The 1970's saw our involvement in many major developments in the industrial, agricultural and educational sectors. Traces of the solid foundation built then are still apparent today and they are still a source of influence.

This momentum was carried forward to the next decade with added frenzy caused by the need for modernisation. The high-rise era had arrived and again, conforming to the needs of the nation, we made our presence felt, being responsible for a large number of the buildings in Kuala Lumpur. Our responsiveness to innovative technology influenced many pioneering features that have become industry standards today: slipforming, steel scaffolding, skid-mounted portable cabins, tower cranes and passenger hoists amongst others.

Our special interest in health services dates back to the 1950's, starting with a small outpatient centre and progressing steadily to building fully-fledged General Hospitals around the country. We have recently successfully completed the design, contruction and equipping of 12 district hospitals in a major nationwide scheme for the Government.

Property Development Division

The development of property seemed to us the natural progression from construction. We started with social housing schemes in the 1980's and initiated a Housing Development Unit (HDU) specifically to research into this area. The dedication we gave to this particular field reflected our inspiring success. The reputation we earned for being a reliable developer was further recognised with our entry into condominium developments. We have now carried our social housing experience overseas through projects for the Governments of Papua New Guinea, South Africa and the Seychelles.

Tourism Division

Our comprehension of the design, building, development and management of properties gave us the faculty to progress into tourism. Our first venture into hotels began on the remote and then uninhabited island of Pangkor Laut. Time and experience saw staged improvement plans, and it now enjoys enormous popularity as an international 5-star resort, following its re-opening in 1994 by the Prime Minister which was celebrated by a special concert given by Luciano Pavarotti.

Our involvement in the tourism industry has not been restricted to just 'total package' developments. Each division is more than capable of making its contribution to the Group. The Eastern & Oriental Express luxury train which journeys from Singapore to Bangkok via Kuala Lumpur has had a strikingly successful first year.

Manufacturing Division

The core of our manufacturing activity is Buildcon Berhad, producer of ready-mixed concrete. Operations began in the late 1970's, with a single plant and six trucks, primarily to complement the construction activity. Systematic upgrades now place us as a market leader, with 28 plants and over 200 trucks. 1992 saw the creation of a fresh national record when **Buildcon Berhad** delivered and placed 5,000 cubic metres of concrete in a record 31 hours for the raft foundation of Kuala Lumpur's Telecommunications Tower, Menara Kuala Lumpur. As a proclamation of our commitment to this sector we not only received the MS ISO 9002 International Certification for quality but we were also listed on the Kuala Lumpur Stock Exchange in 1993. Two further pours, totalling 13,000 cubic metres for the Kuala Lumpur City Centre's twin towers, were achieved in end 1993/early 1994. YTL/Buildcon is now going into cement manufacture in a Joint Venture with the Pahang State Government to build a 1 million tonne plant.

Power Generation Division

Firmly established in all our activities, we were confident enough to participate further in the nation's development. In order to reduce spending and streamline operations the Government tabled many privatisation plans. Under the Independent Power Producer (IPP) programme, we secured the licence to become the first IPP in the country and we have now built and commissioned two power stations with a combined capacity of 1,212 megawatts. Financial closure was achieved within a year and the first gas turbine went into operation after only 10 months, resulting in the first supply of IPP electricity into the Malaysian National Grid, 7 months ahead of schedule.

The YTL Group

Our growth into the Utilities is further testimony that our progression as a company corresponds with that of the nation. As Malaysia proceeds with its bid for nation building towards full development status by 2020 we will continue to play our part in enhancing and advancing its infrastructure.

CARING FOR THE ENVIRONMENT IS OUR BUSINESS

Enersave Group has over 12 years' experience in water treatment

THE **Enersave Group of Companies** is a one-stop water and waste-water treatment specialist.

The Group is capable of manufacturing turnkey environmental process plants as well as total solutions for water and waste-water treatment.

It has engineers of varied disciplines and is capable of doing civil engineering works, piping, mechanical installations as well as chemical engineering systems.

Fully-equipped with Computer-Aided Design and a vast database accumulated over a decade, the Group is capable of producing comprehensive engineering designs for complex water treatment systems in a matter of weeks.

Enersave waste water treatment plants are specially designed according to the stringent demands of the various industries. With the years of experience behind it, the company has become one of the most innovative solution solvers in waste water treatment in the South East Asia region.

It all began in 1982 when a group of professionals envisioned a need for ecologically sound solutions for various water needs from a wide spectrum of industrial applications.

Enersave Engineering Systems was established that year followed later by Enersave Engineering Products and Enersave Chemicals.

The group's philosophy is that the environment must be protected against the destructive effects of industry. Industrialisation affects the fragile environment that we live in and wherever there is a need for industry, there is a need for water which needs to be treated before put to use and treated again so that it can be safely discharged without poisoning the environment.

The Enersave Group is now represented in Malaysia, Singapore, Indonesia, Taiwan and China.

Enersave undertakes the design, supply, installation, testing and commissioning of all types of waste water treatment plants in the following industries:

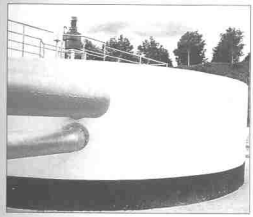
- Semiconductor industry
- Electroplating industry
- Textile Industry
- Dyeing industry
- Pulp and paper industry
- Palm oil industry
- Oleochemicals industry
- Food processing industry
- Rubber & latex industry
- Tannery industry
- Petrochemical industry
- Pharmaceutical industry
- Metal surface treatment industry
- Hospital wastes
- Sewage and Domestic work

The following processes and applications can be applied to the above industries:

- Water and waste water treatment
- Demineralisation
- Softening systems
- Flocculation & filtration systems
- Reverse osmosis systems
- Sewage treatment
- Waste recycling
- Sludgeless waste water treatment process
- Deep shaft waste treatment process
- Mini RO systems (household)
- NF membrance filtration
- Drinking water/portable water
- Air pollution treatment
- Maintenance & trouble shooting
- Chemical cleaning of RO/DI systems

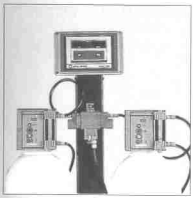
ENERSAVE ENGINEERING PRODUCTS SDN BHD

E E P



EEP provides sales and services to a large clientele in public utilities, building services, manufacturing and resource/power based industries with a wide product range of leading technology from reputable overseas manufacturers.

This company was formed to meet the growing demands for better pumping equipment, water disinfection systems in water and waste industries and process plants with the expertise accumulated through years of experience.



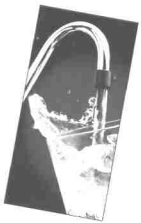
With a highly capable marketing team complemented by a proven track record, services ranging from pumping and water disinfection designs to single equipment selection are provided with state-of-the-art CAD and CAM technology.

Currently, the company supplies and services installations in:

- JKR pumping and water treatment plants
- Municipal and industrial waste treatment plants
- JPS irrigation and drainage stations
- Felda, Felcra and TNB power plants
- Manufacturing process plants
- The company is also a licensed supplier under the Ministry of Finance, Malaysia

EEP is the sole distributor of the following products:

- ABS Pumpen AG (Germany): Submersible pumps, mixers, aerators and packaged pumping stations. ABS Scan process pumps
- Capital Controls Company Inc (USA): Water disinfection systems
- Seepex Pumpen (Germany): Eccentric screw pumps and macerators
- Paco Pump (USA): Centrifugal pumps for building services
- Huber Rotamat (Germany): Dewatering and sludge removal systems



ENERSAVE ENGINEERING SYSTEMS

Enersave Engineering Systems designs, instals and services various types of water and waste-water treatment plants for all industrial applications. Among its services/products are:

DI/Softeners: The use of Ion exchange resin makes it possible to reduce the TDS in water down to theoretical low levels. For low pressure boilers, we need a simple softening process by using cation exchange resins. For more demanding/effective TDS removal, both cation and anion resins are used in various combinations to purify water down to theoretical levels.

RO-NF: Reverse Osmosis membranes provide ultra-pure water for all types of industrial, domestic and even medical applications. This system removes impurities and dissolved minerals such as bacteria, pyrogens, colloids, particles, silica and organic matter from water. NF is used for removal of trihalomethanes from drinking water sources as well as for softening among other applications.

Deep Shaft Waste-water treatment: The Deep Shaft activated sludge process by means of aeration is an excellent solution in saving space and energy. Ideal for optimising factory/plant space and substantially reduces operating costs.

Sludgeless waste-water treatment and heavy metal recovery: All industries must meet the strict standards of industrial effluent discharge into sewers and water-courses. This system provides waste-water treatment plus the capability of recovering valuable metals after rinsing.

Chemical Treatment - Flocculation and Filtration: This system converts river or well-water for industrial and domestic applications effectively and economically. Employing the latest technology including sludge blankets and tube module clarifiers, EES also provides multi-media filtration process among other treatments.

ENERSAVE CHEMICALS SDN BHD

When it comes to chemical treatment technology, Enersave Chemicals provides advanced chemical treatment technology services and complex industrial solutions for increased efficiency and productivity.

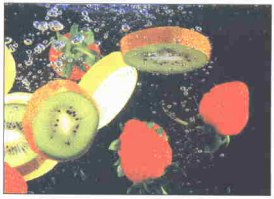
As the key supplier for completed EES projects, Enersave Chemicals also produces Technical Grade Caustic Soda Liquor and Composite Polymers for Deionising Plants and Water Treatment respectively.

Enersave Chemicals also produces and supplies specialised chemicals including:

- Coagulants and flocculant polymers
- Scale and corrosion inhibitors
- Microbiocides
- Dispersants
- Fuel additives
- Bacteria for bio-treatment

Enersave industrial chemicals, advanced biological chemical treatment technologies have been proven in the following industries:

- Electronics
- Electro-plating
- Food & brewing
- Industrial effluent treatment
- Municipal sewage treatment
- Paper & textiles
- Plastics & rubber
- Boilers & cooling water
- Portable & raw water treatment



Enersave Engineering Systems Sdn Bhd

ENERSAVE GROUP

JOB REFERENCES

Client : Motorola (M) Sdn Bhd
Contract value : RM3,100,000
Year : 1989
Description : Design, supply, installation, testing and commissioning of RO/DI water plants and waste water treatment plant

Client : Baxter (M) Sdn Bhd
Contract value : RM2,000,000
Year : 1990
Description : Design, supply, installation, testing and commissioning of a 12,000 m^3/d waste water treatment plant and an 18m^3/hr RO plant

Client : ChungHwa Picture Tubes (M) Sdn Bhd
Contract value : RM22,500,000
Year : 1992
Description : Design, supply, installation, testing and commissioning of raw water, DI water, waste water, process piping works and accessories

Client : Procter and Gamble (M) Sdn Bhd
Contract value : RM2,550,000
Year : 1992
Description : Design, supply,installation, testing and commissioning of a waste water treatment plant

Client : Samsung Electronic Devices and Samsung Corning (M) Sdn Bhd
Contract value : RM11,000,000
Year : 1993
Description : Design, supply, installation and commissioning of DI water system, waste water treatment plant and piping works

Client : PT Indocement, Indonesia
Contract value : RM3,100,000
Year : 1993
Description : Design, supply, installation, testing and commissioning for ultra pure water system

Client : Motorola Inc, Tianjin, China
Contract value : RM2,800,000
Year : 1994
Description : Turnkey project of RO/DI and waste water treatment plant for Motorola Tianjin, China. The RO/DI plant is good for wafer fabrication application having a product resistivity of 18 mega Ohm

Client : Siemens AG
Contract value : RM2,850,000
Year : 1994
Description : Design, supply, installation, testing and commissioning of DI water treatment plant and chemical dosing systems for both Paka and Pasir Gudang Power Plants

Client : Genting Sanyen Paper Industries
Contract value : RM2,000,000
Year : 1994
Description : Upgrading of waste water treatment plant

Client : Babcock K-W Sdn Bhd
Contract value : RM1,400,000
Year : 1995
Description : Design, supply and install DI water treatment plant for Kerteh refinery

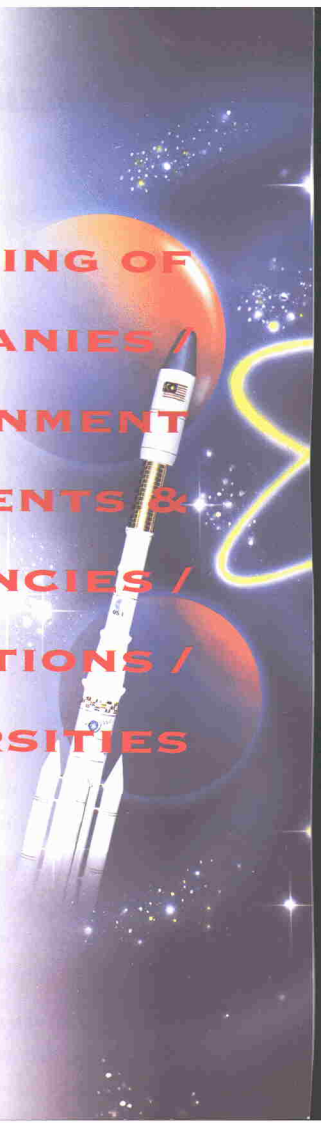
Head office & Factory: **Enersave Engineering Systems Sdn Bhd**
Lot 4, Jalan Kemajuan Satu 16/17A, 40000 Shah Alam, Selangor, Malaysia
Tel: 603-559 6666 Fax: 603-559 3666, 559 4875

ALPHABETICAL INDEX TO ADVERTISERS AND LISTING OF ORGANISATIONS

(Advertisers are marked in bold)

INDEX TO THE FIELDS OF RESEARCH/ PRODUCTS & SERVICES

Listing of Companies / Government Departments & Agencies / Institutions / Universities



STABILCHEM (M) SDN BHD

Quality comes first in our corporate way of life. We believe that our partnership will foster a strong and lasting bond between us to work together in solving problems in plastic processing.

We invite our customers to visit us and see for yourselves our facilities and commitment to provide the most innovative and competitive Quality products.

Start now to build a bridge with ***STABILCHEM's*** Research & Development Centre.

STABILCHEM (M) SDN BHD *(A wholly-owned subsidiary of Acidchem (Malaysia) Berhad)*
P.O. Box 152, 12100 Butterworth, P.W., Penang, Malaysia
Tel: 604 - 390 7818 *Fax:* 604 - 399 9370

Acidchem Group
Stabilchem (M) Sdn Bhd

Name of agency/institution/company:
Stabilchem (M) Sdn Bhd
A wholly-owned subsidiary of Acidchem (Malaysia) Berhad

Name of group/centre:
Stabilchem's Research & Development Centre

Person(s) to contact:
- Michael Tiah *(Managing Director)*
- Sam Appalasami *(Business Development Manager)*

Office address:
P.O. Box 152
12100 Butterworth, P.W.
Penang, Malaysia

Telephone:
604 - 390 7818

Telefax:
604 - 399 9370

PRODUCTS MANUFACTURED

- Metallic stearates for rubber, pharmaceuticals, paint & coatings, pigment compounding, cosmetics & toiletries, animal feed application
- 1 pack PVC compound stabilizers
- Liquid type stabilizers - solvent free & solvent types
- We specialise in producing to customer specifications

GENERAL INFORMATION

Stabilchem's Research & Development is Customer Driven

STABILCHEM is the largest producer of Metallic stearates and PVC stabilisers in Malaysia. It is based in the Prai Industrial Complex, Penang and uses palm based fatty acids supplied by the **ACIDCHEM** Group as raw materials for its production.

STABILCHEM has established a Research and Development centre fully equipped with the latest state-of-the-art equipment for the formulation and testing of plastic compounds and other products. These equipment include High Speed Mixer, Two Roll Mill, Torque Rheometer, Impact, Hardness and Tensile Testers, Thermostatic Oven etc.

STABILCHEM is fully committed to support its sales activities by working closely with its customers worldwide and providing them with technical back-up services on product quality, development and testing of new formulations and trouble-shooting.

STABILCHEM plays a leading role in Research and Development in the oleochemical industry by offering specialised services to the PVC, paint, polymers and rubber industries.

The specialised services offered by **STABILCHEM** include:

- Evaluation of plastic compounds
- Simulation of industrial process conditions
- New product formulations for the stabilisation of PVC, Polystyrene, Polypropylene
- Evaluation of formulations required by customers
- Technical back-up services to trouble-shoot problems during processing of compounds

Airod Sdn Bhd

Name of agency / institution / company:
AIROD Sdn Bhd

Person(s) to contact:
- Dato Wan Abdul Majid
  (Senior Director, Marketing and Contracts)
- Kong Kok Wah
  (Director, System Engineering and Research)

Postal address:
Locked Bag 4004
Pejabat Pos Kampung Tunku
47309 Petaling Jaya
Selangor, Malaysia

Telephone:
603 - 746 5112

Telefax:
603 - 746 4709

Telex:
MA 379 10

Office hours:
7.30 am - 5.00 pm *(Mon - Fri)*

SERVICES OFFERED

- Manufacturing and process technologies and engineering:
  - Cleaning process
  - Electroplating
  - Welding
  - Machining
  - Heat treatment
  - Inspection methods
  - Painting
  - Sheetmetal and fibreglass shop
  - Hoses and tubing fabrication
  - Precision measuring equipment laboratory
- Mechanical and industrial engineering
  - Bearing and seal
  - Non-destructive test
  - Rotor balancing
  - Hydraulic equipment
  - Fuel and oil accessories
- Aerospace technologies and engineering
  - Avionics
  - Aeronautical engineering/electrical engineering

GENERAL INFORMATION

AIROD is a joint venture between Aerospace Industries Malaysia (AIM) and Lockheed Aircraft Services International (LASI), California, USA.

AIM's partners are the Government of Malaysia, Malaysia Airline System and UMW Holdings Berhad.

AIROD has well established facilities and a dedicated, experienced and reliable workforce to provide high quality internationally recognised cost-effective depot level maintenance services to meet the growing needs of national and international civil and military aviation.

The facilities, professional engineering, design and development expertise are also open to general industries.

Amalgamated Steel Mills Berhad

Name of agency / institution / company:
Amalgamated Steel Mills Berhad

Name of group / centre:
Technical Services

Name of laboratory/ project:
Chemical and Mechanical Laboratory

Person(s) to contact:
- Yap Kok Lai
  (Assistant Manager)
- Tee Teck Hooi
  (Executive - Mechanical Lab)
- Chia Boon Hock
  (Executive - Chemical Lab)

Office address:
Lot 6, Solok Waja Dua
Bukit Raja Industrial Estate
41050 Klang
Selangor, Malaysia

Telephone:
603 - 341 2323, 341 2322

Telefax:
603 - 342 1923

Office hours:
8.30 am - 5.15 pm *(Mon - Fri)*
8.30 am - 4.15 pm *(Sat)*

FIELDS OF RESEARCH

Material science and technology - metal (steel)

SERVICES OFFERED

- Chemical analysis of plain carbon steel sample - common element C, Mn, P, S, Sl.
  Other element upon request.
- Tensile test of steel sample

SUMMARY OF TECHNICAL SPECIFICATIONS

For chemical analysis of plain Carbon Steel Sample, the company has equipment which is capable of analysing up to 17 elements i.e. C, Mn, P, S, Sl, Cu, Nl, Cr, Al, Mo, Sn, As, Nb, V, B, Ca Tl. In the area of Tensile testing of steel sample, the yield strength,the tensile strength, elongation and reduction area can be determined.

Bio - Focus Saintifik Sdn Bhd

Name of agency / institution / company:
Bio-Focus Saintifik Sdn Bhd

Name of group:
Melaka Branch
Lab Essentials (S) Pte Ltd, Singapore

Person(s) to contact:
- Mr. Riza A Beg *(General Manager)*
- Mr. Christopher Tay *(Sales Manager)*
- Ms. Wong La Hong *(Sales Executive)*

Office address:
29, Jalan PJS 11/16, Bandar Sunway
46150 Petaling Jaya, Selangor, Malaysia

Melaka Office:
PO Box 468, 75760 Melaka, Malaysia

Lab Essentials (S) Pte Ltd:
108, Pasir Panjang Road
#02-02 Amcol Warehouse, Singapore 0511

Telephone:
603 - 733 7055 *(Petaling Jaya)*
603 - 733 7056 *(Hunting line)*

Telefax:
603 - 734 4962 *(Petaling Jaya)*

Office hours:
8.30 am - 5.30 pm *(Mon - Fri)*

SERVICES OFFERED

Bio-Focus Saintifik, which is 10 years old has been and will continue to serve the R&D agencies/ institutions, public and industrial sectors by supplying their scientific instrumentation and consumables needs.

We focus our efforts to promote advanced technology and methodology to fulfill the objectives and aspirations of our customers. This effort is made possible through a dedicated team of sales/marketing, customer service and the technical service department.

Our aim is to provide a customer orientated service in the field of material and analytical testing, environmental analysis, filtration technology, microbiological applications and life sciences studies.

Credos to YOU, our customers;

- First to be responsible to the customers we serve and all those who use our services and products
- Continually strive to meet customer's requirement in products sold and services provided
- Meeting customer's requirement through Total Quality Performance
- Servicing customer's order promptly and accurately
- Strive to be cost effective in everything we do to maintain reasonable prices for the customers

SUMMARY OF RESEARCH / CONSULTANCY EXPERIENCE

- Analytical Instruments
- Environmental Applications
- Filtration Processes
- Life Sciences
- Material Testing
- Microbiology Studies
- Plasticwares and Basic Lab Items
- Thermal Processes

We are registered with the Treasury Department

Biochem Laboratories Sdn Bhd

Name of agency / institution / company:
Biochem Laboratories Sdn Bhd

Office address:
51C Beach Street,
10300 Penang,
Malaysia

Telephone:
604 - 261 3612, 261 1212

Telefax:
604 - 261 2532

Type of organisation:
Independent Testing Laboratory
The field of activities of the laboratory is to provide chemical testing and microbiological analysis

Chemistry laboratory:
Mr Khoo Boo Chai
B. Sc. (Hons), M. Sc. AMIC, AMSA, MMOSTA, LRSC

Microbiological laboratory:
Ms. Kanaka Menon
B. Sc. (Hons), CMLT, D.A.P. & E.

Type of Services:

- Microbiological Analysis
- Chemicals Analysis
- Industrial Hygiene - Noise and Inorganic Lead Monitoring

Accreditation and Recognition

- A SAMM LABORATORY

ACCREDITED
MALAYSIA
ISO / IEC G 25
TESTING
SAMM NO. 020

- FOSFA International Affiliate Member Analyst

FOSFA INTERNATIONAL
AFFILIATE MEMBER ANALYST

- Affiliate Member of the UnionInternationale Des Laboratories Independants (UILI)

- Licensed by PORLA (Palm Oil Licensing Authority) to analyse Palm Oil

Clarion (Malaysia) Sdn Bhd

Name of agency / institution / company:
Clarion (Malaysia) Sdn Bhd

Name of laboratory / project:
R & D Centre

Person(s) to contact:
- Mr. K. Ichikawa *(Managing Director)*
- Mr. TK Tan *(Director)*

Office address:
Bayan Lepas, Free Industrial Zone 1
11900 Penang
Malaysia

Telephone:
604 - 643 9106 / 7, 644 4054, 644 5177

Telefax:
604 - 643 9108

Office hours:
8.20 am - 5.30 pm *(Mon - Fri)*

FIELD OF RESEARCH

Car audio products

HARDWARE FACILITIES

Equipment

- IBM RISC 6000
- PC 486DX2

SOFTWARE FACILITIES

- Mechanical Design Software
- PCB Design and Simulation Software

Ebor Research - Sime Darby Plantations

Name of agency / institution / company:
Ebor Research - Sime Darby Plantations

Name of laboratory / project:
Ebor Laboratories

Person(s) to contact:
- Ho Chai Yee
  (Research Director, Sime Darby Plantations - Ebor Research)
- Ms Wooi Kheng Choo
  (Laboratory Manager, Ebor Research)

Postal address(es):
- Sime Darby Plantations - Ebor Research
  P.O. Box 7202
  40706 Shah Alam
  Selangor, Malaysia
- Ebor Research
  P.O. Box 147
  41910 Klang
  Selangor, Malaysia

Telephone:
Shah Alam: 603 - 559 0137
Klang: 603 - 341 1762

Telefax:
Shah Alam: 603 - 550 3728
Klang: 603 - 341 4188

Office hours:
8.30 am - 5.00 pm *(Mon -Fri)*
8.30 am - 12.00 pm *(Sat)*

FIELDS OF RESEARCH

- **Analytical Laboratory** - foliar, soil, fertiliser, water & effluent
- **Quality Control Laboratory** - SMR, latex, palm oil & pesticide
- **Tissue Culture Laboratory** - cloning of crops
- **Project & Development** - advisory services on all aspects of rubber cultivation, clonal selection, nursery practices and rubber exploitation
- **Oil Palm and Planting Material Section** - covering all aspects of oil palm cultivation
- **Plant Protection Section** - specialist advice on plant protection
- **Soil and General Agriculture Section** - technical consultancy on soil and water management and diversification projects including fruit trees and plantation forestry
- **Oil Recovery Department** - specialist advice on optimising harvesting organisation in oil palm plantation, maximising crop recovery, minimising processing losses in the mill and grading and awarding system for Group Estate and Non-des FFB
- **Mechanisation Department** - specialist advice on agriculture mechanisation

GENERAL INFORMATION

Ebor Research undertakes R & D on plantation agriculture for Sime Darby. Formed in 1979, it conducts research on oil palm, cocoa and other crops. The R & D programmes are mainly of an applied nature and geared towards the profitability of these crops. Basic research is left largely to the public sector research institutions with which Ebor Research has close liaisons.

Envilab Sdn Bhd

Name of agency / institution / company:
Envilab Sdn Bhd

Name of group / centre:
ITS Holdings Sdn Bhd

Name of laboratory / project:
Envilab Sdn Bhd

Person(s) to contact:
- Kee Hong Chai *(Country Manager)*
- Tin Kim Ang *(Project Manager)*
- Lim Swee Choon *(KL Manager)*

Office address:
26 & 28, Jalan 25/34, Taman Mayang
47301 Petaling Jaya
Selangor, Malaysia

Telephone:
603 - 703 1888

Telefax:
603 - 703 8047

Office hours:
8.30 am - 5.30 pm *(Mon - Fri)*

SERVICES OFFERED

- Chemical analysis
  (Accredited to SAMM, FOSFA, NIOP)
- Water & wastewater treatment
  (Design & installation)
- Air pollution control
  (Monitoring, design & installation)
- Sewage treatment (Design & installation)
- EIA study
- Wastewater characteristics study
- Specialty chemical
- Commissioning & maintaining of wastewater & sewage treatment plant
- Upgrading of wastewater plants

RESEARCH EXPERIENCE

- Solved wastewater pollution problem.
- Formulated chemicals for wastewater treatment plant

CONSULTANCY EXPERIENCE

- Conducted EIA study
- Conducted wastewater characteristics study
- Design & install air pollution control unit.
- Design & install wastewater treatment plant
- Design & install industrial water treatment plant

COMPANY PROFILE

First founded in 1979 as an analytical laboratory, Envilab provides a comprehensive range of analytical services for industries ranging from edible oil to trade waste and sewage effluent. Today, Envilab is accredited by both the local and international authorities for various tests. These include the SAMM (Malaysia), FOSFA (Europe) and NIOP (USA).

Envilab has diversified its operations into Pollution Control, Wastewater Treatment, EIA Studies and Sewage Treatment. In these areas, it has gained tremendous experience and expertise, particularly in the design, installation and commissioning of all forms of wastewater and sewage treatment.

Concentrating its activities mainly in the ASEAN region, Envilab has to-date supplied some 100 wastewater treatment system in a wide variety of applications. It has also provided numerous EIA studies for various industries.

Envilab Sdn Bhd has regional offices in Johor Bahru, Kuala Lumpur and Ipoh. The company is registered with Pusat Khidmat Kontractor under Class C (Section I sub-section 1 & 5, Section III sub-section 5,6 & 14) Skim Akreditasi Makmal Malaysia (SAMM) for water and wastewater analysis, DOE as Analytical Chemist and pollution control consultant

Fisheries Research Institute

Name of agency / institution / company:
Fisheries Research Institute

Person(s) to contact:
Director of Research

Office address:
Fisheries Research Institute
Department of Fisheries Malaysia
11700 Glugor
Penang, Malaysia

Telephone:
604 - 657 2777, 657 3150

Telefax:
604 - 657 2323

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

RESEARCH EXPERIENCE

- Aquatic ecology and pollution studies
- Demersal fish resource survey
- Remote sensing
- Mollusc research
- Marine fisheries biology and survey
- Marine fisheries resource assessment
- Marine turtle research and conservation
- Fishing gear research
- Recreational fisheries
- Hatchery technology
- Brackishwater aquaculture
- Freshwater fisheries research

GENERAL INFORMATION

The Fisheries Research Institute (FRI) was established in 1957 as a branch of the Department of Fisheries, Ministry of Agriculture, Malaysia, to carry out research in all aspects of fisheries for its rational development.

Starting from a single premise in Glugor, Penang, FRI has since developed into a major research complex with 6 branches throughout the country, each specialising in a particular field of fisheries research. The facilities available at FRI and its branches could possibly be described as the best in this part of the world.

With increasing contribution and importance of the fisheries sector in the national economy, the staff strength has grown steadily to 516 with 84 research officers in 1992 from a skeleton staff of around 10 people in 1950s. Since the department also recognises the need for trained and qualified staff, a training programme was initiated in the late 80s with the primary aim of upgrading the research capability at postgraduate level.

The major objective of fisheries research is to provide the scientific basis and technical support for the rational development and management of capture fisheries as well as aquaculture. The success of fisheries research could be reflected by the rapid development of the offshore fisheries sector, the effective management of the coastal fisheries resources of the country, the tremendous growth of the aquaculture industry and the establishment of fish sanctuaries at strategic locations throughout the country in the form of artificial reefs and marine parks.

Forest Research Institute Malaysia

Name of agency / institution / company:
Forest Research Institute Malaysia

Person(s) to contact:
- Dr. Salleh b. Mohd. Nor
  (Director General)
- Dr. Abdul Razak b. Mohd. Ali
  (Deputy Director General)
- Pn. Norhara Hussein
  (Head of External Project Unit)
- Dr. S. Appanah
  (Head of Research Planning and Evaluation Unit)

Office address:
Forest Research Institute Malaysia
Kepong
52109 Kuala Lumpur, Malaysia

Telephone:
603 - 634 2633

Telefax:
603 - 636 7753

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

GENERAL INFORMATION

Forestry research in Malaysia was formally organised in 1918 by the Forestry Department in the British colony. The Research Branch of the Forestry Department was transferred to the present premise at Kepong in 1929. The Branch was named the Forest Research Institute (FRI), Kepong.

In 1985, the Malaysian Forestry Research and Development Board Act was passed which allowed the Institute to change its status to that of a statutory body called Forest Research Institute Malaysia (FRIM). This was to enable the Institute to serve a Malaysia-wide clientele and interact better in an international context. FRIM is now responsible to the Malaysian Forestry Research and Development Board (MFRDB), which in turn is responsible to the Minister of Primary Industries.

MISSION

To promote the sustainable management and optimal utilisation of forest resources by generating knowledge and technology through research, development and application.

OBJECTIVES

- To generate knowledge and develop appropriate technology for the conservation, management, development and utilisation of forest resources
- To provide research-based services to meet the needs of clients
- To commercialise R & D results
- To acquire and disseminate information
- To create awareness on the environmental and conservation roles of forestry
- To pursue excellence and attain leadership in tropical forestry research.

ORGANISATIONAL STRUCTURE

Since its formation, the organisational structure of FRIM has undergone several changes to improve its effectiveness. There has been no change, however, in the organisational structure since 1993.

Analytical Chemistry
Instrumentation Methods

Name of group/centre:
Analytical Chemistry Group

Name of laboratory/project:
Analytical Chemistry Laboratory

Person(s) to contact:
- Dr. Azizol b. Hj. Abdul Kadir
- Salamah Selamat

Postal address:
Chemistry Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:
603 - 634 2633

Telefax:
603 - 636 7753

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES / EQUIPMENT

Equipment	Application	Technical specifications
Gas chromatograph	Essential oils, resins acids phenols	Max. temperature 500°C Detector : Flame Ionisation Detector (FID) Electron Captured Detector (ECD) Flame Photometer Detector (FPD)
GC/MS - QP 2000	Secondary metabolites; terpenoids, alkaloids	Mass range 10 -65 a.m.u.
GC/MSD - HP 5971A	Secondary metabolites; terpenoids, alkaloids	Mass range 10 - 6 a.m.u.
Digital polarimeter	Optical activity of organic compounds	100 cm max. p length
Infrared spectrophotometer	Inorganic and organic compounds	4000cm^{-1} - 400 cm^{-1} - wave number
UV VIS spectrometer	Secondary metabolites enzymes	190 - 1100 cm^{-1} -
N.M.R.	Secondary metabolites	H^1, C^{13}
HPLC	Sugars, acids, terpenoids	
Inductively coupled plasma (ICP)	Metallic element of wood preservative	For B, Cu, Cr & As
Atomic absorption spectrometer (AAS)	Metallic element of wood preservative	For Cu, Cr & As
Gas chromatography (GC)	Separation of molecular mixtures	For organochlorine preservative
High performance liquid chromatography (HPLC)	Separation of molecular mixtures	For synthetic pyrethroid

SOFTWARE FACILITIES / EQUIPMENT

Name of Product	Application	Technical specifications
GC/MS	Secondary metabolites	MS chemstation
UV-VIS spectrometer	Secondary metabolites	Lambda series

RESEARCH EXPERIENCE

- Analysis of essential oils, resins and phenolic acids from plant materials
- Extraction, separation and isolation of secondary metabolites from medicinal plants
- Perfumes and fixatives from essential oils
- Analysis of synthetic pyrethroid, CCA and CCB preservatives in treated wood
- Distribution of copper chrome arsenic in treated timbers
- Synthesis and evaluation of new organotin (IV) compounds

CONSULTANCY EXPERIENCE

- Use of traditional medicinal plants for technical preparation
- Influence of extractives on the gluing of kapur veneers
- Consultancy on treating timber

SERVICES OFFERED

- Testing of alcohols, perfumes and liquids from external agencies using infrared, GC/MS and gas chromatograph (GC)

- Sugars and acids analysis on HPLC
- Extraction of essential oils and other metabolites from plant materials
- Technical advice and training on equipment and extraction of plant materials for individuals and external agencies
- Analysis of CCA formulation and CCA treated wood
- Analysis of boron formulation and boron treated wood
- Penetration test for boron and CCA treated wood
- Analysis of chlordane treated wood.

Biotechnology

Plant Biotechnology and Biodiversity

Name of group/centre:
Forest Biotechnology Group

Name of laboratory/project:
Forest Genetics,
Tree Improvement and Biotechnology Laboratory

Person(s) to contact:
- Dr. Wickneswari Ratnam
- Mrs. Aziah Mohd. Yusoff

Postal address:
Plantation Forest Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur, Malaysia

Telephone:
603 - 634 2633

Telefax:
603 - 636 7753

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Horizontal electrophotesis unit	Protein/Enzyme separation	LKB 2117 Multiphor II
High speed refrigenerated microfuge	DNA isolation and purification	Tomy MRX-150
Ultra low temperature freezer	Storage of tissues, tissue extracts and DNA	Nuaire NU 6225 with min. temp. of -80 °C
Hybridising oven with shaking platform	Northern, Southern Dot, Slot or Colony Blots and Enzyme staining	Hybrid Dual Hybridisation Oven
Polaroid MP4 system with UV transilluminator table	Viewing and photography of DNA preps/ digests	Uses type 667/669 polaroid films
Tissue homogeniser with turbo shear blades	Homogenise tissues/solutions and disrupt cells	Virtis Hi-Speed "23" Homogeniser
DNA Thermal Cycler	Amplification of DNA	Astec Program Temp Control System PC-700
Laminar flow cabinets	Preparation of clean cultures	
Water purifier	Production of pure distilled water for cell cultures	Elgastat UHQ MK11
Orbital shaker	Aeration of suspension culture	Labline - tabletop version

SOFTWARE FACILITIES/ EQUIPMENT

Name of product	Application	Technical specifications
Biosys-1	Analysis of isozyme data for population genetic parameters	Biosys-1 Release 1.7

RESEARCH EXPERIENCE

- Population genetic studies of A cacia auriculiformis, Hopea species, Dryobalanops aromatica, Dyre costulata, Neobalanocarpus, Hevea brasiliensis, etc.
- Genetic assessment of A cacia mangium seed sources
- Interspecific hybrid detection in A cacia species
- Tissue culture of calamus manan, Dyera costulata, acacia hybrids and some bamboo species

SERVICES OFFERED

- Acacia hybrid verification
- Clonal identification
- Seed source identification
- Training of isozyme and DNA analysis techniques for forest species
- Training of tissue culture techniques for forest species

Forestry Sciences
Fire Protection of Wood

Name of group/centre:
Fire Protection Group

Name of laboratory/project:
Fire Protection Laboratory

Person(s) to contact:
Dr. Abdul Rashid Abd. Malek

Postal address:
Forest Products Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:
603 - 634 2633

Telefax:
603 - 636 7753

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Fire propagation machine	Propagation of fire	Class O Performance index
Large-scale furnace	Fire resistance	Fire ratings
Thermal analyser	TG DSC analysis	Thermal analysis
Indicative furnace	Fire resistance	Fire ratings

RESEARCH EXPERIENCE

- Fire performance of panel products
- Fire resistance of timber framed partition
- Physical and combustion behaviour of fire retardent treated timber

CONSULTANCY EXPERIENCE

- Design and construction of decorative fire doors
- Production of fire retardent chipboard
- Fire testing for building components

SERVICES OFFERED

- Fire resistance test for doors and partition
- Fire propagation test
- Fire resistance test for ceiling

Forestry Sciences
Non - Wood Forest Products

Name of group/centre:
Non-wood Forest Products Group

Name of laboratory/project:
Non-wood Forest Products/
Small Scale Industries Development Laboratory

Person(s) to contact:
- Abd. Latif Mohmod
- Razak Wahab

Postal address:
Forest Products Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:
603 - 634 2633

Telefax:
603 - 636 7753

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Rattan boiling system	Curing of rattan	Diesel tanker
Rattan grinding machine	Peeling off skin	0.5 mm thickness
Bamboo blind weaving machine	Weaving splits	8000 m/day
Chopsticks machine	Chopstick	1cm thickness
Image analyser	Ultrastructure	RGB facilities and real frame grabber

RESEARCH EXPERIENCE

- Analysis of variation of properties for manufacturing rattan/bamboo products
- Fabrication of machines for industrial uses
- Characterisation of of non-wood resources for manufacturing purposes
- Properties and utilisation of rattan, bamboo and other non-wood resources

CONSULTANCY EXPERIENCE

Technical and advisory services to small and medium rattan and bamboo-based industries.

SERVICES OFFERED

- Technical training for processing rattan/bamboo
- Maintenance of machineries (rattan/bamboo)
- Physical, mechanical testing of rattan/bamboo
- Anatomical/identification of rattan and bamboo

Forestry Sciences
Seed Technology

Name of group/centre:
Seed Technology Group

Name of laboratory/project:
Seed Technology Laboratory

Person(s) to contact:
- Dr. Baskaran K.
- Marzalina Mansur

Postal address:
Plantation Forestry Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:
603 - 634 2633

Telefax:
603 - 636 7753

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Programme Freezer	Cryopreservation of tissue	Cryo-med Model 2700-C
Freeze Dryer	Freeze drying of plant tissue	Thermovac

RESEARCH EXPERIENCE

- Seed research
- Cryopreservation techniques

SERVICES OFFERED

- Testing the viability of seeds
- Advice on proper storage of seeds

Forestry Sciences
Wood Processing

Name of group/centre:
Wood Processing Group

Name of laboratory/project:
Wood Processing Laboratory

Person(s) to contact:
- Ho Kam Seng
- Dr. Sim Heok Choh

Postal address:
Forest Products Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:
603 - 634 2633

Telefax:
603 - 636 7753

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Shimedzu testing machine	Timber testing	10,000 kg force

Instron testing machine	Timber testing	250 KN dynamic, 500 KN static
Zwick testing machine	Timber testing	10 KN
Wehrhahn gang saw	Log cutting	900 mm opening
Chugoku-kikai band head rig	Log cutting	1200 mm pulley diameter
Colombo & Cremon peeler lathe	Veneer peeling	1600 mm length, 1mm diameter log
Weinig moulder	Wood moulding	6 heads
Anderson CNC router	Routing	4 spindles, 15,000 - 18,000 rpm Table size 2100x1000m
Taihei finger jointer & press	Finger jointing	Length: 150-1500mm Width max. 300mm Height max. 150mm

RESEARCH EXPERIENCE

- Evaluation of mechanical strength of timber
- Full size testing for structural components
- Evaluation of machinery properties of timber (sawing, planing, moulding, shaping, turning, routing, boring and chiseling, veneering)
- Evaluation of glueing property of timber
- Evaluation of operational parameters for different wood convention processes (sawing, moulding, furniture manufacturing and glue lamination)

CONSULTANCY EXPERIENCE

- Machining properties of timber
- Plant layout
- Process development
- Wood products manufacturing

SERVICES OFFERED

- Timber testing (mechanical strength and machinising properties)
- Technical and advisory services to sawmills, plywood mills, moulding plants, furniture mills, glue laminator plants
- Training on wood processing techniques

Forestry Sciences

Wood Protection

Name of group/centre:

Wood Protection Group

Name of laboratory/project:

Wood Seasoning and Preservation Laboratory

Person(s) to contact:

- Choo Kheng Ten
- Mohd Dahlan Jantan

Postal address:

Forest Products Research Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:

603 - 634 2633

Telefax:

603 - 636 7753

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Boiler	Steam generation for timber drying	2000 lb/hour steam production (Robey Lincoln)
Dry kiln	Timber drying	15 ton capacity
Solar kiln	Timber drying	7 ton capacity
Timber treatment plant (Fully automatic)	Timber preservation	0.5 ton capacity, max. press. 14 bars
Timber treatment plant	Timber preservation	0.5 ton capacity, max. press. 14 bars

RESEARCH EXPERIENCE

- Kiln drying schedule and dry kiln design
- Processing and utilisation of rubberwood (drying and preservation)
- Solar drying of timber
- Preservation treatment of timber

CONSULTANCY EXPERIENCE

Dry kiln design

SERVICES OFFERED

- Timber technology services
- Rubberwood utilisation (drying and preservation)
- Drying technology
- Timber preservation technology

Forestry Services

Wood Composite

Name of group/centre:

Wood-based Panels

Name of laboratory/project:

Wood-based Panels Laboratory

Person(s) to contact:

- Dr. Mohd Noh Mohd Yusoff
- Dr. Koh Mok Poh

Postal address:

Chemistry Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:

603 - 634 2633

Telefax:

603 - 636 7753

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Instron universal testing machine	Strength properties testing	10 KN x 100 KN range
Perforator	Formaldehyde determination	EN 120 standard
1m³ CT i Chamber	Formaldehyde determination	Up to 250°C, 45% R.H.
Pressurised refiner	TMP's MDF	2 - 7 kg capacity
Hydraulic hot press	Board pressing	5 cycles, max. 200 °C, pressure : 140 kg/cm²
Disk flaker	Preparation of flakes	1 foot wood disc
Ring-knife flaker	Preparation of flakes	2.5 feet diameter (36 knifes)
Disintegrator (hammermill)	Preparation of wood particles	10-50 slot size
Pallmann Drum Chipper	Preparation of wood chips	Chip size: width: 10-15mm length: 15-20 mm thickness: 3-5 mm
▶ Tathei Wood Chipper	Preparation of wood chips	Chip size: width: 10-15mm length: 15-20 mm thickness: 3-5 mm

SOFTWARE FACILITIES/ EQUIPMENT

Name of product	Application	Technical specifications
Instron series 1x automated materials testing system	Strength testing of panels	Version 5.21 Chart & table
Test pro (FRIM)	Strength testing of panels	Chart & table

RESEARCH EXPERIENCE

- Manufacturer of particleboard, medium density fibreboard, cement board, gypsum board and fibre-cement board from rubberwood, wood residues and oil palm residues
- Distribution of resin on fibres using SEM
- Density profile of medium density fibre board

CONSULTANCY EXPERIENCE

- Manufacture of MDF from young rubberwood and A cacia mangium thinnings
- Production of fibre-cement board using oil palm pulp to replace asbestos fibres
- Use of low emission resins in panel products

SERVICES OFFERED

- Mechanical testing of panel products
- Formaldehyde emission tests (perforator & chamber methods)
- Evaluation of panel products from new raw materials
- Testing of glue for panel products

Information System

Geographical Information System (GIS) and Remote Sensing (RS)

Name of group/centre:

GIS/RS Group

Name of laboratory/project:

Geographical Information System and Digital Image Processing Laboratory

Person(s) to contact:

- Nor Azman Hussein
- Khali Aziz Hamzah

Postal address:

Natural Forest/Environmental Science Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:

603 - 634 2633

Telefax:

603 - 636 7753

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Intergraph IP2450 workstation	GIS/RS	32 MB RAM 426 MB Hard Disk 19" Colour monitor Modular hardware based on CLIPPER engine run on UNIX OS
Intergraph PC 433	GIS/RS	486DX, 33 MHz desktop 16MB RAM 213 MB Hard disk 17" colour monitor - SVGA Run on DOS
Digitizer	Graphic data capturing	Summagraphics Microgrid III 36" x 48" active area Resolution 2000 lpi Accuracy 0.002-0.005" Repeatability 0.002"
CD-ROM Drive		Toshiba XM-3301B
Tape Drive	Read/write input/ output	Qualstar 1050 Series 1600/3200 BPI 50 IPS 25 IPS 80 KBS
External Hard Disk	Storage	Integraph, 426 MB
Colour printer	Hard copy output	Hewlett Packard Paint Jet XL 300
Computer ACER Power 486DX-2	Image processing	RAM: 16 MB Hard disk: 120 MB

SOFTWARE FACILITIES/ EQUIPMENT

Name of product	Application	Technical specifications
Microstation 32	Computer Aided Drafting and Design (CADD), 2D/3D	Compatible with IGDS file format Run on UNIX, Windows, DOS
Modular GIS Environment (MGE)	Microstation GIS platform	Run on UNIX, DOS
▶ MGE analyst	Analytic component for the GIS environment: Creating, Querying, Analysing, Displaying Topographical-structured Geographic data	Based on Microstation 32 Required Relational Interface Software (RIS) and RDBMS (Informix, INGRESS, ORACLE)
MGE Imager	Digital Image Processing (DIP) with emphasis on Remote Sensing (RS) module	Raster-based format with capability to handle Ventor-based format under one environment
MGE Grid Analyst/ Modeller	Grid analysis for: Overlay, Zoning, Proximity analysis, Ranking, Cost surface generation, Optimal path analysis	Integration of Grid, Raster and Vector
Relational Database Management System (RDBMS)	Large data storing as well as data management capabilities	Oracle for DOS environment Informix for UNIX environment
IDRISI	Image processing	-

RESEARCH EXPERIENCE

- Mapping of coastal living resources
- Assessing and mapping of landuse and land cover changes
- Mapping of forest resources and forest cover changes
- Establishment of management criteria for parks and conservation areas
- Development for testing of methodology for biodiversity mapping
- Development of inventory techniques

CONSULTANCY EXPERIENCE

- Application of Remote Sensing technique for EIA studies
- Technical advice on system requirement and development

SERVICES OFFERED

- Drafting and design for microstation environment
- Data capturing for GIS and remote sensing including DTM/DEM
- Development of databases of both graphical and attribute data for GIS and remote sensing application
- Digital image processing for various remote sensing application

- Integration of remote sensing and GIS or other raster and vector based format for various mapping application or updating GIS databases
- Application of remote sensing for EIA studies
- Developing topographically-structured geographic databases for management information system and management of parks and conservation areas
- Satellite image processing for mapping, identification and monitoring of forest resources
- Development of inventory technique for forest resources

Information System and Technologies

Information System Management

Name of group/centre:

Information Technology Group

Name of laboratory/project:

Information Technology

Person(s) to contact:

- Mrs. Kong How Kooi
- Mr. Woon Weng Chuen

Postal address:

Techno-Economic Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:

603 - 634 2633

Telefax:

603 - 636 7753

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
PCs	CDS-ISIS	1 MB RAM 386 200 MB Hard Disk
PCs	Databases	4 MB RAM 486 120 MB Hard Disk

SOFTWARE FACILITIES/ EQUIPMENT

Name of product	Application
PCs	• CDS-ISIS Library Information • Agrostats FAO-Forest Products Year Book Statistics (1961-1991) • Rubberwood Information System

SERVICES OFFERED

Information related to forestry and forest products

Other Manufacturing and Process Technologies and Engineering

Furniture Design and Manufacturing

Name of group/centre:

Furniture Design and Evaluation Group

Name of laboratory/project:

Furniture Design and Evaluation Laboratory

Person(s) to contact:

- Mohd Arshad Saru
- Abd. Hamid Salleh

Postal address:

Forest Products Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:

603 - 634 2633

Telefax:

603 - 636 7753

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

The laboratory is accredited by the Furniture Industry Research Association (FIRA), UK.

Equipment	Application	Technical specifications
Basket ball impact tester	Table stability	500 N
Pivoted door cyclic machine	Door cabinet strength	300 N
Drawer cyclic machine	Drawer strength	300 N
Drawer slamming machine	Drawer strength	300 N
Seat impact tester	Chair strength	250 N
Impact pendulum hammer	Chair strength	7 kg
Universal testing machine	Chair stability	2000N
Arm rest testing machine	Chair strength	-
Chair testing machine	Chair strength	2000N
Table testing machine	Table strength	150N

SOFTWARE FACILITIES/ EQUIPMENT

Name of product	Application	Technical specifications
Sun spacstation CAD	Drafting 3D modelling	Unix Workstation

RESEARCH EXPERIENCE

Furniture quality

CONSULTANCY EXPERIENCE

Technical committee for MITI umbrella concept

SERVICES OFFERED

- Plant layout
- Machinery
- Product costing
- Design/quality evaluation

Renewable Energy

Biomass

Name of group/centre:

Wood Energy Group

Name of laboratory/project:

Wood Energy Laboratory

Person(s) to contact:

- Dr. Hoi Why Kong
- Puteri Faridatul Akmar

Postal address:

Chemistry Division
Forest Research Institute Malaysia *(FRIM)*
Kepong
52109 Kuala Lumpur
Malaysia

Telephone:

603 - 634 2633

Telefax:

603 - 636 7753

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Coulter omnisorp 100/360 series	BET determination	2000 data points continuous and static volumetric mode
Rosemount gas analyser	CO, CO_2, CH_4, H_2 measurements	Measurement up to 55%
CAB pyrolyzer	Testing of charcoal	Assessment of charcoal quality
Rotary activater	Activated carbon process	Steam, CO_2 and N_2 activation
Sorbent equipment	Manufacture of sorbent	Rotary batch system

RESEARCH EXPERIENCE

- Research in the development of solid, liquid and gaseous fuels from biomass
- Development of animal feed from palm trunk
- Development of soil-slick sorbent from biomass

CONSULTANCY EXPERIENCE

- Small-scale wood energy systems - FHO (1985-1986)
- Rubberwood gasification for energy - EEC (1988 - 1992)
- Anti-pollution incineration systems - Good wood International (1991 - 1993)

SERVICES OFFERED

- Activated carbon process
- White and black charcoal production
- Animal feed from oil palm trunk
- Sorbent for oil control
- Anti-pollution incineration systems

Geological Survey of Malaysia

Name of agency / institution / company:
Geological Survey of Malaysia

Person(s) to contact:
Director-General

Postal address:
Geological Survey of Malaysia
19th - 21st Floor, Bangunan Tabung Haji
Jalan Tun Razak
P.O. Box 11110
50736 Kuala Lumpur
Malaysia

Telephone:
(603) - 261 1302, 261 1325

Telefax:
(603) - 261 1036

Office hours:
8.00 am - 4.15 pm *(Mon -Fri)*
8.00 am - 12.45 pm *(Sat)*

FIELDS OF RESEARCH

- Engineering geology
- Marine geology (geophysical survey and sea bottom sampling)
- Hydrogeology
- Mineralogy and petrology
- Geophysics
- Analytical geochemistry

GENERAL INFORMATION

The Geological Survey Department of Malaysia, an agency under the Ministry of Primary Industries Malaysia, was set up in 1903 with the following objectives:

> To facilitate the mobilisation of mineral resources and the use of geoscience for national development.

In fulfilling the objective, the Geological Survey Department (GSD) undertakes the following functions which include undertaking systematic geological mapping, exploitation for minerals other than petroleum and gas, engineering geology investigations, investigating and developing groundwater resources, undertaking and providing analytical services such as analysis of rocks, minerals, ores, alloys and water, and physical testing of rocks, gemstones and industrial minerals, and preparing thematic maps such as geological, geochemical, hydrogeological, geophysical and mineral resources maps.

The Department also acts as the national repository for all information related to the geology and mineral resources of the country and advises Federal and State Government agencies on policies and technical matters related to geology and the mineral industry. It excutes Federal and State Governments policies on geological activities and mineral industry.

To ensure that the functions are carried out efficiently and effectively, the GSD has a professional staff strength of 188 officers with support personnel numbering 512.

The vision of GSD is to become a Research and Development organisation with the ability to export its geoscience expertise to developing countries by the year 2020.

Glory Water Management Sdn Bhd

Name of agency / institution / company:
Glory Water Management Sdn Bhd

Person(s) to contact:
- K.S. Chin *(Managing Director)*
- W K Tan *(Planning Manager)*

Office address:
58, Ground Floor, Jalan 6/116B
Kuchai Entrepreneurs Park
Jalan Kuchai Lama
58200 Kuala Lumpur, Malaysia

Telephone:
603 - 781 4836/7

Telefax:
603 - 781 2881

Office hours:
8.00 am - 5.00 pm *(Mon - Fri)*
8.00 am - 1.00 pm *(Sat)*

SERVICES OFFERED

Water Treatment Specialist
(Engineering/Design, Consultancy, Manufacturing, Installation, Servicing)

SPECIALISED IN

- Ultra Pure Water Treatment System
- Demineralizer/Water Softener
- Industrial Waste Water Treatment System
- Integrated Waste Water Recycling System
- Recovery System/Evaporation System
- Portable Drinking Water System
- Chemicals For Water Treatment
- All Kinds of Water Treatment Products

SUMMARY OF RESEARCH / CONSULTANCY EXPERIENCE

Types of industries

- Metal Finishing Industries
  - Electro & Electroless Plating
  - Surface pretreatment and painting
  - Galvanizing and Anodizing
  - Automobile Assembly Plant
  - Airline Industries
- Electronic & Semiconductors Industries
- Ceramic, Glass and Plastic Industries
- Textile, Printing, Cosmetics and Rubber Industries
- Medical, Hospitals and Pharmaceutical
- Plantations and Fisheries Industries
- Food and Beverage Industries

Customer Reference

- M/s. Kayaba (Malaysia) Sdn Bhd
- M/s. Kawasaki Sunrock Sdn Bhd
- M/s. Amalgamated Industrial Steel Bhd
- M/s EP Polymers (M) Sdn Bhd
- M/s. Earntrade Industries Sdn Bhd
- M/s Marui Industrial Co. Ltd
- M/s. Shimano Components (M) Sdn Bhd
- M/s. Perusahaan Otomobil National Sdn Bhd
- M/s. Trox (Malaysia) Sdn Bhd
- M/s Ampri Rubberware Industries Sdn Bhd
- M/s Mitsui High-Tec (M) Sdn Bhd
- M/s Continental recision Technology (M) Sdn Bhd
- M/s Malaysian Airline System Berhad

GLORY

Glory Water Management Sdn Bhd
58, Ground Floor, Jalan 6/116B, Kuchai Entrepreneurs Park Jalan Kuchai Lama,
58200 Kuala Lumpur, Malaysia *Telephone:* 03 - 781 4836 / 7 *Telefax:* 03 - 781 2861

Water Treatment Specialist

Engineering/Design
◆
Consultancy
◆
Manufacturing
◆
Installation
◆
Servicing

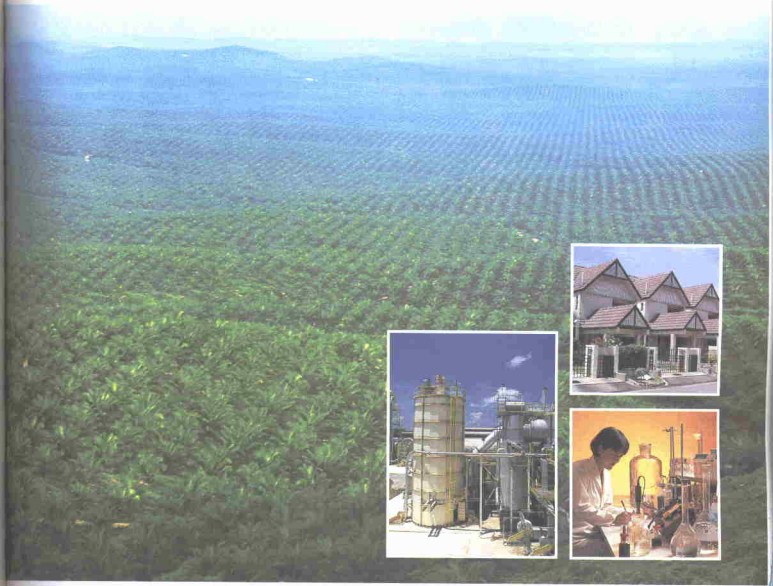
"PATRONE I/ BOMBE" Portable Ion-Exchangers

General Industrial effluent treatment system

Effluent treatment system (for hard chrome plating manufacturer)

Sludge dewatering system

Water deionisation system



We have 100 years behind us, and a golden future ahead

We are an established company, with a long history of plantations management in Malaysia. For nearly a hundred years, we have been at the forefront of the Malaysian plantations sector, contributing to its growth and success.

We own and manage more than 150,000 hectares of oil palm, rubber, cocoa, coconut and fruit. Besides ownership and management, we also undertake processing, marketing and research activities, and we share our expertise in tropical agriculture with others in the industry.

While plantations remain our core business, we have begun to diversify our operations. Today, you will find us manufacturing glycerine or fatty alcohol, fruit juices, food and rubber-based products – and building houses too.

We recognise that there is growth beyond plantations. And that we can enrich our business and enhance the role we play in national development by adding greater value to our resources.

Today, we have become one of Malaysia's diversified business leaders with interests in plantations, manufacturing, property development and overseas operations.

The years ahead will find us actively pursuing our diversification strategy. With a hundred years behind us, the future looks great.

Golden Hope.
Into a new era.

Golden Hope

Golden Hope Plantations Berhad, 13th Floor, Menara PNB, 201-A Jalan Tun Razak, 50400 Kuala Lumpur, Malaysia. Tel: 03-2619022 Fax: 03-2618221

Golden Hope Plantations Berhad

Name of agency / institution / company:
Golden Hope Plantations Berhad

Name of department:
Research & Development Department

Person(s) to contact:
Mr. Teoh Cheng Hai *(Director, Research & Development)*

Office address:
9-16th Floor, Menara PNB
201-A, Jalan Tun Razak
50400 Kuala Lumpur
Malaysia

Telephone:
603 - 261 9022

Telefax:
603 - 261 8221, 261 3290

Office hours:
8.00 am - 5.00 pm *(Mon - Fri)*

FIELD OF RESEARCH

Agriculture, biotechnology, technology, quality, product-development and environment.

SERVICES OFFERED

Agriculture-related services, feasibility studies, agronomy, training, quality-management, effluent treatment systems.

SUMMARY OF RESEARCH/ CONSULTANCY EXPERIENCE

Golden Hope's involvement in the Research & Development dates back to 1921 when research on rubber commenced soon after the opening of its Prang Besar Estate. Today, the Group is an industry leader in the research & development of perennial crops and it is a major producer of quality planting materials of oil palm, rubber, cocoa and coconuts. Research in agriculture is undertaken in the Oil Palm Research Station and work on quality and technology is done at the Quality & Technology Centre.

In their full extent, Golden Hope's Research and Developement programmes cover activities from the seed to our customers. They include diverse topics such as plant breeding and selection and biotechnology, the development of the best and most cost-effective management and planting practices, mechanisation of field operations, plant protection, process and product development and the implementation of environmentally sound practices such as the "zero-burning" technique which earned Golden Hope the United Nations Environmental Programme (UNEP) Global 500 Award for Environmental Achievement in 1992.

In all areas of activity, the Group is committed to stringent standards of quality control, as reflected in its 'Quality Above All' policy. In order to ensure that quality control is maintained at all levels of its operations, the Group is currently implementing the ISO 9002 Quality Assurance System at all its production centres.

The results of these research endeavours are made available to all the Group's estates and production units through advisory visits, training courses and workshops, etc. The Group's expertise is also available to others through our consultancy services, Golden Hope Agrotech Consultancy Services Sdn. Bhd.

Grundig R&D (M) Sdn Bhd

GRUNDIG

Name of agency / institution / company:
Grundig R & D (M) Sdn Bhd

Name of laboratory / project:
Grundig R & D (M) Sdn Bhd

Person(s) to contact:
- C de Faria *(Managing Director)*
- Joerg Sulek *(General Manager)*

Office address:
Bayan Lepas Free Industrial Zone
11900 Penang
Malaysia

Telephone:
604 -644 0840

Telefax:
604 - 644 3333

Office hours:
7.15 am - 4.35 pm *(Mon - Fri)*

FIELD OF RESEARCH

F070500

HARDWARE FACILITIES / EQUIPMENT

Measurement equipment like oscilloscopes, S/N meter, Audio precision SI, PCs for software described below, Photoplotter for plotting films

SOFTWARE FACILITIES

Programme	Application	Technical specifications
Micro-Cadam	Mechanical design	PC based
PCAD	PCB layout and systematic	PC based

SUMMARY OF RESEARCH / CONSULTANCY EXPERIENCE

Development of new high-tech audio and Hifi products like radios, radio recorder, clock radios, radio controlled clock radios, CD-Players, double/single cassette decks with auto-reverse logic mechanism (Hifi), Hifi tuner and amplifier/receiver including research for new CD concepts, synthesizer tuner concepts and digital techniques.

Henkel Oleochemicals (M) Sdn Bhd

Name of agency / institution / company:
Henkel Oleochemicals (Malaysia) Sdn Bhd

Name of group / centre:
Technical Service Division

Person(s) to contact:
- Tan Boon Teck *(Head, Technical Service Division)*
- Siti Rosemina Bux *(Quality Control Manager)*

Postal address:
P.O.Box 122
42507 Telok Panglima Garang
Selangor, Malaysia

Telephone:
603 - 352 6015

Telefax:
603 - 352 6955 / 8702

Office hours:
9.00 am - 5.30 pm *(Mon - Fri)*
9.00 am - 1 pm *(Sat - alternate off)*

RESEARCH EXPERIENCE

- Formulation and preparation of toiletries and detergents products
- Formulation and preparation of cosmetics products
- Oleochemical product quality improvement

CONSULTANCY EXPERIENCE

Technical problem-solving on oleochemicals manufacturing and application

SERVICES OFFERED

- Accredited tests based on ISO/IEC Guide 25/ SAMM
- Non-accredited tests conforming to international standards
- Products formulation and development of cosmetics, toiletries and detergents
- Application of olechemicals

GENERAL INFORMATION

Henkel Oleochemicals (Malaysia) Sdn Bhd (HOM) commenced operations in early 1984 as a manufacturer of basic oleochemicals viz. fatty acids and methylesters basing on the natural oil of palm and palm kernel.

HOM is a 50:50 joint venture between Henkel KGaA of Germany, a world renowned name in the oelochemical industry and Golden Hope Plantation Berhad, Malaysia, one of the largest and longest established plantations in the country.

HOM become the foremost basic oleochemicals producer in South East Asia which produces the four major building blocks of oleochemistry, namely fatty acids, methylesters, fatty alcohols and glycerine.

To meet the exacting nature of today's quality control standards, HOM has acquired the most up-to-date analytical appliances and equipment which are centred in a modern laboratory complex within the factory premises itself and are manned by a team of qualified personnels.

HOM laboratories have adopted and have been successfully accredited the quality system according to ISO/IEC Guide 25/SAMM (Skim Akreditasi Makmal Malaysia) and undergo regular independent audits to ensure customers are being provided with accurate analytical results and the best possible services.

Hexagon Technologies Sdn Bhd

Name of agency / institution / company:
Hexagon Technologies Sdn Bhd

Name of laboratory / project:
Electrolytic deflashing system for integrated circuit

Person(s) to contact:
- Charlie Yeo Ban Hun *(General Manager)*
- Richard Tey Yat Cheng *(Operations Manager)*

Postal address:
41-2, Jalan Radin Anum Satu
Bandar Baru Seri Petaling
57000 Kuala Lumpur
Malaysia

Telephone:
603 - 957 7877

Telefax:
603 - 957 7806

Office hours:
8.30 am - 5.30 pm *(Mon - Fri)*
8.30 am - 1.00 pm *(Sat)*

RESEARCH EXPERIENCE

- Custom-built deflashing machines for integrated circuits
- Software for process monitoring (temperature, pH, flow, voltage)
- Development of a filter system that is self-contained for capture of e.g. asidic, toxic fumes without requirement of a full-scale scrubber system to meet the Department of Environment standards

CONSULTANCY EXPERIENCE

Design concepts for automated wet processing systems for electronics and semiconductor industry

SERVICES OFFERED

- Custom-built wet processing machines
- Software for data monitoring of industrial processes

IBM World Trade Corporation

Name of company:
IBM World Trade Corporation

Person(s) to contact:
- Rodzlan Akib Abu Bakar *(General Manager)*
- Norhayati Kasim *(Human Resource Manager)*

Office address:
Plaza IBM
No. 1, Jalan Tun Mohd Fuad
Taman Tun Dr. Ismail
60000 Kuala Lumpur
Malaysia

Telephone:
603 - 717 7788

Telefax:
603 - 717 2188

Office hours:
8.30 am - 5.00 pm *(Mon - Fri)*

SERVICES OFFERED

- Hardware and software maintenance services
- Education services
- Systems and operation services
- Client/Server Services
- Network Services
- Systems Integration Services
- Consulting Services
- Leasing Services

IBM PRODUCT LIST

- AS/400 Business Commercial System
- RISC System/6000 Commercial Servers and Technical Workstations
- ES/9000 Enterprise Systems and Servers
- PS/2 and PSVP Personal Computers
- OS/2 Warp Operating System for Personal Computers
- ThinkPad Notebooks
- Pennant Laser and Impact Printers
- DB/2 Databases
- 3494 Tape Library Dataservers
- Nways Networking Product Series

ICM Industrial Chemical Manufacturing

Name of agency / institution / company:
ICM Industrial Chemical Manufacturing

Name of group / centre:
Research and Development Group

Person(s) to contact:
B.Y. Yoeng

Postal address:
15, Jalan Seroja 54
Taman Johor Jaya
81100 Johor Bahru
Johor, Malaysia

Telephone:
607 - 554 787, 542 391

Telefax:
607 - 554 788

Office hours:
8.30 am - 5.30 pm *(Mon - Fri)*
8.30 am - 2.00 pm *(Sat)*

RESEARCH EXPERIENCE

- Treatment of textile and paper waste
- Product development of industrial and domestic chemical

SERVICES OFFERED

- Treatment of industrial waste water and treatment plant design
- Chemical, polymer and environmental engineering design and development
- Product development of chemical products for textile industries and domestic

Institute For Medical Research

Name of agency / institution / company:
Institute for Medical Research

Person(s) to contact:
Director

Office address:
Jalan Pahang, 50588 Kuala Lumpur, Malaysia

Telephone:
603 - 298 6033

Telefax:
603 - 293 8306

E.mail:
lib.@ imr. po. my

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

GENERAL INFORMATION

Divisions:

- Administration
- Acarology
- Bacteriology
- Behavioural Research
- Biochemistry
- Biotechnology Center
- Clinical Research Center
- Cytology
- Endocrinology
- Epidemiology & Biostatistics
- Haematology
- Human Nutrition
- Immunology
- Laboratory Animal Resources
- Library, Information & Publications
- Medical Ecology
- Medical Entomology
- Parasitology
- Stomatology
- Virology
- School of Medical and Laboratory Technology

International Affiliations:

- National Center for the Southeast Asian Ministers of Education Organisation - Tropical Medicine Programme *(SEAMEO-TROPMED)*
- World Health Organisation *(WHO)* Regional Center for Research and Training in Tropical Diseases and Nutrition
- WHO Collaborating Center for
  - Taxonomy and Immunology of Filariasis, and Screening and Clinical Trials of Drugs against Brugian Filariasis, and
  - Ecology, Taxonomy and Control of Vectors of Malaria, Filariasis and Dengue
- National focal point for the WHO Collaborative Surveillance Programme on antibiotic resistance in the Western Pacific Region
- WHO National Influenza Center
- Secretariat for the Inter-Islamic Network for Tropical Medicine *(INTROM)*

Institute For Medical Research

The Institute for Medical Research (IMR) was founded in 1900 and serves primarily as the research arm of the Ministry of Health, Malaysia. The main functions of the IMR are to ◆ conduct research for the prevention and control of pertinent health issues and problems ◆ perform specialised diagnostic tests ◆ provide training in various specialised fields and ◆ provide consultative and advisory services.

OUR MISSION:
EXCELLENCE IN MEDICAL RESEARCH THROUGH TOTAL COMMITMENT

RESEARCH

The IMR conducts on-going research in the following key areas: Allergies, Behavioural Research, Blood Disorders, Cancer, Cardiovascular Diseases, Community Health, Dengue, Febrile Illnesses, Filariasis, Malaria, Human Nutrition, Mycobacterial Diseases, Scrub Typhus, and other Parasitic Diseases. We are most interested in collaborative research in the above areas.

DIAGNOSTIC SERVICES

Our laboratories perform specialised diagnostic tests. We are the National Polio Eradication Center and National Influenza Center. Several of our laboratories serve as referral centers of the Ministry of Health Malaysia, other government agencies and the private sector. We have vast experience in the development, improvement and evaluation of diagnostic test kits.

TRAINING

Regular training courses offered by the IMR include the 3-year Diploma Course in Medical Laboratory Technology, 6-month Diploma course in Applied Parasitology and Entomology, and 6-month Diploma course in Medical Microbiology. Ad hoc programmes can be arranged for local and foreign scientists, and allied personnel.

CONSULTATIVE AND ADVISORY SERVICES

We provide such services to the Ministry of Health Malaysia, other government departments, agencies and institutions, both local and foreign. Our staff provide valuable inputs in the following: National Quality Assurance Programme on Laboratory Services, National Drug Reference Laboratory, Accreditation of Food Laboratories of the Ministry of Health Malaysia, HIV and AIDS Surveillance Programme, Malaysian Food Regulations, SIRIM Standardisation Programme, and World Health Organisation Collaboration Centers

Institute for Medical Research
Jalan Pahang, 50588 Kuala Lumpur, Malaysia Tel: 603 - 298 6033 Fax: 603 - 293 8306

International Islamic University Malaysia

Name of agency / institution / company:
International Islamic University Malaysia *(IIUM)*

Telephone:
603 - 755 5322

Telefax:
603 - 757 1006 / 9598

Person(s) to contact:
Dr. AbulHasan M. Sadeq
(Dean, Research Centre)

Telephone:
603 - 757 7207

Telefax:
603 - 757 2589

Office address:
P.O Box 70, Jalan Sultan
46700 Petaling Jaya
Selangor, Malaysia

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

GENERAL INFORMATION

The objective of the University is to provide education from an Islamic perspective and also to conduct research from Islamic outlook. Being International and Islamic in nature, the University has a good number of internationally reputed scholars who can provide expert opinion, advisory and consultancy services in a number of fields. These fields are:

- Islamic & Shari'ah Laws as well as Conventional Laws
- Islamic Economics and Finance including Islamic Institutions like Islamic Banking, Zakat Administration, Waqaf, Takaful
- Islamic Business
- Islamic Management
- Islamic Accounting
- Islamic aspects of other social and human sciences
- Engineering, particularly in the following fields: Manufacturing, Engineering, Computer and Information Engineering

The University has a Research Centre to coordinate and conduct research activities of the University. Besides conducting its in-house research, the Centre organises research to be conducted by experts who are drawn from different faculties of the University.

Research & Publication at IIUM

Your Partner in Agro-based and Food Industries Ventures

MARDITECH CORPORATION SDN BHD
(Wholely owned by Malaysian Agriculture Research Development Institute)

MARDITECH Corporation Sdn Bhd is a pioneer in revolutionising traditional agriculture into a modern and sophisticated commercial agro-based venture.

MARDITECH plays a major role in commercialising modern agriculture technologies into viable and efficient business ventures.

With more than 400 trained scientists of different disciplines, and vast land area as well as a wide range of agro-based and food processing technologies available, **MARDITECH** looks forward to participating and contributing towards national economic growth.

Specialised services:

- ☆ **Joint-venture in agro-based and food processing projects**
- ☆ **Technical and management consultancy services in agro-based and food processing**
- ☆ **Venture capital for agro-based and food processing projects**
- ☆ **Contract research, analytical job (lab analysis) and feasibility studies**
- ☆ **Marketing and distribution agent of agriculture produce**
- ☆ **Trading in agro-based input and products**
- ☆ **Contract manufacturing via vendor system**

Corresponding Address:

MARDITECH Corporation Sdn Bhd
P.O. Box 12301 General Post Office
50774 Kuala Lumpur

Person to contact:	Chief Executive Officer
Telephone:	603 - 943 7111 (General line)
	603 - 948 5420 (Direct line)
Telefax:	603 - 948 3664
Telex:	MA 371 15

Malaysian Agricultural Research & Development Institute (MARDI)

'Taking the Lead In Agro-technology'

The Malaysian Agricultural Research and Development Institute (MARDI) has built up a special expertise in agro-technology and ensures that Malaysia's vibrant agricultural sector keeps in step with the country's pace of industrialisation. Agricultural technologies aim at developing a market-led, commercially viable and sustainable agricultural sector which will help give the country that vital competitive edge.

Special Expertise in Tropical Agriculture

The Institute's R & D focus is very firmly on building excellence in tropical agriculture. Given Malaysia's current and future agro-technology needs, R & D activities are targeted at:

- Commodity Development (fruit, livestock, horticulture, cocoa, coconut, tobacco, rice) where the thrust is towards productivity improvement through superior crop varieties and animal breeds, and efficient production and management system.
- Agricultural Engineering that supports the modernisation of agriculture via mechanisation and automation, and the development of controlled environment production systems.
- Biotechnology which aims at the exploitation of biological process to overcome the limitations of conventional methods.
- Agriculture Natural Resource Management which is geared to the management, conservation and sustainability of land, water and genetic biodiversity and environmental quality improvement.
- Food Technology which recognises the need to modernise the food industry through new food products, efficient processing technologies and supportive regulatory functions.

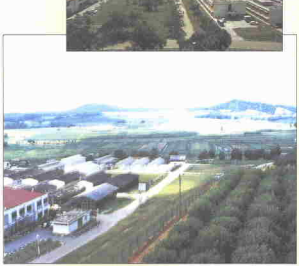
Strong R & D Capability

Access to global advancements in science and technology knowledge is ensured through collaborative arrangements with 43 regional and international R & D institutions. These lingkage shave helped establish MARDI as an expert in post harvest and food safety, particularly in the ASEAN region.

MARDI offers consultancy and advisory services to clients with strong emphasis on technology transfers through pilot projects, technical training and contract research. It also undertakes commercialisation of research results through MARDITECH Corporation, its commercial arm.

The institute's research infrastructure and facilities for agricultural R & D are among the best in the region. It has 31 research stations strategically located across the country, and employs close to 500 qualified research scientists.

MARDI won both the prestigious Prime Minister's Quality Award and the Development Management Award from Asian Institute of Management in 1992.



Biotechnology

Animal Biotechnology

Name of group/centre:

Biotechnology Centre

Name of laboratory/project:

Animal Biotechnology

Person(s) to contact:

- Dr. Abas Mazni Othman *(Program Leader)*
- Dr. Zainur Alsmi Sharif *(Researcher)*

Postal address:

Biotechnology Centre, MARDI
PO Box 12301
50774 Kuala Lumpur
Malaysia

Telephone:

603 - 948 6601

Telefax:

603 - 948 3664

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Ovens	Drying purposes	Standard laboratory
Autoclave	Sterilisation of material	Front loading 40 litres capacity
Laminar-flow cabinets	Aseptic manipulation of biological materials	HEPA Filter, 0.3×10^{-6} m
Biohazard cabinet	Aseptic manipulation of biological materials	Nuaire
Electronic balances	Weighing of chemicals/samples/equipment/etc	Up to 4 decimal points
pH meters	pH measurement	Portable
CO_2 incubator	Studies on controlled growth environment	Controlled temperature regimes
Inverted microscope	Visualisation and magnification of minute items	Olympus
Stereo microscope	Microscopic examination of material	Olympus
Osmometer	Measurement of osmolarity	
Refrigerated centrifuge	Centrifugation of biological	Sigma 6K10
Gamma counter	Radioimmunoassay work	1261 Multigamma Wallac

Microbalance	Minute weighing of material	Mettler MT5
Automatic pipettor	Multipipetting of material	Microlab 1000

RESEARCH EXPERIENCE

- Superovulation, embryo collection and transfer in sheep, goat and cattle
- Semen and embryo cryopreservation of sheep, goat and cattle semen
- In vitro maturation, in vitro fertilisation and in vitro culture of bovine embryos
- Nutritional and physiological evaluation of animal feed and feeding
- Immunoneutralisation of animals as against hormones and fat cells
- Utilisation of radioactive materials in animal research

CONSULTANCY EXPERIENCE

- Embryo transfer technology
- Cryopreservation
- Fibrous material for animal feed utilisation

SERVICES OFFERED

- Superovulation, embryo collection and transfer
- Semen and embryo cryopreservation
- In vitro fertilization of bovine oocytes
- Evaluation of straw as animal feed
- Radioimmunoassay of animal productive hormones

Biotechnology

Environmental Biotechnology

Name of group/centre:

Biotechnology Centre

Name of laboratory/project:

Environmental Biotechnology

Person(s) to contact:

- Dr. Mohamad Hanif Mohamad Jamil *(Program Leader)*
- En. Ong Hwee Keng *(Researcher)*
- Puan Aini Zakaria *(Researcher)*
- Dr. Lee Boun Siew *(Researcher)*
- Dr. Sepiah Muid *(Researcher)*
- Puan Umi Kalsom Md. Shah *(Researcher)*

Postal address:

Biotechnology Centre, MARDI
PO Box 12301
50774 Kuala Lumpur
Malaysia

Telephone:

603 - 948 6601

Telefax:

603 - 948 3664

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Bioreactor	Anaerobic digestion	10 litre capacity
COD apparatus	Determination of COD	Chemical method
Ovens	Drying purposes	Standard laboratory
N apparatus	Determination of N	Chemical method
Fibre analyser	Fibre determination	Semiautomatic
Laminar-flow cabinets	Aseptic manipulation of biological materials	HEPA Filter, 0.3×10^{-6} m
Micro-balances	Weighing of chemicals/samples/equipment/etc	up to 4 decimal points
pH meters	pH measurement	Portable
Incubators	Studies on controlled growth environment	controlled temperature regimes

RESEARCH EXPERIENCE

- Mushroom cultivation management using alternative growth media developed from agro-industrial byproducts :
  - Exotic - shiitake, Ling Zhi, abalone, white oyster, grey oyster
  - indigenous - termite, telinga kera, gelang

  Note : *Collection of fungal materials is continuous and list of materials available is more than those listed above.*

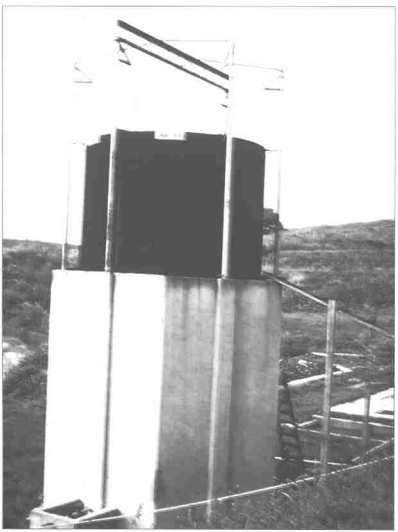
- Compost development and management using agro-industrial byproducts as base materials
- Organic waste management, utilisation and control
- Product development (e.g. alternative animal feed, chemical compounds, biodegradable products) from microbial interaction on agro-industrial byproducts

CONSULTANCY EXPERIENCE

- Mushroom production
- Animal waste control

SERVICES OFFERED

- Mushroom production
- Animal waste control
- Agro-industrial byproduct utilisation



Biotechnology

Food Biotechnology

Name of group/centre:

Biotechnology Centre

Name of laboratory/project:

Food Biotechnology

Person(s) to contact:

- Dr. Subari Shibani *(Program Leader)*
- Dr. Suhaimi Masduki *(Researcher)*
- Dr. Abidin Hamid *(Researcher)*
- Puan Norzihan Abdullah *(Researcher)*
- Puan Nor Azni Md Adnan *(Researcher)*
- Puan Yeoh Quee Lan *(Researcher)*

Postal address:

Biotechnology Centre, MARDI
PO Box 12301
50774 Kuala Lumpur
Malaysia

Telephone:

603 - 948 6601

Telefax:

603 - 948 3664

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Fermentor Biostat F	Stirred fermentation process	10 litre capacity
Fermentor Biostat B	Air-lift fermentation process	2 litre capacity
Fermentor Biostat B	Stirred fermentation process	2 litre capacity
Gas Chromatography	Chemical analysis	Perkin Elmer
UV-Visible Recording Spectrophotometer	Chemical analysis	UV-160A Shimadzu
Ovens	Drying purposes	Standard laboratory
pH meters	pH measurement	Portable
Incubators	Studies on controlled growth environment	Controlled temperature regimes

RESEARCH EXPERIENCE

- Identification of microorganisms using Microbial Identification System
- Technology for the production of inoculum or starter culture for fermented foods
- Technology for the production of fermented food products:
  - Soy souce
  - Tapai
  - Nata
- Technology for the production of food ingredients:
  - Natural food colour
  - Microbial polysaccharide
  - Organic acids
- Utilisation of by-product for the production of microbial biomass and photosynthetic bacteria

CONSULTANCY EXPERIENCE

Fermented food production : soy souce

SERVICES OFFERED

- Fermentation process and technology
- Technology for the production of fermented food : as above
- Technology for the production of food ingredients : as above

Biotechnology

Molecular Biology & Genetic Engineering

Name of group/centre:
Biotechnology Centre

Name of laboratory/project:
Molecular and Cellular Biology

Person(s) to contact:
- Dr. Hassan Mat Daud *(Program Leader)*
- Dr. Lam Peng Fatt *(Researcher)*
- Dr. Vilasini Pillai *(Researcher)*
- Dr. Kamal Hizat *(Researcher)*
- Puan Hamidah Ghazali *(Researcher)*
- En. Tan Chon Seng *(Researcher)*

Postal address:
Biotechnology Centre, MARDI
PO Box 12301
50774, Kuala Lumpur
Malaysia

Telephone:
603 - 948 6601

Telefax:
603 - 948 3664

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
PCR Thermal cycler DNA sequences for gene	Amplification of gene or Automated PCR amplification cloning, DNA fingerprint and molecular screening	Built-in heating and cooling, protocols, Temp. : 0 - 100 °C, Accommodate 48 PCR tubes
Microscope	Visualisation and magnification of minute items	Magnification : 10x, 20x, 40x, 100x Equipped with influorescence system
Electrophoresis or protein	Separation of DNA, RNA Gel cast of different sizes	Power supply up to 2,500 volts (Large, Medium or Small)
DNA sequencing	Manual sequencing of DNA	Power supply up to 3,00 volts. Gel cast of 2 sizes (Medium and Long)
Vacuum blotter	Rapid transfer of DNA onto membrane	Vacuum blotter and pump
Electroporator Resistance: sc	Gene transfer into plant protoplast and bacterial cells	Voltage : Up to 2.5 kV. Capacitance extender: Up to 960 µFD, Pulse Controller
Spectrophotometer for DNA/RNA analysis	Quantification of DNA, RNA and protein	UV and visible light system. UV : 5 wavelengths. DNA/RNA computer program

Biotechnology
Plant Biotechnology

Name of group/centre:
Biotechnology Centre

Name of laboratory/project:
Plant Biotechnology

Person(s) to contact:
- Dr. Mohamed Senawi Dato' Mohamed Tamin *(Program Leader)*
- Dr Vilasini Pillai *(Researcher)*
- En. Mohd Shaib Jaafar *(Researcher)*

Postal address:
Biotechnology Centre, MARDI
PO Box 12301
50774 Kuala Lumpur, Malaysia

Telephone:
603 - 948 6601

Telefax:
603 - 948 3664

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*

8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Microscopes	Observation and visual recording of specimens	64 x magnification, 35mm camera attachment
Laminar-flow cabinets	Aseptic manipulation of plant cell and tissue cultures	HEPA Filter, 0.3×10^{-6} m
Autoclaves	Sterilisation of medium, instruments, etc.	Sterilisation temperature 121°C, pressure 1.0 kg/cm^2
Micro-balances	Weighing of chemical/samples/equipment/etc	Sensitivity up to 4 decimal points
pH meters	pH measurement of medium and samples	Digital accuracy ± 0.01
Dispenser	Dispensing of growth medium	
Orbital shakers	Growth in liquid culture	0-250 rpm, 25mm amplitude
incubators	Studies on controlled growth environment	Controlled light and temperature (-30 to 50°C) regimes
Glassware washer	Cleaning of glassware	Capacity 1500 test tube/hr
Deep freezer	Storage of chemicals and samples	Min temperature -20 °C

RESEARCH EXPERIENCE

- Micropropagation of:
  - horticultural crops - banana, papaya, muskmelon, pineapple, mangosteen, potato, sweet potato, orchids, anthurium, Brunfelsia, Jasmimum, ginger
  - industrial crops - cocoa, abacca
- Meristem culture
- Germplasm storage (short and medium term)
- Secondary metabolism in plant cell cultures

CONSULTANCY EXPERIENCE

Micropropagation technology

SERVICES OFFERED

Plant micropropagation

Freeze drier	For freeze drying of samples	Temp: -55 °C. Sample flask : 100ml, 200ml and 500 ml.
Polaroid photography film system	Viewing and instant photography	Uses type 667/669 Polaroid

RESEARCH EXPERIENCE

- Gene cloning :
  - Gene cloning of papaya ringspot virus coat protein gene
  - Gene clothing of Acc synthase gene from Eksotika papaya
- Transformation of plants and bacteria:
  - Transformation of rice and papaya
  - Transformation of bacterial cells with plasmid
- Mono and polyclonalantibodies :
  - Monoclonal antibody against rice tungro spherical virus
  - Polyclonal antibody against plant growth metabolites
- DNA fingerprint :
  - DNA fingerprint of durian clones
- Embryo sexing of livestocks :
  - Embryo sexing of cattle and sheep

CONSULTANCY EXPERIENCE

Screening of transgenic rice for tungro virus resistance

SERVICES OFFERED

- Gene cloning and manipulation
- Plant transformation
- DNA fingerprint
- Embryo sexing
- Diagnostiers through the use of antibody

FOOD ENGINEERING

Food Process Control, Physical Properties, Transfer Processes and Plant Design

Name of group/centre:
Food Technology Research Centre (Food Engineering)

Research laboratory/project:
Pilot Plant and Food Engineering Fabrication Workshop

Person(s) to contact:
- Adinan Husin *(The Director)*
- Mohd. Zainal Ismail *(Programme Co-ordinator)*

Postal address:
Food Technology Research Center, MARDI
GPO Box 12301
50774 Kuala Lumpur
Malaysia

Telephone:
603 - 948 6401

Telefax:
603 - 942 2906

Office hours:
8.00 am - 12.45 pm / 2.00 pm - 4.15 pm *(Mon - Thurs)*
8.00 am - 12.15 pm / 2.45 pm - 4.15 pm *(Friday)*
8.00 am - 12.45 pm *(Saturday)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Laboratory scale and pilot scale conventional drying unit	Drying study, product quality assessment, drying cost	Drying capacity 2-100kg, tray type dryer, using heating element and diesel burner
Pilot scale traditional food processing machine	To prepare and carry out studies on traditional food using machines	Specially designed machinery for selected product such as lemang, karas, rempeyek, tahalo and emping
Pilot scale processing machineries for kerisik, salted egg and dried shrimp	To prepare and carry out studies on selected products	Processing capacity 20kg/hr for kerisik, 100 eggs/hr for salted eggs and 5 kg dried shrimp/hr
Pilot scale packing house machines for fruits	Postharvest handling for fruits	Hot water treatment and precooling of fruits fruits with a capacity of 100-160 kg/batch
Data acquisition system for measurement of physical properties of food	Measurement of thermal properties of food	Transient method, speed of about 4 replicates per 5 minutes
Falling film evaporator	Concentration of fruit juice and food products	Capacity of 50 kg/hr of feed, evaporative capacity of 40 kg/hr
Aseptic packaging	Production of aseptically packed fruit pulp and juices	800 litr/hr at max. pump speed

Westfalia separator	Separation of 2 liquid phase base on density difference	Ca. 1 to 30 gal/hr, sediment holding space of 0.25 lit.
Plate heat exchanger	Pasteurisation of milk and other liquid food	Capacity: 100 lit/hr of liquid

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Autocad	Design of processing lines/equipment	Release 12
Fabrication equipment	Fabrication and modification of machineries	For mild steel and stainless steel works
ASYST	Thermal property analysis	

RESEARCH EXPERIENCE

- Development of new processing equipment for the mechanisation of traditional food products
- Evaluation and development of various types of mechanical dryers for food products
- Designing of food processing equipment for SMI

CONSULTANCY EXPERIENCE

- Development of Tebaloi Machine and Dryer for Udang Sesar Unjur for Ministry of Industrial Development, Sarawak
- Trouble shooting and servicing SMI in solving engineering problems especially those related to plant and equipment design

SERVICES OFFERED

- Evaluation and modification of food processing equipment
- Design of traditional food processing lines
- Design and evaluation of conventional and non-convention dryer for food products
- Food physical property analysis - thermal properties of food
- Food factory/plant design - building layout, utilities and services (not including electrical)
- Performance testing of food processing equipment
- Mass and energy balance for food factory

Food Processing & Food Technology

Name of group/centre:
Food Technology Research Centre

Name of laboratory:
Food Processing & Packaging

Person(s) to contact:
- Adinan Husin *(The Director)*
- Dr. Noraini Khalid *(Programme Co-ordinator)*

Postal address:
Food Technology Research Centre, MARDI
GPO Box 12301
50774 Kuala Lumpur
Malaysia

Telephone:
603 - 948 6401

Telefax:
603 - 942 2906

Office hours:
8.00 am - 12.45 pm / 2 pm - 4.15 pm *(Mon - Thur)*
8.00 am - 12.15 pm / 2.45 pm - 4.15 pm *(Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Pilot scale batch type cryogenic freezer	Rapid chilling and freezing	*Sifter-as* - hand operated freezing chamber - liquid nitrogen
Can seamer	Seam cans	Metalbox-manual
Retort	Thermal processing of food packed in rigid containers	Vertical and horizontal types. Capacity ca. 150 cans, size 300x505
Pilot scale retort pouch simulator	Thermal processing of food packed in retort pouches	System heated by either steam, hot water or mixture of both up to 145 °C. Automatic temperature/pressure controls with fully automatic operating cycle. Built in compressed air system and water storage tank
Laboratory plate heat exchanger	Thermal processing of fluids e.g. milk, juices	De Laval P20 - Throughout capacity 1000l/h max. Max operating temperature 150 °C.
Falling film evaporator	Concentration of fluids	Anhydro - Capacity : 50 kg/hr of feed. Evaporative capacity 40kg/hr
Vacuum evaporator	Concentration of fluids e.g. puree, sauce under vacuum	10 gal vacuum max. W.P. 100 psi at 170 °C.
Vacuum dehydrator	Drying of food e.g. fish, ginger, herbs under vacuum	Babcock BSH
Cabinet air dehydrator	Drying of food with heated air.	Capacity : 45 trays (117x57x85.5cm) Mofaz.

Spray drier	Drying of liquids to form powders	Anhydro-Type Lab SI. Evaporation capacity 7.5 kg/hr. Centrifugal and nozzle atomiser
Pilot scale freeze drier	Drying of frozen food to make freeze-dried products	Vacudyne Altair-Capacity11 kg wet weight
Membrane filtration system	Ultrafiltration and microfiltration of liquids	Sartocon II - System SM17546. Module holding device - 7 series (max) and rotary lobe pump 0.6 - 4 m³/hr
Ice-cream machine	Making of soft ice-cream	Gelmark GM/80 continuous freezer. Mixture pump motor 0.5hp. Frigorific capacity 2400 frig/hr
Pulper	Pulping of fruits	Reeves
Colloid mill	Homogenisation of easily cuttable to tough fibrous food	Fryma
Pressure fryer (electric)	Frying of food under pressure in oil	Mies - 2000HD Thermostat control. Uses ca. 11kg oil
Vacuum sealer	Sealing packages under vacuum	hindaigo
Rotary sealer	Sealing packages	
Impulse sealer	Sealing packages	
Vacuum packaging system	Vacuum skin packaging	Intact vacuum skin packaging RM573 system
Skin pack vacuum forming machine	Skin packaging	Skin pack vacuum forming machine
Overwrapping machine	Overwrapping boxes/cartons	
Stretch wrapping machine	Stretch wrapping of food	
Shrink wrapping machine	Shrink wrap solids in boxes/trays	Shrink tunnel and sealer
Horizontal form-fill-seal machine	Filling/packing solids in tray/box	Chiong Taiw - CPW 280 Wrap Star
Vertical form-fill-seal machine	Filling/packing powders and liquids - sachet form	Chiong Taiw
Strapper	Box strapping	MK Pak
Fruit/vegetable processor	Slice/dice/chop/shred/grate	Hallde Giant RG 61. Capacity 400kg/min.
Pascal mortar and pestle mill	Grinding of roasted cocoa beans and mixing chocolate paste	Capacity 1 kg, with mortar heating element.
Triple roll mill	Refining chocolate paste to flakes	Water jacketted rollers. Size reduction 23-30 microns
Tempering vessel	Tempering chocolate	Capacity 2 kg
Fondant beater	Make fondant. Also general purpose mixer. A miniature chocolate conche	Capacity 1 kg Water jacketted
Toffee cooker	Make toffee	Capacity 1 kg. Heater and stirrer
Mini conche - Karlshamns	Conching chocolate	Capacity 1 kg
Low temperature incubator	Setting chocolate	Temperature -10 to 50 °C
Fluidised bed dryer	Agglomerating, instantising and coating	Max. temperature 150 °C. Charge quantity 0.1 to max. 1 kg. Buchi 710
Corn treat centre	Mixing and snack coating. Prepare coating syrup	Capacity 2 kg puffed snack
Dragee pan/ball mill	Making panned products	Capacity 0.5kg
Complete line for bread and pastry processing	Bread and pastry processing	Oven capacity 200 loaves/900 buns per batch
Cakes/bun moulding machine	Moulding and filling of traditional cakes/ pastries	Rheon - Encrusting machine. Moulding process 25 pieces/min.

Rotary cake making/baking machine	Baking of cakes. Burners in circular path	Morikawa - egg bake 960 pieces "baulu"/hr
Parallel cake burners	Baking of traditional cakes	48 pieces/batch
Doughnut cake former and fryer	Forming and frying machine for doughnuts	
Forming machine	Forming meat patties	Forms 2100 portions/hr of various shapes and thickness
Griddle (hot plate)	Grills meat and meat products	Thermostat control with 2 heating elements. Pull out grease drawer. Stainless steel plate.
Paddle mixer	Mixing comminuted meat with other ingredients	Reversible mixing action. Bowl capacity 20 kg meat. Tiltable bowl. Mainca AS35
Meat grinder	Grinding of meat into smaller sized particles	Saarbrucken EMS
Bowl cutter	Comminution of meat for emulsion type products	30 kg meat mass capacity Laska
Stuffer	Stuffing of meat mass into casings	20 kg meat mass capacity Hydromat
Slicer	Manual or automatic slicing of meat products into variable thickness	Berkel

RESEARCH EXPERIENCE

The Centre has wide research in thermal processing, dehydration, chilling, freezing, concentration and fermentation.

CONSULTANCY EXPERIENCE

The Food Technology Research Centre has consultancy experience in the various disciplines of food processing covering fruits, vegetables, meat, poultry, fish, seafood, dairy, legumes, grains, confectionery, traditional food and miscellaneous crops.

SERVICES OFFERED

Research and Development services with respect to product development, product evaluation and parameter determination in the areas of thermal processing, dehydration, chilling, freezing, concentration, fermentation.

Malaysian Institute For Nuclear Technology Research (MINT)

PROFILE

Creating New Frontiers of Innovative Research

MINT, one of the first fully-dedicated technological and non-commodity-based R&D organisations in the nation, was established in 1972, with the onus of introducing and promoting the use of nuclear science and technology in national development.

Nuclear science and technology being a science of the atom, finds applications in vast areas of activities of Man and his Environment. It extends into the basic sciences of biology, chemistry and physics. It forms the basis of the applied physical sciences of solid-state and fluid physics; and the material sciences of metallurgy, and of ceramic, polymer and composite technology. It contributes to the growth of the medical sciences of diagnostic and therapeutic medicine; the earth sciences of geology, hydrology, sedimentology, and meteorology; and the applied life sciences of plant cultivation and breeding, food processing and preservation, pest and disease control. And it penetrates into the engineering technologies associated with energy, instrumentation and control, waste management, and process engineering.

Notwithstanding the diversity and expanse of nuclear science and technology, **MINT** maintains a skilful balance in its activity mix placing **MINT** in the unique position of being in the centre of intersectoral and interdisciplinary technology integration.

MINT conducts active R & D programmes in the industrial, agricultural, medical and strategic sectors for the generation and development of new products and processes, backed by an excellent multidisciplinary team of researchers, equipped with equally and diversified research laboratories and facilities, at its two locations near Bangi, Selangor. A continuous in-flow of technologies is ensured through **MINT**'s active participation in multilateral, regional and bilateral collaborative research programmes, further strengthening the nation's capacity for technology absorption.

This enables **MINT**, as a creative, innovative and knowledge-based organisation, to develop a strong foundation as a research contractor. A role well suited to **MINT**'s competitve edge as a diversified technology-based organisation.

MINT's products and services range from standardised items, such as the sterilisation of medical products by gamma irradiation, repair and calibration of radiation measuring devices, and neutron activation and radiochemical analytical services; through customised services, such as the production of radiopharmaceutical, and industrial and agricultural radiotracers, column scanning for oil refineries, and design and installation of nucleonic control systems; to training and consultancy in areas pertaining to nuclear and related technologies.

Aerial view of MINT's main complex at Bangi

"Our Present Business Mix"

STANDARDISED PRODUCTS

- Health Physics & Radiation Protection
- International Nuclear Information
- Neutron, Gamma & Electron Irradiation Services
- Nuclear Analytical Services
- Nuclear Instrumentation Maintenance
- Radioactive Waste Treatment
- Radiochemical Analysis
- Secondary Standards Dosimetry
- Sterilisation of Medical Products

CUSTOMISED PRODUCTS

- Biotechnology & Tissue Culture
- Design and Fabrication of Nuclear Instrumentation & Nucleonic Control Systems
- Materials Characterisation and Analyses
- Non-Destructive Evaluation
- Production of Medical, Industrial & Agricultural Radioisotopes
- Radiation Cross-Linking of Polymers
- Radiation Processing of Surface Coating, Agro-Industrial Wastes & Natural Rubber Latex
- Radiotracer Technique & Nuclear Gauging

TRAINING SERVICES

- Non-Destructive Evaluation
- Occupational Health & Safety
- On-the-Job Technical Training for International Fellows
- Radiation Protection
- Regional & International Training Courses
- Research Reactor Operator Training

CONSULTANCY & ADVISORY SERVICES

- Radiological Impact Assessment
- Environmental Monitoring
- Hydrology & Sedimentology Studies
- Infrastructural Development of Nuclear Centres
- Policy Analysis and Planning
- Radiation Processing
- Radiation Safety Programme
- Radioactive Waste Management
- Technical Conferences, Seminars & Workshops

***For* enquiries, please contact the relevant R&D personnel listed in the following sections or contact:**

Head Business Unit
Malaysian Institute for Nuclear Technology Research *(MINT)*
Bangi, 43000 KAJANG, SELANGOR, MALAYSIA

Telephone: 60 - 3 - 825 0510 ***Telefax:*** 60 - 3 - 825 8262

Working hours:

Monday - Thursday:	0800-1245 1400-1615	*Friday:*	0800-1215 1445-1615
Saturday:	0800-1245		

Advanced Materials

Ceramics, Optical, Semiconductor Materials

Name of group/centre:

Materials Science & Technology Programme

Person(s) to contact:

Dr. Abdul Fatah Awang Mat *(Group Leader) ext.1118 / 1166*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Scanning Electron Microscope	Surface microstructure analysis and X-ray elemental analysis	Philips SEM 616 with EDAX; elements analysed Z>10
X-Ray Diffractometer	Powder diffraction; phase determination	Siefert XRD3000P, 2kW Cu target X-ray tube, continuous or step scan, programmable q/2q scan or q/q scan
Small Angle Neutron ScatteringInstrument	Study of bulk inhomogeneities in ceramics, polymers and metals	Resolvable size distribution is 1 - 80 nm
Universal Testing Machine	Mechanical tests; tensile, compression & bending test	Zwick 1474 with100 kN load cell
Low temperature cryostat	I-V and C-V characteristics measurements of semiconductors and ceramics down to 77K	LakeShore
Spectrophotometer	Optical characteristics measurement of semiconductors, glass & thin metal films	Hitachi
Vacuum Coating Unit	Production of thin metal films for electrical and optical usage Thickness Range: 0.1 - 50 microns	Edwards
Continuous-flow Mixer-settler	Development of continuous chemical extraction processes	

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
CD-ROM Powder Diffraction Library	Standard and reference peaks for most materials	PDF2 Database Powder Diffraction Files from International Centre for Diffraction Data

RESEARCH EXPERIENCE

- Materials characterization and analysis covering metals & alloys, ceramics, composites and semiconductor materials
- Corrosion research
- Development of semiconductor materials and devices
- Extractive metallurgy of zirconia

SERVICES OFFERED

All materials characterization such as structural, electrical and optical properties of metals & alloys, ceramics, composites and semiconductors

Agricultural Sciences

Soil & Water Sciences

Name of group/centre:

Soil Plant Relationship Group

Name of laboratory/project:

Soil water and irrigation studies

Person(s) to contact:

- Asiah Ahmad *(Researcher) ext.1320*
- Khairuddin Abdul Rahim *(Researcher) ext.1328*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Depth moisture gauge (neutron probe)	Precise and fast determination of the moisture content of soils at different soil depth	Troxler 4300 depth moisture gauge. Probe contains Americium-241: Beryllium source and Helium detector
Tensiometers (mercury manometer type)	Soil water status determination as a guide for regulating irrigation practices	DTM 5000 and soil moisture corp
Pressure chamber	Plant moisture stress measurement	PMS Instrument Co.
Emission Spectrometer	Determination of the relative abundance of the stable isotope N-15	NOI-6PC Analyzer
Liquid Scintillation Counter	Quantification of low energy β-emitters such as C-14, H-3 and P-32	Packard. Tri-Carb 4530

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application
Geo-Eas1.2.1 Software	Two dimensional geostatistical analyses of spatially distributed data

RESEARCH EXPERIENCE

- Crop water requirement of groundnut by using water balance approach
- Calibration and application of neutron probe in-soil water and irrigation studies
- Biological nitrogen fixation using N-15 tracer technique
- Root activity studies of crops and tree crops using P-32 radioisotopic technique
- Evaluation of N and P fertilizers in crop and tree crops

CONSULTANCY EXPERIENCE

Pertaining to the above

SERVICES OFFERED

- Nitrogen-15 analysis in plant & soil samples
- Phosphorus-32 analysis in plant samples

Analytical Chemistry

Chemical, Physical & Instrumentation Method

Name of group/centre:

Nuclear Analytical Chemistry Group

Person(s) to contact:

Dr. Abd. Khalik Haji Wood *(Group Leader) ext.1130*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Gamma-ray spectrometer system for Neutron Activation Analysis	• Simultaneous elemental analysis in various forms of samples • Uranium and Thorium analysis in environmental and mineral samples.	Detection levels: • Minerals: % down to ppm • Environmental samples: ppm down to sub ppm • Geological samples: ppm down to sub ppm
Atomic Absorption Spectrometer	Element analysis especially in water or easily digestable solids	Graphite Furnace Type Detection Levels: ppm down to sub ppm
CHN Analyzer	Analysis of carbon, hydrogen and nitrogen in various kinds of samples	Fisons. Detection Levels: % down to 0.05%

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical Specifications
SAMPO-90 Software for running of CHN Analyzer and Atomic Absorption Spectrometer (AAS)	Gamma spectra analysis software Elemental analysis by CHN Analyzer and AAS	

RESEARCH EXPERIENCE

- Establishment of methods and procedures for elemental analysis by nuclear analytical technique in various types of material such as geological, biological and environmental
- Quantification of Uranium and Thorium for assessment level of natural radioactivity in environmental samples
- Marine environmental studies (Heavy metal)

SERVICES OFFERED

- Radioactivity measurements (Uranium and Thorium)
- Elemental contents in rubber products
- Multielemental analysis of geological samples
- Heavy metals in minerals
- Rare earth elements in geological samples

Biotechnology
Plant Biotechnology

Name of group/centre:
Isotope & Radiation in Biology & Agriculture Programme

Name of laboratory/project:
Plant Biotechnology Laboratory

Person(s) to contact:
- Dr. Mohd. Nazir Basiran *(Group Leader) ext.1335*
- Azhar Mohamad *(Researcher)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Ultracentrifuge	Sample separation, DNA & RNA Isolation	Beckman Optima XL-70
High Speed Centrifuge	Sample separation, DNA & RNA Isolation	Beckman J2-MC
Freeze Dryer/ Concentrator	Sample Drying	Savant Speedvac SS2
Polymerase Chain Reaction Machine	DNA Amplification	Perkin Elmer Gene Amp PCR System 9600

RESEARCH EXPERIENCE
- Plant genetic manipulation (gene tagging, gene transfer, gene isolation, gene cloning)
- Plant cells in-vitro mutagenesis

CONSULTANCY EXPERIENCE
Pertaining to above

SERVICES OFFERED
- Irradiation of plant cell cultures (ornamentals & fruit trees)
- Gene amplification through polymerase chain reaction

An orchid plantlet developed through radiation-induced mutation breeding at MINT. This is a sample of MINT's contribution to the development of new varieties of ornamental plants for potential export

Crop & Pasture Production/Horticulture

Plant Breeding

Name of group/centre:

Isotope & Radiation in Biology & Agriculture Programme

Name of laboratory/project:

Plant Mutation Breeding

Person(s) to contact:

- Dr. Mohd. Nazir Basiran *(Group Leader) ext. 1335*
- Abdul Rahim Harun *(Researcher) ext. 1339*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Walk-in growth chamber	Research on plant development under controlled environment	Series MC 11/4 with controlled humidity, temperature and lightings
Seed Nutrient Analyser	Analysis of proteins, oils, carbohydrates, moisture etc	Bran & Luebbe Infra Analyser 260 NIR
Infra-Red Spectrophotometer	Specific biochemical analysis of agricultural samples	Buck Scientific Series M 500
Fluorescent Microscope	Identification of specific microorganisms	Nikon Fluophot Series 523055

RESEARCH EXPERIENCE

- Induced mutation in plant breeding by using ionizing radiation, radioisotopes and chemical mutagens
- Techniques in molecular biology and gene cloning
- Agricultural microbiology for crop protection
- Radiation induced mutagens for ornamentals improvement

CONSULTANCY EXPERIENCE

- Experimental design using a combination technique of radiation and radioisotopes for legumes improvement
- Use of gamma rays for rice improvement
- Radiation induced mutagens for the improvement of fruit trees & ornamentals

SERVICES OFFERED

- Irradiation of agricultural samples for mutation induction e.g. seeds, cuttings, potted plants, tissue culture materials etc.
- Radiosensitivity test to determine the effect of radiation doses on growth

Ecology

Freshwater & Terrestrial Ecology

Name of group/centre:

Isotope and Radiation in Biology and Agriculture Programme

Name of laboratory/project:

Environment

Person(s) to contact:

Dr. Nashriyah Mat *(Group Leader) ext.1319*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Liquid High Performance Chromatography (HPLC)	Pesticide residue analysis	Gilson with two pumps and UV detector

RESEARCH EXPERIENCE

- Residue analysis of Carbofuran, Carbaryl and Paraquat
- Monitoring of water quality in terrestrial and aquatic (paddyfield) ecosystems

SERVICES OFFERED

- Monitoring of NO_3^-, NH_4^+, PO_4^{2-}, Cl, physical parameters of water quality
- Residue analysis of selected pesticides

The use of nuclear techniques for flow measurement in an irrigation canal, part of an integrated agronomic management consultancy package that includes studies on pesticide residues, fertiliser uptake and soil studies

Electrical & Electronic Engineering

Electronic Engineering

Name of group/centre:

Instrumentation and Control Programme

Name of laboratory/project:

Nuclear and Scientific Instrument Development

Person(s) to contact:

- Izhar Abu Hussin *(Group Leader) ext.1082*
- Ishak Mansor *(Research Officer) ext.1160*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Board Master Diagnostic System	Maintenance of diagnostic and testing board level	Range of integrated circuit library, in-circuit and out-circuit testing board comparing capabilities.
Portable Rework System	Repair of electronic printed circuit board	Brushing, polishing, drilling, vacuum and soldering capabilities.
Huntron Tracker with computer control	Troubleshooting of circuit board and electronic component for developmental and maintenance purposes	Divides up to 110 section per board with 330 components per section, Database for unit under test to maximum of 40 pins integrated circuit component
Gauss measuring Instrument	Magnetic field measurement	Maximum to 20K gauss with polarity indicator and recording facilities
Digital Storage Scope	Measurement of high speed signal	100MHz, 4-channel and digital storage capability
AGEMA Thermal-vision with computerized imaging	Detection of hot spot or figure in the operation of electronic board, electronic or electromechanical components	Temperature range -30°C to 80°C, infra-red thermal imaging, view finder, scanning image recording with PAL, RS 170 video output and scanning frequency of 15Hz
CNC Workstation-Etchmaster	Development of printed circuit board	12" x 18" maximum board size, routing, numeric controlled drilling, copying printed circuit board capability.
Nuclear Spectroscopy System	Guidance in nuclear instrument development for radionuclide analysis	NIM crate with Power supply (+5V, +12V, +24V), spectroscopy amplifier, High Voltage (up to 4KV), signal counter and detector system

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
SPESKO	Electronic components Storage Management System	Dbase III
SIMPERAS	Scientific Equipment Inventory System	Dbase IV
CMPM	Computerised Preventive Maintenance Management System	FOXBASE

RESEARCH EXPERIENCE

- Development of radiation area monitoring system
- Development of computerised tomography system for industry
- Development of an automated radiation safety system
- Design of steel flaw detection instrumentation
- Development of computerised control and interfacing in research instrumentation
- Development of a single chip computer
- Animal monitoring system
- Development of a public address system for office complex

CONSULTANCY EXPERIENCE

- Software development methodology and engineering
- Interfacing and communication
- Instrument development and control systems
- Quality Control in Nuclear Medicine Instruments

SERVICES OFFERED

- Design and upgrading of scientific instruments
- Maintenance of scientific instruments
- Design and production of printed circuit board

Repair and maintenance of a liquid scintillation counter equipment at MINT, part of MINT's nuclear instrumentation services also provided to external users

Environmental Biotechnology & Environmental Conservation

Radiation Processing

Name of group/centre:

Radiation Processing Programme

Name of laboratory/project:

Upgrading Agro-Industrial By-Products

Person(s) to contact:

- Dr. Khairul Zaman Hj. Mohd Dahlan *(Programme Head) ext.1400*
- Dr. Mat Rasul Awang *(Group Leader) ext.1404*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Cobalt-60, gamma irradiation facilities	Pasteurization of agro-industrial by-products	Source Strength: 1.5 MCi
Electron Beam Machine	Pasteurization of oil palm empty fruit bunch	Voltage: 0.5 to 3.0 MeV Current: 0.1 to 30 mA Conveyor speed: 1-20 m/min
High Performance Liquid Chromatography (HPLC)	Determination of aflatoxin & proteins	Water based solvent. Detectors: UV/vis, RI, Spectrofluorometer & Electrochemical
Solid State Fermentor	Fermentation in solid state form (cellulosic waste etc.) by monitoring CO_2 released	Capacity: 250 ml & 2L Temp: 10 to 50 °C Min air flow: 50 ml/min
Incubator	Incubation of fungi	Temp: 15 - 50 °C Humidity: 40 - 90 %
Freeze Dryer	Freeze-drying samples	Temp: -40 to 60 °C
Refrigerated centrifuge	Concentrating liquid samples	Temp: -10 to 40 °C 20 x 1000 rpm max.

RESEARCH EXPERIENCE

- Production of ruminant feeds from oil palm waste (empty fruit bunches [EFB]) treated by radiation
- Growth of mushroom on EFB substrates that have been treated by radiation
- Production of compost from EFB treated by radiation

SERVICES OFFERED

- Technical consultancy services on the processing of EFB for ruminant feed
- Technical consultancy services on mushroom production using EFB as a substrate
- Technology transfer on the production of mushroom and ruminant feeds from oil palm empty fruit bunches treated by radiation

Industrial Biotechnology & Food Sciences

Food Irradiation

Name of group/centre:

Isotopes & Radiation in Biology & Agriculture Programme

Name of laboratory/project:

Food Irradiation

Person(s) to contact:

- Zainon bt. Othman *(Group Leader) ext. 1432*
- Radziah bt. Ariffin *(Researcher)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Capillary Gas Chromatograph	• Analysis of components of volatile mixtures (aromatic hydrocarbons) in essential oils of spices (black and white pepper) • Analysis of pesticide residues in foods • Fingerprinting of fatty acid profiles in fats and oils • Determination of food sugars	VARIAN 3400 Capillary Gas Chromatograph Detector : Flame Ionisation (FID) Columns available: Bonded FSOT OV-255, OV-1 and Carbowax -20 Data handling system software: Delta Junior
High Performance Liquid Chromatograph (HPLC)	• Amino acids analysis in food and biological samples • Sugar and vitamin analysis • Detection of aflatoxin in animal feeds	WATERS Chromatography System with UV/visible detector
Penetrometer	Determination of penetration depth as a measure of consistency of products, e.g. fruits, meats, vegetables for quality control or product assessment.	Microprocessor controlled penetrometer PNR 10
UV-visible Spectrophotometer	For measurement of concentration of organic compounds in foods e.g. piperine, vitamin A. Also in enzymatic determination of sugars and other food constituents	LLKB Ultrospec II UV/Visible Spectrophotometer . Light source: Tungsten and Deuterium

RESEARCH EXPERIENCE

Applications of ionising radiation (gamma) for preservation of food (spices, rice, prawns, cocoa beans, poultry, fruits and vegetables and ornamentals)

SERVICES OFFERED

- Irradiation of food products (product handling, required dose and dosimetry)
- Information on food irradiation

Material Science & Technology

Non Destructive Testing

Name of group/centre:

NDT Group

Name of laboratory/project:

Eddy Current Laboratory

Person(s) to contact:

- Dr. Abd. Nassir Ibrahim *(Group Leader) ext.1209*
- Azhar Azmi *(Researcher) ext.1230*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Defectomat H2.835	Surface crack detection	
LCR meter	Capacitance, resistance and inductance (impedance) measurement	Freq: 20Hz-1MHz, accuracy 0.05%
Defectoscope	Defect detection, material characterization	S2.85 & S2.85
Ferritector	Ferrite content measurement	0FN-29FN
Elcometer	Thickness measurement	
Sigmatest	Conductivity measurement	

RESEARCH EXPERIENCE

Establishment of probe parameters that influence the sensitivity of eddy current test

CONSULTANCY EXPERIENCE

Overseeing heat exchanger inspection requirements in processing plants

SERVICES OFFERED

- Crack detection in engineering components
- Heat exchanger and condenser inspection
- Conductivity measurement on metal
- Paint thickness measurement
- Measurement of ferrite content

Heat exchanger inspection by eddy-current technique - assuring higher standards of safety and plant quality as demanded by the oil and gas industry

FIELD OF RESEARCH

Material Science & Technology

Non Destructive Testing

Name of group/centre:

NDT Group

Name of laboratory/project:

Ultrasonic Laboratory

Person(s) to contact:

- Dr. Abdul Nassir Ibrahim *(Group Leader) ext.1209*
- Mahmood Haji Dollah *(Researcher)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Sonatest sidescan 1410	Crack detection in metals	2.25MHz, 5Mhz, 4.3MHz
Nortec NDT131	Crack detection in metals	2.25 MHz, 5 MHz
Krautkramer USL35	Crack detection and velocity measurement in non-metals	0.5 - 2.0 MHz
PUNDIT	Velocity measurement in concrete	54 kHz, 82 kHz
Micro-Dur	Measurement of metal hardness	in HRC and HV
Hammer Test	Measurement of Surface hardness	
Compression Machine	Concrete Strength Measurement	
Krautkramer DME	Thickness Gauge	5.0 MHz

RESEARCH EXPERIENCE

- Ultrasonic technique for determination of concrete characteristics and detection of defects
- The use of surface wave to monitor the grain structure of 316 stainless steel weld

CONSULTANCY EXPERIENCE

- Development of ultrasonic inspection procedures
- Skilled manpower development

SERVICES OFFERED

- Ultrasonic inspection of welded plates and pipes
- Thickness gauging
- Compression test of concrete
- Ultrasonic velocity in rock, concrete and other non-metallic materials

Material Science & Technology

Non Destructive Testing

Name of group/centre:

Non-Destructive Testing Group

Name of laboratory/project:

X-ray and Gamma-ray Laboratory

Person(s) to contact:

- Dr. Abd. Nassir Ibrahim *(Group Leader) ext.1209*
- Aziz Amat *(Technician)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
X-ray machine	X-Radiographic Inspection	Andrew & Siefert KV : 0 - 300 mA : 0 -10mA
Gamma Ray Projector	Gamma Radiographic Inspection	Max. 100Ci of Ir-192

CONSULTANCY EXPERIENCE

- Design of Exposure Room
- Preparation of radiological safety program for licensing purposes
- Development of radiographic laboratory and skilled manpower for specific needs
- RPO for radiography

SERVICES OFFERED

- Radiographic inspection of welded plates and pipes and engineering components
- Maintenance of gamma projector

Ensuring gas pipeline integrity by x-ray radiography - one of the many MINT-developed non-destructive evaluation (NDE) techniques

Material Science & Technology

Radiation Processing

Name of group/centre:

Radiation Processing Programme

Name of laboratory/project:

Radiation Effect on Polymer

Person(s) to contact:

- Dr. Khairul Zaman Hj. Mohd Dahlan *(Programme Head) ext.1400*
- Mr. Ishak Manaf *(Group Leader) ext.1403*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Electron Beam Facility (ALURTRON)	• Sterilization of rubber gloves • Degradation of polymer • Crosslinking of plastic	Voltage: 0.5 to 5.0 MeV Current: 0.1 to 50 mA Conveyor speed: 1 - 20 m/min
Gamma Irradiation Facility (SINAGAMA)	• Sterilization of rubber gloves • Degradation of polymer	Source strength: 1.5 MCi
Universal Tensile Machines	Measurement of tensile properties	Load cell: 1.5 kN x head speed: Max. 500 mm/min
High Performance Liquid Chromatography (HPLC)	Separation of organic compounds	Working temp: RT - 99 °C Spectrophotometer detector
Melt Flow Indexer	Melt flow index	Load: 0.325 - 21.6 kg Temp: RT + 350 °C
Dynamic Mechanical Analyzer	Modulus of dynamic rigidity, Tg and viscosity factor of high molecular materials	Mode: Torsional Temp: - 160 to 500 °C Meas. modulus: 10^{-1} - 10^{11} dyne-cm^2
Chemiluminescence	Determination of oxidative degradation	Wavelength: 300 - 650nm; Temp: RT - 200 °C
Vicat Softening Point	Determination of softening point	Temp: RT - 300 °C
Brabender:	• Mixing • Processibility test • Compounding of materials	PL2000 Lab Extruder Compounder Capacity: 50 and 470 g LD 19:25
Hot and Cold Press	Sample preparation	Max. Press.: 160 kg/cm^2
Fourier Transform Infra-red Spectrophotometer (FTIR)	Identification of polymer functional groups in solid, liquid and film samples	NICOLET 60SX Series Wavelength Range: 4000-400 nm (mid-IR) Optics : Michelson Interferometer Detector: DTGS (deuterated tri-glycerine sulphate)

RESEARCH EXPERIENCE

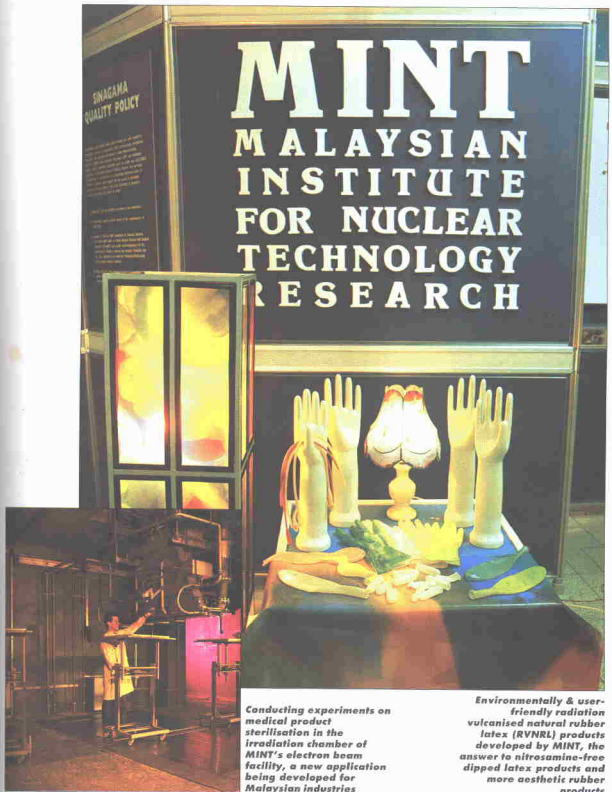
- Radiation compatible materials, PP and co-polymer
- Radiation compatible materials, PVC
- Electron beam processing for sterilization of surgical rubber glove

CONSULTANCY EXPERIENCE

Technical advice on radiation sterilization of medical products and radiation compatible materials

SERVICES OFFERED

- Testing of polymeric/plastic materials
- Technical consultancy services on radiation sterilization of medical products
- Research cooperation in the development of radiation compatible material for medical products
- Electron beam irradiation services for sterilization of medical products



Conducting experiments on medical product sterilisation in the irradiation chamber of MINT's electron beam facility, a new application being developed for Malaysian industries

Environmentally & user-friendly radiation vulcanised natural rubber latex (RVNRL) products developed by MINT, the answer to nitrosamine-free dipped latex products and more aesthetic rubber products

Material Science & Technology

Radiation Processing

Name of group/centre:

Radiation Processing Programme

Name of laboratory/project:

Radiation Crosslinking of Plastic

Person(s) to contact:

- Dr. Khairulzaman Hj. Mohd. Dahlan *(Programme Head) ext.1400*
- Zulkafli Ghazali *(Group Leader) ext.1401*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Electron Beam Machine	Crosslinking of plastic	Voltage: 0.5 to 3.0 MeV Current: 0.1 to 50mA Conveyor speed: 1 to 20 m/min.
Brabender: PL 2000 Lab. Extruder Compounder	• Mixing • Processibility test • Compounding of materials	Capacity: 50 and 370 g L/D 19:25
Universal Tensile Machine	Tensile properties	Load cell: 1.5 kN x head speed (max): 500 mm/min
Melt Flow Indexer	Melt flow index	Load 0.325-21.6 kg Temp: RT - 550°C
Dynamic Mechanical Analyzer	Modulus of dynamic rigidity, Tg and viscosity factor of high molecular materials	Mode: Torsional Temp: -160 to 500 °C Meas. modulus: 10^{7} to 10^{11} dynes/cm
Plastometer	Heat deformation test	Load 50 - 100 gf, Max temp. 200 °C
High Resistance Meter and Resistivity Cell	Volume and surface resistivity measurement	Test volt (v-d) range: 0.1 to 1000 V Resistivity range: 10^{7} to 1.6×10^{17} ohms

RESEARCH EXPERIENCE

- Radiation crosslinking of PVC and PE for wire and cable insulations
- Radiation crosslinking of PE for heat shrinkable products
- Radiation effect on thermoplastic natural rubber (PP/NR)

CONSULTANCY EXPERIENCE

- Electron beam processing of wire and cable insulation
- Electron beam processing of heat shrinkable products

SERVICES OFFERED

- Material testing
- Electron beam irradiation for crosslinking of wire and cable insulation
- Electron beam irradiation for crosslinking of heat shrinkable materials
- Electron beam irradiation for crosslinking of foam
- Electron beam irradiation for crosslinking of various plastic moulded products (e.g. car parts/accessories)
- Research cooperation or research contract on radiation crosslinking of plastic

Material Science & Technology

Radiation Processing

Name of group/centre:
Radiation Processing Programme

Name of laboratory/project:
Radiation Curing of Surface Coatings

Person(s) to contact:

- Dr. Khairul Zaman Hj. Mohd Dahlan *(Programme Head) ext.1400*
- Mohd. Hilmi Mahmood *(Group Leader) ext.1406*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Electron Beam Machine (Curetron)	• Curing of coatings of wood and non wood substrates • Curing of printing ink & adhesive	Voltage: 150-200 keV Current: 1 - 20 mA Conveyor speed: 5 - 50 m/min
Ultraviolet Irradiation System	• Curing of coatings of wood and non wood substrates • Curing of printing ink & adhesive	IST, 80 watts/cm 20 cm sample width, 1-60 m/min
Universal Tensile Machines	Measurement of tensile properties	Load cell, 1, 5 kN x head speed Max: 500 mm/min
Gel Permeation Chromatography (GPC)	Determination of molecular weight averages & distribution	Working temp: Room Temperature - 50°C
Dynamic Mechanical Analyzer	Measurement of modulus of dynamic rigidity, Tg and melting point of polymers	Mode: torsional Temp: -160 to 500 C Meas. modulus: 10^7 to 10^{11} dyne-cm^2
Fourier Transform Infra-red Spectrophotometer and IR	Identification of polymer functional groups in solid, liquid and film samples	FTIR: NICOLET 60SX Series
Accelerated Weathering Machine	UV and weathering test	Xenon lamp, Humidity up to 99% RH Temp: - 99 to 199.9 °C
Curtain coater	Coating surfaces	Min. coating vol: 50 g/m^2
Roller coater	Coating surfaces	Coating Qty: 5-50g/ft^2

RESEARCH EXPERIENCE

- Radiation curing of surface coatings, (urethane, epoxy and unsaturated polyester acrylates) of wood and non-wood substrates
- Radiation curing of printing inks
- Development of acrylate oligomer/monomer from epoxidised palm oil products
- Development of acrylate oligomer from liquid epoxidised natural rubber

CONSULTANCY EXPERIENCE

Technical advice on radiation curing of surface coatings

SERVICES OFFERED

- Testing of coated film
- Technical consultancy services and transfer of technology for the development of radiation curable resins from epoxidised palm oil for surface coatings and printing inks
- Technical consultancy services and transfer of ultraviolet/electron beam curing technology for surface finishing of wood and non-wood substrates
- Research cooperation or research contract for development of radiation curable resins for surface finishing

Material Science & Technology

Radiation Processing

Name of group/centre:

Radiation Processing Programme

Name of laboratory/project:

Radiation Induced Modifications of Natural Rubber Latex

Person(s) to contact:

- Dr. Khairul Zaman Hj. Mohd Dahlan *(Programme Head) ext.1400*
- Dr. Wan Manshol Wan Zin *(Group Leader) ext.1405*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Gamma Irradiation Facility (SINAGAMA)	• Vulcanization of natural rubber latex • Radiation induced modification of natural rubber latex	Source Strength: 1.5 MCi Cobalt-60
Electron Beam Machine (ALURTRON)	Vulcanization of natural rubber latex	Voltage: 0.5 to 3.0 MeV Current: 0.1 to 30 mA Conveyor speed: 1-20m/min
Universal Tensile Machines	Measurement of tensile properties	Load cell: 1.5 kN x head speed (max): 500mm/min
Gel Permeation Chromatography (GPC)	Measurement of molecular weight averages and molecular weight distribution	Working temp.: R.T - 150°C
Melt Flow Indexer	Melt flow index	Load: 0.325- 21.6 kg Temp: RT - 350 °C
Dynamic Mechanical Analyzer	Modulus of dynamic rigidity, Tg and viscosity factor of high molecular weight materials	Mode: torsional Temp: - 160 to 500 °C Meas. modulus: 10^7 to 10^{11} dyne-cm^2
Viscometer	Measurement of viscosity of materials	Brookfield

RESEARCH EXPERIENCE

- Radiation vulcanization of natural rubber latex
- Radiation induced modification of natural rubber latex

CONSULTANCY EXPERIENCE

Research cooperation with industry on 'Radiation vulcanization of natural rubber latex'.[1]

SERVICES OFFERED

- Physical testing of natural rubber latex/rubber products
- Research contract or research cooperation on radiation vulcanization of natural rubber latex and radiation induced modification of natural rubber latex
- Technology transfer on radiation vulcanization of natural rubber latex
- Radiation services for vulcanization of natural rubber latex

Medical Microbiology

Bacteriology

Name of group/centre:

Quality Control (Microbiology and Biology) Group

Name of laboratory/project:

Microbiology and Biology Laboratory

Person(s) to Contact:

- Dr. Shaharuddin Mohd *(Group Leader) ext.1015*
- En. Mizan Abd. Wahid *(Researcher) ext.1125*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Clean room	Preparation of samples for conducting tests under sterile conditions	Esco Class 100
Laminar flow (horizontal and vertical)	Preparation of samples/ conducting tests under clean conditions	Esco Gelman Science
BACTEC	Sterility test (results obtained within 24 hours)	using Carbon-14 to detect presence of microorganisms
Pyrogen test equipment	Pyrogen test using rabbits	ELLAB pyrogen test
Gamma Counter	Radiotracer distribution studies in animals	1282 Compugamma CS LKB Wallac for gamma emitters Low and high energy
Freeze Dryer	Freeze drying of samples/ microorganism cultures	VIRTIS UNITOP 600SL - 12 SL

RESEARCH EXPERIENCE

- Good Manufacturing Practice (GMP) procedures in medical gloves producing plants
- Microbiological studies on gamma irradiated medical products and pharmaceuticals
- Animal biodistribution studies on radiolabelled compounds

CONSULTANCY EXPERIENCE

- as above -

SERVICES OFFERED

- Microbiological studies on medical products manufacturing based on GMP requirements
- Dose validation and verification for gamma irradiated/sterilised medical products and pharmaceuticals (based on AAMI guidelines)
- Microbiological tests:
  - Sterility
  - Pyrogen (L.A.L and rabbit)
  - Identification
  - Bioburden
  - Sensitivity
  - Preservatives Effectiveness
- Animal biodistribution (radiotracers) and toxicity studies

FIELD OF RESEARCH

Medical Microbiology

Tissue Grafting

Name of group/centre:

Isotopes & Radiation in Biology & Agriculture Programme

Name of laboratory/project:

Radiation Sterilization & Tissue Bank

Person(s) to contact:

Dr. Norimah Yusof *(Leader) ext. 1311 / 1431*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Freeze Dryer	Freeze drying tissues and bacteria	• CHRIST Model 100402 shelf temp - 50°C • LYOVAC GT2 Model 204555 shelf temp - 55°C
High Speed Refrigerated Centrifuge	Separation of human and bacterial cells	TOMY Model RS20-IV Max Speed 20,000rpm Temps - 10 to 40°C Rotor 10N
Upright Deep Freezer	Storage/Preservation of human and other biological tissues	QUEVE Model QUT1585 WUA Temps -50°C to 75°C Capacity: 579 litres

RESEARCH EXPERIENCE

- Radiation sterilization of medical products using gamma irradiation and electron beam: biological and microbiological aspect
- Production of tissue grafts (amnion and bones)

CONSULTANCY EXPERIENCE

- Dose-setting, bioburden and sterility test of medical devices
- Processing of tissue grafts and quality control

SERVICES OFFERED

- Bioburden and radiation dose-setting of medical disposables
- Setting up of tissue banking
- Supply of radiation sterilized amnions and bones for clinical use

Human tissue grafts sterilised by MINT. The MINT Tissue Bank is nationally capable of supplying clinical quality radiation-sterilised allografts, xenografts & biomaterial to substitute imported grafts

Nuclear Energy

Policy and Planning Advisory

Name of group/centre:

Reactor Department

Name of laboratory/project:

Nuclear Electric Power Policy Planning and Infrastructure Assessment Studies

Person(s) to contact:

Jamal Khaer Ibrahim *(Project Leader) ext. 1080*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Nuclear Research Reactor and Support Facilities	Training of planning personnel to familiarise with the basic requirements and issues pertaining to the establishment and operation of nuclear reactor facilities	1MWth TRIGA Mark II pulsing research reactor

RESEARCH EXPERIENCE

- Joint policy and planning studies for the introduction of nuclear electric power generation in Malaysia with central energy and electricity planning and generation organisations since 1984
- Joint infrastructural assessment studies on the national state-of-preparedness for the introduction of nuclear power generation in Malaysia with other public sector planning agencies and private sector organisations, in areas such as industrial support infrastructure readiness, human resource availability and development, preliminary power plant site selection, and resource availability studies
- Monitoring of international development in nuclear power generation and in the international trade and technology transfer relating to nuclear power generation and the provision of related policy advisory to relevant authorities
- Monitoring of international development in nuclear weapon non-proliferation issues and their impact on the nuclear power generation industry as well as the provision of related policy advisory services to relevant authorities

CONSULTANCY EXPERIENCE

- Consultancy services relating to the above experiences to national economic and energy planning authorities, electric power utilities, and the Ministry of Foreign Affairs Malaysia
- Participation in national energy planning and policy formulation exercises

SERVICES OFFERED

Policy and planning studies and advisory services on the above issues to economic and energy planning authorities, electric power utilities, foreign relations authorities, and institutions for strategic studies

FIELD OF RESEARCH

Nuclear Technology

Gamma Irradiation

Name of group/centre:

Gamma Irradiation Facility *(SINAGAMA)*

Person(s) to contact:

- Razali bin Hamzah *(Unit Head) ext.1003*
- Noor Hasnah Khairullah *(QA/QC Manager) ext.1305*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Co-60 Irradiator	Irradiation Services	1.5 MCi carrier type Automatic, continuous 4-pass system

RESEARCH EXPERIENCE

- Dosimetry requirement of medical devices
- Radiation compatibility studies

CONSULTANCY EXPERIENCE

Good Manufacturing Practice, Microbiological aspects, routine control, quality management, material compatibility and dosimetry studies on radiation sterilization

SERVICES OFFERED

- Radiation Sterilization
- Irradiation of products for the purpose of decontamination, mutation-inducing, vulcanization or preservation

Handling of medical products for sterilisation at MINT's ISO 9002 certified gamma irradiation facility, increasing the added value of Malaysian products

Nuclear Technology

Nuclear Reactor Technology

Name of group/centre:

Reactor Department

Name of laboratory/project

Nuclear Reactor Design and Analysis

Person(s) to contact:

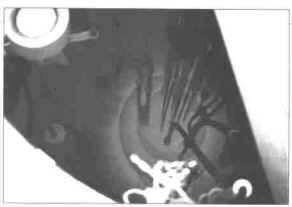
- Jamal Khaer Ibrahim *(Project Leader) ext. 1080*
- Mohamad Subaimi Kassim *(Software Specialist) ext. 1094*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Nuclear Research Reactor and Support Facilities	• Radioisotope Production • Neutron Activation Analysis • Delayed Neutron Analysis • Neutron Scattering • Neutron Radiography • Reactor Experiments • Neutron Irradiation Services • Reactor Operator Training	1 MWth TRIGA Mark II pulsing research reactor

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
WIMS - D/4	General code for reactor lattice cell calculations for a wide range of nuclear reactor systems	PC-based computer code with Original, PWR and TRIGA Libraries
TRIGAM	One-dimensional neutronic design analysis of TRIGA type nuclear research reactors	Modified version of the original PC-based TRIGAC code with ELIP and all standard fuel libraries
PULSTRIM	Power pulse analysis of mixed core TRIGA type nuclear research reactors, based on the Fuchs-Hansen adiabatic approximation model	Modified version of the original PC-based PULSTRI code
PARET	One-dimensional thermal-hydraulic design analysis of nuclear research reactors and the analysis of reactor transients	PC-based coupled neutronics-hydrodynamics-heat transfer software
EXTERMINATOR	Two-dimensional solution of multi-group neutron diffusion equations	PC-based software
TRISTAN	One-dimensional calculations of flow parameters in a coolant channel of a nuclear reactor core cooled by natural convection	PC-based software



The bluish glow of Cerenkov radiation, a view of the core of MINT's nuclear research reactor in operation

RESEARCH EXPERIENCE

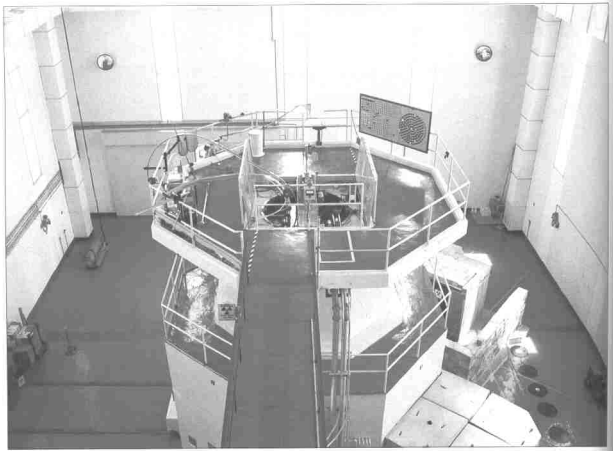
- Neutronic and thermal-hydraulic design for the power upgrading of the MINT nuclear research reactor
- System modification of the MINT nuclear research reactor.
  Safety analyses and nuclear fuel management calculations in support of the operation and utilisation of the MINT nuclear research reactor since 1982

CONSULTANCY EXPERIENCE

- Training of foreign nuclear research reactor operators
- Preliminary design calculations for the power upgrading of a foreign TRIGA type nuclear research reactor
- University student training in nuclear reactor technology
- Technical advisory for the infrastructural design and development of nuclear research reactor and irradiation facilities

SERVICES OFFERED

- Target irradiation for the production of radioisotopes for medical, industrial, agricultural, educational, environmental impact assessment, hydrological and other applications
- Sample irradiation for neutron activation and delayed neutron analyses
- Reactor operation for small-angle neutron scattering experiments in material analyses
- Reactor-based neutron radiography
- Reactor experiments for university training
- Customised neutron irradiation services for specific applications



Malaysia's first and only nuclear research reactor

Nuclear Technology

Radiotracer Techniques

Name of group/centre:
Radiotracer Technology Group

Name of laboratory/project:
Radiotracer Technology Laboratory

Person(s) to contact:

- Md. Syahid Ayub *(Group Leader) ext.1230*
- Mohd. Tadza Abd. Rahman *(Research Officer) ext. 1218*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Mass Spectrometry System	Ratio measurement of oxygen-18, deuterium-2, carbon-13	Sira Series II
Liquid Scintillation Counter	Measurement of carbon-14, tritium, and phosphorous-32	Tricarb
Micro-Fix	Boat positioning during off-shore radiotracer tracking activities	Racal
Sodium iodide scaler ratemeter system	Detection of radiotracers in environmental samples	
Flame photometer	Measurement of cation content in surface and underground water	
Gas counter sampler system	Gas flow studies	
Boats & Outboard Motors	Sea water sampling, sediment movement studies, estuary current monitoring studies.	
Sediment Gauge	Measure bed-load density	
Echo Sounder	Measure sea depth	

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Tracer-90	Pipe line flow measurements	
I-Minefix	Boat Positioning	
Newtrit	Tritium Analysis	

RESEARCH EXPERIENCE

- Ground water study and stream flow measurement
- Process engineering in chemical and petro-chemical industries
- Lake, dam and reservoir studies- seepage, leakage and efficiency of systems
- Combustion process in waste tracing
- Ocean bed-load measurement study for dumping efficiency

CONSULTANCY EXPERIENCE

Expert advice in tracer techniques in the field of hydrology, sedimentology and industry

SERVICES OFFERED

- Sedimentation studies
- Sub-surface water tracing
- Surface water measurement
- Resident-times and related parameters in process industries
- Trouble-shooting - blockage, water-seepage and gas-seepage

Nuclear Technology

Sealed Source Applications

Name of group/centre:

Industrial Radiometry Group

Name of laboratory/project:

Industrial Radiometry Laboratory

Person(s) to contact:

Mohd Azmi Ismail *(Group Leader) ext.1228*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application
Radioactive sources	Sealed gamma and neutron emitter eg. Co-60, Cs-137, Cf-252 of various source strength
Radiation Detector	Radiation intensity measurement
MCA system	Spectroscopy analysis
Moisture Density Gauge	Moisture and density measurement of soil, aggregate, asphalt, cements, etc.

RESEARCH EXPERIENCE

- Establishment of sealed radioactive source applications in solving various process plant problems and in quality assurance of civil engineering earthworks
- Development of nuclear technology based instrumentation for scanning
- Development of computed tomography facilities

CONSULTANCY EXPERIENCE

- Distillation Column Scanning at refinery, petrochemical, oleochemical plants throughout Malaysia
- Tank Floor Inspection at refinery and power station
- Level/Interface Measurement in Storage Tank and Process Vessels
- Blockage and Build-up Detection in Pipeline at various plants
- Moisture and density measurement

SERVICES OFFERED

- Distillation Column Scanning
- Tank Floor Scanning
- Level/Interface Measurement in Storage Tank and Process Vessel
- Blockage and Build-up Detection in Pipeline
- In-situ determination of moisture and density of soil, asphalt and cement

Processing of radioisotopes for the production of radiopharmaceutical kits at MINT's hot cell facilities, a technology introduced into Malaysia by MINT

Pharmacology

Radiopharmaceuticals & Radiotherapeutics

Name of group/centre:

Radiopharmaceuticals & Radiotherapeutic Development Group

Name of laboratory/project:

Development and Production of Radiopharmaceuticals and Radiotherapeutic Kits

Person(s) to contact:

- Dr. Rehir Dahalan *(Group Leader) ext.1128*
- Mohamad Hadzri Yaacob *(Researcher) ext.1127*

HARDWARE FACILITIES/EQUIPMENT

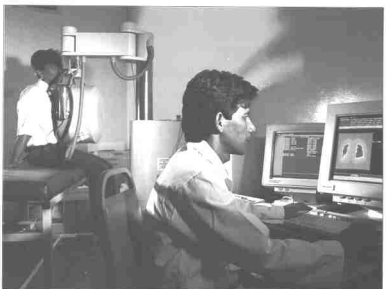
Equipment	Application	Technical specifications
Hot-cells	Handling and processing γ-emitting radioisotopes eg. Tc-99m and I-131	Can tolerate up to 10 Ci of Co-60
Glove-box	Handling and processing β-emitting radioisotopes eg. P-32, Sm-153	Can tolerate up to 1 Ci of P-32
Liquid Scintillation Counter	Liquid scintillation counting of low level α and β emitters	Packard 2550TR/AB
Gamma camera	Radiopharmaceuticals biodistribution and imaging studies in animals	Polaris small view gamma camera (ADAC)
Freeze Drier in Clean Room	Preparation of sterile and pyrogen-free freeze-dried preparation	Freeze Drier: ULRTIS UNITOP 600SL-125E Clean Room: ISCO Class 100

RESEARCH EXPERIENCE

- Development and preparation of Chromatographic Generators for Technetium-99m and Sodium Iodine (I-131) for use in Nuclear Medicine
- Development and preparation of Methoxy Isobutyl Isonitrile (MIBI) for cardiac imaging and Ethyl Cysteine Dimer (ECD) for brain imaging
- Production of sterile evacuated vials and radiopharmaceutical kits (MDP, DTPA, tin Colloid) for medical application

SERVICES OFFERED

- Production and supply of Tc-99m Generator, P-32, I-131, radiopharmaceutical kits and miscellaneous radioisotopes
- Importation and supply of un-sealed radioactive sources (e.g. Ir-192, Co-60 and Am-241)



A gamma camera at MINT used in the laboratory development of nuclear medical imaging procedures. MINT is instrumental to the catalytic development of nuclear medicine applications in Malaysia

Public Health, Environmental & Occupational Health & Safety Research

Biological Dosimetry

Name of group/centre:

Isotope and Radiation in Biology and Agriculture Programme

Name of laboratory/project:

Biological Dosimetry Laboratory

Person(s) to contact:

Mohd. Zaidan Kandar *(Research Officer) ext. 1336*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application
Biological Dosimetry Analytical System	Radiation Dose Assessment

RESEARCH EXPERIENCE

- The setting up of biological dosimetry laboratory facility in the department to give an analysis of absorbed radiation dose in human body by using chromosome aberration analysis in human blood lymphocyte cells
- Conducting human population monitoring study on the induction of genetic damage in human blood lymphocyte cells among radiation workers in Malaysia

SERVICES OFFERED

Radiation dose assessment in human body due to exposure or suspected to be exposed to ionizing radiation by using chromosomal aberration analysis

Preparation of radiopharmaceutical kits in the clean room at MINT, meeting the manufacturing standards of the Drug Control Bureau of Malaysia

Public Health, Environmental & Occupational Health & Safety Research

Environmental Protection

Name of group/centre:

Health and Radiation Control Department

Name of laboratory/project:

Environmental Monitoring

Person(s) to contact:

- Dr. Muhamat Omar *(Group Leader) ext.1146*
- Dr. Zaharuddin Ahmad *(Researcher) ext.1141*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Gamma Spectrometry	Radionuclide analysis	10 Bq/Kg Oxford Model CN VDS40-25200, CPVDS 50-3 Gamma Trac Version 1.21
Radon Monitor • Radon gas	Measurement of Radon gas in air	0.1 - 999 pCi/litre Alpha Prism Model 560
• Radon WL Monitor	Measurement of Radon daughters in air	1 mWL Honeywell Model A9000A
High Pressurised Ionization Chamber (HPIC)	Measurement of external radiation	0-1 mSv/hr Reuter stokes Mode: RSS-112
Low background alpha/beta counting system	Gross alpha and gross beta activity measurement	Tennelec LB1000
Alpha Spectrometry System	Po-210/Pb-210 Analysis Isotopic U and Th Analysis	EG & G Ortec
Liquid Scintillation Counting System	Bioassay for H-3, P-32 and I-125	Tri-Carb 4530, Packard

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application
Gamma Trac	Analysis of radionuclides by Gamma Spectrometry

RESEARCH EXPERIENCE

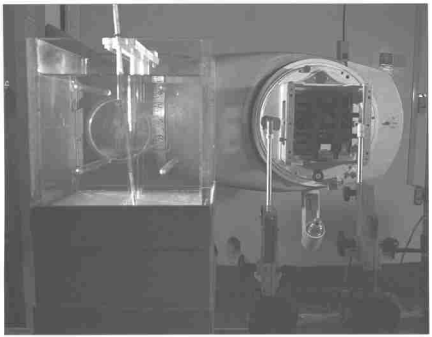
- Environmental radiation and radioactivity levels in Malaysia
- Environmental radioactivity survey around Asian Rare Earth (ARE) and amang plant
- Indoor and outdoor radon measurement
- Radioactivity of building material, minerals, fertilizers, rock and industrial wart
- Radiometric dating using Pb-210 in marine contamination and sediment transport studies in Malaysia.

CONSULTANCY EXPERIENCE

- Expert service to CNESTEN (Nuclear center), Morocco in Environmental Monitoring under the Malaysian Technical Cooperation Programme, 7-26th May 1993
- Discussions with companies on radioactivity of industrial samples
- Panel member of ad hoc committee set up by Atomic Energy Licensing Board to evaluate safety analysis report of Asian Rare Earth company

SERVICES OFFERED

- Radioactivity Analysis of environmental (including food) and industrial samples
- Measurement of Radon gas and radon daughters in air (in factory and in the environment)
- Measurement of environmental radiation level (inside and outside factory)
- Gross alpha and gross beta measurement in mineral water and environmental samples



Dosimetric calibration facilities for theraphy level gamma radiation sources, contributing to the safety of patients at nuclear medical establishments

Determining natural radioactivity contents of imported mineral water at MINT's gross alpha/beta counting facility, MINT's contribution in ensuring public health

Public Health, Environmental & Occupational Health & Safety Research

Health & Safety (Occupational & Public Health)

Name of group/centre:

Health & Radiation Control

Name of laboratory/project:

Waste Management Unit

Person(s) to contact:

- Dr. Syed Abdul Malik Syed Zain *(Group Leader) ext.1102*
- Syed Hakimi Sakuma Syed Ahmad *(Researcher) ext.1101*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Facilities:		
Low-level effluent treatment plant	Treatment of low-level aqueous radioactive waste	100 m³/week
Equipment:		
High Resolution Hyper Pure Germanium (HPGe) gamma spectroscopy system	Determination of gamma-emitting radioisotopes in the energy range of 5keV – 10MeV	Oxford HpGe Detector
Low alpha/beta gamma counter	Determination of gross alpha, beta & gamma emitters	Canberra Model 2404
Jar tester	Determination of optimum chemical dosage	Miyamoto

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application
Inventory software	Inventory updating of all radioactive wastes

RESEARCH EXPERIENCE

- Migration of radionuclides through different types of soil
- Develop treatment of low and intermediate level radioactive waste
- Immobilization of spent radium needles in concrete
- Development of inventory software of all radioactive waste stored in MINT
- Analysis of water quality parameters after treatment at the low level treatment plant
- Radioactive waste water treatment
- Conditioning/stabilisation of thorium bearing sludge in cement matrix

CONSULTANCY EXPERIENCE

- Radioactive waste management
- Design of radioactive waste water treatment plant

SERVICES OFFERED

Disposal of low and intermediate level radioactive wastes

Public Health, Environmental & Occupational Health & Safety Research

Occupational Health

Name of group/centre:
Health and Radiation Control

Name of laboratory/project:
Secondary Standard Dosimetry Laboratory

Person(s) to contact:

- Taiman Kadni *(Group Leader) ext. 1157*
- Abd. Aziz Mohd. Ramli *(Researcher) ext. 1145*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Dosemeters		
• NPL Secondary Standard Therapy level X-ray Exposure meter	• Radiation Standardization • Calibration of radiation instruments and sources	Electrometer NE 2560 & Ionization chamber NE 2561 (525mm³)
• Digital Current Integrator	"	Electrometer DCI-NP2100 & Ionization Chamber Tk0100 (6cm³)
• Digital Current Integrator	"	Electrometer DCI 8500 & Ionization Chamber LS-01 (1000cm³)
• Farmer dosemeter	"	Electrometer NE 2570 & ionization chambers NE2571 (0.6cm³), NE 2581 (0.6cm³), NE2550 (45 cm³), NE2575 (600cm³), NE2536 (0.3cm³)
• Dosimeter	"	Electrometer PTW-IQ4, Ionization Chamber LS01(100 cm³) and PTW Extrapolation Chamber 30-360
Radiation sources		
• X-Ray	• Radiation Standardization • Calibration of radiation instruments • Irradiation samples	Philips, Constant Potential X-ray System MG 160/320 (160 kV, 10mA & 320kV, 10mA)
• Gamma ray	"	Co-60 (0.1 mCi-1.5 kCi) Cs-137 (0.2 mCi-20 Ci), Am-241 (300 mCi)
• Beta ray	"	Sr-90/Y-90 (2 - 50 mCi), Pm-147 (14 mCi) Tl-204 (0.5 mCi)
• Neutron	"	Am-241 Be (0.4 & 5Ci), Cf-252 (2.7mCi)
Automated Thermoluminescence Analyzer system	Analysis of thermoluminescence materials for personnel and environmental dosimetry.	TLdetector HARSHAW 2000D & TLanalyzer HARSHAW 2080
UV/VIS Spectrophotometer	Analysis of perspex and chemical dosemeter e.g. Ferrous sulphate & Fricke dosemeter and Ceric-cerous dosemeter.	Philips PU 8620
Radiochromic reader	Analysis of plastic dosemeters	FarWest Technology Inc.
Transmission densitometer	Analysis of optical density of personal monitoring film	DT 1505 R.Y. Parry & Macbeth TD501
Biological Microscope	Analysis of nucleat track of neutron personal monitoring film	Nikon Labophot, Magnification x 400

RESEARCH EXPERIENCE

- Radiation dosimetry
- Standardization of radiation measurements

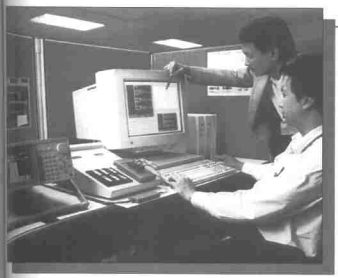
CONSULTANCY EXPERIENCE

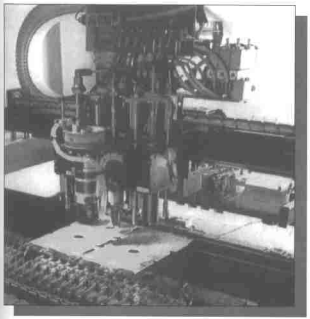
- High dose dosimetry for radiation processing
- Design of photon irradiation bunker

SERVICES OFFERED

- Calibration of radiation measuring instruments e.g. dosemeters and survey meters
- Personal and area monitoring by means of film badge and thermoluminescence dosemeter (TLD)
- Dosimetry for industrial radiation processing
- Calibration of radiation sources

Transforming your product idea into cost effective prototypes



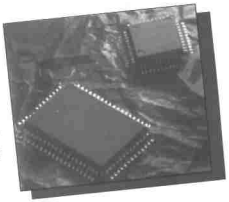


MIMOS, the Malaysian Institute of Microelectronic Systems is a research and development institute focused on the microelectronics and information technology industry in the country.

Established in 1985, MIMOS works in collaboration with the private and public sectors, research and academic institutions with the aim of assisting enterprises towards technological capability and industrial competitiveness.

MIMOS can assist you with product design, printed circuit boards, microprocessors and microcontroller systems, application specific integrated circuit design (ASIC), among others.

So, if you are a would-be investor in electronics or a manufacturer with a product idea or product problem, call us for a discussion. We have the resources to assist you in getting your idea into the market faster.



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For enquiries please call:

Tel: 03 - 2552700 Fax: 03-2552755
E-mail: upa@ms.mimos.my
Marketing & Commercialisation Unit
Malaysian Institute of Microelectronic Systems (MIMOS)
7th Floor, Exchange Square, Bukit Damansara, 50490 Kuala Lumpur

Malaysian Institute of Microelectronic Systems (MIMOS)

Name of agency/institution:
Malaysian Institute of Microelectronic Systems *(MIMOS)*

Contact person(s):
Marketing & Commercialisation Unit

Office address:
Malaysian Institute of Microelectronic Systems *(MIMOS)*
7th Floor, Exchange Square, Bukit Damansara
50490 Kuala Lumpur
Malaysia

Telephone: 603 - 255 2700

Telefax: 603 - 255 2755

E-mail: upa@ms.mimos.my

GENERAL INFORMATION

The Malaysian Institute of Microelectronic Systems (MIMOS) is an R & D institute specialising in microelectronics and information technology. Established in 1985, the Institute works towards meeting the needs of the private & public sectors, and research and academic communities.
MIMOS serves the industry through assistance in research and development, education and training by offering:

- expertise in the areas of microelectronics and information technology
- training programmes in microelectronic design
- seminars and technical meetings
- information on non-propriety research results
- placement of guest engineers and scientists
- use of MIMOS resource centre, and
- use of innovation centre

MIMOS' Objectives are:

- To promote microelectronics and information technology as strategic technologies for national development
- To stimulate the coordinated development of an integrated electronics industry
- To enhance industrial innovation and competitiveness, and
- to support the development of effective and efficient processes in production, manufacture, commerce and services

Communication Technologies

Telecommunication Technology

SERVICES

- Preconformance Testing
- Development of ISDN based Terminal equipment
- Joint development activities in ISDN

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
ISDN Protocol Tester	ISDN Protocol Development	Development of Layer 1, Layer 2 and Layer 3 of ISDN

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
ISDN Conformance Test Suite	Conformance Testing	Testing of Layer 2 and Layer 3

RESEARCH EXPERIENCE

- Development of ISDN Layer 2 and Layer 3
- Development of ISDN PC card and ISDN Terminal

Computer Software

Software Engineering

SERVICES

- Multimedia softwares
- Real-time application systems
- Software development methodology and engineering
- Distributed information systems
- User interface
- Open Systems

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Workstations, PCs	Software development	21 pcs. SPARC stations, 10 pcs. X86 and others

SOFTWARE FACILITIES/EQUIPMENT

Facilities	Application	Technical specifications
Software products	DBMS	Oracle, Unify, Informix, Sybase, Ingres, Keietel,
	System Development	Compilers, Toolkits, Networking
	Office Systems	Uniface, Uniplex
	Public Domain	Multimedia, Interfaces, Networks, Operating systems, etc.

RESEARCH EXPERIENCE

- Computer networking
- Software development
- Information systems

Electrical and Electronic Engineering
Application Specific Integrated Circuit (ASIC) Design

SERVICES

- Prototyping of Field Programmable Gate-Array ASIC's (Application Specific Integrated Circuits)

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
SUN SPARC Workstations	ASIC Design	12 units, 1GB hard disk 64 MB RAM 20" monitor
LV500 ASIC Verification System		1 unit 64-channel Test System

SOFTWARE FACILITIES/EQUIPMENT

Facilities	Application	Technical specifications
Synopsys	ASIC Design	VHDL Coding & Logic Synthesis

RESEARCH EXPERIENCE

Prototyping of Data Encryption processor and Central Processing Unit (CPU)

Electrical and Electronic Engineering
Failure Analysis

SERVICES

Material analysis and Dynamic Voltage Contrast Analysis

HARDWARE FACILITIES/EQUIPMENT

Facilities	Application
Scanning Electron Microscope (SEM)	Surface/material analysis. Voltage contrast analysis of integrated circuit (IC)
Curve Tracer	Electrical Characterisation
Semiconductor Parametric analyser	Parameter Analyser of IC
Polishing/Microsectioning Tools	Sample preparation for further analysis using SEM and other related activities

RESEARCH EXPERIENCE

- Material analysis by SEM
- Developed Dynamic Voltage Contrast Analysis Technique using SEM

Electrical and Electronic Engineering
Printed Circuit Board (PCB) : Layout Design and Fabrication

SERVICES

- Advance PCB Prototype Design
- Artwork Generation (photoplot/Gerber file)
- Industry Standard Prototype Fabrication
- PCB Layout Design
- PCB Fabrication/Assembly

HARDWARE FACILITIES

Equipment	Application	Technical specifications
Workstations: SUN Sparc10-41	Circuit Layout	1 GB Hard disk (6 units) 64 MB RAM, 20" monitor
Gerber Plotter	Artwork Generation	Size : 26" x 20" Resolution: 0.002"

SOFTWARE FACILITIES

Equipment	Application	Technical specifications
Mentor Graphics - Design Architect and Board Station V8.0	PCB Layout Design and Simulation	Board size: 100" x 100" Resolution: 0.0001" Components: 32,000 Layers: 256
Auto Therm	Thermal Simulation	Isotherm temp. map Junction temp. map Case temp. Critical temp Ambient temp. Flow map Temp. graph/report

RESEARCH EXPERIENCE

- Schematic Capture
- Digital Circuit Simulation
- PCB Layout
- Artwork Photoplot

Information Systems and Technologies

Artificial Intelligence

SERVICES

- Development of an expert system application & software package

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
PCs	Expert System Development	5 units, 80486 PCs

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
ART Enterprise	Expert System Development	Object oriented & Rule Based development tool
CBR Express	Expert System Development	Case based retrieval tool

RESEARCH EXPERIENCE

Expert system for identifying failure mechanism in integrated circuits.

Informations Systems and Technologies

Information Systems Management

SERVICES

- System design and development
- Distributed information systems
- Low cost solution for networking
- World wide (Internet) connectivity through Jaring
- Network Services
- Information System Development

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Workstations PCs	Information Server	Open System Based
Modems	Networking equipment	V.22 bis, V.32 bis
Routers	Networking equipment	TCP/IP & X.25
Communication Servers	Networking equipment	
Switches	Networking equipment	
Test equipment	Networking equipment	

SOFTWARE FACILITIES/EQUIPMENT

Facilities	Application	Technical specifications
Network Management	Network Monitoring	SNMP
Information Retrieval	System Information Access	TCP/IP
Messaging System		
File Transfer & Remote Access		

RESEARCH EXPERIENCE

- Computer networking
- Information systems
- Software development

Manufacturing and Process Technologies and Engineering

Assembly Technology Systems

SERVICES

- Printed Circuit Board assembly prototyping services
- Surface-Mount Technology & Through-Hole PCB assembly services

HARDWARE FACILITIES/EQUIPMENT

Facilities	Application	Technical specifications
Screen Printer	To print solder pastes & other materials onto PCB	Capability - 12 mil fine-pitch
Pick-and-Place Machine	To mount wide range of surface mount devices automatically	Mounting capability - 1 x 0.5 mm Surface Mount Device Max. board size - 450 x 550 mm Min. board size - 50 x 50 mm
Reflow Oven	Reflow soldering of surface mount PCB	12 Heating zones
Wave Soldering Machine	To solder (mount) non-SMT components	Max. usable width - 350/400 mm Solder volume - 400 kg Flux volume - 3, 5 l
Repair and Rework Station	To repair and rework populated (components) PCB	Single Wall Nozzles ● PLCC-18, -20, -28, -52, -44, - 52; ● SOIC-8, -14, - 16; ● SOL-20, -24, - 28; ● FP-80
Component Inserter Equipment	To insert odd-shaped components	Axial forming; Radial forming
Visual Checker Equipment	To inspect mounting and soldering condition of components	Lighted magnifying glass

RESEARCH EXPERIENCE

- Surface Mount Technology production system
- Production and manufacturing quality management

Get the Best Guide To MALAYSIAN SERVICE INDUSTRIES

The all-new Mida-Business Times Directory of Service Industries has a comprehensive listing of companies involved in various service professions and industries.

Detailed information in this book will enable users to:

- assess the capabilities of companies in Malaysia to offer various essential services
- source for service providers in various sectors
- build contacts and find out who's who in the service industries
- get vital information on the Malaysian service industries and find out what services are available to help you in establishing your business in Malaysia. Especially useful for foreign investors, businessmen and Government officials
- explore opportunities and assess competition in the industries
- keep abreast of the services industry which has been identified as one of the most important and fastest-growing sectors in the Malaysian economy that will boost the country's effort to go global

This directory is a handy guide for those with services to offer. And those who need the services.

The directory has a listing of:

Accountancy services ■ Advertising/Public Relations ■ Architecture ■ Banking ■ Building & Construction ■ Convention/Exhibition/Seminar/Training ■ Engineering ■ Finance ■ Freight Forwarding/Warehousing ■ Hotels/Accommodation/Hotel Management ■ Insurance ■ Management Consultancy ■ Market Research/ Marketing Services ■ Office Equipment, Furniture & Supplies ■ Printing/Publishing ■ Real Estate/Property Consultancy/Industrial & Property Development ■ Recruitment/ Employment Consultancy ■ Secretarial/Administration Services ■ Tax Consultancy ■ Telecommunications ■ Transportation ■ Travel/Tourism ■ Other Services

This all-colour publication is produced by **BT Information Sdn Bhd,** ***a Member of The New Straits Times Press Group,*** in collaboration with the **Malaysian Industrial Development Authority (MIDA)**, the Government's principal agency for the promotion and co-ordination of industrial development in Malaysia.

This directory is the fourth in a series of Mida-Business Times directories. The first three titles are: ***Engineering Supporting Industries, Electronics & Electrical Industries*** **and** ***Plastics & Ancillary Industries.***

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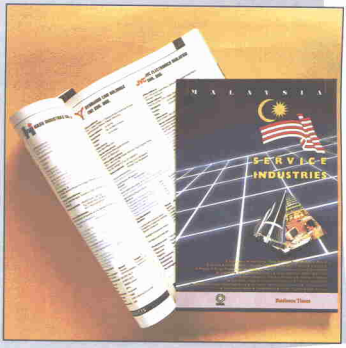

MAIL ORDER FORM (Excel)

MIDA-BUSINESS TIMES DIRECTORY OF SERVICE INDUSTRIES

To: BT Information Sdn Bhd, 31 Jalan Riong, 59100 Kuala Lumpur

Please mail to me .....copy/copies of this directory.

Title	Cover price
SERVICE INDUSTRIES	RM65.00 for Pen. M'sia RM77.00 for Sabah/Sarawak S$65.00 for Singapore B$65.00 for Brunei

(Kindly allow three weeks for delivery. Postage is free!)

I enclose my crossed cheque */ bank draft/ money order No. _____ for the sum of _____ payable to **BT INFORMATION SDN BHD** (* Local cheque only)

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MALAYSIAN

An Associate Company of the BOC Group, UK and L'Air Liquide, France

Head Office : No. 13, Jalan 222, 46100 Petaling Jaya, Selangor, Malaysia Tel : 603 - 755 4233 Fax : 603 - 756 6389

Manufacturer of Industrial, Medical, Special Gases & Welding Electrodes
Specialising in Welding, Health Care and Safety Equipment

CUSTOMER SERVICE CENTRES/DEPOTS

Petaling Jaya	: No. 13, Jalan 222, 46100 Petaling Jaya, SELANGOR	*Tel :* 603 - 755 4233 *Fax :* 603 - 756 6389
K.L. (North)	: 36, Jalan Sibu 16, Taman Wahyu, 6th Mile, Jalan Ipoh, 68100 Batu Caves, KUALA LUMPUR	*Tel :* 603 - 627 7655
K.L. (South)	: Lot 47, Jalan Chan Sow Lin, 55200 KUALA LUMPUR	*Tel :* 603 - 221 8664
Sungai Buloh	: 11, Jalan TSB 5, Sungai Buloh Industrial Park, 47000 Sungai Buloh, SELANGOR	*Tel:* 603-656 9909
Pasir Gudang	: Lot PLO 87, Jalan Gangsa Dua, Kawasan Perindustrian Pasir Gudang, 81700 Pasir Gudang, JOHOR	*Tel :* 607 - 251 1652 *Fax :* 607 - 251 5332
Melaka	: 112 & 114, Jalan Suria Satu, Taman Malim Jaya, 75250 MELAKA	*Tel :* 606 - 351 406 *Fax :* 606 - 351 407
Penang	: 101-A Block C, Mukim 12, Non Free Trade Zone, 11900 Bayan Lepas, PENANG	*Tel :* 604 - 643 8604 *Fax :* 604 - 644 0415
Prai	: 2026, Mukim 1, Prai Industrial Complex, 13600 Prai or P.O. Box 84, 12710 Butterworth, PENANG	*Tel :* 604 - 390 8077 *Fax :* 604 - 399 6537
Kuantan	: Lot 43, Semambu Industrial Estate, Mukim of Kuala Kuantan, 25350 Kuantan, PAHANG	*Tel :* 609 - 566 1325 *Fax :* 609 - 566 1396
Ipoh	: 198, Jalan Lahar, 30200 Ipoh, PERAK	*Tel :* 605 - 282 4144 *Fax :* 605 - 282 1558
Temerloh	: B-80, Kawasan Perindustrian Song Sang, 28000 Temerloh, PAHANG	*Tel :* 609 - 277 2833 *Fax :* 609 - 277 1900
Kota Kinabalu	: Lot 16, Jalan Kilang, Kolombong Industrial Estate, P.O. Box 12727, 88830 Kota Kinabalu, SABAH	*Tel :* 6088 - 421 166 *Fax :* 6088 - 424 302
Sandakan	: Lot 30, Phase 2, BDC Light Industrial Estate, Off 1st Mile Labuk Road, 90000 Sandakan, SABAH	*Tel :* 6089 - 214 280
Tawau	: Lot A15, TB2940, SEDCO Light Industrial Estate, Mile 3, Jalan Apas, 91000 Tawau, SABAH	*Tel :* 6089 - 913 015

MANUFACTURING SITES

Petaling Jaya	: No. 13, Jalan 222, 46100 Petaling Jaya, SELANGOR	*Tel :* 603 - 755 4233 *Fax :* 603 - 756 6389
Bukit Raja	: Lot 2, Solok Waja 3, Kawasan Perindustrian Bukit Raja, 41050 Klang, SELANGOR	*Tel :* 603 - 341 8745 *Fax :* 603 - 341 8749
Rawang	: Lot 1245, Kundang Industrial Estate, 48000 Rawang, SELANGOR	*Tel :* 603 - 604 2346 *Fax :* 603 - 604 2348
Penang	: 101 - A Block C, Mukim 12, Kampung Jawa, 11900 Bayan Lepas, PENANG	*Tel :* 604 - 838 604 *Fax :* 604 - 840 415
Prai	: 2026, Mukim 1, Prai Industrial Complex, 13600 Prai or P.O. Box 84, 12710 Butterworth, PENANG	*Tel :* 604 - 390 8077 *Fax :* 604 - 399 6537
Pasir Gudang	: Lot PLO 87, Jalan Gangsa Dua, Kawasan Perindustrian Pasir Gudang, 81700 Pasir Gudang, JOHOR	*Tel :* 607 - 251 1652 *Fax :* 607 - 251 5332
Kuantan	: Lot 35, Kawasan Perindustrian Gebeng, 26080 Kuantan, PAHANG	*Tel :* 609 - 433 949 *Fax :* 609 - 433 660
Kemaman	: P.O. Box 22, Chukai, 24007 Kemaman, TERENGGANU	*Tel :* 609 - 863 1158 *Fax :* 609 - 863 1660
Port Dickson	: Jalan Esso, 71009 Port Dickson, N.SEMBILAN	*Tel :* 606 - 471 426
Muar	: Lot PLO 87, Tanjung Agas Industrial Estate, 84000 Muar, JOHOR	*Tel :* 606 - 952 1530 *Fax :* 606 - 951 8730
Kota Kinabalu	: Lot 16, Jalan Kilang, Kolombong Industrial Estate, P.O. Box 12727, 88830 Kota Kinabalu, SABAH	*Tel :* 6088 - 421 166 *Fax :* 6088 - 424 302

OXYGEN BERHAD

GASES DIVISION

Range of Products

- A wide range of gases including nitrogen, oxygen, argon, acetylene, nitrous oxide, hydrogen and carbon dioxide.
- Supplies industrial gases, medical gases, special gas mixtures and research grade gases including krypton, nenon, xenon, which are purified to ultra-high research grade purities.

Distribution

- ASU and hydrogen plants are built and gas piped directly to our customers.
- Served by a fleet of modern tankers, which operates round-the -clock, while a second fleet of lorries distributes cylinders across a whole spectrum of industries.

GAS APPLICATIONS

R & D is in three main areas - cyrogenic, non-cyrogenic and purification.
All technological breakthroughs by BOC and L'Air Liquide are available to MOX:
Use of liquid nitrogen in concrete cooling - a first in Malaysia.
Use of carbon dioxide for rice preservation and tobacco processing.
Use of liquid nitrogen in tyre curing, the first in South East Asia, food freezing, spice and rubber grinding.

WELDING DIVISION

Range of Welding Electrodes

- A technology leader in the manufacture of electrodes.
- Largest producer of electrodes in Malaysia.
- Its range of Malaysian-made products includes general-purpose mild steel electrodes, low hydrogen electrodes, special electrodes and hardfacing electrodes.
- Tested and approved by international bodies such as Lloyd's Register of Shipping, Det Norske Veritas and the American Bureau of Shipping.
- Used in structural welding workshops, tin mining, oil and chemical industries, the fabrication of high-strength steel for critical applications, pipeline fabrication, shipbuilding, and many other engineering related industries.

Welding Equipment

Markets a comprehensive range of gas welding and cutting equipment, from computerised numerically controlled (CNC) profile cutting machines to protective devices, regulators, hoses and fittings, flashback arrestors, nozzles, gas economisers, welding rods and fluxes, as well as welding accessories. A wide selection of arc welding equipment is available ranging from standard manual arc welders, MIG and TIG units to state-of-the-art automation systems.

Safety Equipment

A wide range of personal protective equipment is available for both arc and gas welding and cutting processes, including hearing and respiratory protection, safety spectacles and goggles, face and head protective gear and safety shoes.

Technical Centre

- Houses facilities for R & D in the applications of welding technology.
- Maintenance services and repairs of all equipment sold by MOX are handled at the centre under the strict supervision of qualified technicians and supervisors.
- Offers consultancy services on design specifications, development of welding procedures, quality control practices and selection of welding consumables.
- The Welding Services Unit (WSU) provides training to MOX staff, customers and other companies involved in the welding industry.

HEALTH CARE DIVISION

Wide range of specialised equipment, including anaesthesia machines, inhalation apparatus, respirometers, respiratory care, infant care equipment and monitoring equipment. We also handle the repair and servicing of medical products, advanced Venturi suction technique for medical pipelines.

Vaporizer Service Centre

- Set up in 1985, our expertise in this specialised area is recognised at home and abroad in that we are the regional centre for servicing vaporizers of anaesthesia apparatus from Malaysia, Hong Kong, Thailand, Singapore, Taiwan, Myanmar and Sri Lanka.
- Overhauls, tests, calibrates and regular servicing of vaporizers, infant care and respiratory management, monitors, ventilators and other oxygen therapy equipment.

MTDC

Implementing The Commercialisation Of Research And Encouraging The Growth Of Technology-based Enterprises

MTDC, a Government-industry venture was established with the objectives of implementing the commercialisation of research results of universities and research organisations and promoting the growth of technology-based enterprises.

TRANSFERING RESEARCH FINDINGS TO THE MARKET PLACE

The successful transfering of research findings to the market place is coordinated by MTDC through:

- Identifying commercially viable technologies.
- Financing feasibility studies and investment proposals.
- Identifying potential partners.
- Developing closer linkages amongst local and foreign universities, research institutions and technology based enterprises.
- Organising seminars and conferences on selective technologies.
- Facilitating the protection of intellectual property rights.

PROVIDING VENTURE CAPITAL FOR DYNAMIC ENTERPRISES

MTDC extends venture capital to dynamic Malaysian firms to grow as world class entities. The funds could be as;

- Seed capital
- Start-up capital
- Expansion capital

ENHANCES COMPETITIVENESS THROUGH CONSULTANCIES

MTDC also provides non-financial services namely:-

- Technical Consultancy in the areas of business planning and feasibility studies.
- Technical support services such as technology and equipment evaluation, productivity improvement, building market linkages and business management.

for further informations please contact:-

MTDC
MALAYSIAN TECHNOLOGY DEVELOPMENT CORPORATION
(The National Venture Capital And Technology Transfer Organisation)
3rd Floor RHB1, Jalan Tun Razak, 50400 Kuala Lumpur, Malaysia Tel: 60-3-9828288 Fax: 60-3-9826289

Malaysian Technology Development Corporation Sdn Bhd

Name of agency / institution / company:
Malaysian Technology Development Corporation Sdn Bhd

Person(s) to contact:
- En. Anuar Md Nor *(Chief Executive Officer)*
- En. Nordin Mohamad Desa *(General Manager)*

Postal address:
3rd Floor, RHB1
424 Jalan Tun Razak
50400 Kuala Lumpur, Malaysia

Telephone:
603 - 982 8288

Telefax:
603 - 982 6289

Office hours:
8.30 am - 4.30 pm *(Mon - Fri)*
8.30 am - 1.00 pm *(Sat)*

SERVICES OFFERED

- Financial Services :
  Seed, start-up & expansion financing
- Non - financial Services :
  - Technical Consultancy Services
  - Technical Support Services

SUMMARY OF RESEARCH / CONSULTANCY EXPERIENCE

MTDC provides technology transfer services to clients who need technology from Malaysia or would like to seek potential Malaysian users for their own technology. MTDC is the national technology transfer body and have linkages with all the universities and research institutions. MTDC also provides technical consultancy in various areas of expertise.

OTHER INFORMATION

Malaysian Technology Development Corporation (MTDC) was incorporated by the Government as a joint-venture company between the Malaysian Government and 16 other private organisations. MTDC is the leading technology transfer organisation in Malaysia which has been placed as a company under the jurisdiction of Ministry of International Trade and Industry, Malaysia.

COMMERCIALISATION

MTDC was established with the objective of commercialising research results of universities and research institutions, to develop indigenous technology and to facilitate the absorption by the private sector of technologies developed by universities and research institutions.

TECHNOLOGY-BASED COMPANIES

Another objective of MTDC is to encourage the growth of technology-based enterprises through the provision of venture capital to selected technology-based companies, introduction of new technologies, both local and foreign, to Malaysian companies and provision of management and technical consultancy services to emerging technology-based companies.

TECHNOLOGY TRANSFER

MTDC assists local universities and research institutions to develop and transfer to the private sector commercially promising and viable technologies including know-hows resulting from their research work. MTDC also syndicate good foreign technologies from foreign parties which need investment and willing to set up plant in Malaysia.

DATABASE OF RESEARCH RESULTS

MTDC keeps a database of all the technologies offered by the universities and research institutions for commercialisation. Thus companies have access to a broad range of technologies for commercialisation. The database allows MTDC to monitor indigenous technologies which mainly focus on the utilisation of Malaysian natural resources and expertise. The database is continually updated as universities and research institutions develop new technologies.

FINDING SUITABLE PRIVATE SECTOR COMPANIES TO TAKE UP TECHNOLOGY

MTDC will identify suitable companies to take up technologies offered to MTDC by the local universities and research institutions. Important features sought in a partner are :

- Technical competence in the particular field of activities
- Business reputation in the market areas
- An ability to work smoothly in the proposed venture

MARKETING OF LOCAL TECHNOLOGIES

MTDC continues to market locally developed technology through various methods, namely :

- Malaysian Technology Forum (MTF)
  Through the Malaysian Technology Forum, MTDC organises networking sessions where local researchers could present their research results to a select audience from the private sector.

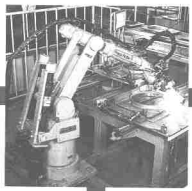
- Malaysian Technology Bulletin (MTB)
  MTB is a quarterly publication of MTDC which is distributed locally and to select clients worldwide. It is the channel for the dissemination of technology know-how and achievements made by local universities, research institution and industry and also serve as an instrument in informing the private sector and industry of areas of new technology and venture capital. The bulletin is available by subscription.

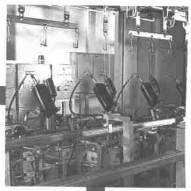
- Mass Media
  MTDC contributes articles in the local newspapers which feature relevant information on local technology.

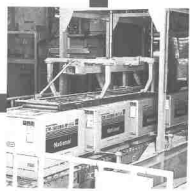
ASSISTANCE IN NEGOTIATIONS AND AGREEMENTS

MTDC negotiates on behalf of the universities and research institutions on the most appropriate arrangement for the technology transfer to companies. MTDC can also provide advice on the type of agreements that could benefit both parties including the researchers.

National air-con factories are fully integrated to serve you better on the whole.





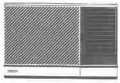


The Matsushita Air-conditioning Group of Companies in Malaysia (MACG) is the most fully integrated room air-conditioner manufacturer in the country. This means that we carry out every process right here within the company – from product development to the manufacture of major components. And intensive and on-going research and development ensures that every process meets our high standards.

Because we manufacture all major components ourselves, we are in the best position to provide the most efficient after-sales service including spare parts supply to our customers around the world and in Malaysia.

Today, we are the world's largest exporter of room air-conditioners, bringing a cooler, happier and healthier environment to people around the world. This is because more and more people are accepting our products, and trusting in our efficient after-sales service. Our products have also met the quality standards of many countries.

If we are able to take care of our customers worldwide, you can rest assured we can take care of you.



National
ROOM AIR-CONDITIONERS
Matsushita Air-Conditioning Group of Companies in Malaysia (MACG)

Matsushita Air-Conditioning Group of Companies Sets Up The First R & D Centre in Malaysia Solely for the Design and Development of Air Conditioners

Matsushita Air-Conditioning R&D Centre Sdn Bhd (MACRAD) was established in June 1991 as part of the four companies that make up the **Matsushita Air-Conditioning Group of Companies in Malaysia (MACG)**.

It is the first R & D Company to be set up by the private sector for the research, design and development of air-conditioners. This is a positive move by **MACG** in an effort to attain its aspiration of self-conclusive management comprising three main elements i.e. R & D, manufacturing and marketing.

This Centre was initially built at a cost of RM35 million and is well equipped with state-of-the-art technology and sophisticated equipment such as high humidity room, material testing room, anechoic sound proof chamber, vibration testing room, etc.

MACRAD was established to be a world-class room air-conditioner research and development centre with the following aims:

- to further contribute to the nation's industrialisation
- to further enhance utilisation of local materials and parts through new product development
- to tap and further develop local human resources to enhance international competitiveness in quality, cost and present product development cycle.

MACRAD is also ready to provide technical and engineering assistance in the form of testing services for companies requiring them. As a start, some of the services available to the public are:

- certain organic and inorganic material tests
- acoustic sound pressure measurement
- vibration test for packing
- others

MACRAD OFFERS THE FOLLOWING SERVICES:

- CERTAIN ORGANIC AND INORGANIC MATERIAL TESTS
- ACOUSTIC SOUND PRESSURE MEASUREMENT
- VIBRATION TEST FOR PACKING

Matsushita Air-Conditioning R&D Centre Sdn Bhd (MACRAD)

Name of agency / institution / company:
Matsushita Air-Conditioning R&D Centre Sdn Bhd

Person(s) to contact:
- M Kaibara *(General Manager)*
- Sulaiman Yahya *(Executive)*

Postal address:
Lot 2, Persiaran Tengku Ampuan
Section 21, Shah Alam Industrial Site
40000 Shah Alam
Selangor, Malaysia

Telephone:
603 - 541 9933 *ext. 8110*

Telefax:
603 - 541 9920

Office hours:
7.45 am - 5.20 pm *(Mon - Fri)*

NAME OF LABORATORY: *Material Development*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Infrared Spectrophotometer	Organic Material Qualitative analysis	Range : 4000 cm - 1 - 400 cm - 1 Transmittance 0 % - 5 % Absorbance OABS - 3.0 ABS
Combined Cyclic Corrosion Test Chamber	Anti-Corrosive Performance Test	Salt spray : 5 % NaCl w/v Dry test : -25 C - 80 C Humidity : 98 % RH Open air test cycle : 1 - 99

NAME OF LABORATORY: *Anechoic Sound Proof Chamber*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Anechoic Sound Proof Measuring Room	Acoustic sound pressure measurement	Background noise : 15dB Humidity : 30 - 85 % RH

NAME OF LABORATORY: *Packaging Laboratory*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
2- Axis selectable type vibration test system	Transportation Simulation test	Max load : 500 kg Max. acceleration : 4 kg Max velocity : 100 cm/s Frequency : 2 - 500 Hz

Mecomb Malaysia Sdn Bhd

Name of agency / institution / company:
Mecomb Malaysia Sdn Bhd

Name of group / centre:
Customer Service Centre

Name of laboratory / project:
Electrical Calibration Laboratory

Person(s) to contact:
- Vivien Gan
  (Executive)
- Hamdan Supar
  (Assistant Service Manager)

Office address:
Electrical Calibration Laboratory
Mecomb Malaysia Sdn Bhd
Lot 20, Jalan 225
46100 Petaling Jaya
Selangor, Malaysia

Telephone:
603 - 774 3422

Telefax:
603 - 774 3414

Office hours:
8.30 am - 5.30 pm *(Mon-Fri)*
8.30 am - 12.30 pm *(Sat)*

SERVICES OFFERED

- Accreditated Calibration Laboratory conformed to ISO/IEC Guide 25 and MIL-STD-45662A for calibration of electrical instruments such as Oscilloscope, Curve Tracer, DC/AC Voltmeter, DC/AC Ammeter, Ohmmeter, Capacitance meter, Frequency counter and I.C. Programmer.
- Traceable Calibration for Pressure Gauge, Temperature controller/Indicator/Recorder and Digital Thermometer.

GENERAL INFORMATION

Mecomb is a leading instruments and engineering specialist which provides technologically advanced and quality products from reputable manufacturers. The company is equipped with local system integration capabilities and staffed by a team of factory-trained engineers.

Mecomb was founded in Singapore in 1953 and incorporated in Malaysia in 1964. It was acquired by Sime Darby Berhad in 1978. In 1978, it became a subsidiary company of PSD Holdings Sdn Bhd.

PSD Holdings is a joint venture company between Sime Darby Berhad, which is one of ASEAN'S largest multinational companies, and Perbadanan Nasional Berhad (PERNAS). Mecomb's expertise includes marketing technically advanced products and providing total service support. Its well-equipped workshop is manned by a team of factory-trained personnel. Services provided by the workshop include:-

- Pre-delivery testing
- Installation and commissioning
- Warranty services
- Overall services and repairs, preventive maintenance contract and instrument calibration.

Metertek Schlumberger Sdn Bhd

Name of agency / institution / company:
Metertek Schlumberger Sdn Bhd

Name of group / centre:
Calibration Laboratory

Person(s) to contact:
- Thien You Fong
  (Production Manager)
- Lim Beng Seng
  (Production Engineer)

Postal address:
Lot 1, Jalan Pelabur (23/1)
40400 Shah Alam
Selangor, Malaysia

Telephone:
603 - 541 6950

Telefax:
603 - 541 6948

Office hours:
8.30 am - 5.45 pm *(Mon- Fri)*

RESEARCH EXPERIENCE

- Energy auditing with The Ministry of Energy, SIRIM, TNB and UTM
- Assisting UKM in research project

SERVICES OFFERED

- Calibration of three phase watthour and varhour meters
- Calibration of single phase watthour and varhour meters
- Monitoring and load profiling energy consumption

GENERAL INFORMATION

Metertek Schlumberger Sdn Bhd (MSSB) is a joint venture company incorporated in Malaysia on May 1988. The major business interests of MSSB is in the assembly and manufacture of domestic kilowatthour electricity meters. MSSB also acts as the agent for the whole range of products offered by the Schlumberger Industries Electricity Group.

It is the policy of MSSB to constantly strive for and to maintain a high level of quality for all its products and services rendered to its customers. The Calibration Laboratory is MSSB's in-house calibration facility. This Laboratory always ensures that its calibration services are conducted with professional integrity, technical competence, a known level of uncertainty and careful observation and accurate recording.

Mines Research Institute
Department of Mines Malaysia

(Institut Penyelidikan Galian, Jabatan Galian Malaysia)

Taking the Lead in Research & Development of Mining, Quarrying and Mineral Processing

As Malaysia enters a new industrial era, the Mines Research Institute takes pride in its contribution towards the technological development of the Mining, Quarrying and Mineral Processing industries.

Since the Institute's establishment in 1951, it has done many investigations and research and development work in the fields of mineability for ore deposits, mining technology, geotechnical engineering and mineral processing. Now the Institute is focussing its R & D programmes on new technologies and techniques in the exploitation of non-tin minerals, with emphasis on value adding Industrial Minerals.

The main thrust of the Institute's R & D activities is aimed at:

* Facilitating rehabilitation of lands affected by mining
* Optimising output of minerals and beneficiated rock products
* Overcoming adverse environmental effects caused by mining, quarrying and mineral processing activities
* Reducing health and safety hazards in mining and quarrying operations
* Diversifying into non-tin, industrial minerals and dimensional stones
* Downstream value adding of minerals

For more information on the Mines Research Institute's technical and advisory services, contact:

The Director, Mines Research Institute, Department of Mines Malaysia

Locked Bag Number 17, 30990, Ipoh, Perak, Malaysia Tel: 605 - 577 052 Fax: 605 - 577 185

Mines Research Institute
Department of Mines Malaysia
(Institut Penyelidikan Galian, Jabatan Galian Malaysia)

Name of agency / institution / company:
Mines Research Institute,
Department of Mines Malaysia

Person(s) to contact:
- Dzulkarnain Hj. Kamaruzzaman *(Director)*
- Chin Kee Chin *(Deputy Director)*
- Abdullah b. Ismail *(Senior Research Officer)*

Office address:
Jalan Sultan Azlan Shah
31400 Ipoh, Perak, Malaysia

Postal address:
Locked Bag No. 17
30990 Ipoh, Perak, Malaysia

Telephone:
605 - 577 052

Telefax:
605 - 577 185

Office hours:
8.00 am - 12.45 pm
2.00 pm - 4.15 pm *(Mon - Thurs)*

8.00 am - 12.15 pm
2.45 pm - 4.15pm *(Fri)*

8.00 am - 12.45 pm *(Sat)*

FIELD OF RESEARCH

Mineability evaluation, mining, quarrying and mineral processing schemes, geotechnical evaluation/test, seismic and resistivity surveys, underground cavity detection, close range aerial photograph/mapping, data analysis through GIS, efficiency of metal/non metal extractions and other aspects related to mining, quarrying and mineral processing.

GENERAL INFORMATION

The Mines Resarch Institute is the R & D arm of the Department of Mines Malaysia, Ministry of Primary Industries. It was established in 1951 in Kuala Lumpur as a measure to improve the production of tin after the deadline of the mineral industry during the years of World War II. In view of the fact that many of the alluvial tin mines were then located in the state of Perak, the Institute was transferred to Ipoh in 1957. Since its establishment more than a quarter of a century ago, many investigations and R & D work have been carried out in the fields of mineability for ore deposits, mining technology, geotechnical engineering and mineral processing.

In answering to the urgent needs of the mineral industry, the Institute has reoriented its R & D programmes with focus on new technologies and techniques in the exploitation of non-tin minerals.

The main objective of the Institute is to promote optimum exploitation of mineral resources for the benefit of the nation by carrying out investigations, R & D programmes, technology transfer and human resource development. To achieve this objective, the Institute performs the following five functions:

- To provide technical support to the other divisions of the Department of Mines.
- To conduct investigations and R & D activities in the fields of mineral evaluation, mining and quarrying, geotechnical engineering, mineral processing and other related areas.
- To provide advisory and technical services to the public and private sectors in the fields of mining, mineral processing and related subjects.
- To transfer technology to the mining and mineral industry.
- To enhance coordination and cooperation among the private sectors, R & D institutions and universities for the development of the mineral industry through R & D and innovation.

M.Y.P. Sdn Bhd, Syarikat

Name of agency / institution / company:
Syarikat M.Y.P. Sdn Bhd

Person(s) to contact:
Azira bt. Mohd Rawi

Office address:
No. 9-9A, Jalan Petaling
Larkin Industrial Area
80350 Johor Bahru
Johor, Malaysia

Telephone:
607 - 371 509

Telefax:
607 - 373 593

RESEARCH EXPERIENCE

Essential oil analysis

SERVICES OFFERED

- Purity and composition analysis using GC
- QC analysis for medicated oil product

GENERAL INFORMATION

Syarikat M.Y.P. Sdn Bhd, a company based in the state of Johor, is 100% owned by bumiputras. It was established in late 1967 with the aim of manufaturing OTC medical ointment and other medical preparations.

The most well known of its product is MINYAK GELIGA. It has also expanded its activity base to distribution of raw essential oils (for commercial and household use) and some medical devices.

Syarikat M.Y.P. is now embarking on a project aimed at attaining GMP status and is undergoing structural changes in its administrative and production processes to meet the challenges of the 21st century. In addition, we would also like to give our support to the public sector by sharing our expertise in the area of essential oils and herbal preparations.

Naval Dockyard Sdn Bhd

Name of agency / institution / company:
Naval Dockyard Sdn Bhd

Person(s) to contact:
- Sulaiman bin Mat Jam
  (Corporate Division Manager)
- Wafa S.S.T
  (Quality Assurance)

Office address:
Pangkalan TLDM
32100 Lumut
Perak, Malaysia

Telephone:
605 - 683 5701, 683 5710

Telefax:
605 - 683 5708

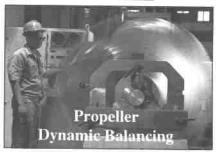
Office hours:
8.00 am - 4.30 pm *(Mon - Fri)*
8.00 am - 12.30 pm *(Sat)*

Summary of Research Experience

SIRIM ACCREDITED CALIBRATION LABORATORY

- 9LV212 / 9LV230 - Weapon System Overhaul - MIL STD
- Pressure (Deadweight) - Pressure Calibration - ISO / IEC Guide 25
- Temperature (Temp Bath) - Temperature Calibration - ISO / IEC Guide 25
- Frequency (Rubidium) - Time & Freq. Calibration - ISO / IEC Guide 25
- Pump Testing -ISO / IEC Guide 25
  Chain Testing - ISO / IEC Guide 25
  Motor Testing - ISO / IEC Guide 25
  Tank Testing - ISO / IEC
  Engine Test Bed - ISO / IEC
  Gun Testing - ISO / IEC


Radar Testing


Propeller Dynamic Balancing


Metal Fabrication

FIELD OF RESEARCH

TEMPERATURE & PRESSURE LABORATORY

Name of agency/institution/company:
Naval Dockyard Sdn Bhd

Name of group/centre:
Calibration Laboratory

Name of laboratory/project:
Temperature & Pressure Laboratory

Person(s) to contact:
En. Syed Saadun Tarek Wafa
(Quality Assurance Manager)

Office address:
Naval Dockyard Sdn Bhd
Pangkalan T.L.D.M.
32100 Lumut
Perak, Malaysia

Telephone:
605 - 683 5701

Telefax:
605 - 683 5708

Office hours:
8.00 am - 4.30 pm *(Mon - Fri)*
8.00 am - 12.30 pm *(Sat)*

SERVICES OFFERED

Accredited test and calibration of pressure and temperature devices based on ISO/IEC G25 and SAMM.

HARDWARE FACILITIES / EQUIPMENT

Equipment calibrated	Range	Best measurement capabilities
Pressure Measuring Devices	1 to 600 bar	± 0.12%
Vacuum Pressure Measuring Devices	0 to 30 Hg	± 0.8%
Resistance Temperature Detectors (RTD)	0°C	± 0.25°C
	-40 to 0°C	± 0.5°C
	0 to 80°C	± 0.5°C
	80 to 280°C	± 0.5°C
Remote Thermometer	-0°C	± 0.5°C
	-40 to 0°C	± 0.5°C
	0 to 80°C	± 0.5°C
	80 to 280°C	± 0.5°C
	80 to 600°C	± 0.5°C
Thermocouples	80 to 280°C	± 0.5°C
Temperature Switches	-40 to 280°C	± 0.5°C

FIELD OF RESEARCH

TANK / CHAIN, PUMP & ENGINE TESTING

Name of group/centre:
Calibration Laboratory / Testing

Name of laboratory:
Tank / Chain / Pump / Engine / Gun & Motor Testing

Person(s) to contact:
- En. Syed Saadun Tarek Wafa *(Quality Assurance Manager)*
- En. Mohd Fauzi b. Abd Wahab *(Department Manager - Engine/Pump)*
- En. Mohd Khair b. Abd Rashid *(Workshop Manager - Pump Testing)*
- En. Mohd Wazir b. Jaafar *(Workshop Manager - Engine Testing)*
- En. Lecthumanan a/l Katharaveloo *(Workshop Manager - Chain / Tank Testing)*
- En. Rahman Saad *(Workshop Manager - Gun & Motor Testing)*

Office address:
Naval Dockyard Sdn Bhd
Pangkalan TLDM
32100 Lumut, Perak, Malaysia

Telephone:
605 - 683 5701 / 7

Telefax:
605 - 683 5708

Office hours:
8.00 am - 4.30 pm *(Mon - Fri)*
8.00 am - 12.30 pm *(Sat)*

SERVICE OFFERED

Non-accredited test and calibration conforming to manufacturers standards

HARDWARE FACILITIES / EQUIPMENTS

Equipment Calibrated	Range
Tank Testing	0 to 6 bar

Chain Testing	1 to 100 ton
Wire rope	1 to 100 ton
Pump Testing	1 to 10 Bar 7 to 120 M3/Hr
Engine Testing	57KW - 5200KW

FIELD OF RESEARCH

PRINTED CIRCUIT BOARD MANUFACTURING

Name of group/centre:

Electronic Research and Development

Name of laboratory:

Printed Circuit Board Manufacturing

Person(s) to contact:

- En. Haji Jaafar bin Salim *(Department Manager)*
- En. Amirsharifuddin b. Sarudin *(Lab. Supervisor)*

Office address:

Naval Dockyard Sdn Bhd
Pangkalan TLDM
32100 Lumut
Perak, Malaysia

Telephone:

605 - 683 5701

Telefax:

605 - 683 5708

Office hours:

8.00 am - 1.30 pm *(Mon - Fri)*
8.00 am - 12.30 pm *(Sat)*

SERVICE OFFERED

- Printed Circuit Board Design
- Small scale PCB manufacturing, double layer plated through hole

SOFTWARE/HARDWARE FACILITIES AND EQUIPMENT

- Computer Aided Design software application on electronic schematic entries (OrCad/SDT III Draft Ver 3.22 - by OrCad System Corporation U.S.A.)
- Computer Aided Design software application on electronic artwork for PCB (OrCad/PCB II Ver 2.01 - by OrCad System Corporation U.S.A.)
- Temperature control, spray type etch machine (Ammonia etchant - Brand Garant W.Germany)
- Temperature control developer machine. (Brand - HEPELA)
- Size A3 exposure machine.(Brand - HELLAS)
- Size 12 inches Photo Laminator machine
- Printed circuit board drilling machine
- Full ranges clean cut Tungsten carbide drill bits.
- 2 cubic feet Copper plating bath with (KRAF) Rectifiers
- 2 cubic feet Nickle plating bath with (KRAF) Rectifiers
- Electroless Copper plating for PTH process (Chemical - Option 1)
- Copper plating for PTH process (Chemical - Option 2)
- Screening alignment machine (Screen Printing) for: (a) Solder masking (b) Legend printing (c) Image transfer (optional)
- Temperature control oven (1m X 1m X 0.25m)
- Bronson Ultra Sonic cleaner
- De-ioniser water filter

OTHER INFORMATION

THE BASE OF SUPERIOR TECHNOLOGIST

The Naval Dockyard Sdn Bhd is located within the main base of the Royal Malaysian Navy in Lumut, Perak. Located between Kuala Lumpur and Penang, the Dockyard is approximately 260 kilometres from the capital city and some 200 kilometres from Georgetown. Although it only occupies an area of 26 hectares, the Naval Dockyard can be fairly described as an independent maritime industrial park, which houses every aspect of Structural, Mechanical, Electrical and Electronic workshop facilities in meeting the need and demand of the Navy and Marine industries.

It was built at a cost of RM650 million. The Dockyard is constructed and fitted with facilities that are completely adequate to provide competent maintenance and ship-repair services, new construction and other engineering works. We have since undertaken with great success in repairs, fabrication and maintenance of Naval and Commercial ships and their associated equipment and systems.

Certainly, the highly superior facilities at the Dockyard, coupled with our wide experience in this field, enables the Naval Dockyard to serve other maritime clients with equal satisfaction. Indeed, ours is one of the most modern and comprehensively equipped Dockyard in the ASEAN region.

The Dockyard has been fully operational since 1984 and was privatised on 1st September 1991 as Naval Dockyard Sdn Bhd. Prior to privatisation, we

were known as RMN Dockyard. Our core business was chiefly attending to the maintenance, repair and servicing requirements of the Royal Malaysian Navy.

Today, the activities of Naval Dockyard Sdn Bhd are more diversified encompassing Ship Repair, Ship Building and General Engineering works for Naval and Commercial customers.

DOCKING AND SHIPLIFTS

The Naval Dockyard has the capability to undertake the construction of ships, servicing and ship-repair works. We carry out "afloat" repairs,especially for vessel of higher tonnage and dockings.

The Dockyard ship-repair shop can easily accommodate six medium-sized vessels at any one time.

The Dockyard is equipped with two synchro-lifts (450T and 4,500T in capacity) and quay-side craneage. Berthing at the Dockyard include a 400m deep berth and a 250m long shallow berth alongside a floating jetty. It is supplied with reticulated fresh water, salt water, compressed air, oxygen and electrical supplies to facilitate the complex nature of ship-repairs and construction works.

Our expertise and facilities allow us to engage in all the major engineering disciplines, whether structural, mechanical, electrical, electronics, instrumentation and system engineering.

Our past experience has included upgrading, long refits, overhauls and repairs of warships and the weapons, equipment and systems of these vessels. We have also undertaken similar work for foreign naval vessels and for commercial vessels.

Sophisticated test and maintenance tools, equipment, systems and professional personnel distinguish the Naval Dockyard as a superior technologist in the highly specialised field of maritime engineering.

FABRICATION

The Naval Dockyard is equipped with forges, presses and heat treatment furnaces necessary for fabrication processes. We confidently undertake complete fabrication in specialist ferrous and non-ferrous metals and non-metalic materials, in particular GRP (glass reinforced plastics).

The Hull section carries out construction and repair of ship's hull and superstructures. Some of the work carried out here includes fabrication of metal plates, GRP work, ship construction, rigging, boat building and sailmaking.

MECHANICAL ENGINEERING

The Naval Dockyard undertakes overhauls, repairs and maintenance of mechanical engineering equipment and systems ranging from prime-movers, engines and rotating machinery and systems.

Our facilities include fully equipped machine shops with a complete range of machine tools, specialist workshops and a foundry with a 2-ton steel and 1/2-ton non-ferrous furnaces.

The metallurgical workshop is equipped with surface treatment, electroplating, galvanishing and chemical treatment plants. The surface treatment shop is fitted with basins measuring 4.5m X 1.5m X 1m each and baths for hot galvanising. This shop is also equipped with a degreasing bath, rinsing bath, acid bath and two drying chambers.

The Engine Test-Shop facilitate factory test on diesel engines up to 7,500 Bhp. The engine repair shop which repairs all types of engines is also specialised in MTU Engine repair.

An assortment of machines facilitate prompt and effective repairs at the Mechanical Engineering Workshop.

ELECTRICAL ENGINEERING

The Naval Dockyard has a large, well equipped electrical test plant and extensive load-bank testing facilities to meet the maritime industry's needs in the field.

The Dockyard is capable of handling rewinding, maintenance and testing of electric motors up to 1 MW ratings. Commissioning, maintenance and testing is also available for batteries used in all application including submarine "power pack". An insulating winding and wrapping machine, an impregnating plant and a commutator undercutting machine are other facilities available for repair works.

The Dockyard handles servicing and fabrication of switchboard, controller and starters and all classes of wiring and cabling work for marine and industrial applications.

The Naval Dockyard offers specialised services for the design, fabrication and development of system, controls and instrumentation, by specialist with wide experience in this field.

WEAPONS AND FIRE CONTROL SYSTEMS

The dockyard is well equipped with weapons and fire control repair and test facilities and undertakes overhaul and maintenance of weapons systems, sonar, guns, mine hunting "fish" and provides other services indispensable to the defence industries.

Complete weapon maintenance work is undertaken by the dockyard to ensure the weapons are properly tested and tuned to the associated system.

The weapons and weapons control facilities, however are not limited to the defence industry alone. This section of the Dockyard also provides support to

general industries requiring expertise in the fields of digital and analog systems.

GENERAL ELECTRONIC

The Naval Dockyard has a most sophisticated and elaborately fitted electronics facility.

The Radio Workshop is fitted with two screened tuning rooms, a Universal test set for IFF, 62 standard electronic test benches, 15 compact radio test benches and a UHF test bench.

The Dockyard, competently undertakes repairs of radio systems, radar, fire control systems, gyro, laser ranging equipment and engine monitoring systems.

There is also capacity to undertake the design, development, manufacture and fabrication of special applications in radio communications as applied to intelligent defence communications systems.

Computer Aided Design facilitates development and fabrication of Printed Circuit Board (PCB).

Various other department within the Naval Dockyard provide vital support services to ensure smooth running and success of the organisation

IT DEPARTMENT

This department manages entry and compilation of data for production planning and scheduling, material and resource management costing and financial accounting and personnel management using main frame computer, together with the application of a Local Area Network (LAN).

ADMINISTRATION DEPARTMENT

This department manages some of the crucial areas for the management of the organisation such as:

PERSONNEL TRAINING & DEVELOPMENT

Naval Dockyard staff undergo special development and training programmes designed to bring out the best in an employee and thereby reach optimum productivity levels.

SECURITY

To safeguard the interests of our clients by enforcing and observing stringent security measures and policies.

INDUSTRIAL SAFETY

Strict safety procedure are enforced and all necessary precautions are taken to minimise the risk of damage of destruction to life and property at the yard.

THE FINANCE DEPARTMENT

All matters of finance - budgeting, costing, financial accounting and control and managed by professionally qualified financial managers.

MATERIAL MANAGEMENT

Material resource required for a given job or project are worked out by the department. The warehouse issues materials based on approved requisitions. Purchases of additional materials not immediately available are also sourced by the department.

PLANNING & SUPPORT DEPARTMENT

This department sees that all projects are successfully estimated, costed and completed within the time frame and cost allocated and that all client specifications are met with.

PROJECT MANAGEMENT

Work schedules and work papers, together with material specifications and requirements are planned and issued at the onset of a project, and work progress are effectively managed to meet target dates.

THE DESIGN DEPARTMENT

This department is reponsible for providing workshop drawings and documentation for new construction and modification works. Computer Aided Design packages facilities design work and preproduction programmes, from conceptual to implementation stage of new build/construction work.

QUALITY ASSURANCE & CONTROL

X-ray and other non-destructive testing (NDT) facilities and demands are managed by this department and provide documentation and guidelines on Quality Assurance measures and procedures.

RESEARCH & DEVELOPMENT

Research and Development (R&D) work and seeking technological improvements in mainly applied in electronic applications, such as PCB fabrication and electronic control engineering.

SHIP BUILDING DEPARTMENT

This division is gearing towards establishing a full and competent team capable of undertaking design and project management activities for new construction of naval and commercial vessels and other marine industrial structures.

The Dockyard workforce comprises competent, experienced and professionally qualified individuals who are young, dynamic and committed to the common objectives of prompt service and quality production.

The Naval Dockyard is Ready to Serve You With Our Commitment To Total Quality Service and Excellence

Packaging Research Centre Sdn Bhd

Name of agency / institution / company:
Packaging Research Centre Sdn Bhd

Name of laboratory / project:
- Plastic Testing Laboratory
- Paper Testing Laboratory

Person(s) to contact:
- Dr. Patrick Loi Suok Tee *(General Manager)*
- Ms. Lok Mei Mei *(R & D Executive)*

Office address:
Lot 5036, Jalan Teluk Datuk 28/40
Off Persiaran Sepang, Seksyen 28
40000 Shah Alam, Selangor, Malaysia

Telephone:
603 - 511 5986

Telefax:
603 - 511 6273

Office hours:
9.00 am - 5 pm *(Mon - Fri)*
9.00 am - 1.00 pm *(Sat)*

RESEARCH EXPERIENCE

Research into paper, plastic and metal related packaging. Staff research experience ranges from fresh university graduates to more than 25 years.

CONSULTANCY EXPERIENCE

Mainly in packaging design, material combination, packaging-content compatibility, process trouble shooting and printing (gravure, litho and flexo-graphic printing).

SERVICES OFFERED

- Laboratory testing
- Product research & development, raw material study and evaluation on project basis
- Process improvement on project basis
- Information dissemination
- Training

GENERAL INFORMATION

Packaging Research Centre Sdn Bhd (PRC) was established as a private and independent packaging research organisation manned by a team of experienced and professional packaging specialists who support the packaging industry in Malaysia with the necessary technology, R & D laboratory and investigative facilities, information dissemination and technical training programmes.

PRC is equipped with state-of-the art testing equipment and laboratories capable of investigating a wide spectrum of technologies from paper, metal to plastics packaging.

PRC is striving to achieve international recognition as a Packaging R & D organisation in Malaysia when it eventually obtains ISO/IEC G25 accreditation.

Pahang State Development Corporation

Name of agency/institution/company:
Pahang State Development Corporation

Person(s) to contact:
- Hamdan b. Jaafar *(Chief Executive Officer)*
- Lias b. Mohd Noor *(Deputy Chief Executive Officer)*

Office address:
16th Floor, Teruntum Complex, Jalan Mahkota
25000 Kuantan, Pahang, Malaysia

Telephone:
609 - 513 5566

Telefax:
609 - 513 0510

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

SERVICES OFFERED
- Industrial Development & Promotion
- Tourism Promotion
- New Township Development & Rural Growth Centre
- Bumiputra Entrepreneur Development

PASDEC CORPORATION SDN. BHD.

Name of agency/institution/company:
Pasdec Corporation Sdn. Bhd.
(A Member of The Pahang State Development Corporation)

Person(s) to contact:
Haji Mohd Kharuddin b. Mohd Ali

Office address:
Tingkat 13 & 14,
Kompleks Teruntum, Jalan Mahkota
25000 Kuantan, Pahang, Malaysia

Telephone:
609 - 513 3888

Telefax:
609 - 514 5988

Office hours:
8.00 am - 4.30 pm *(Mon - Fri)*
8.00 am - 1.00 pm *(Sat)*

SERVICES OFFERED
- Property Development
- Hotel & Resorts Development
- Plantation

PASCORP HOLDINGS SDN. BHD.

Name of agency/institution/company:
Pascorp Holdings Sdn. Bhd.
(A Member of The Pahang State Development Corporation)

Person(s) to contact:
- Baharum Md. Salleh *(General Manager)*
- Kamarudin Abdull Rani *(Finance Manager)*

Office address:
Tingkat 19, Kompleks Teruntum , Jalan Mahkota
25000 Kuantan, Pahang, Malaysia

Telephone:
609 - 513 4000

Telefax:
609 - 513 4940

Office hours:
8.00 am - 4.30 pm *(Mon - Fri)*
8.00 am - 1.00 pm *(Sat)*

SERVICES OFFERED
- Manufacturing
- Resource Based

Palm Oil Research Institute of Malaysia (PORIM)

Palm Oil Competitiveness Through R&D

Dr. Yusof Basiron
Director-General, PORIM

The prolific expansion in palm oil markets is attributed in no small measure to the industry's commited investment in R&D. As the sole R&D arm of the industry, PORIM develops cost effective production technologies for producers, and provides profit motivated options for manufacturers and consumers of oils and fats. PORIM's R&D findings add to the growing viability and credibility of palm oil as the preferred choice among many.

R&D Planning

PORIM's research programmes are developed on the basis of inputs not only from the industry, but also through market feedback. Proposals for projects are rigorously scrutinised by expert committees comprising select representation from the local industry, international marketeers as well as world-renowned scientists. Approved programmes reflect scientific pragmatism and market relevance.

Production Viability

PORIM's R&D in breeding, agronomy, plantation management, milling and refining has led to techniques which prove to be highly effective in keeping cost of production within reasonable norms.

New approaches in biotechnology and automated processing promise continued and improved viability of such investments. The world should thus be assured of a sustained reliable supply of palm oil always.

Expanding Enduse

PORIM's R&D in enduse has not only widened palm oil's growing areas of application, but has also led to the development of exacting palm-based formulations catering to the varying tastes of different markets. Current R&D actively explores other still unchartered territories of product development. As a renewable resource, palm oil demonstrates material excellence in many products.

Palm-based Vitamin E

PORIM's worldwide network of Technical Advisory Service (TAS) offices ensure consumers are updated on the latest developments in palm oil applications.

Nutrition Credibility

R&D in nutrition brings out the positive health image of palm oil. Studies have not only confirmed its cholesterol reducing tendency but have also unraveled the disease-suppressing role of its rich minor components of beta carotene and the highly potent vitamin E tocotrienols. Current R&D suggests a very strong likelihood of even extracting such potentially viable pharmaceutical products for commercialisation.

PORIM Headquarters

Red Palm Oil

Environmental Credential

The increasing influence of environment on world trade proves a plus point for palm oil. PORIM's continuing emphasis on R&D to develop environmentally friendly technologies in the growing and processing of palm oil is expected to generate market dividends for the industry. Coupled with their scientifically attested inherent biodegradability, palm-based products should therefore enjoy better acceptance in the competitive oleochemical and detergent sectors.

Market Acceptance

Palm oil is now the leading vegetable oil in international trade. A major factor contributing to this envious achievement is the widespread world acknowledgement of its positive techno-economic merits. PORIM's R&D helps generate the necessary technical information in support of such convincing arguments. R&D nurtures the expansion of the palm oil industry.

For more information, readers are encouraged to contact PORIM:

Palm Oil Research Institute of Malayaia.
Head Office: 6, Persiaran Institusi,
Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia
P.O. Box 10620, 50720 Kuala Lumpur
Telex: MA 31609 Telegram: PALMSERCH,
KUALA LUMPUR
Telephone: 603-8259155, 8259775 Fax: 603-8259446

Palm Oil Research Institute of Malaysia (PORIM)

Name of agency / institution / company:
Palm Oil Research Institute of Malaysia (PORIM)

Person(s) to contact:
Director-General, PORIM

Office address:
6, Persiaran Institusi
Bandar Baru Bangi
43000 Kajang, Selangor, Malaysia

Postal address:
P.O. Box 10620
50720 Kuala Lumpur, Malaysia

Telephone:
603 - 825 9155

Telefax:
603 - 825 9446

Office hours:
8.30 am - 4.30 pm *(Mon - Fri)*
8.30 am - 1.15 pm *(Sat)*

PORIM'S R&D GROUPS:

- Physics and Chemistry Group:
  Measurements of density, solid fat content, viscosity, thermograms by DCS, polymorphism by X-ray diffraction and microscopy
- Nutrition Laboratory Group:
  Full scale blood lipid and lipoprotein analysis
- Milling Group:
  Provides advisory services to the milling industry; organises training courses; disseminates information to the palm oil milling and refining industry and coordinates the milling certificates of competency scheme
- Processing Group:
  Process development for the production of esters, red palm oil, carotenoid concentrates, monoglycerides & diglycerides and palm oil minor components; palm oil mill/refinery/oleochemical waste treatment; biofuel; palm based lubricants
- Technology Group:
  Isolation, identification and quantification of minor components with special reference to tocopherols, tocotrienols, sterols and squalene from various sources such as crude and refined oil/fats distillates and fronds
- Analytical Group:
  Analytical services for most contractual parameters for palm oil products. Other non-routine analyses (e.g. using sophisticated instruments and techniques) could be undertaken on a case-by-case basis subject to prior discussions with relevant parties
- Food Uses Group:
  Evaluation and performance studies and pilot plant processing facilities
- Non-Food Uses Group:
  Soaps and candles production on small scale and evaluation; CHN analysis; detergency analysis; GC-MS analysis

Petronas Research & Scientific Services Sdn Bhd

Name of agency / institution / company:
Petronas Research & Scientific Services Sdn Bhd

Person(s) to contact:
Dr Mohd Ariffin Haji Aton
(Managing Director/Chief Executive Officer)

Office address:
Lot 1026, PKNS Industrial Estate
54200 Hulu Klang
Selangor, Malaysia

Telephone:
603- 407 1022

Telefax:
603 - 408 7471, 408 8811

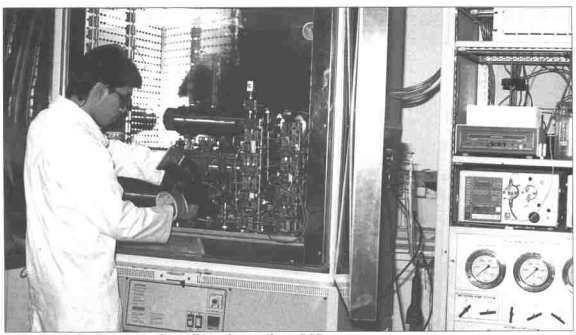
Office hours:
8.30 am - 4.30 pm *(Mon - Fri)*
8.30 am - 12.30 pm *(Sat)*

PETRONAS Research & Scientific Services Sdn Bhd *(PRSS)* began as an analytical laboratory in 1978; with increasing R & D needs of PETRONAS it further expanded its function to Petroleum R & D. PETRONAS reviewed the situation and on 16 September 1988, the PETRONAS Petroleum Research Institute (PRI) was formed. As of 8 December 1992, PRI was incorporated as PETRONAS Research & Scientific Services Sdn. Bhd. (PRSS), a wholly-owned subsidiary of PETRONAS.

Supported by dedicated, skilful and experienced scientists and facilitated with state-of-the-art testing equipment, PRSS will:-

- conduct contract research on hydrocarbon exploration, exploitation and product development through state-of-the-art technology.
- achieve improvement and innovation of process and products to gain a sustained competitive edge.
- provide credible and efficient technical and scientific and consultancy and support to petroleum industries.

PRSS undertakes collaborative work with both local & international oil companies and universities.



PRSS aims to be the centre of excellence in petroleum R&D

EXPLORATION TECHNOLOGY

Name of group/centre:

Exploration Technology Group

Person(s) to contact:

En Kassim Kinchu *(Senior Manager)*

Telephone:

603 - 400 2233

Fax:

603 - 408 7471, 408 8811

LABORATORY: *SEM laboratory*

SERVICES OFFERED

- Analysis of materials using Scanning Electron Microscope
- Age determination of rocks based on microfossils.
- Biostratigraphic analysis

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Scanning Electron Microscope with Energy Dispersive Spectrometry	Microstructure and elemental analysis of material	Accelerating voltage: 0.2 - 50kV Resolution: 5nm
Polarised Transmitted Light Microscope	Calcareous nannofossil analysis	Max. magnification 1000X. Rotating stage
Transmitted Light Microscope	Palynological analysis	Max. magnification 1000X square stage
Reflected light microscope	Foraminifera	Zoom stereo microscope Max.magnification: 800X

RESEARCH EXPERIENCE

- Geological and material science
- Biostratigraphical studies

LABORATORY: *Sedimentology*

SERVICES OFFERED

- Petrography and diagenesis
- Facies identification and depositional environment identification
- Subsurface analyses
- Clay analyses
- Reservoir studies

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Polarizing microscope	Petrography/ Mineral identification Diagenesis/ Photomicrography	Mag. up to 1000X.
Cathodoluminescent Microscopy	Diagenesis; Chemical zoning; photomicrography	Luminoscope-ELM-3R 30kV, 2MA
X-Ray Difrectometer system	Clay analysis Mineral identification	Computerized system Operating condition: 40kV Loading capacity: 21 samples
Sedimeter	Clay distribution	Stoke's methods size: 30-500 micron
Petrographic image analysis system	Reservoir pore typing Quantitative pore analysis. Reservoir characterization	Normal PC, 486/33 MHz PIA software
Rock Thin Section Preparation System:		
• Polishing system	Slide polishing	Petrographix - 500W 220-240V
• Diamond Bort, cutting machine	Rock cutting/ trimming	Microtec Three phase 220/380V Various sizes of blades
• Slabbing machine	Rock slabbing	

RESEARCH EXPERIENCE

- Regional geological studies
- Hydrocarbon prospectivity
- Reservoir geological modeling
- Diagenetic and sedimentological studies
- Subsurfaces analyses and facies correlation
- Reservoir studies

CONSULTANCY EXPERIENCE

Regional geological studies in relation to hydrocarbon exploration.

LABORATORY: *Geophysical Processing & Analysis*

SERVICES OFFERED

- 2D / 3D Seismic data analysis for structural & stratigraphic
- Data loading / reformat
- Well log digitizing
- Thermal and Electrostatic plotting
- Leasing of seismic interpretation system
- Leasing of seismic modelling system
- Specialised seismic processing
- Thermal conductivity measurement

- Seismic raytrace-modelling for acquisition design, seismic interpretation and processing
- Thermal and pressure modelling

HARDWARE FACILITIES

Equipment	Application	Technical specifications
Seismic Processing System	Seismic processing and modelling	5 Sun Sparc workstations
Seismic analysis/ interpretation system	Seismic analysis, interpretation and modelling	3 Sun Sparc workstations

SOFTWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical application
Seismic interpretation software	Structural workstations Seismic attributes analysis Subsurface visualization	2D/3D interactive mode
Well log software	well log editing well log correlation	interactive mode
Synthetic seismogram software	Generate synthetic trace from well data	interactive mode
Seismic modeling software	Seismic ray tracing and generate synthetic seismic section	2D/3D interactive mode
Seismic processing software	Basic and advanced seismic processing Signal enhancement Structural imaging Stratigraphic analysis	Interactive/Batch mode
Basin Mod software	Thermal pressure modelling	Window-based

RESEARCH EXPERIENCE

- Seismic attribute analysis for direct hydrocarbon indicator
- Reservoir mapping
- Advanced seismic processing
- Structural imaging
- Stratigraphic analysis
- Geothermics study
- Geopressure study

CONSULTANCY EXPERIENCE

- Contract research on seismic attributes analysis
- Technical problem solving on seismic interpretation
- Contract research on seismic structural imaging
- Geothermics of Malaysian Basins

LABORATORY: *Basin Modelling*

SERVICES OFFERED

- Modelling of Thermal evolution, burial and maturity history, and hydrocarbon generation and expulsion
- Simulation of tectonic evolution, thermal maturity history, overpressure mechanism and fluid flow, and hydrocarbon generation and migration across a basin
- Structural and tectonic analysis of basin

SOFTWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical application
GENEX	One dimensional modelling	486 with math coprocessor
TEMISPACK	Two dimensional basin modeling	Sun Sparc 10 workstation
pc ARC/INFO	A geographic database and utilized for spatial analyses and modelling of map features	486/DX
pc TIN	A 3-D digital terrain modelling system	486/DX

RESEARCH EXPERIENCE

- Structural and tectonic analysis of the Malay Basin
- Geochemical modeling of the Tembungo area

LABORATORY: *Geochemistry*

SERVICES OFFERED

Routine and detailed Petroleum Geochemical Analyses.

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Carbon determinator	Determination of carbon content	Infrared absorption detector Furnace temperature = 1,200 °C Analysis time = 30 seconds
Source rock analyser	Screening for source rock potential	Analysis time = 25 min Pyrolysis temperature = 300-600 °C
Portable Source Rock Analyser	Screening for source rock potential	Pyrolysis temperature= 700-800 °C Pyrolysis time = 60 seconds Weight = 4 kg

Elemental Analyser	Elemental analysis (C,H,N,O)	Combustion temperature = 950 °C Reduction temperature = 650 °C
Soxhlet extraction apparatus	Extraction of soluble organic matter	
Rapid extraction apparatus	Rapid extraction of soluble organic matter	
Gas Chromatograph (FID/FPD)	Analysis of aromatic hydrocarbon fraction	Operating temperature = 80-300 °C
Gas Chromatograph (FID)	Analysis of saturated hydrocarbon fraction	Operating temperature = 80-300 °C
Gas analyser	Quantitative gas analysis	
TLC/FID Analyser	Quantitative determination of hydrocarbon fractions	FID detector Electronic integrator Silica rods (particle size 5 um)
Gas Chromatography - Mass Spectrometer (GC-MS)	Characterisation of biomakers	Oven temperature = 25-350 °C Mass range= 10-600 amu Ion source=EI ionisation
Gas Chromatography - Mass Spectrometer (GC-MS)	Characterisation of biomarkers	Oven temperature = 25-350 °C Mass range= 10-1200 amu Ion source=EI/CI
High temperature gas chromatograph	High molecular weight hydrocarbons analysis	Oven temperature = 10-450 °C Autosampler
Medium pressure liquid chromatograph	Hydrocarbon fractionation	Autosampler Programmable UV wavelength detector (400 - 600nm)
Kerogen isolation unit	Isolation of insoluble organic matter from rock sample	Maximum temperature = 80 °C Maximum sample weight = 10g
Transmitted light microscopes	Visual kerogen analyses	Fluorescence Photomicrography system
Microscope photometer system	Spectral fluorescence, vitrinite reflectance and chromaticity measurement	Photomultiplier Grating monochromator Spectral range 380-800nm Photomicrography
Vitrinite reflectance microscope	Vitrinite reflectance measurement and fluorescence observation	Photomultiplier Grating monochromator Pol vertical illuminator Photomicrography system
High pressure reaction vessel	Artificial maturation	Maximum pressure = 6,000 psi Maximum temperature = 550 °C Volume = 500ml
Ball Mill	powdering of rock samples	
Zoom stereo microscope	Picking of ditch cuttings Lithology description	
Freeze Dryer	Freeze drying kerogen samples	Capacity 5 litres
Grinder-polisher	Grinding/ polishing mounted rock samples	

RESEARCH EXPERIENCE

- Thermal Maturity and Source Rock Evaluation of Malaysian Source Rocks
- Geochemical modelling of selected fields in Malaysia
- Reservoir Geochemistry
- Characterization of Biomarkers

CONSULTANCY EXPERIENCE

- Petroleum Geochemical Studies
- Correlation Studies - Oils/Source Rocks

PRODUCTION TECHNOLOGY

Name of group/centre:

Production Research Group

Person(s) to contact:

DM Anwar Raja *(Senior Manager)*

Telephone:

603 - 291 4200

Fax:

603 - 291 9860

LABORATORY: *Well Technology*

SERVICES OFFERED

- Performance testing of drilling fluids/additives
- Particle characterisation (number, size and distribution)
- Acid core flow tests

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Acid Stimulation Equipment	To carry out research and service work involving fluid flow through cores for petrophysical	Core diameter : 1½" Core length : 0-6" Overburden pressures : max. 10,000 psi

	and acid stimulation studies	Flowing pressures : max. 6,000 psi Temperature : 302 °F All wetted parts are acid resistant
Long Core Holder	To carry out acid flow tests through plug samples to determine the effectiveness of various acid formulations on reservoir rocks and to be used for other conventional core-flooding purposes	Core diameter : 1½" Core lenghth: max. 48" Confining pressures : max. 10,000 psi Operating pressures: max. 5,000 psi Temperature : 105 °C All wetted parts are acid resistant
Liquid particle counter	To determine the number of particles present in core injection fluids and core effluents	Sensor: Laser diode scattering Size range: 0.3 - 500 microns All wetted parts are acid resistant
Particle size analyser	To measure particle concentration and size distribution in core injection fluids and core effluents. Capable of analysing dry powders in air, particles in liquid suspensions and continuous sprays	Sensor : Laser diffraction Size range :0.5 - 564 microns
High pressure viscometer	To determine the viscosity and flow behaviour of waxy and asphaltenic crudes, drilling muds and visco-elastic fluid samples	Pressure : ambient to 100 bars Temp. : -30 °C - 100 °C Viscosity : 50 - 10,000 mPas
Rotary Viscometer	To determine the viscosity and gel strength of drilling fluids	Speed : 3, 6, 30, 60, 100, 200, 300, 600 RPM
High Pressure High Temperature filter press	To evaluate the filtration properties of drilling fluids, cement slurries and fracturing fluids	Pressure : max. 1500psi (using standard nitrogen manifolds) Temperature: max. 450 °F
Hot Roller Oven	To simulate heating and agitation for the investigation of drilling muds and drilling mud additives performance	Temperature : 100 - 425 °F Built-in 7-day clock to start and end the test automatically 3-roller configurations Outside digital thermometer
Standard drilling fluids analysis equipment	To determine physical, chemical and rheological properties of drilling fluids	Marsh funnel Hand crank viscometer Resistivity meter Versenate test kit Emulsion stability tester Mud balance Oil and water retort kit Hamilton beach mixer Capillary suction time (CST) Kit Sand content kit

SOFTWARE FACILITIES

Equipment	Application
SOLMINEQ software	To monitory water-water and water-mineral compatibility To identify scale forming phases and calculate their scaling potential at high temperatures and pressures To monitor formation temperatures in subsurface through time
EASYSIZER and MASTERSIZER software	To be used in conjunction with Particle Size Analyzer for data acquisition, archiving and manipulation
PDAS software	To control the use of liquid particle counter and sampler for a complete acquisition, archiving and reduction of data
NETPAC software	To be used in conjunction with Acid Stimulation Equipment and Long Core Holder for a complete data acquisition, archiving and manipulation
HAAKE software	To control the use of High Pressure Viscometer for a complete acquisition, archiving and reduction of data.
PIPESIM software	To model hydrocarbon flow in wells, flowlines and pipeline systems
PIE (Well Testing software)	To analyse well test data from oil and gas wells, e.g. pressure build-up and pressure drawdown tests
NAPS (Nodal Analysis software)	To study the inflow performance of oil and gas wells.
SPSS software	To carry out advanced statistical analysis

RESEARCH EXPERIENCE

- **Completed Project:**
  Causes and Extent of Formation Damage in Tembungo and Baram Delta Fields
- **On-going Projects:**
  Matrix Acidisation in Malaysian Sandstones.
  Drilling Fluid Optimisation Study for Dulang Field.
  Optimisation of Oil and Gas Production Systems.

CONSULTANCY EXPERIENCE

Have carried out consultancy work on acid core flushing studies, drilling fluid studies and fluid incompatibility studies.

LABORATORY: *Core Analysis*

HARDWARE FACILITIES / EQUIPMENT

Equipment	Application	Technical specifications
Helium porosimeter	To determine the grain density, volume of core	Core diameter : 1" and 1½" Core length : Max. 2"

	plug sample and subsequently to calculate porosity	Overburden pressure : max. 10,000 psi
Air micropermeameter	To determine the Air permeability of core plug sample	Core diameter : 1" and 1½" Core length : max 2" Overburden pressure : max. 10,000 psi
Klinkenberg gas permeameter	To determine the gas permeability with Klinkenberg correction	Core diameter : 1" and 1½" Core length : max. 2" Overburden pressure : max. 10,000 psi
Mini probe permeameter	To determine permeability of rock sample	Rock sample of any shape and sizes
Core flooding equipment	To determine liquid permeability, relative permeability (unsteady state & steady state) at both room and reservoir condition	Core diameter: 1½" Core length: 0-6" Overburden pressures : max. 10,000 psi Flowing pressures : max. 6,000 psi Temperature: max.102 °C
Ultra-Centrifuge equipment	to determine drainage and imbibition capillary pressure curves, wettability by USBM method and wettability by Amott method	Core diameter : 1 and 1½" Core length : max. 2" RPM : max. 16,500 for drainage and 12,500 for imbibition Temperature: max. 40 °C
Core gamma logger	To determine natural radioactivity of core samples	Core : max. size 5" and slabbed core
Wettability equipment	To determine wettability of core by Amott and spontaneous method	Core diameter : 1½"
Capillary pressure porous plate	To determine drainage capillary pressure curves	Coreore diameter : 1 and 1½" Core length : max. 2"
Core freezer	To freeze unconsolidated core sample	Core : any size and shape
Gas-oil relative permeability	To determine gas and oil relative permeability by unsteady state at room condition	Core diameter : 1 and 1½"

SOFTWARE FACILITIES

Software	Application
NIPER CAPILLARY	To determine capillary pressures from centrifuge experiment
HERBERT CORE GAMMA	To simultaneously plor Total and Spectral Gamma ray profiles of conventional core while making core gamma measurements

LABORATORY:

Reservoir Simulation-Workstation Room

PETRONAS RESEARCH

SERVICES OFFERED

- Reservoir Simulation Study and general reservoir engineering advice
- Software Development
- System consultancy (e.g.: system configuration/ set-up, software set-up, system optimisation and customisation)

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical application
HP 720 server (RSS1)	To carry out research and service work involving reservoir simulation and software development	19" colour monitor 128 MB RAM 5 GB hard disk 5 GB DAT backup tape 640 MB rewritable optical disc
HP 720 workstation (RSS2)	To carry out research and service work involving reservoir simulation and software development	19" colour monitor 32 MB RAM 420 MB hard disk
HP 720 workstation (RSS3)	To carry out research and service work involving reservoir simulation and software development	19" colour monitor 64 MB RAM 840 MB hard disk 3.5" floppy disk
A0 Summagraphics digitiser	To digitise map for reservoir simulation input	A0 size 16 buttons mouse
Phaser III A3 colour plotter	To plot reservoir simulation results for result interpretation and report writing	A3 size 600dpi Postscript file
Deskjet 1200 C/PS A4 colour printer	To plot reservoir simulation results for result interpretation and report writing	A4 size 600 dpi Postscript file
Laserjet III printer	To print text file (input & output) for data analysing	A3 size 300dpi

SOFTWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
ECLIPSE 100 (with Local Grid Refinement	Black - oil reservoir	Three phases with adaptive fully implicit

(Coarsening and Wellbore Friction) and IMEX Reservoir Simulator	simulator	calculation Horizontal well model Non-neighbour connections
GRID and FILL softwares	To carry out gridding process for reservoir simulation input	Corner point geometry Data (e.g. porosity) interpolation 3D visualisation
PVT and CMGPROP softwares	To simulate PVT processes	Peng Robinson/Redlish Kwong equation of state
Pseudo software	To simplify and reduce reservoir simulation parameters	Fully interface with Eclipse software
EDIT software	To edit input file for Eclipse reservoir simulator	Interactive graphical user interface
GRAF and RESULT softwares	To view and interpret simulation results	Fully interactive graphical user interface 3D visualisation

SOFTWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
STAR software	Thermal reservoir simulator	Able to simulate multi-component thermal and steam additive process Control volume finite element gridding technique
GEM software	Compositional reservoir simulator	Able to simulate all important mechanism of a miscible process e.g. vaporisation and swelling of gas; viscosity and interfacial tension reduction and the formation of miscible solvent bank through multiple contacting

RESEARCH EXPERIENCE

On-going projects:

- Formulation of Field Development Concepts for Thin Oil Reservoirs In Malaysia
- Gaslift Expert System

CONSULTANCY EXPERIENCE

- Provided general consultancy on reservoir simulation system set-up and configuration to PETRONAS OPUs and production sharing contractors (Shell, Esso)
- Informal advice on reservoir simulation matters

LABORATORY: *PVT*

SERVICES OFFERED

- Phase behaviour studies of fluids at reservoir condition
- Compositional analysis of crude oil (including condesate)
- Viscosity studies of fluids at high pressure and temperature
- Phase behaviour studies using EOS software

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
PVT equipment	Phase behaviour studies at reservoir pressure and temperature	Maximum pressure : 10000 psi Maximum temperature: 200 °C Visual type of cell:
Gas chromatography	Compositional analysis for C_1-C_{30+}	On-line gas analysis On-column injection Maximum temperature: 350 °C
Molecular weight determination equipment	Molecular weight of crude oil	40 -5,000 Dalton
Sampling equipment	Separator oil and gas sampling	Maximum pressure : 5,000 psi
Capillary column viscometer	Viscosity measurement at high pressure and temperature	Maximum pressure: 10,000 psi Maximum temperature: 200 °C

SOFTWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Equi-phase Equi 90	To predict the phase behaviour of hydrocarbon and non-hydrocarbon mixture under wide range of pressure and temperature	Proprietary information
Equi-phase EOR	To predict the phase behaviour of hydrocarbon	Proprietary information
LABSIM	To model phase behaviour and gas injection process	Proprietary information

RESEARCH EXPERIENCE

Six years experience in conducting phase behaviour and reservoir fluid studies for PETRONAS OPUs and Production Sharing Contractors (EPMI and SSB)

CONSULTANCY EXPERIENCE

Have carried out consultancy work for PETRONAS Carigali in installing and testing "Spike Flash" equipment (August 1993)

LABORATORY:

Enhanced Oil Recovery

SERVICES OFFERED

- Interfacial Tension Measurement at reservoir condition by VLE-IT equipment
- Minimum Miscibility Pressure Determination by Gas Flooding / Sand pack equipment
- Fluid flow through porous media by Core Flooding Equipment

HARDWARE FACILITIES / EQUIPMENT

Equipment	Application	Technical application
Vapour-liquid equilibrium interfacial tension (VLE-IT) equipment	Measurement of vapour-liquid equilibrium and interfacial tension of reservoir fluid at reservoir temperature and pressure	Maximum pressure : 10,000 psi Maximum temperature: 150 °C Cell volume : 100cc Dual window Equilibrium cell
Gas flooding sand pack equipment	Determination of Minimum Miscibility Pressure (MMP) by miscible gas injection through porous media	Sand pack diameter : 15mm Sand pack length: 2,000mm Max. working pressure : 10,000 psi Max. working temperature : 200 °C

SOFTWARE FACILITIES

Equipment	Application
LABSIM II Software	To model the multiple contact phase behaviour between reservoir fluid and solvent for gas injection process
PRIZE Software	To predict EOR processes that are technically feasible for a reservoir of interest. To generate oil recovery predictions for different EOR processes applied to the reservoir of interest

RESEARCH EXPERIENCE

Have carried out phase behaviour screening for Peninsular Malaysian fields on miscible gas injection processes.

CONSULTANCY EXPERIENCE

Able to provide laboratory testing for measurement of interfacial tension between reservoir fluid and solvent and minimum miscibility pressure through porous media.

OFFSHORE ENGINEERING

PETRONAS RESEARCH

Name of group/centre:

Development Engineering Department

Person(s) to contact:

Mohd Sapihie Ayob *(Section Head)*

Telephone:

603 - 291 4200

Fax:

603 - 291 9860

LABORATORY:

Development Engineering/ Reservoir Simulation - Workstation Room

SERVICES OFFERED

- Structural Analysis
- Fluid and Gas Dynamics
- Numerical Code Development
- Programming
- Software Development

SOFTWARE FACILITIES / EQUIPMENT

Equipment	Application	Technical specifications
F77 FORTRAN Compiler	Compiler for mathematical models programmed in Fortran	Fortran 77 Version 9.0
NAG	Mathematical and statistical Fortran library	Mark 15
IMSL	Mathematical and statistical Fortran library	Version 2.0
Mathematica	Symbolic and numeric mathematical computing system	Version 2.2
Pipesim	Steady multiphase flow in production pipe/riser	

RESEARCH EXPERIENCE

On-going projects:

Transient Analysis of Pipe Flow

CONSULTANCY EXPERIENCE

Study of Two-Phase Flow Condensate Hold-up

OCEAN ENGINEERING

LABORATORY:

Development Engineering/
Reservoir Simulation - Workstation Room

SOFTWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
SESAM	Finite element engineering analysis for offshore and marine industry	SESAM 80 ● cgul ● fetpos ● fenris ● fensea ● float3d ● framework ● gensod ● launch3d ● pilgen ● postfem ● postresp ● prefem ● preframe ● prelaunch ● pretube ● sestra ● splice ● wajac
F77 FORTRAN Compiler	Compiler for mathematical models programmed in Fortran	Fortran 77 Version 9.0
NAG	Mathematical and statistical Fortran library	Mark 15
IMSL	Mathematical and statistical Fortran library	Version 2.0
Mathematica	Symbolic and numeric mathematical computing system	Version 2.2

RESEARCH EXPERIENCE

On-going projects:

- Lightweight Structures for Marginal Field Development
- Structural Integrity Studies of Marine Growth on Platform Legs
- Flexible Riser Analysis and Design

New Projects:

- Dynamics of Moored Floating Structures
- Mechanics of Slender Offshore Structures
- Subsea Hydraulic Control Systems
- Explosive Shaped-Charges

CONSULTANCY EXPERIENCE

- Shallow Gas Studies

APPLIED MATHEMATICS

MATHEMATICAL MODELLING

LABORATORY:

Development Engineering/
Reservoir Simulation - Workstation Room

RESEARCH EXPERIENCE

On-going projects:

- Flexible Riser Analysis and Design
- Transient Analysis of Pipe Flow

New Projects:

- Dynamics of Moored Floating Structures
- Mechanics of Slender Offshore Structures

CONSULTANCY EXPERIENCE

Study of Two-Phase Flow Condensate Hold-up

FIELD OF RESEARCH

PROCESS TECHNOLOGY

Name of group/centre:
Process Technology Group

Person(s) to contact:
Dr Hj Zainal Abidin Hj Kasim *(Senior Manager)*

Telephone:
603 - 4000 2255

SERVICES OFFERED

REFINING

- Characterisation and evaluation of crude feedstock
- Physical separation and purification techniques
- Conversion process
- Plant efficiency
- Malaysian crude database
- Pilot plant studies

GAS & PETROLEUM PROCESS

- Characterisation and evaluation of gas feedstock
- Physical separation and purification techniques
- Polymerisation process
- Natural gas upgrading
- Plant efficiency

PROCESS SIMULATION & ENGINEERING

- Computer modelling
- Process simulation consultancy
- Reactors and pilot plant engineering design
- Chemical engineering support

CATALYSIS

- Catalyst synthesis and modification
- Catalyst and microporous solids characterisation and evaluation
- Kinetics and reaction mechanisms
- Molecular modelling

HARDWARE FACILITIES

Equipment	Application	Technical specifications
Mercury Analyser	Mercury content in gas and liquid	
Gas Chromatography	Liquid hydrocarbon	FID / TCD, packed capillary
PONA Analyser	Hydrocarbon type analysis	FID, capillary
Natural Gas Analyser	Natural gas composition and non combustible gas	TCD, packed column
Acidity test equipment	Functional groups in-situ titration of porous materials	
Catalyst Activation System	Fully automated evaluation of catalyst performance using both gaseous and liquid feeds	Max catalyst load: 10 to 100mg Feed: gas - 0 to 20 bar Liquid - 0 to 300 ml/h Reaction temp.: room temp to 750°C Reaction pressure: atm to 20 bar
Micro Catalytic Reactor	Evaluation of catalyst performance	Catalyst volume: 5 to 20ml Feed: Gas - 0 to 20 bar Liquid -0 to 300 ml/h Reaction temp. : room temp to 750°C Reaction pressure: atm to 150 bar
Gas Analyser	Analyse inert gases (H_2, O_2, N_2, CO, CO_2, H_2S), saturated and unsaturated hydrocarbons (C_1 - C_6). Sample can be either gas or liquid	Temperature range: Column Oven: -99 to 250 °C Detector: FID 120 to 420°C TCD 120 to 500 °C Injector - ambient
Carbon and Sulphur Analyser	Analyser carbon and sulphur contents of solid samples	Detection limit: Carbon - 0 to 6wt% Sulphur - 0.001 to 5.5wt%
Steaming Unit	Deactivate catalysts to simulate equilibrated commercial catalysts	Max reactor capacity: 70ml Max operating temp: 760 °C Max water flowrate: 180 ml/hr Pressure: atm
Microactivity Test Unit	Evaluate the activity and selectivity of FCC, RCC catalysts	Maximum reactor temp - 600°C Feed delivery rate - 0.5 to 15 g/min Catalyst capacity - 1 to 10g Injection time - 15 to 360 sec. Gas collection capacity - 2,000ml
Catalytic Reforming Unit	To perform catalytic reforming studies	Gas module: Max pressure - 20MPa Liquid feed: Flowrate - 50 -70ml/hr Reactor module: Max pressure - 15MPa Max temp. - 550°C Furnace module: 4 heating zones and 2 insulated flanges Max temp. - 650°C Temp. sensor: Monitor both outlet and inner reactor

High vacuum Distillation Unit	Crude oil distillation and separation	Working volume of 30 litres and vacuum of 1 mmHg
Propane Deasphalting unit	Removal of asphaltics material from vacuum residues	Working volume of 10 litres and pressure 30 - 40 bars
Furfural Extraction Unit	Extraction of aromatics compounds from vacuum distillates and residue by using rotating disc	Working volume 5 litres RDC - 60cm height
Batch Solvent Dewaxing Unit	Removal of wax from distillats and residue	Working volume - 10 litres Temperature - -25 to 0°C
Micro Catalytic Reactor	Reaction on Catalyst Performance	Max. Vol. of 55ml
Electro Chemistry Equipment	Oxidation State of Catalyst and Reaction Study Based on Electrolysis Principle	Liquid medium
Batch Reactor, 4 litre (Autoclave)	Polymerisation Reaction - produce polymer resin	4 litre stirred tank Max Pressure - 34 bar Max Temperature - 100 C
Melt Flow Indexer (MFI)	Melt Flow Reading	Melt flow index for polymers Max temperature - 300°C
Glove Box	Controlled Environment (for handling of air-sensitive materials)	Volume - 20 Gallons

SOFTWARE FACILITIES

Programme	Application	Technical specifications
Molecular Weight Calculation	High pressure condensate	Proprietary information
PCQT Microcomputer with mathco processor	Data Acquisition and equipment monitoring and control	Using CIM PAC software package
Chemical Engineering Process Simulation Software (Hysim chemtran)	Steady state process simulation	Standard oil and gas simulator with limited capability to handle more complex chemical systems
Microsoft Visual Basic	Windows based basic compiler for creating customized windows programs	Prewritten Group User Interface's (GUI) software is similar to Pascal
Statistical Analysis Software	Statistical analysis of experimental results	Standard Statistical package
Physical Property Package (chemtran)	Calculation of thermodynamic properties, Vapor Liquid Equilibrium (V.L.E)	N/A

RESEARCH EXPERIENCE

- Fouling of preheat exchanger and atmospheric tower bottom
- New methods for characterisation and evaluation of Malaysian Crude Oils
- Upgrading and identifying potential products from Malaysian Crude Oils for local and export market
- Upgrading of Natural Gas to Petrochemicals using Zeolite Catalyst
- Synthesis of special chemical via metathesis reaction
- Mercury removal from Malaysian Natural Gas
- Batch rest of Polymerisation Catalyst

CONSULTANCY EXPERIENCE

- Molecular weight determination for High Pressure Condensate
- Premature ageing molecular sieve
- Unsaturated compounds formation from an Amine Solvent in Acide Gas Treating
- Batch distillation simulation
- Plant debottleneck simulation
- Fire case simulation for free water knockout drum
- Formulations and performance assessment of sulphur removal adsorbent in natural gas
- Petroleum laboratory set-up and commissioning

FIELD OF RESEARCH

PRODUCT DEVELOPMENT

Name of group/centre:
Product Development Group

Person(s) to contact:
Dr Hamzah Abdul Hamid *(Manager)*

Telephone:
603 - 400 2244

Fax:
603 - 408 7471, 408 8811

LABORATORY:
Automotive Product Testing

SERVICES OFFERED

- Measurement of diesel smoke density
- Measurement of white smoke density
- Analysis of automotive exhaust emissions

- Automotive lubricants evaluation on stationary engines
- Automotive fuels evaluation on gasoline engines
- Planning, managing and implementation of field trial operation for gasoline natural gas and diesel vehicles
- Tests on cold and hot start driveability and intake system cleanliness
- Performance evaluation of natural gas engines and natural gas engine conversion kits
- Development of engine power curves
- Troubleshooting of gas analyzer problems
- Performance evaluation of gas appliances
- Simulation and trial tests of gas industrial equipment

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
250 kW Eddy current chassis dynamometer (dyno)	Tests on engine performance and endurance	Max. dyno power: 250kW Max. test speed: 200KM/h Roller dia.: 565.5mm
60kW direct current chassis dyno w/gas analyzers	Tests on exhaust emissions and fuel consumption ECE 15-04	Max. dyno power: 60kW Max. test speed: 150KM/h Roller dia.: 220mm
300kW stationary engine test bed	Test on fuels and lubricants for heavy duty vehicles	Max. dyno power: 300kW Dyno type: DC
Hydra single cylinder research diesel engine	Diesel fuel research (engine ignition delay, cylinder pressure and emissions)	Engine displacement: 450cc Engine type: Direct injection diesel Dyno type: DC Max. dyno speed: 4,500 rpm Computer DAC
180 kW PROTON engine test bed	Tests on performance of automotive fuels and lubricants	Max. engine dyno power: 180 KW Dyno type: Eddy current Engine: (Presently) 1468 cc PROTON Magma, 12 valves Computer DAC
44 KW small engine test bed	Tests on performance of automotive fuels and lubricants for small engines Development of engine power-torque curves.	Max. dyno power: 44 kW Max. dyno speed: 12,000 rpm Dyno type: Eddy current Engine: (Presently) 100 cc YAMAHA Y-100 2-stroke gasoline two-cycle engine
50 cc generator engine test facility	Screening tests on fuels and lubricants for small engines	Engine type: 50 cc YAMAHA ET600A two-stroke gasoline generator engine
PROTON Iswara 1.3i	Field trial for evaluation on fuels and lubricants performance	Displacement: 1,468 cc Engine type: Gasoline, 12 valves, 4 in-line cylinders Max. power: 87 PS/6000 rpm Max. torque: 12.5kg-m/ 5,500 rpm
Homel Surface Roughness Instrument	Wear measurement for lubricant performance evaluation	Measurement of Ra, Rz, Rmax, Ry, Rt, Rp, Rq, Wc, Pt, R3z, D, Nr, Pc, Sm, Sk, Tp
HARTRIDGE Smoke Meter-4	Measurement of diesel smoke density	12V battery operated; portable
Gas analyzer	Measurement of exhaust emissions: NOx, CO, CO2, O2, HC	Chemiluminescent for NOx NDIR for CO, CO2 Paramagnetic for O2 FID for HC Power: 240V single phase
SOKKEN LESM-2 white smoke meter	Measurement of white smoke density	Discharged white smoke
Gas appliances test equipment	Performance evaluation of gas appliances	Multiple
Portable data logger w/instrumentation rig	Performance evaluation of gas appliances	Channels: 10 analog, 1 digital

SOFTWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
VEPMAS™ data logging system	Engine data acquisition and monitoring for field trial operation	
TASKMASTER™ engine data acquisition and control system	Small engine performance evaluation	
AUTOTEST 111™	Engine data acquisition and control system	
DECIPER Plus™ data acquisition system		Multiple channel input: analog and digital
TURBOLINK™ data acquisition and control system		Multiple channel input/ output (analog and digital)

RESEARCH EXPERIENCE

- Natural gas vehicle (NGV) engine performance test
- Diesel fuel performance tests on HYDRA research engine
- Evaluation of engine performance for formulation of automotive engine oils
- Monitoring of heavy duty vehicle performance on field trial operation
- Induction system deposit (ISD) evaluation on PROTON engine test bed
- Engine performance evaluation of MTBE-doped gasoline

- Engine performance tests and evaluation of two-stroke engine oils
- Performance tests of industrial and domestic gas appliances

CONSULTANCY EXPERIENCE

- Recommendations on reformulated lubricants for two-stroke engine
- Development cost analysis for automotive products and gas-related projects
- Design of instrumentation for GAC performance evaluation

LABORATORY: *Lubricants*

SERVICES OFFERED

- Thermal behaviour of different types of samples from various department using thermal analysis system
- Lubricant oil testing and analysis
- Lubricant blend studies for the formulating of automotive and industrial lubricants
- Used oil analysis (Scheduling Oil Shipping)
- Selection of suitable base oils and additives for lubricant formulation works

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Cold Cranking Simulator	Lubricant Dynamic temperature	Temperature: -40 °C
Atomic Absorption Spectrophotometer	Trace metals determination in fresh and used lubricants	ppm - ppt level
Pour point bath	Pour point determination of lubricant	0 - (-51 °C)
Dielectric Strength Tester	Trace water determination in lubricant	-60V - +60V
Densitometer	Density and specific gravity of lubricants	0.8 - 0.9
Four Ball Machine	Friction and Wear test for lubricants	rotation : 1,350 rpm
Timken Machine	Wear test for gear oils and grease	Load: 40 kg
FTIR Spectrometer	Additives determination	7500 - 200 cm-1
Gas Chromatography	Volatility and additive determination	Oven temperature from ambient to 425 °C
High Temperature Gel Permeation Chromatography	Molecular weight distribution of polymer and additives	Temperature range: ambient to 140 °C
Minirotary Viscometer	Borderline pumping temperature of lubricant	Temperature range: from -10 to -40 °C
Oil Analyser	Used engine oil determination	Determination for water, glycol, fuel dilution and oxidation products
Panel Coker test	Coke formation tendency of lubricants	Temperature range: 50 - 500 °C
Rotary bomb apparatus	Oxidation stability of lubricant	Temperature : 150 °C
Taper bearing simulator	Determination of dynamic viscosity at high temperature and high stress	Temperature: 50 - 200 °C
Rotary vacuum evaporator	Additive separation	Temperature: Ambient to 150 °C
Shear Stability Apparatus	Polymer degradation under high stress	High speed injector
Differential Scanning Calorimeter (DSC)	Characterisation of fuels, lubricants and petrochemicals	Temperature range: - 170 to 600 °C
Thermogravimetry (TG)	Characterisation of fuels lubricants and petrochemicals	Temperature range: 50 - 1,000 °C
High Pressure DSC	Oxidation stability of automotive engine oils	Pressure : 0 - 1,000 psi Temp : 0 - 600 °C
Potentiometer	Acidic and basicity of petroleum products	pH: 1 - 14
Viscosity Bath	Kinematic viscosity of fuel and lubricants	Temperature: -40 & 100 °C

SOFTWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
BDH safety software	Chemical and physical properties of various types of chemical compounds	

RESEARCH EXPERIENCE

- Formulation of mineral-based automotive and industrial lubricants
- Screening on the quality of lubricants by analytical and engine test methods

- Formulation of synthetic lubricants based on synthetic base oils from esters and polyalphaolein
- Used oil analysis and interpretation
- Base oil characterisation and performance

CONSULTANCY EXPERIENCE

- Lubricant blend study on new products for PDB
- Provide consultancy on procedure in carrying out field trial in evaluating the quality of synthetic engine oils

LABORATORY: *Petrochemical*

SERVICES OFFERED

- Blending/compounding of plastifiable material
- Materials characterisation (mechanical, physical, chemical and thermal properties)

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Izod Impact Tester with Cryomatic Chamber	Impact Strength	Pendulums: 2J, 7.5J, 50J Temperature range: -70°C to ambient temperature (ASTM D256)
Injection Moulding Machine	Sample Preparation	40 ton, closed loop control
Torque Rheometer: Lab Extruder: Compounder System	Mixing, Compounding, Extruding, Film Blowing and Rheological Study	L/D : 19:25 Capacity: 1-2kg/hr
Compounder	Compounding	40kg/hr
Universal Tensile Machine (5 kN) with Temperature Chamber	Tensile and Flexural Properties	Temperature range: -70 to 250°C (ASTM D638)
Pulveriser	Grinding of plastic pellet	Perforations: 0.5mm, 1.0mm, 1.5mm
Polarised Microscope	Observation of spherulite	incident & transmitted light, heating & freezing stage
Pneumatic die punch	Preparation of sheet samples	Die ASTM D638.82 Type IV
DMA	Mechanical damping (Viscoelastic) properties	Temperature: -150 to 800°C Frequency: 0.01 to 50 Hz
Rockwell Hardness Tester	Hardness Test	(ASTM D785)
Elemendorf Tear Tester	Tear Strength	Pendulums:200m6,400gms
Densitometer	Density Measurement	
Melt Flow Indexer	Melt Flow Index	Automatic loading and analysis, temperature: 100 to 400°C
High Temperature Gel Permeation Chromatography	Molecular Weight Distribution	RI Detector, Temperature up to 150°C
FTIR Spectrometer	Identification of Additives and Copolymer Composition	Film, liquid and pellet 7,500 200 cm-1
DSC/TGA	Thermal Behaviour of Polymer such as Crystallisation, Melting and Degradation	DSC : -600°C TGA : 1,000°C
Hydraulic Hot Press	Sample preparation	

RESEARCH EXPERIENCE

Development of value added Polypropylene resins.

CONSULTANCY EXPERIENCE

- Evaluation of plastic drums Evaluation of PP resin by thermal analysis
- PP and PE characterisation by Gel Permeation Chromatography

LABORATORY: *Fuel*

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Cooperative Fuel Research Engine	Research and Motor Octane Number determination for gasoline	Engine speed: 600 - 6r/min and 900 - 9r/min respectively Inlet air temp: 52°C ASTM D2699 and D2700 respectively
Gas Chromatograph	Oxygenates and benzene determination in gasoline	Individual alcohol and MTBE are determined from 0.1 to 10% vol. 50 to 400°C ASTM D 4815
Induction System Deposit (Bench-Top simulator)	Deposit forming determination in gasoline	50 to 800°C
High Performance Chromatograph	Separation of hydrocarbon groups	Isocratic gradient, Range: 0 - 4,000 psi
Distillation Unit	Distillation/ Volatility of petroleum products	Range: 0 - 800°C
Hot Filtration Tester	Determination of the existent and accelerated dry sludge contents	Determination of the existent and dry sludge contents down to 0.02% (m/m) of residual fuel oils having a maximum viscosity of 150mm²/s (cst) at 80°C SMS 2696

RESEARCH EXPERIENCE

Ongoing Project

- MTBE in gasoline
- Influence of formulation on gasoline performance
- Influence of additives and blending components on diesel performance

Completed Project

- Cetane Number Improver
- Product Compatibility, Storage Life of Fuel Oil

CONSULTANCY EXPERIENCE

Fuel Formulation and Evaluation

- Using new blending components and additives
- Reformulation for improved quality and performance (eg. racing fuel, reference fuel)

Additive Fuel and Evaluation

- Detergent additive for gasoline and diesel
- Flow improver for waxy crudes
- Smoke suppressant for diesel fuel

SERVICES OFFERED

- Supply and testing of reference fuel for emission testing
- Gasoline fuel testing and analysis including oxygenates and benzene content
- Diesel fuel testing and analysis
- Automotive Fuel Quality Survey
- Fuel oil blending and compatibility evaluation
- Additive laboratory performance evaluation and quality monitoring

FIELD OF RESEARCH

MATERIALS, ENVIRONMENT & FACILITIES ENGINEERING RESEARCH

Name of group/centre:

Materials, Environment & Facilities Engineering

Person(s) to contact:

Dr Adilah Abdul Hamid *(Senior Manager)*

Telephone:

603-4002211, 4087177

Fax:

603-4087471, 4088811

LABORATORY:

Facilities Engineering

SERVICES OFFERED

- Condition monitoring of equipment
- Vibration analysis
- Energy audits

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Ferrography	Wear Debris Analysis	Condition monitoring-quantitative & qualitative analysis of 1 to 250 micron particles
Rotary particle Depositor	Wear Debris Analysis	Condition monitoring-qualitative analysis
Particle Quantifier	Wear Debris Analysis	Condition monitoring-quatitative analysis of 1 to 250 micron particles
Elcontrol Microvip Mk1.1	Energy audit	Energy characterisation and Analysis
Temperature/ Humidity Recorder	Energy audit	-

SOFTWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Ferrotrend and Coulter Multisizer	Wear Debris Analysis	Quantitative trending databank
ASEAM 2.1	Energy Audit	Energy analysis of buildings & associated facilities
Impulse Turbolink and Genesis	Performance Analysis	Data acquisition for gas appliances facilities set-up
ROTLAT ROTTOR JBMTI DIGIT	Vibration monitoring for turbomachinery	Lateral vibration analysis Torsional vibration analysis Fluid film journal bearings Mass inertia calculation

RESEARCH EXPERIENCE

- Machinery condition monitoring
- Vibration Studies
- Energy Audits of factories, equipment and laboratory buildings
- Fuel Cells: Performance testing and development
- Gas fired absorption chillers and heat pumps for air-conditioning

CONSULTANCY EXPERIENCE

- Machinery condition monitoring
- Vibration analysis
- Energy management and applied technologies
- Gas fired absorption chillers and heat pumps

LABORATORY:
Materials Engineering

SERVICES OFFERED

- Material identification
- Replica metallography (on-site)
- Coating performance testing
- Mechanical testing
- Metallurgical services
- Corrosion/inhibitor testing
- Positive materials identification (on-site)

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Polisher/Grinder	Polish and grind material surface	Polishing: Load required: 500 g Grinding: - 1 kg for small specimen - 2 kg for large specimen
Humidity Chamber	Study the effect of humidity on coating	Temp. range: -40 °C to + 180 °C or -10 °C to 95 °C Humidity: 15% to 95%
Salt Spray Tester	Study the coating performance and corrosion	Temp.: 35 °C
Rockwell Hardness Tester	Determine the hardness of specimen	Test cycle : 7.5 sec. Test height : 0-300 mm
Vickers Hardness Tester	Determine the hardness of specimen	Test load: 1, 5, 10, 20, 30 and 50kg
Data Lodging System	For data acquisition	Max 30 channels
Potentiostat	Study the corrosion rate using electrochemistry	Voltage applied: + -5 volts
Ultra Sonic Cleaner	Clean and deoxidize test specimen	Frequency of vibration: 16,000 Hz
Olympus Microscope	Magnify and record images for photomicrographication studies	Dim: Width : 180mm Depth : 225 mm Height: 392 mm
Mef-3 Microscope and Video Monitor	Study the metallographical structure of the material surface and quantification of image	Dim: Length : 270mm Width : 565mm Height : 145 mm Weight : 44.3 kg
Replica kits	Grind and polish material surfaces for microscopic examination of the material structure	Rotating speed : 100-700 rpm Voltage : 220 V/50/60 Hz
Autoclave	Sterilise media for microbiological analysis	I.D. : 7" and O.L. : 24" Temp : 121 °C Pressure : 262 kPa
Laminar Flow Chamber	Create dust-free, bacteria-free, and clean air environment for microbiological analysis	HEPA filter rated at 99.999% against all particles 0.3 micrometer and larger
Anaerobic Chamber	Provide oxygen and condensate-free environment for microbiological study	Dim: Length: 60" Height: 30" Width: 31" Operating Temp: +4 °C - 70 °C Incubator volume : 2.7 ft³
Low Temperature Incubator	Grow microorganisms at any specified temperature, lower than 50 °C	Working Temp: -10 °C - 50 °C.
Widefield Photomicroscope	For microbiological analysis and viewing of microorganisms	6 piece objectives, Contrast techniques, widefield condensers, multi-illumination system, large format camera

SOFTWARE FACILITIES/ EQUIPMENT

Equipment	Application
AC Impedance	Study perfomance of coatings
Image Analyzer	Analyse images from
Feature analysis module	image sources such as microscope for
Metallography module	quantification
Coatings module	
DOS Window	

RESEARCH EXPERIENCE

- CO_2 Corrosion Studies
- Marine growth studies
- Corrosion monitoring, prevention and protecting techniques
- Corrosion and erosion resistant coatings

CONSULTANCY EXPERIENCE

- Failure analysis/troubleshooting
- Plant corrosion
- Materials selection
- Coating performances
- Materials specification reviews

LABORATORY: *Environment*

SERVICES OFFERED

- Water/groundwater quality monitoring
- Air quality monitoring and modelling
- Environmental microbiology
- Noise pollution monitoring
- Assessment of soil contamination
- Post-EIA study
- Toxicity testing

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical specifications
Ion chromatography (IC)	Anion & Cation analysis	Conductivity Detector
Gas chromatograph (GC)	Hydrocarbon analysis	Operating temperature (-55°C to 450°C)
Gas chromatograph Mass Spectrophotometer (GCMS)	Priority pollutants & Polyaromatic analysis	Quadruple detector & NBS library
Ultra-violet (UV) Visibles Spectrophotometer	Colorimetric method of quantitative analysis	200-900 nm wavelength
Atomic Absorption spectrophotometer	Heavy metals analysis	Graphic furnace & flame ionization
Sound level meter	Measurement of the level of noise pollution	25-130dB
Total organic carbon (TOC) analysis	Determine TOC, TIC & TC	UV persulfate & combustion technique
High volume sampler	Air quality monitoring	24hrs total suspended particulate measurement
PM-10 air sampler	Air quality monitoring	Measure dust less than 10 micron
Ambient air sampler	Air quality monitoring	Accepted by OSHA
Hach Drel-5	On-site water quality monitoring	Measure chemical & physical properties of water
Hydrolab surveyor II	On-site water quality monitoring	Measure salinity, pH, DO, Conductivity, Temp & Oxidation Reduction Potential
Sampler and accessories for biological study	Macrobenthos study	

RESEARCH EXPERIENCE

- Seawater pollution and its chemical clean-up treatment
- Petroleum sludge treatment and disposal
- Effect of air pollution and acid rain on the degradation of material
- Toxicity study on selected dispersant

CONSULTANCY EXPERIENCE

- Soil contamination study
- Effluent and influent characterization studies and process analysis
- Sludgefarm area assessment
- Toxicity characteristic leachate prodedure (TCLP) analysis on waste water treatment sludges
- Environmental monitoring of sludgefarm
- Post-EIA monitoring and Environmental Audit

FIELD OF RESEARCH

ANALYTICAL & GEOSERVICES LABORATORIES

Name of group/centre:
Laboratory Services Department

Person(s) to contact:
Mr P K Seah *(Manager)*

Telephone:
603 - 400 2121

Fax:
603 - 408 7471, 408 8811

LABORATORY: *Analytical & Geoservices*

SERVICES OFFERED

- Analysis on Crude Oil & Gas
- Analysis on water, sediment, sludge, soil and monitoring gas and effluent water
- Quality control on various products such as battery water, radiator coolant, brake fluid, car shampoo and catalyst
- Quality control analysis on Lubricating Oil & Grease
- Quality control analysis on petroleum product
- Organic Geochemical analysis
- Biostratigraphical analysis

HARDWARE FACILITIES

Equipment	Application	Technical specifications
Arc spark	Metal Content	Bulk solid sample
Atomic absorption	Metal content	
Ag Cu corrosion apparatus	Ag & Cu corrosion (liquid)	Temperature : 50°C/100°C
Oxidation stability apparatus	Gasoline sample	Temp at 100°F
Cone penetration	Grease sample	Max penetrometer 400mm
Crude distiller	True boiling point distillation for crude oil	Capacity 55 L, at atm and reduced pressure
Automatic Distillation apparatus	Distillation of liquid petroleum product	At atm pressure, 100 ml sample, maximum FBP 370 °C
Existent gum apparatus	Tendency of gum formation in gasoline and jet A1 sample at high temperature	Using steam and air
Foaming Characteristic	Lubricating oil	At 24 °C and 94 °C
JFTOT apparatus	Thermal oxidation stability tester for Jet A1 sample	
Micro Carbon Residue Tester	Carbon residue in diesel and fuel oil	
Nitrogen Analyser	Gas, liquid & solid samples	ppm level
Reid Vapor Pressure - semi automatic	Pressure of gasoline sample	
Trace sulphur Analyser	Volatile liquid samples	ppm level
Oxidation stability	Lube/diesel sample	Testing temp: 98 & 110 °C
Dielectric Strength	Dielectric constant of transformer oil	
Leakage tendency	Grease leakage tendency	Operating temp: 120 °C
Dropping point	Lubricating grease	Max temp: 300 °C
Roll stability	Consistency of grease	
Gas Chromatograph	Paraffin, isoparaffin, olefin, napthenic and aromatic compound	
Wax content apparatus	Waxy petroleum product	Min. bath temperature -17 °C
High Performance Liquid Chromatograph	Water analysis Adulteration study	
Hydrocarbon type composition	Saturates, olefin and aromatic compound in petroleum product	Standard column
Medium Pressure Liquid Chromatograph	Hydrocarbon fractionation liquid	
Scanning electron microscope with energy dispersive Spectrometry	Microscope and elemental analysis of materials	Accelerating voltage: 0.2 - 30kV Resolution 5 nm
Polarised transmitted light microscope	Calcareous nannofossil analysis	Max magnification 1,000x Rotating stage
Transmitted light microscope	Palynological analysis	Max magnification 1,000x square stage
Reflected light microscope	Foraminifera	Zoom stereomicroscope Max magnification: 800x

SOFTWARE FACILITIES

Equipment	Application	Technical specifications
Autodest 800/860 AC	Crude distillation operation program	
PIONA program	PIONA calculation	Energy analysis of building & associated facilities

RESEARCH EXPERIENCE

- Geological and materials science
- Biostratigraphical studies

CONSULTANCY EXPERIENCE

- Advisory on waste water treatment and environmental aspect.
- Schedule Oil Sampling (SOS) program in monitoring machine condition.
- Advisory on off specification petroleum products.

FIELD OF RESEARCH

TECHNICAL SERVICES

Name of group/centre:

Technical Services Department

Person(s) to contact:

Dr Alias Husin *(Manager)*

Telephone:

603 - 400 2222

Fax:

603 - 408 7471, 408 8811

LABORATORY:

Fertilizer Research Services

SERVICES OFFERED

- Urea research involving collaboration with third parties to study the suitability of urea with various types of crops

PETRONAS RESEARCH

- Laboratory research on fertilizer product i.e modification of urea materials and finding correct curing parameter
- Services related activities for agricultural samples such as fertilizer, plant and soil analyses:- NPK, CEC, Exchangeable cations, Ca, Mg, Boron, trace elements, pH, moisture content and crushing strength

HARDWARE FACILITIES/ EQUIPMENT

Equipment	Application	Technical applications
Fluidized Bed Coater & Dryer	Coating and drying of granules, pellets etc with liquified materials	Charge capacity: 1 - 4 kg Air heating: 20-80 °C
Autoanalyzer	Analysis: total N, P, N-Urea Boron and K for soil, plant and fertilizer	Wavelength selection: 380-800 nm
UV-VIS Spectrophotometer	Analysis available P and formaldehyde	Wavelength selection: 200 - 1,100 nm
Kjeldahl Block Digestor unit	Digestion of foliar samples	Temp: 500 °C
Buchi Distillation Unit	Digestion and automatic titration of nitrogen and protein	
Compression Tester	To test crushing strength of material	Crushing strength: 0-5 kg and 0 to 25 kg

CONSULTANCY EXPERIENCE

Involved with local verification trials for the usage of granular urea for paddy in Mekong Delta in Vietnam and some ASEAN member countries.

LABORATORY: *Engineering & Instrumentation Services*

SERVICES OFFERED

- Offers technical support in terms of engineering site management, office engineering and instrumentation
- Provides maintenance and repair of research and services facilities
- Manage and assist in maintenence commissioning of scientific instrument
- Provides services in fabrication, modification and repair of scientific or non-standard glass apparatus for research and services activities

Equipment	Application	Technical specifications
Glass blowing lathe machine	To fabricate/ repair glasswares	Limit of fabrication: Length: 60 - 121.9cm Diameter: 6mm - 9.5cm

PRSS aims to build world class technological capability

Pharmmalaysia Berhad

PHARMMALAYSIA

Name of agency / institution / company:
Pharmmalaysia Berhad

Name of group / centre:
Pharmmalaysia Berhad

Name of laboratory / project:
Research & Development
Quality Control Laboratory

Person(s) to contact:
Mr. Dinesh J.Patel *(Managing Director)*

Head & Marketing Office:
No. 69 & 71, Medan Setia 1
Bukit Damansara
50490 Kuala Lumpur
Malaysia

Factory & Admin. Office:
Lot 24, Bakar Arang Industrial Estate
08000 Sungei Petani
Kedah Darul Aman, Malaysia

Telephone:
603 - 255 3166 *(Head & Marketing Office)*
604 - 421 3011 *(Factory & Admin Office)*

Telefax:
603 - 255 4971 *(Head & Marketing Office)*
604 - 421 5731 *(Factory & Admin Office)*

Office hours:
Head & Marketing Office
8.00 am - 5.15 pm *(Mon - Fri)*
Factory & Admin Office
8.00 am - 5.15 pm *(Mon - Sat)*

FIELD OF RESEARCH

Pharmaceutical Product Analysis

Pharmaceutical Product Formulation

SERVICES OFFERED

- Analysis of pharmaceutical products (Chemical, Biological, Sterility & Pyrogen - LAL)
- Development of formulations, analysis methods for new generic products

OTHER INFORMATION:

Pharmmalaysia Berhad is a public limited company principally involved in manufacturing generic pharmaceutical products. It is well equipped and has state-of-the-art machinery and equipment. To date it has to its credit some 200 commonly used products. Pharmmalaysia's products are marketed locally and also overseas.

The Quality Control Department has one of the largest and well equipped laboratories in Malaysia. It comprises the following sections:-
Analytical laboratory, Microbiological laboratory, Sterility testing laboratory, Packaging Control, Retain and Stability Section, Plant Inspection and Sampling Section.

The laboratory is fully equipped with equipments, such as:-
Infra -Red Spectrophotometer,
UV-Visible Spectrophotometer,
Gas Chromatography, High Performance Liquid Chromatography, Kinetic Q-CL, STS System and Atomic Absorption Spectrophotometer.

Public Works Institute Malaysia

Name of agency / institution / company:
Public Works Institute Malaysia

Name of group / centre:
Pavement Research Unit

Name of laboratory / project:
Material and Bitumen Laboratory

Person(s) to contact:
- Ir. Mohamed Shafii Mustafa *(Senior Assistant Director 11)*
- Ir Hj. Ab. Latif Hj. Mohd Dewa *(Assistant Director)*

Office address:
Public Works Institute Malaysia
Jalan Serdang
43000 Kajang
Selangor, Malaysia

Telephone:
603 - 836 7244

Telefax:
603 - 836 9908

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

RESEARCH EXPERIENCE

- Design and performance of flexible pavements
  - Long-term performance of flexible pavements
  - Non-destructive testing methods for pavement strengths
- Pavement rehabilitation and maintenance
  - Surface recycling in pavement rehabilitation
  - Thin overlays
  - Methods of preventing reflective cracks
  - Base recyling
- Aggregage Mixtures
  - Performance of various aggregate mixtures as wearing course
  - Various aggregate mixtures as binder course
- Bitumen and Bitumen Additives
  - Quality control of bitumen
  - Modified bitumen
  - Bituminous emulsion
  - Rubberised bitumen/emulsion
- Concrete Pavements
  - New technology for concrete roads
  - Rahabilitaion and maintenance of concrete roads
- Road Safety
  - Effect of geometrical design on road safety
  - Low cost counter-measures to reduce accident rate
- Rural Roads
  - Rehabilitation and maintenance of rural roads & Design and performance of rural roads
- Traffic Engineering
  - Traffic congestion study
  - Pedestrian facilities
  - Traffic engineering parameters

CONSULTANCY EXPERIENCE

- Pavement evaluation and overlay design for JKR roads
- Evaluate and design overlays for airport pavement (Subang, Butterworth, Sandakan, and Pangkor)
- Pavement design for the Kuala Lumpur International Airport

SERVICES OFFERED

- Pavement condition survey
- Dynamic cone penetrometer (DCP) test
- Axle load survey
- In-situ CBR
- Falling Weight Deflectometer (FWD) tests
- Functional and structural evaluation of pavements
- Investigation of pavements failures
- Pavement analysis and design
- Airport pavement analysis and design
- Ashpalt and material testings

Pyrometro Services

Name of agency / institution / company:
Pyrometro Services

Person(s) to contact:
- Lua Kheng Beng *(Manager)*
- Lua Kheng Leong *(Calibration Manager)*

Office address:
3rd Floor, No. 15, Jalan Daya 11
Taman Daya, Kepong
52100 Kuala Lumpur
Malaysia

Telephone:
603 - 636 9879

Telefax:
603 - 635 7521

Office hours:
8.30 am - 5.30 pm *(Mon - Fri)*
8.30 am - 12.30 pm *(Sat)*

SERVICES OFFERED

- Calibration services both in-house and site calibration as per SAMM list
- Oven, furnace and humidity chamber calibration
- Electronic and mechanical temperature instrumentation calibration
- Mercury thermometer calibration
- All temperature sensor calibration
- Lab balance calibration
- Other types of instrumentation calibration

CONSULT

Rubber Research Institute of Malaysia

TO ASSIST OUR CUSTOMERS ATTAIN LEADERSHIP

Name of agency/institution:
RRIM-Consult

Name of group/centre:
Rubber Research Institute of Malaysia *(RRIM)*

Name of laboratory/project:
RRIM-Consult

Person(s) to contact:
- Dr Chan Heun Yin *(Executive Director)*
- Dr Zahar Samsuddin *(General Manager)*

Office address:
RRIM-Consult, 260, Jalan Ampang
50450 Kuala Lumpur, Malaysia

Postal address:
RRIM-Consult
P.O. Box 10150
50908 Kuala Lumpur
Malaysia

Telephone:
603-456 7033, 456 4516

Telefax:
603-451 1301, 457 3512

Office hours:
8.00 am - 4.15pm *(Mon-Fri)*
8.00 am - 12.45pm *(Sat)*

FIELDS OF RESEARCH

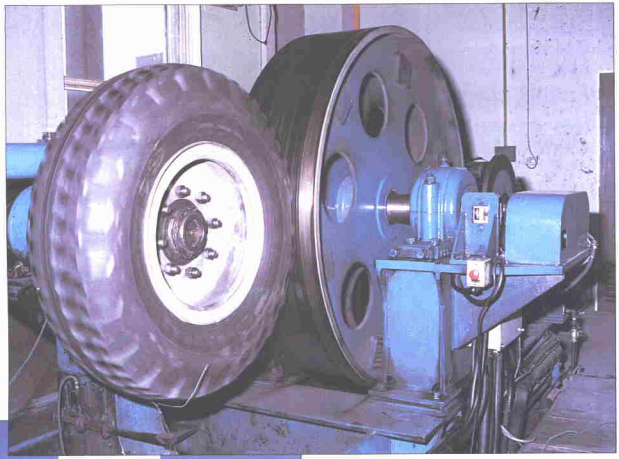
Breeding and selection, physiology, molecular biology, "In Vitro" culture, microbiology, propagation, plantation practices, improving manuring practices, soil characterisation, agronomic practices on problem soils, tapping and exploitation physiology, crop protection, weed control, applied chemistry and processing, latex technology, dry rubber technology, physics and engineering, analytical methodology, agricultural economics, project development and implementation.

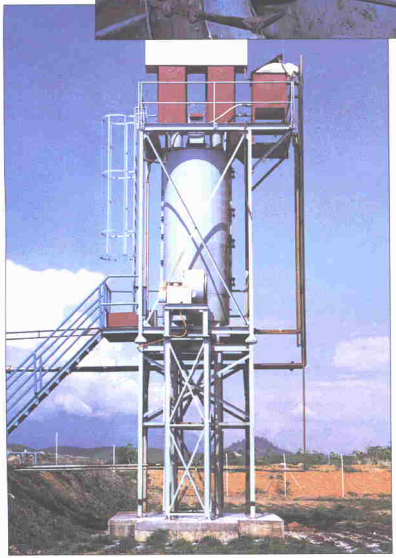
SERVICES OFFERED

Consultancy and Feasibility Studies, Contract Research and Testing, Training, Analytical Services and Statistical Services, Leasing of sophisticated equipment, product formulation

SUMMARY OF RESEARCH/ CONSULTANCY EXPERIENCE

- Technical advice on all aspects of agriculture and factory processing (Entre Rios S.A. , Guatemala)
- Concept Report for the development of rubber cultivation in Papua New Guinea (Concord Pacific Pte Ltd)
- Training programme on crumb rubber processing (World Bank/Indonesian Government)
- Total Quality Management Workshop (Cameroon Development Corporation)
- Sarawak Natural Rubber Industrial Development Master Plan (Sarawak State Government)
- Laboratory set-up and Personnel training on Tissue Culture and Molecular Biology of Cocoa (Malaysian Cocoa Board)
- Tyre thread formulations (United Nations Industrial Development Organisation)
- Soil and Leaf Nutrient Surveys (FELDA, FELCRA, SEDC and Large company plantation)
- Tree Crop Smallholder Sector Project (Asian Development Bank)
- Elastomer Bearings for Leg Mounting Unit of an Offshore Oil Platform (Brown & Root) of rubber for wood and latex (Nasiry Consultancy Services)
- A feasibility study of the proposed 2,000-hectare Plantation for Latex and Rubberwood Production in Forest Reserve Land near Keningau, Sabah (Borneon Timber Sdn Bhd/ Excella Wood Industries Sdn Bhd)
- Feasibility and potential of expanding the rubber industry in Philippines (Ministry of Science and Technology, Philippines)





- Quality control in tyre manufacturing (Ministry of Industries, Iran)
- Production of 2.5 million planting materials by RISDA (World Bank)

HARDWARE FACILITIES/ EQUIPMENT

- Tyre testing equipment according to international specifications
- Analytical equipment such as an electron microscope and Nuclear Magnetic Resonance (NMR) Spectrometer
- A commercial-scale natural rubber processing factory
- A latex thread pilot plant
- A pilot plant and commercial equipment for rubber manufacturing (Banbury, extruders, etc)
- Rubber testing facilities for all international specifications
- Plus many other types of equipment to run an internationally renowned R & D institute

SOFTWARE FACILITIES

Expert system on Enviromax - the choice of the right rubber clones to be planted in the right environment.

(plantation industry) or downstream (manufacturing industry).

We have a tradition of excellence which was acknowledged at the national level in 1991 when RRIM won the prestigious Malaysian Prime Minister's Quality Award.

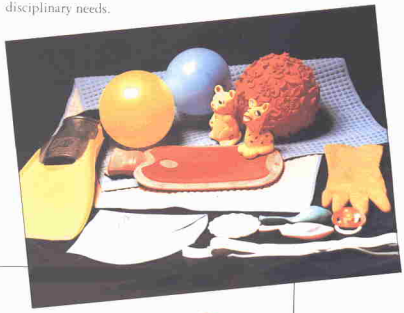
We also have a wide network of contacts and linkages with other R & D organisations, including a sister association (Malaysian Rubber Producers' Research Association) in Brickendonbury, England.

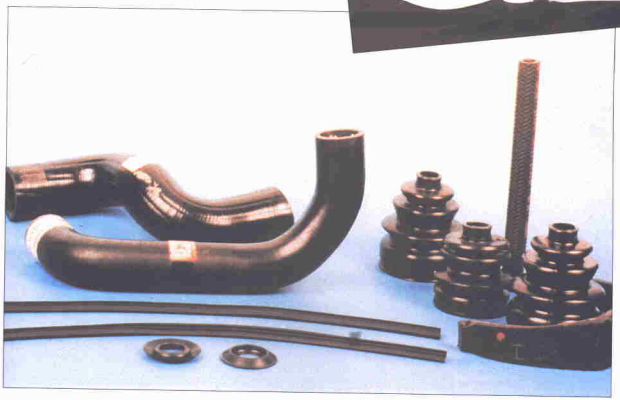
Finally, we have the expertise and experience of 160 highly-qualified, trained and experience experts plus 1,600 supporting staff in the RRIM to meet almost all your multi-disciplinary needs.

Other Information

RRIM-Consult, with the vision "To Assist Our Customers Attain Leadership", is the consultancy arm of the world-renowned Rubber Research Institute of Malaysia (RRIM). Its establishment is to ensure that customers are provided with a one-stop agency to enhance the consultancy services that will be provided to them.

It is fully supported by the RRIM, which is the largest organisation of its kind in the world devoted to Research and Development (R &D) on a single perennial crop - natural rubber (NR) and acknowledged internationally as a centre of excellence for R & D in all aspects of NR - whether upstream





Sapura Research Sdn Bhd

Name of agency / institution / company:
Sapura Holdings Sdn Bhd

Name of group / centre:
Sapura Research Sdn Bhd

Name of laboratory / project:
Telecommunications, Computers and Data Communications

Person(s) to contact:
En. Shahrulzaman Hassan
(Managing Director)

Office address:
G.02 Sharidal Court
Jalan Tiga, Taman Sri Ukay
68000 Ampang
Selangor, Malaysia

Telephone:
603 - 451 5588

Telefax:
603 - 456 5008

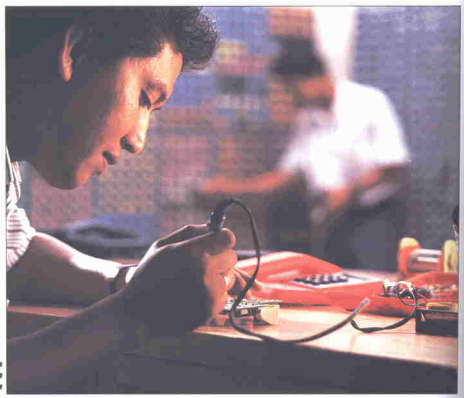
Office hours:
8.30am - 6.00pm *(Mon-Fri)*

RESEARCH AND DEVELOPMENT EXPERIENCE

- Telecommunication and computer product design (Hardware and software) e.g. phones, payphones, PABXs, cellular phones, pagers, VHF transmitters/repeaters etc.
- Data communications, computer networking and information systems design e.g. telemetry/SCADA for real time data acquisition and control, paging (in-house/wide area) and payphone management systems

SERVICES OFFERED

- Computers and communication products design (mechanical/industrial, software and electrical/electronic hardware)
- Computers and communication systems integration and engineering
- Consultancy services in the area of computers and communications (voice and data)



Innovation through dedication

HARDWARE FACILITIES

Equipment	Application	Technical specifications
PCs Workstation	Software Hardware development CAD	IBM PC compatible 386, 486 and Pentium. Novell Netware File Server Intergraph workstation
In-circuit emulators ICE	Embedded system development	For various microprocessors and microcontrollers including 68000, Z80, 8051, x86 cpu mca families
Environmental chamber	Environmental test	Temperature and humidity
Acoustics test system	Acoustics test	OREM, Loudness Ratings etc. Brüel & Kjær (B & K)
Surge generator EFT-Burst generator	Overvoltage test	6KV
Spectrum analysers	Audio and Radio (RF) frequencies	6.5 Ghz Hewlett Packard (HP)
Radio communication test systems	RF	2 Ghz Marconi, Schlumberger

In the lightning testing lab, phones are tested against the effects of lightning.

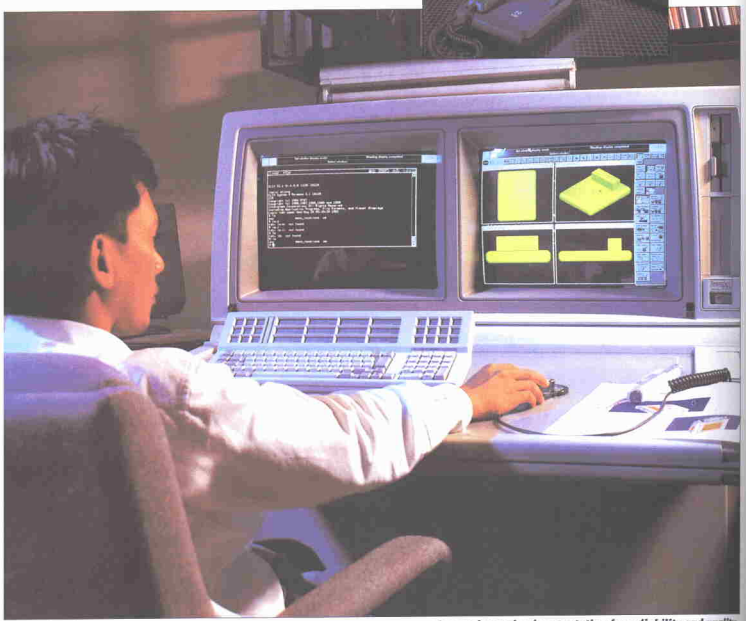
Sapura Research Sdn Bhd has been responsible for many innovations

SOFTWARE FACILITIES

Facilities	Application	Technical specifications
Software tools	Embedded systems development	Various cross compilers and assemblers for 4bit, and 16bits target microprocessors and microcontrollers including 6800, Z80, 8051, x86 families
	Application Software development	Basic and C/C++ optimising compilers
	CAD (mechanical and electrical)	Intergraph I/EMS, Autocad, Printed PCB
Data comms debugging tools	System development	Serial data comms analyser, LAN analyser

OTHER FACILITIES

Oscilloscopes, Logic analysers, Meters, Signal generators, etc, for the design and development of computers and communication (Telecommunication, RF, data comms) products.



Sapura has gained a reputation for reliability and quality. Many Sapura products have been designed to meet increasingly sophisticated needs

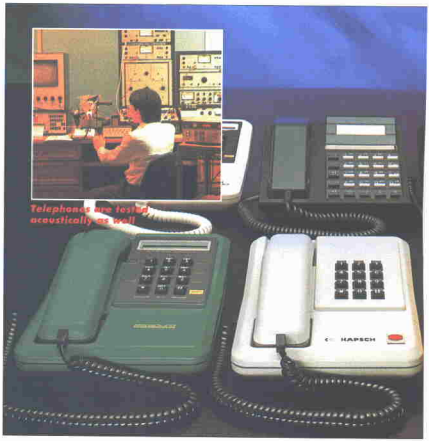
OTHER INFORMATION

Sapura Research Sdn Bhd was incorporated in 1985 to meet the growing needs of the telecommunications industry and its related business in Malaysia. It was one of the first Malaysian companies to venture into the field of telecommunication, and it played a major role in establishing the infrastructure. In less than a decade, it had gained a reputation for reliability and resourcefulness. Sapura enjoys a reputation of being in the forefront of telecommunications today because it believes in the importance of Research and Development.

The Company is ably supported by a team of outstanding engineers who have been responsible for the many innovations which have garnered recognition and accolades for Sapura the world over. This vital group of professionals consists of computer, electronic, radio frequency and industrial engineers. They are assisted by young and fresh talents from both local and foreign universities who are eager to test their ideas and innovativeness.

The team represents the most exciting aspect of the Company, as they possess the ability to innovate, invent and create new and better products for the community. Their research efforts cover both hardware, software and system engineering. CAD/CAM tools are used in a major part of their design work ranging from cosmetic design to electronic components of Sapura products.

Sapura products are true innovations. The S2000 Series of feature telephones designed under the most stringent standards received type approval on their first submission from Deutschen Bundespost TELEKOM, the authority on telecommunications product quality in Germany. Subsequent approval from the authorities of United Kingdom, United States of America, Canada, Germany, France, Austria, Netherlands, Japan, Indonesia, Singapore, Myanmar, Thailand and Sri Lanka attest to their international standard in quality and reliability. The S2000A, a single line telephone, is Malaysia's first homogenous telephone designed and manufactured by Sapura. The S2000B is the first microcomputer controlled feature telephone while the S2000HF is the world's first voice-activated answering handsfree telephone. Sapura also created MP12 and MP64, low cost small capacity PABX, to meet specific needs of growing businesses. A numeric digital pager complying with world standards was created for the Group's paging division. It is compact and



lightweight, with its design emphasis on function. Another Sapura innovation is SCADA or Supervisory Control and Data Acquisition. This is a system which allows the remote monitoring, supervision and control of plants. The SCADA system can be used in communication networks as well as power stations throughout the country.

In summary, as a corporate entity, Sapura is committed to utilising its assets and resources in the design and manufacture of advanced, innovative products with the objective of enhancing the life of the community.

Shell Malaysia

Name of agency / institution / company:
Shell Marketing Companies in Malaysia

Name of group / centre:
Shell Group of Companies in Malaysia

Name of laboratory / project:
Product-Application-Development Laboratory

Person(s) to contact:
Agnes Yoong
(Tech. Dev. Chemist)

Office address:
Bangunan Shell Malaysia
Damansara Heights
50490 Kuala Lumpur, Malaysia

Telephone:
603-255 9187

Telefax:
603-251 2019

Office hours:
8.00 am-5.00 pm *(Mon-Fri)*

FIELD OF RESEARCH

Petroleum Products

SERVICES OFFERED

- Used and unused petroleum products analysis
- Predictive maintenance of equipment with the use of Pulse (Preventive Maintenance Utilising Lubricants States in Equipment) programme

SUMMARY OF RESEARCH / CONSULTANCY EXPERIENCE

The Shell Group spends some RM2,000 million a year in Research & Development activities in over 10 R & D centres worldwide. The expertise and resources of these centres are available to us in the operation of the Product-Application-Development (PAD) laboratory. Product-application is the final stage of R &D activities where the aim is to assist our customers to increase their productivity and profitability.

The Product-Application-Development laboratory was awarded the SAMM (Skim Akreditasi Makmal Malaysia or Laboratory Accreditation Scheme of Malaysia, equivalent to ISO/IEC G 25) accreditation in August 1993 and is run by a fully qualified chemist who together with a team of experienced professionals i.e. engineers and technical experts located in the major cities throughout the entire country, provides technical services to our customers in the use of our products.

HARDWARE FACILITIES

Equipment	Application	Technical specifications
Infrared Spectrophotometer	Product identification	4000 cm-1 - 600 cm-1
Stereo Microscope	Diagnosis of engineering failure	200 X magnification
Distillation unit, Flash point tester and a range of fuel testers	Fuel characteristics	Tests to international standards
Existent gum analyser Freezing point analyser, Silver and copper corrosion testers and a range of aviation fuel testers	Aviation fuel characteristics	Tests to international standards
Penetrometer and Softening point analyser	Bitumen characteristrics	Tests to international standards
Autotitrator, Viscosity analyser, Karl-Fisher titrator and a range of lubricating oil testers	Lubricant characteristics	Tests to international standards

SOFTWARE FACILITIES

Programme	Application	Technical specifications
PULSE programme	Preventive maintenance programme using oil analysis	Equipment condition monitoring
Laboratory manager	Data analysis and management	Sample management data analysis and reporting

Standards and Industrial Research Institute of Malaysia (SIRIM)

Name of agency/institution/company:
Standards and Industrial Research
Institute of Malaysia

Office address:
Standards and Industrial Research
Institute of Malaysia
Persiaran Dato' Menteri, Section 2
PO Box 7035
40911 Shah Alam, Selangor, Malaysia

Enquiries and correspondence:
Promotion and Customer Services Unit

Telephone:
603 - 559 2601, 559 1630

Hotline:
603 - 550 3535

Telefax:
603 - 550 8095

Telex:
SIRIM MA 38672

Introduction

The Standards and Industrial Research Institute of Malaysia (Incorporation) Act 1975, establishes SIRIM's role as the national standards agency and an industrial research organisation. In keeping with this role, the Institute not only continues research activities in its priority areas but also directs its focus towards industrial needs through the development and use of new and existing technologies.

Activity

SIRIM holds strongly to its philosophy of being **a friend and partner of industry**, and this is shown by its corporate mission 'to enhance Malaysia's international competitiveness through partnership in industrial technology and quality'.

This is reflected by SIRIM's activities which cover all aspects of the manufacturing sector - from standards development to product testing, from research and development of product to production, certification and export assistance; and from consultancy to training, technology transfer and dissemination. The Institute also provides information and technology to enable entrepreneurs to stay competitive.

Research and Development

Befitting its role as a technology resource centre, SIRIM's research and development activities relevant to the needs of industry revolves around six core areas of excellence:

- Advanced Manufacturing Technology
- Materials Technology
- Product and Machine Development
- Process Technology
- Packaging Technology
- Measurements Science

Besides undertaking research and development (R & D) on advanced and strategic programmes, SIRIM also extends its services to industry through contract research, joint research venture and tripartite research venture programmes, and consultancy.

SIRIM

Advanced Manufacturing Technology

The Advanced Manufacturing Technology involves the application of advanced manufacturing techniques and automation. The main research and development activities are focused on:

Activity	Range of Capability
■ Assembly Technology	• Design for Assembly • Material Handling (Robotics and Automated Guided Vehicle) • Feeding and Orientation • Industrial Engineering (Ergonomics) • Control System • Joining and Fastening
■ Manufacturing Systems	• Computer Aided Design/Computer Aided Engineering/ Computer Aided Manufacturing • Rapid Prototyping • Flexible Manufacturing Cell/Flexible Manufacturing System • Computer Aided Process Planning • Manufacturing Simulation • Manufacturing Resource Planning II
■ Mechatronics	• Sensors and Actuators • Embedded Microprocessors System • Motion Control • System and Design
■ Circuit and Electronic System Design	• Microprocessor Technology • Communication • Electronics • Image and Vision • Automation • Printed Circuit Board • Computing
■ Software Development	• Software Development for Engineering Application • Networking • Computer System • Expert System • Multimedia • Hardware/Software

Materials Technology

Continuous research efforts on Materials Technology are directed towards the development of materials technology for the advancement of ceramics, metals and plastics. The varied scope of research activities and capabilities for Ceramics, Metals and Plastics are distinctly identified under three technology areas as follows:

Materials/ Technology Areas	Ceramics	Metals	Plastics
Materials Development	Whitewares Structural Clays Refractories Structural Ceramics Functional Ceramics Porous Ceramics	Metallic Alloys Powder Metal Alloys Metal-Matrix Composites	Specialty Plastics Plastics Composites Plastic Blends and Compounds
Materials Evaluation	Chemical Physical/Mechanical Mineralogical Thermal Microstructure Failure Analysis Electrical	Metallography Failure Analysis Non-Destructive Evaluation Mechanical/Physical Chemical Composition	Mechanical/Physical Chemical Thermal Electrical Optical Rheology
Process and Product Development	Extrusion Slip Casting Isostatic Pressing Uniaxial Pressing Machining Sintering Decorating	Electroplating Corrosion Specialty Coating Powder Metallurgy Die Casting Heat Treatment	Injection Moulding Blow Moulding Blown Film Vacuum Forming Fibre Reinforced Plastics Processing

Product and Machine Development

This area of expertise is exclusively created to develop specialised technical services in the fields of Design and Prototype Development for Industrial Products, Production Tooling and Industrial Machinery.

The comprehensive range of services and capabilities are prioritised under the following areas:

Activity	Range of Capability
Product Development	• Industrial and Consumer Product Design (Manual and CAD) • Rendering and Final Presentation (Manual and CAD) • Product Dimensioning and Technical Drawing • Mockup development and Model Making (Wood and resin based) • Prototyping
Production Tooling Development	• Design of Production Tooling (Press Dies, and Plastic Moulding) • Machining and Assembly Dies and Moulds (Dies and Moulds Making) • Dies and Moulds Repair
Machine/Equipment Development	• Design and Development of Customised Machinery/Equipment • Prototype Fabrication of Machine/Equipment • Machine Retrofitting
Prototyping and Small Order (Sample) Production	• Casting Products Design, Process Development and Production • Casting Design Simulation • Quality Analysis of Casting Products • Precision Machining • Sheetmetal Fabrication • Presswork • Woodworking

SIRIM

Process Technology

Intensive R&D activities and projects in chemical and biotechnology are classified under the broad disciplines of:

- **Biotechnology**
  - Research projects undertaken in the area of Industrial Biotechnology involve the adaptation of advanced technologies to the utilisation of local raw materials and requirements. Two main research areas of industrial interest include enzyme biotechnology and fermentation biotechnology.
- **Chemical Technology**
  - This programme caters to the needs of the chemical industry in the production of quality chemical products through the utilisation of imported and locally available resources.
- **Energy and Environmental technology**
  - This programme is designed to develop appropriate waste treatment and management processes and systems for industrial and other applications. It also encompasses research, development, promotion and consultancy activities on clean, efficient energy utilisation and management.

The range of services and capabilities are:

Biotechnology	Chemical Technology	Energy and Environmental Technology

• Development of Fermentation Processes for Production of:
  • Enzymes such as Cellulases and Lipases
  • Ethinol/Acetaldehyde
  • Acetic Acid
• Development of Enzymatic Processes for Production of:
  • High Fructose syrup from tapioca and sago starches
  • Modified Oils and Fats
• Isolation and Application of Industrially-useful Microorganisms
	• Chemical Analysis
	• Quick Silicate Analysis
	• Small Batching of Chemical and Chemical Product
	• Quality Control on Materials
	• Trouble-Shooting for Chemical Process/ Product
	• Sourcing Chemicals
	• Formulation of Chemical and Chemical Products
	• Chemical Processing
	• Designing Chemical and Process Lay-out
	• Physical Processing of Chemical and Chemical Products
	• Organic Synthesis and Extraction
	• Formulation of Coating Materials
	• Formulation of Detergent, Cosmetic and Toiletry Products
		• Waste Characterisation
		• Treatability and Feasibility Studies
		• Design Parameters for Treatment Systems
		• Development of Appropriate Technology for Waste Management
		• Anaerobic Digestion and Post-treatment Technology
		• Hazardous Waste Management Technology (Heavy Metals)
		• Low-cost Treatment Technology
		• Treatment System Monitoring and Upgrading
		• Training for Treatment Plant Operators
		• Energy Audit and Guidance in Energy Intensive Industries
		• Energy Conservation and Utilisation
		• Energy Management
		  • Industrial Equipment Efficiency
		  • Energy Efficiency Techniques and Processes
		  • Process Control and Automation

Packaging Technology

Packaging Technology offers services to industry in packaging testing and to develop packaging technology appropriate to the requirements of industry.

The activities of Packaging Technology are conducted in two groups:

GROUP	PACKAGING EVALUATION		PACKAGING DEVELOPMENT	
Unit	Performance Testing	Material Testing	Packaging Technology Development	Consumer Packaging & Promotion
Activity	• UN Test • Filled Transport Packaging Testing	• Paper Testing • Plastics Testing	• Information Update • R & D • Packaging Engineering Design • Advisory/consultancy • Training	• R & D • Consumer Packaging Design • Market Study • Promotion

Measurements Science

The main thrust of Measurements Science is on the development of national primary physical standards and measurement services which include legal metrology, and statutory verification and services.

Testing Services

Testing Services, equipped with a comprehensive range of testing facilities and expertise, enables SIRIM to test a broad spectrum of products according to company, national and international standards, professional organisation specifications and other prescribed specifications and regulations.

The activities of the testing domain are grouped into four major areas:

Chemical	Civil Engineering and Building Materials	Mechanical and Automotive Engineering	Electrotechnical
• Water and Pharmaceuticals • Domestic and Agriculture • Textile and Paper • Microbiological • Industrial • Food • Paint	• Cement • Concrete and Structure • Fire • Material Science • Construction Materials	• Petroleum and Gas Appliances • Physical and Dynamic Tests • Emission and Engine Performance • Vehicle Inspection and Performance	• Industrial Appliances • Domestic Appliances • Lamp and Accessories • Electronic Components

With the sphere of testing activities, SIRIM has the capability to undertake:

- Testing evaluation and inspection of a wide array of locally manufactured products and materials
- Verification of claims on the performance or safety of products or processes

Telekom Malaysia Berhad Calibration Center (Telecal)

Name of company:
TELEKOM MALAYSIA BERHAD

Name of group/center:
Research and Development

Name of laboratory:
Telekom Calibration Center
(TELECAL)

Person(s) to contact:
- Rosmah Hj Mat Yunus
  (Unit Manager)
- Md Said Kassim
  (Physicist)

Office Address:
Unit Bengkel Telekomunikasi
Bahagian Penyelidikan dan
Pembangunan, Telekom Malaysia Berhad
Lot 2 Jalan Asam Jawa 16/15
Seksyen 16
40200 Shah Alam
Selangor, Malaysia

Telephone:
603 - 548 7575 *(Office)*
603 - 548 7586 *(Laboratory)*

Telefax:
603 - 542 4429

Office hours:
8.30am - 4.45pm *(Mon - Fri)*
8.30am - 1.00pm *(Sat)*

FIELD OF SERVICE

Calibration and repairs of test gears

SERVICES OFFERED

- Calibration of telecommunication test gears
- Repair of telecommunication test gears

SUMMARY OF SERVICE

TELECAL provides calibration services on test gears that are used to maintain and check telecommunication systems. The center is currently seeking Skim Akreditasi Makmal Malaysia (SAMM) accredition from Standards and Industrial Research Institute of Malaysia (SIRIM) which complies to ISO/IEC Guide 25. TELECAL is designed to provide quick, accurate, and high quality calibration service through computerization and fully documented procedures. Repair service of defective test gears is also available.

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
HP 8902 SG Signal Generator Calibration System	Signal Generator Calibration	150 kHz to 18 GHz -127 dBm to 30 dBm
5700A Digital Multimeter Calibration System (with 5725A Amplifier)	Digital/Analog meter calibration 220uA - 11 A DC	220mV - 1100V DC 2.2mV - 1100V AC 220uA - 11 A DC
CG 5011 Oscilloscope Calibration System(with Fluke 6060B)	Digital /Analog OSC calibration BW: up to 1050 MHz	0 ohm - 100 Mohm 40us - 200V 1 mA - 100mA FE: 150ps Marker:0.5ns - 5s
HP 34401A Multi-meter	Power supply calibration	100mV - 1000V DC

OTHER INFORMATION

The telecommunication industry has been growing at a fast pace over the past few years with many new technical advances in areas such as digital transmission and networking.

Telekom Malaysia has been putting continuous effort in ensuring its leadership in the development of these highly technical areas with emphasis on total customer satisfaction.

One result of this effort is the establishment of Telekom Malaysia Calibration Center (TELECAL) which is dedicated to giving fast and high quality calibration service for test equipment used in maintaining and developing the telecommunication system.

The main benefit this center gives to our customers is ensuring the accuracy and stability of test equipment used to maintain and check their systems.

Since its inception in 1992, TELECAL has developed from a small laboratory capable of calibrating only signal generator to a well-equipped and computerized calibration laboratory capable of carrying

Computerized Calibration System makes Possible Fast and Accurate Oscilloscope Calibration

out calibrations, performance tests, and repairs on signal generators, digital multimeters, oscilloscopes, power meters, and power supplies.

The center, which is led by a fully qualified physicist and staffed by a group of fully trained technicians, is now actively seeking the SAMM from SIRIM. This accredition, which complies to ISO/IEC Guide 25 is the highest quality award granted to laboratories in recognition of their competency in analysis, calibration and overall management of the laboratory.

Customers who expect top performance from their signal generators can benefit from the advanced calibration system that TELECAL has. Among other standard capabilities, this system can check with great precision the frequencies, RF levels and modulation accuracies.

Needed adjustment can then be made based on these results. Utilization of advanced software for the computerized calibration procedures minimizes human error and enables the quick generation of complete performance report for customer use.

Customers with a large quantity of digital multimeters and oscilloscopes can benefit from TELECAL's superfast and fully automated calibration/performance evaluation procedures.

TELECAL has in its possession a very highly accurate digital multimeter calibration system which meets the high accuracy requirement for calibrating avionic electronic equipment.

Although heavily geared towards providing calibration/performance test service, TELECAL also offers repair service of the equipment that is found to be defective during the calibration procedures. This ability to repair prior to performing calibration shortens the turnaround-time of the defective equipment since both processes are done at the same place and under the same management.

TELECAL is fully committed to quality service. The calibration room's environment (temperature, humidity, RF shielding and cleanliness) is well-controlled and all measurements made are traceable to National Institute of Standards and Technology (NIST). Also, in order to better serve the customer, TELECAL is working towards establishing a fully equipped mobile calibration unit that will offer the same service as the laboratory.

These efforts, commitment and the continuous up-dating of the staffs' skills will ensure our customers of fast and high quality service.

Testing RF and Microwave Signal Generator Using Signal Generator Operation Verification System

Tenaga Nasional Research & Development Sdn Bhd

TENAGA NASIONAL

Name of agency / institution / company:
Tenaga Nasional Research & Development Sdn Bhd

Name of group / centre:
Tenaga Nasional Berhad

Person(s) to contact:
- Ir Hj Hoesni Nasaruddin *(Research Director)*
- Ir Abdul Malek Othman *(Business Development)*
- Lim Chin Bok / Zuhir Ali *(Environment)*
- Albert Rajaratnam *(IT)*
- Dr. Zam Zam Jaafar *(Energy)*
- Syed Ahmad Fuad *(Transmission & Distribution)*
- Dr. Salim Sairan *(Generation)*

Office address:
Lot No 3, Jalan 241,Section 51A
46100 Petaling Jaya
Malaysia

Telephone:
603- 777 6140

Telefax:
603 - 777 2921

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

SUMMARY OF RESEARCH/ CONSULTANCY EXPERIENCE

Tenaga Nasional Research and Development Sdn Bhd (TNRD) commenced operation on 1 September 1993 as a wholly-owned subsidiary of Tenaga Nasional Berhad (TNB). As a strategic business enterprise with its own Board of Directors, TNRD promotes, initiates and undertakes "business-driven" R&D activities.

Within an autonomous business environment, TNRD is well placed to use applied research, new technical development and specialised scientific and engineering services in its endeavours to bring the latest know how and states of the art technologies into the Malaysian power industry.

As a closely linked entity with TNB, TNRD's main trust is to undertake R&D activities that will enhance the value of TNB's core and energy related business. This warrants TNRD to work closely with TNB in electricity generation, transmission, distribution, quality customer service and exploratory R&D.

In order to expand and optimise the R&D horizon, strategic alliances are formed with similar organizations within the country as well as abroad. Our client requirements and expectations are fulfilled through collaborative research, profitable ventures and specialised services. TNRD welcomes new innovative proposals from any organisation or individuals within the country or abroad.

Our immediate priority is to set up a new Research Centre in Bangi adjacent to the campus of Tenaga Nasional Institute of Engineering and Technology Sdn Bhd (IKATAN). When completed by 1996, the new centre will be well equipped to provide research facilities and services to TNB and external clients. The centre will house, among others, high voltage and high current, materials and NDT, environment and chemical services and combustion laboratories and an energy technology application centre (ETAC). The laboratories would be capable to undertake certification and testing activites.

TNRD's strength lies in the pool of dedicated and capable staff. Like most R&D organisation, TNRD is top heavy, supplemented by dedicated technicians and administrative staff. Any need to increase its personnel can be readily sourced from our parent company. TNRD is committed and well-placed to attain its long-term vision of developing new technologies through applied research and breaking new frontiers in its endeavour to modernise the nation's energy industry.

TNRD is looking for new ideas to be researched and develop towards commercialisation, and possible strategic alliances with local or oversea companies. Proposals for joint-ventures and other form of business partnership are also welcomed.

Unilever (Malaysia) Holdings Sdn Bhd

Name of agency/institution/company:
Unilever (Malaysia) Holdings Sdn Bhd

Office address:
55, Jalan Bangsar
59200 Kuala Lumpur
Malaysia

Postal address:
P.O. Box 11015
50990 Kuala Lumpur
Malaysia

Telephone:
603 - 282 1143

Telefax:
603 - 282 1048, 282 2617

SUMMARY OF RESEARCH/ CONSULTANCY EXPERIENCE

Unilever Firmly Rooted in Malaysia

Unilever (Malaysia) Holdings Sdn Bhd, formerly known as Lever Brothers, became one of the first companies to establish a manufacturing plant in Malaysia with the opening of its soap factory in 1952. The company's shareholdings are currently being held by Permodalan Nasional Berhad (23%), Tabung Haji (7%) and the Anglo-Dutch group Unilever Plc, one of the world's leading consumer goods businesses, which holds the remaining 70% equity.

Since its entrance into Malaysia 47 years ago, Unilever's commitment to the nation has remained strong. The company has continually invested in Malaysia. Aside from its landmark headquarters in Bangsar, Unilever also has an 8.3 hectare manufacturing complex in Bukit Raja, Klang. It houses the company's detergent and personal care products plants, as well as a Wall's ice cream factory which stands as one of the most modern of its kind in the world.

In addition, the Bukit Raja site is also the location of Unichema Malaysia, the company's RM110 million oleochemical manufacturing facility. Unichema manufactures and exports a wide range of performance oleochemicals derived from Malaysian palm oil. In 1992, it became the first Malaysian oleochemical producer to be awarded the ISO 9002 certification.

"The strength behind the brands . . . Unilever Malaysia's office and factory at Jalan Bangsar, Kuala Lumpur"

Through the years, Unilever has consistently demonstrated its commitment to help Malaysia progress. Aside from its sizable investments in local manufacturing facilities, the company has also strived towards transferring professional and technological knowledge to its local employees. To keep its workforce up to date with the latest developments in their fields, Unilever places great emphasis on training programmes, both locally and overseas, and has also successfully placed its local staff in cross-postings to other Unilever operations worldwide.

For more than 60 years, Unilever (Malaysia) Holdings Sdn Bhd, (formerly known as Lever Brothers) has been providing Malaysians with quality consumer products. From detergents and personal care products to foods and beverages, each is manufactured to meet your individual demands as a modern consumer.

A COMMITMENT TO EXCELLENCE

Millions of satisfied customers like yourself, have made our brands trusted household names and market leaders in Malaysia and in many other countries.

Like all Unilever companies around the world, we share a commitment to being the best producer of the highest quality products to suit your lifestyle, wishes and needs. This commitment has helped make Unilever one of the leading consumer goods businesses in the world.

Unilever

Unilever (Malaysia) Holdings Sdn Bhd
55, Jalan Bangsar, P.O. Box 11015, 50990 Kuala Lumpur

A Touch of Genius for Better Impact on your R&D

Universiti Kebangsaan Malaysia (UKM) - where excellence in research prevails

UKM's commitment to conducting research activities is a boon to the development of society. As testimony to this commitment, UKM has set up several **Centres of Excellence**:

- Institute of Environmental Studies and Development (LESTARI)
- Institute of Social Studies (IKMAS)
- Food Quality Research Unit (UNIPEQ)
- Systematic Insect Centre
- Institute of Malay World and Civilisation (ATMA)

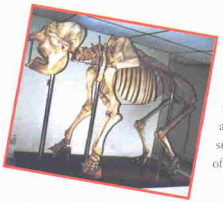
More **Centres of Excellence** are being planned to cover the fields of strategic and security studies, tax policy and application studies, slope failure; land slide studies; thermoplastic and composite studies.

Better Management for Maximum Benefits

To obtain maximum benefits from its research programmes, UKM has formed a new unit called Research Management Unit which is to coordinate all research activities in UKM including reports, financial management and training of researchers. The unit also acts as a liaison, linking UKM with the outside world.

Financial Allocations for Research

UKM has embarked on 360 R & D projects, some of which are commercialised, in the fields of agriculture, industry, medicine, strategy and social science in the Sixth Malaysia Plan (1991-1995). UKM was allocated RM41.7 million under the Sixth Malaysia Plan for the various projects. Besides the university's allocation amounting to RM1 million yearly and external grants, UKM also obtains allocations from the IRPA (Intensification of Research in Priority Areas) programme.



Active Involvement in Research

Since the establishment of UKM in 1970, the academic staff of UKM have been actively involved in research in various fields of knowledge relevant to the society and the nation. With the dual functions of teaching, to convey knowledge, and research, to explore knowledge, the academic staff's contribution to national development is crucial.

Future Vision

Acting in concert with Malaysia's aspiration to become an industrialised nation, UKM has drawn up strategies to be one of the foremost institutions in the region. There will be changes in approach, delivery and utilisation of the university's resources to provide excellent services as well as to produce well-balanced graduates who can be absorbed into various sectors.

Universiti Kebangsaan Malaysia
43600 Bangi, Selangor, Malaysia
Tel: 603-829 2027
Fax: 603-825 0662

Universiti Kebangsaan Malaysia

FIELD OF RESEARCH

Biochemistry

Name of group/centre:
Medical Faculty

Name of laboratory/project:
Biochemistry Laboratory

Person(s) to contact:
Professor Dr. Ton So Har

Postal address:
Department of Biochemistry
Faculty of Medicine, UKM
Jalan Raja Muda
50300 Kuala Lumpur, Malaysia

Telephone:
603 - 292 3066 *ext. 5291*

Telefax:
603 - 291 2659

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*

HARDWARE FACILITIES/EQUIPMENT

Main equipment	Application	Technical specifications
DNA Thermal Cycler	DNA amplification	Perkin Elmer
Gel electrophoresis equipment (both vertical & horizontal)	For electrophoresis of DNA/RNA and sequencing DNA/RNA	EC Apparatus
Gel dryer	For drying gel	Savant
Speed Vac	For concentrating DNA/RNA protein	Heto
Ultracentrifuge & various other types of centrifuges	For high speed centrifugation/ centrifugation	Refrigerated centrifuge - sorval; ultracentrifuge- Beckman
Microfuge		Jouan
HPLC	For separation of substances	Gilson
G.C	For separation of substances	Shimadzu
Atomic absorption spectrophotometer	Trace elements analysis	Shimadzu
Spectrophotometer UV/Vis and others	Measurement of substances concentrations	Shimadzu
Freezers -70° C -50° C -20° C	Storage of specimen/ reagents	Kelvinator Heto Sanyo Temp Heto GEC National
Microtom	For slicing tissue	Microm
Image analyser	Measures surface area of cells etc.	Carl Zeiss

RESEARCH EXPERIENCE

- Molecular Biology + Biochemistry of HBV infection
- All aspects of medical/clinical biochemistry

SERVICES OFFERED

- Estimation of HBV-DNA + transcripts + sequencing of HBV-DNA precore/core region
- Estimation of cotinine in urine
- Estimation of serum thymidine kinase

FIELD OF RESEARCH

Biotechnology

DNA Resource Bank for Wildlife Species

Name of group/centre:
Wildlife DNA Bank Specialist Group

Name of laboratory/project:
Genetic Resource Centre

Person(s) to contact:
Prof. Dr. Mohd Nordin Hj. Hasan

Postal address:
Faculty of Life Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 2969

Telefax:
603 - 825 2698

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

- Facility available for acquisition, storage and dissemination of tissue/blood/hair from wild animal species. Methodologies available in sampling of blood/tissue during field work
- Laboratory well-equipped for DNA extraction/ purification from samples collected and also possible installation of automated DNA extractor. PCR and DNA sequencing facilities are available for DNA fingerprinting work
- Ultra low temperature, liquid nitrogen cryopreservation and dessication facilities for storage of tissues and DNA from wildlife species

SOFTWARE FACILITIES/EQUIPMENT

- Link to DNA Bank network in laboratory undertaking collaborative research where gene bank has been established
- Software for complete documentation and history of samples collected
- Computer simulation models for sampling strategies and management of banks

RESEARCH EXPERIENCE

- Expertise in sampling of blood/tissue from wildlife species
- Experience in extraction and purification of DNA from diverse sources
- Extensive DNA sequencing experience

CONSULTANCY EXPERIENCE

- Facilitor for workshops on molecular approaches to wildlife conservation
- Involved in training of personnel from government institutions in DNA extraction/purification and PCR methodologies

SERVICES OFFERED

DNA Bank will be made accessible to collaborative research at national and international level in bio-medicine, molecular evolution, conservation of biodiversity and DNA finger printing for wildlife forensic

FIELD OF RESEARCH

Biotechnology

Plant Biotechnology

Name of group/centre:
Biological Improvement of Plant Species

Name of laboratory/project:
Plant Biotechnology Laboratory

Person(s) to contact:
- Assoc. Prof. Dr. Normah Mohd. Noor
- Assoc. Prof. Dr. Ismail Ahmad

Postal address:
Plant Biotechnology Laboratarory
Faculty of Life Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 3936

Telefax:
603 - 825 2698

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

The Plant Biotechnology Laboratory is well-equipped with facilities for tissue culture research, micropropagation and other *in vitro* studies such as cryopreservation and plant transformation. Equipment available include:

Equipment	Application	Technical specifications
Programmable freezer	Freezing plant cells, tissue and organs for conservation of genetic resources	Cryomed 1010
Agar filling and accessories	Automatic dispensing media system	Technomara
Electroporation system	Transformation of plants	Beakon 2000
UV spectrophotometer	Assay of macromolecule concentration	UV 160A
Ultra centrifuge	Separation of macromolecules	Beckman
HPLC	Phytohormone analysis	Water system W 600 E
Bioreactor	Scaling-up and system control	Infor system 18F - 100
Freeze Driver	Bulk sampling freezing	North Star et al 1791
Research microscopes (3) and Inverted microscopes (2)	Cytogenetic, histology anatomy	Nikon Optiphot, Zeiss Axioplan, Sofival

RESEARCH EXPERIENCE

- Plant tissue culture
- Plant transformation
- Cryopreservation of plant cells, tissues and organ
- Plant hormone and growth development
- Cytogenetics

CONSULTANCY EXPERIENCE

Orchid tissue culture

SERVICES OFFERED

- Extension and technical services
- Chromosomal analysis

FIELD OF RESEARCH

Biotechnology

Postharvest Biotechnology and Packaging Technology

Name of group/centre:
Postharvest Technology and Biotechnology Group

Name of laboratory/project:
Postharvest Technology and Biotechnology Laboratory

Person(s) to contact:

- Prof. Dr. Hamid Lazan *(Plant Physiologist - Group Leader)*
- Assoc. Prof. Dr. Zainon Mohd Ali *(Plant Biochemist)*
- Assoc. Prof. Dr. Aminah Abdullah *(Food Scientist)*

Postal address:
Department of Botany
Faculty of Life Science, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 2869

Telefax:
603 - 825 2698

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application
Gas chromatography with FID & TCD detectors	Analysis of gases O_2, CO_2, ethylene
HPLC Isocratic gradient systems with UV, fluorescent and RI detectors	Analysis of sugars, organic acids, phenolics, proteins, amino acids, and nucleic acids
Labtek microplate reader	Large scale measurement of samples having varied OD
Low temperature incubators with RH control	For chilling injury study
Deep freezers	Storage of samples at -30 °C to -70 °C
Various chromatography columns	Analysis of plant proteins and cell wall carbohydrate polymers
Thermocouple psychrometery hygrometer	Analysis of water status in plant materials

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application
Delta Junior	Analysis of chromatography peaks

RESEARCH EXPERIENCE

- Developing effective storage technology of tropical fruits to enhance the shelf-life via combination of low temperature storage and packaging technology
- Purification of enzymes that are involved in fruit ripening as an essential step in amino acid sequencing and development of specific DNA probes
- Evaluation of quality changes during storage of tropical fruits and vegetables
- Developing immunoprobes to detect changes in the level of specific proteins during fruit development

SERVICES OFFERED

- Evaluating and developing suitable packaging films to be used in packaging of tropical fresh commodities for shelf-life extension
- Advisory services in methods on how to alleviate chilling injury during storage and transport of tropical fruits and vegetables
- Use of immunoprobes to detect specific proteins in tropical fruits
- Assessment of postharvest quality in fruits and vegetables via physico-chemical analysis and sensory evaluation

FIELD OF RESEARCH

Biotechnology
Protein Bioprocessing

Name of group/centre:
Protein Pure

Name of laboratory/project:
Protein Purification and Analysis Laboratory

Person(s) to contact:

- Prof. Dr. Mohammed Noor Embi *(Team Leader)*
- Dr. Rahmah Mohamed *(Principal Researcher)*
- Dr. Othman Omar *(Principal Researcher)*
- Dr. Sheila Nathan *(Principal Researcher)*
- Dr. Hasidah Mohd Sidek *(Principal Researcher)*
- Dr. Sahidan Senafi *(Principal Researcher)*

Postal address:

Department of Biochemistry
Faculty of Life Sciences, UKM
43600 Bangi, Malaysia

Telephone:

603 - 829 2964

Telefax:

603 - 825 2698

Office hours:

8.00 am - 5.00 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES EQUIPMENT

Name of equipment	Application	Technical specifications
Ultracentrifuge	DNA and protein separation	Beckman L8M Max speed 70,000 rpm with 70.1 Ti rotor
Ultra low temperature freezer	Sample storage	Temperature range -80°C
Liquid scintillation counter	Radioactivity estimation	Beckman LS-800
Fast phase liquid chromatography	Protein Purification	Pharmacia
Polyacrylamide gel electrophoresis Transfer Apparatus	Protein separation Western Blotting Studies	Biorad/Hoffer
Densitometer	Protein Quantitation	Biorad
Cold Cabinet	Chromatography work	
Radioactive Handlings Facility	Protein labelling and analysis	
Spectrophotometers	Enzyme and protein analysis	Beckman/Hitachi

RESEARCH EXPERIENCE

- Purification of bacterial proteins
- Monoclonal antibody production
- Large scale enzyme purification for commercial purposes
- Enzyme analysis

CONSULTANCY EXPERIENCE

- Monoclonal antibody purification
- Cell culture
- Protein purification from various bioresources
- Protein/enzyme characterisation
- Protein analysis, quantitation, detection and bioactivity
- Protein modification

SERVICES OFFERED

- Monoclonal Antibody Production
- Protein purification : Large and small scale
- Protein Analysis
- Protein modification studies

FIELD OF RESEARCH

Cancer

Name of group/centre:
Cancer Research Group

Name of laboratory/project:
Lab 1165

Person(s) to contact:

- Assoc. Prof. Azimahtol Hawariah *(Program Leader)*
- Johnson Stanslas *(Research Officer)*

Postal address:

Lab 1165, Department of Biochemistry
Faculty of Life Sceinces, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 3063

Telefax:
603 - 825 2698

Office hours:
8.45 am - 5.45 pm *(Mon - Fri)*
8.00 am - 1.30 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Tissue culture lab	Continuous monitoring of cytotoxicity test	Milli-Q water purification, Hoods, incubator, microscope
ELISA reader	ELISA, proliferative test	660 & 492 nm wavelength
DNA isolation, cloning	Dev. of DNA probe	concentrator, electrophoresis blotting
Toxicity studies Lab	Toxicity testing of drug	LD_{50} software , animal, cages
Microscope, UV and phase contrast	To differentiate cancer cells, immunocytochemical assay	Phase contrast & UV light
PCR (polimerase chair reaction)	DNA probe, oncogen studies	Thermal cycler & PCR kit

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
LD_{50} Software	Software to calculate LD_{50} of drugs	Drug concentration us % death. A standard toxicity parameters.
35 mm palette plus	Software to produce slides from the computer	Instant slide maker (35mm slides)

RESEARCH EXPERIENCE

- Polyclonal and minoclonal antibodies production
- Towards the development of DNA probe for Salmonella thyphimurium
- Mechanism of action of anticancer drug
  - Inhibit proliferation of cells (human cancer cell lines)
  - Anticancer effect in experimental drugs
  - Growth factors vs anticancer drugs
  - Oncogene and oncogene product vs anticancer drugs
- ELISA of small molecular weight compounds :
  Detection in the environment (water, soil and vegetables) and grains
  - Aflatoxins
  - Insecticides : malathion
  - Molluscicides : carbaryl, carbofuran
  - Herbicides : malenate
- Toxicology studies on the effect of anticancer drugs
- Antifertility studies on some Malaysian Plants
  - Block pregnancy - litter size
  - Hormone levels
  - Enz. and hormone synthesis

FIELD OF RESEARCH

Conservation, Systematics and Utilisation of Natural Resources

Name of agency/institution:
Faculty of Life Sciences, UKM

Name of group/centre:
Biodiversity Research Group

Name of laboratory/project:
Conservation, Systematics and Utilisation of Natural Resources

Person(s) to contact:
- Prof. Dr. Abd. Latif Mohamad
- Assoc. Prof. Othman Ross

Postal address:
Faculty of Life Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 2695, 829 2874

Telefax:
603 - 825 2698

RESEARCH EXPERIENCE

A decade of both field and herbarium/museum experience in biodiversity sampling, analysis and observation. Fixation of biological specimens, anatomical, cytological and phytochemical surveys.

CONSULTANCY EXPERIENCE

Environmental Impact Assessment studies especially involving the biological system, both terrestrial and aquatic; biodiversity, benthic and plankton organisms.

SERVICES OFFERED

Identification of flora and fauna, mapping of plant and animal distribution, information on all groups of plants and animals. Assessment of biodiversity and habitat for ecotourism

FIELD OF RESEARCH

Engineering Geology

Name of group/centre:
Engineering Geology Group, Geology Department

Person(s) to contact:
Prof. Dr. Ibrahim Komoo

Postal address:
Department. of Geology
Faculty of Physical and Applied Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 2660

Telefax:
603 - 825 2115

Office hours:
9.00 am - 5.00 pm *(Mon - Fri)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Rock mechanics testing	Engineering properties of rocks	Several equipment for testing physical & mechanical properties of rocks

RESEARCH EXPERIENCE

20 years experience working on:-
- Engineering properties of weak rocks
- Analysis of Rock Mass Properties
- Rock Slope Stability Assessment

CONSULTANCY EXPERIENCE

Consultancy work include:
- Slope Stability Assessment
- Subsurface and Site Investigation
- Environmental Impact Assessment

SERVICES OFFERED

Rock Mechanics or Rock Engineering Testing

FIELD OF RESEARCH

Environmental Factors in Childhood Respiratory Illness

Name of group/centre:
Paediatric Respiratory Group

Name of laboratory/project:
Environmental factors in childhood respiratory illness : Risk assessment, management and prevention.

Person(s) to contact:
Prof. Dr. Azizi Haji Omar

Postal address:
Department of Paediatrics
Faculty of Medicine, UKM
Jalan Raja Muda Abdul Aziz
50300 Kuala Lumpur, Malaysia

Telephone:
603 - 298 1044 *ext. 6580 / 6581*

Telefax:
603 - 291 2659

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application
Lung function test equipment	Lung function testing in children

RESEARCH EXPERIENCE

Clinical and epidemiological research in childhood respiratory disorders with particular emphasis on the contribution of environmental factors on respiratory morbidity. Research results have been published internationally and locally.

CONSULTANCY EXPERIENCE

Clinical trials for established pharmaceutical companies. Medical research methodology and clinical epidemiology courses for postgraduate doctors.

SERVICES OFFERED

Diagnosis and management of childhood respiratory disorders.

FIELD OF RESEARCH

Environmental Radiation

Name of group/centre:
Department of Nuclear Science

Name of laboratory/project:
Environmental Radiation Monitoring Laboratory

Person(s) to contact:
- Professor Dr Sukiman Sarmani, Head
- Dr. Amran Ab. Majid/Dr. Ismail Bahari

Postal address:
Department of Nuclear Science
Faculty of Physical and Applied Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 2984 / 5 / 2472

Telefax:
603 - 825 6086

Office hours:
9.00 am - 5.00 pm *(Mon - Fri)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Gamma spectroscopy (PC BASE)	Gamma emitters identification	1 Bq/kg
Alpha beta spectroscopy	Alpha beta emitters identification	1 Bq/kg
Image analyser	Cytogenetics analysis	Single cell
TLD reader	Dosimetry	100 uR - 5 x 10^{3} R

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application
GDR, GANAAS	Radionuclides qualitative & quantitative analysis
Image analyser program	Cytogenetic analysis

RESEARCH EXPERIENCE

Natural and fallout radioactivities monitoring in Malaysian Peninsular (UKM 58/93)
Extraction of highly valued metals from tin tailings (IRPA 2-07-03-019)
Uranyl nitrate toxicity on human cell measured using microtitration & FISH techniques (IRPA 4-06-05-003)
Interlaboratories study on IAEA Standard Reference Materials

CONSULTANCY EXPERIENCE

Low level radiation monitoring (baseline study) and natural and man-made radionuclides survey to PETRONAS, EPMI, ICI, Tioxide, Asialab, ARE and LPTA (AELB)

SERVICES OFFERED

Qualitative and quantitative analysis of radionuclides (natural and man-made) in environment (including food and drinking samples)
Environmental radiation monitoring
Radiation safety and protection programmes
Irradiation effect on man

FIELD OF RESEARCH

Food Quality

Name of group/centre:
Food Quality Research Unit *(UNIPEQ)*

Person(s) to contact:
Assoc. Prof. Dr. Nik Ismail Nik Daud *(Unit Head)*

Postal address:
Food Quality Research Unit
Faculty of Life Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 2965

Telefax:
603 - 825 2698

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
HPLC	Nutrients & food additives	Waters
GC	Fatty acids	Shimadzu, GC17A
Atomic absorption	Mineral determination	Pye Unicem SP9
Hunter lab colourimeter	Colour measurement	Minolta
Soxhlet, Kjeldahl, oven	Proximate analysis	
Viscometer	Viscosity measurement	Brook field model DV-II

SOFTWARE FACILITIES/EQUIPMENT

Equipment
Sensory evaluation lab
Microbiological lab
Physical chemical lab

RESEARCH EXPERIENCE

- Sensory evaluation and marketing research
- Product evaluation and improvement

CONSULTANCY EXPERIENCE

- Development of new products
- Nutritional labelling compliance
- Quality control programmes

SERVICES OFFERED

- Analytical Services - physical & rheological properties, chemical composition, nutritional analysis, microbiological quality
- Product Development - design new product, new ingredient evaluation, assistance in providing a smooth flow of concept to market product development
- Research & Consultation - shelf-life studies, consumer testing, labelling compliance, food safety regulation & programme development, statistical quality control
- Sensory Evaluation & Marketing Research - quality & acceptance of product, consumer preference evaluation, product evaluation & improvement, product optimisation, descriptive product profiling
- Training/Workshop/Seminar - in-house training, attachment of personnel to UNIPEQ, continuous up-grading of special skills

FIELD OF RESEARCH

Mineral

Name of group/centre:
Geology Department

Name of laboratory/project:
Mineral Research Laboratory

Person(s) to contact:
- Assoc. Prof. Dr. Hamzah Mohamad
- Dr. Mohamad Md. Tan

Postal address:
Department of Geology
Faculty of Physical and Applied Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 2664

Telefax:
603 - 825 0086

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
X-Ray Diffractometer	Phase/mineral identification	D5000 SIEMEN
X-Ray fluorescence spectrometer	Elemental composition	PW 1480 Philips

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specification
PW 1480 spectrometer	Correction of matrix effects	Alpha-on-line

RESEARCH EXPERIENCE

- Mineralogy
- Geochemistry
- Petrology
- Instrumental techniques, esp. XRF and XRD

CONSULTANCY EXPERIENCE

- Exploration of alluvial gold
- Analysis of geological materials
- XRF and XRD techniques

SERVICES OFFERED

- Analysis of geological materials - rocks, soils, minerals, sediments, ores, etc.
- Identification of crystalline phases

FIELD OF RESEARCH

Molecular Electronics

Name of laboratory/project:
Molecular Electronics

Person(s) to contact:
- Dr. Muhamad Mat Salleh *(Lecturer)*
- M. Yusof Musa *(Laboratory Assistant)*

Postal address:
Department of Physics
Faculty of Physical and Applied Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 2892

Telefax:
603 - 825 6086

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
KSV L-B 500	Preparation of LB films	
Sputter coater	Preparation of thin films	Edward S150B
Wire bonder	Prep. electronic devices	Marpet
c-v analyser I-v analyser	Study electrical prop. of materials	Keithley

RESEARCH EXPERIENCE

Research projects of M. Sc. and Ph.D students

FIELD OF RESEARCH

Obesity

Name of group/centre:
Faculty of Allied Health Sciences

Name of laboratory/project:
Preparation of Education Package To Overcome Obesity

Person(s) to contact:
Assoc. Prof. Dr. Fatimah Arshad

Postal address:
Department of Dietetics
Faculty of Allied Health Sciences, UKM
50300 Kuala Lumpur, Malaysia

Telephone:
603 - 440 5273, 292 3066 *ext 5273*

Telefax:
603 - 291 4304

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Computer & printer	Data analysis	IBM
Weighing machine microtoise	Height and weight measurement	Seca
Reflotron	Measurements of triglyceride cholestrol, blood sugar	Reflotron

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application
Microoft diet analysis	Data analysis

RESEARCH EXPERIENCE

Started doing research since 1971. The first topic was Aetiology of iron deficiency anaemia among pregnant women in health centres of Kuala Selangor. Following research on surveillance in anaemia. Malnutrition both under and over nutrition in Malaysia.

CONSULTANCY EXPERIENCE

Diet & nutrition consultant to Government and private institutions.

SERVICES OFFERED

Diet counselling in consultant polyclinic in UKM. Consultant in dietary advice on Radio 3 Shah Alam, RTM 1 and mass media.

FIELD OF RESEARCH

Occupational Health and Safety

Name of group/centre:
Occupational Health

Name of project:
National Survey on Occupational Health & Safety in Malaysia

Person(s) to contact:
Assoc. Prof. Dr. K.G. Rampal

Postal address:
Department of Community Health
Faculty of Medicine, UKM, Jalan Raja Muda
50300 Kuala Lumpur, Malaysia

Telephone:
- 603 - 440 5487 *(Dr. K.G. Rampal)*
- 603 - 440 5278 *(Dr. Noor Hassim Ismail)*

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application
Vitalograph	Pulmonary function test
Sound level meter	Noise survey
Dosimeter	Noise survey
Audiometer	Audiometric testing
Audiometric booth	Audiometric testing
Lux meter	Measure lumination
Heat stress equipment	Evaluate heat stress

RESEARCH EXPERIENCE

- National survey on Occupational Health and Safety in Malaysia
- Health and Safety in Palm Oil Mills in Malaysia
- Motor vehicle accidents among bus and taxi drivers in the Klang Valley
- Reproductive health policies and programs
- Occupational diseases in Granite Quarry
- Incidence of acute symptoms associated with padi farming activities in Tanjong Karang, Selangor

CONSULTANCY EXPERIENCE

- Advisor to Department of Safety and Health/ National Institute of Occupational Safety & Health and Social Security Organisation

- Training programs on safety & helath for industry e.g. Shell, Perwaja, Tioxide and consultancy group
- Training of general practitioner, occupational health nurse

SERVICES OFFERED

- Consultancy services in occupational health
- Training in occupational safety and health
- Medical surveillance for industry
- Risk assessment in the workplace

FIELD OF RESEARCH

Sanitary Microbiology

Name of group/centre:
Sanitary Microbiology Sp.

Person(s) to contact:
Prof. Dr. Mohd Sanusi Jangi

Postal address:
Department of Microbiology
Faculty of Life Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 829 3813

Telefax:
603 - 825 2698

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
2-L cell culture reactor	Production of animal cells in bulk	Bio-star B Gas, agitation and aeration controls

RESEARCH EXPERIENCE

- Microbiology of water and waste water
- Biodegration of petroleum hydrocarbons in the South China Sea
- Local production of microbial insecticides
- Marine microbiology

CONSULTANCY EXPERIENCE

- Medico-ecological and water quality assessment of a mini-hydro-electric power station in Maran: Prefeasibility studies
- EIA studies of the MTBE-propylene plant in Gebeng: Water quality impact
- Bio-mining of chalcopyrite

SERVICES OFFERED

- Microbiological analysis of water and waste water
- Production of recombinant proteins in cell culture
- Production of microbial insecticides, viz., B. thuringiensis, baculoviruses and Metarhizium anisopliae

FIELD OF RESEARCH

Solar Energy

Name of group/centre:
Solar Energy Research Consultancy Group

Person(s) to contact:
- Prof. Dr. Baharudin Yatim
- Prof. Dr. Mohd. Yusof Hj. Othman

Postal address:
Department of Physics
Faculty of Physical and Applied Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 825 0262, 829 3844 / 2420

Telefax:
603 - 825 6086

Office hours:
9.00 am - 5.00 pm *(Mon - Fri)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Computerised PV panel Testing system	PV panel testing	Testing performed under Sunlight
PV pump testing rig	PV pump testing	Pumphead 10 - 30m
Solar drying chamber	Drying of agricultural manufactural products	Chamber temp. up to 90°C

CONSULTANCY EXPERIENCE

- Feasibility studies for solar PV applications
- Solar drier design and fabrication
- Drying of products
- Solar energy development planning, UNIDO, ISLAMIC BANK

SERVICES OFFERED

- Solar PV systems design, sourcing and installation
- Custom design solar drier fabrication
- General consultancy on renewable energy systems

FIELD OF RESEARCH

Solid State Ionics

Name of group/centre:
Faculty of Physical and Applied Sciences

Name of laboratory/project:
Solid State Ionics Laboratory

Person(s) to contact:
- Dr. Ibrahim Abu Talib *(Assoc. Professor)*

- Dr. Muhammad Mat Salleh *(Assoc. Professor)*
- Dr. Muhamad Yahaya *(Professor)*
- Dr. Ramli Omar *(Lecturer)*
- Rokiah Md. Yassin *(Senior Lab Assistant)*
- Mohd. Yusof Musa *(Lab. Assistant)*

Postal address:
Physics Department
Faculty of Physical and Applied Sciences, UKM
43600 Bangi Malaysia

Telephone:
603 - 829 2880

Telefax:
603 - 825 6086

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Electrochemical interface	Potentiostatic & galvanostatic	
High frequency response analyser	Conductivity measurements	
Time domain analyser	Dielectric properties by transient current measurements	1pA - 1mA 100microsec-10kilosec
Differential scanning spectrometer	Thermal analysis	Ambient to 725°C 1mitoW to 750mW
Thermomechanical analyser	Thermal expansion	
Optical microscope	Microstructure investigations	
Automatic Ellipsometer	Thickness/refractive index measurements	633nm wavelength,HeNe laser & dual transparent layer
pH/conductivity meter	pH measurements	
Thermostatic oven	Constant temperature heating	Up to 110° C
Glove box	Controlled environment sample preparation	Working chamber:42x26x28"
Electrodes for solid/ powder/liquid	Sample holder for conductivity/ dielectric measurements	All : 50Hz-1MHz S.P : -70°C - 200°C, L : 0°C - 100°C
Box furnace	Heating	up to 1,100°C
Handpress	Pallet sample preparation	

SOFTWARE FACILITIES

Software	Application	Technical specifications
ADMS	Acquiring & analysingdata from electrochemical interface & high frequency response analyser	AC, DC measurements Data simulation, Data analysis

FIELDS OF RESEARCH

Solid state ionic materials analysis: electrical conductivity, thermal properties and surface structures.

RESEARCH EXPERIENCE

Research on the preparation and characterisation of solid state ionic materials: glass, polymer and thin films. Research is sponsored by the Ministry of Science , Technology and Environment, Malaysia.

SERVICES OFFERED

- AC Conductivity measurement of solid state ionic materials using the high frequency response analyser. ADMS software is used to control, aquire and analyse data from the equipment
- Thermal analysis of materials: transition temperature and thermal expansion

FIELD OF RESEARCH

Utilisation & Processing of Meat

Name of group/centre:
Meat and Poultry R & D Group

Name of laboratory/project:
Utilisation & Processing of Meat

Person(s) to contact:
- Prof. Dr. Abdul Salam Babji
- Cik Seri Chempaka Yusof

Postal address:
Department Food Science & Nutrition
Faculty of Life Sciences, UKM
43600 Bangi, Malaysia

Telephone:
603 - 825 2988, 829 3382

Telefax:
603 - 825 2698

Office hours:
8.30 am - 5.30 pm *(Mon - Fri)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Universal texture machine	Food texture	Schimatzu texture machine
Deboning machine	Removing fish bone	Taiwan-made
Meat processing machinery	Processing	Assorted

SOFTWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Electrophoresis	Food additives	Biorad Equipment Assorted
IEF. unit	Food proteins	
Distillation Kjeldahl units	Laboratory analysis	

RESEARCH EXPERIENCE

- Meat & Poultry processed products
- Biochemistry of meat proteins
- Quality control of poultry & meat products
- Food additives and ingredient analyses
- Meat products development

CONSULTANCY EXPERIENCE

- Product formulation - Dindings poultry processing
- Equipment processing small goods plant - MBf Carls Jr
- Product Development - Fika Food Sdn Bhd

SERVICES OFFERED

- Formulation, new products
- Utilisation of Mdm, Skin, Trimming
- Improvement of meat & poultry products

FIELD OF RESEARCH

Vitamin E and Chemical Carcinogenesis

Name of group/centre:
Medical Faculty

Name of laboratory/project:
Vitamin E and Chemical Carcinogenesis

Person(s) to contact:
- Assoc. Prof. Dr. Wan Zurinah Wan Ngah
- Dr. Alini Marzuki

Postal address:
Department of Biochemistry
Faculty of Medicine, UKM
Jalan Raja Muda
50300 Kuala Lumpur, Malaysia

Telephone:
603 - 292 3066 *ext. 5292 / 5222*

Telefax:
603 - 291 2659

Office hours:
9.00 am - 4.15 pm *(Mon -Fri)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Spectrophotometer	Measure absorbance,enzymes kinetics	Shimadzu UV-Vis 2101 PC Wavelength range 190 nm - 900 nm Wavelength accuracy ±0.5 nm (automatic wavelength calibration) Photometric system - double beam Photometric range 4-5 abs Monochromator - Aberration corrected Czerny - Turner mounting, High performance blaze holographic grating

		Measurement modes: ● Spectrum measurement ● Time course ● Quantitative
Electrophoresis tanks, Vertical and horizontal and power packs	Agarose gel, Polyacrylamide electrophoresis	IBI vertical electrophoresis EC Maxicell EC 360M 10 in x 10 in, Biorad DNA subcell 8 in x 8 in, Biorad Mini Protein 11 cel
Biohazard hood	Sterile techniques	Gelman Sciences Biological safety class II Personnel and product protection
CO_2 incubator	Cell culture	Jouan EQ 115 IR CO_2 Ambient temperature - range 18° to 51°C CO_2 inlet pressure 300Hpato 10kPa. Operating temperature range within the chamber: from 5°C above ambient to 45°C. Operating CO_2 percentage range 0.0% to 20%.
Cryostat	To prepare fresh tissue sections	Microm HM 505E Fine section thickness range 1-20 uM. Storage temp. range - 20°C to +50°C. Operating temp. range 0°C ~+35°C
Image Analyser	Quantitative surface area of cells and tissue	Kontron Elektronik
Ultracentrifuge	Preparation of subcellular fractions, gradient density of substance, Preparation of plasma lipoprotein.	Beckman- Model L-60 Maximum-70,000 rpm Specifications. Maximum speed -70,000 rpm Density rating at full speed - 1.2 g/ml Rotor material - titanium Number of tube cavities - 8

SOFTWARE FACILITIES

Equipment	Application	Technical specifications
Image analyser	Program is able to quantitate and and calculate surface area of cells	Kontron Elektronik
Spectrophotometer	Measure and calculate concentration of substances in solution, enzyme kinetics AU on windows.	Shimadzu 2101 PC UV-VIS Scanning Spectrophotometer

RESEARCH EXPERIENCE

16 years of doing research mainly on detoxication products and enzymes. Currently, doing research in the field of chemical hepatocarcinogenesis and the factors that modify this process viz. Vitamin E and steroids. Measurement of process was concentrated on histochemical and tumour marker enzyme activities.

CONSULTANCY EXPERIENCE

Involved in doing Joint Research with PORIM 1989 - 1993

SERVICES OFFERED

Can offer to test effect of substances/chemicals on the severity of hepatocarcinogenesis induced chemically in animals.

Histochemical and immunohistochemical assay for gamma-glutamyl transpeptidase and glutathione S-transferase.

Assays of drug metabolising enzymes.

Unit Perundingan Universiti Malaya (UPUM)
(University of Malaya Consultancy Unit)

Person(s) to contact:
Director of UPUM

Office address:
2nd Floor, Block D
Bangunan Perdanasiswa, Universiti Malaya
59100 Kuala Lumpur, Malaysia

Telephone:
603-758 7066, 758 5373
603-759 3556, 759 3557

Telefax:
603-758 7066

OBJECTIVES

UPUM was established with the following objectives:

- To provide consultancy and contract research work to various government departments and industries
- To offer professional services and courses to public and private sectors
- To have greater interaction with industries
- To carry out technological transfer to industries
- To introduce various academic and professional expertise available from the University

EXPERTISE

The range of expertise provided by UPUM, but not necessarily limited to, is as follows:

Civil and Structural Engineering
- design of civil and structural engineering works
- infra-structure works
- structural appraisal and assessment and concrete technology

Geotechnical Engineering
- foundation engineering
- slope stability
- site investigation and field instrumentation
- ground improvement

Water Resources and River Engineering
- feasibility study
- physical and numerical modelling
- flood forecasting and mitigation study
- river hydraulics and morphology

Coastal Engineering
- coastal protection structures
- marine and coastal pollution
- cooling water studies for Power Stations
- water quality

Environmental Engineering
- water and waste water treatment
- toxic and hazardous waste treatment
- computer simulation and application
- air and noise pollution study

Environmental Impact Assessment Studies
- new townships
- resort and marina development
- dredging and reclamation
- golf course, road and civil works

Highway, Transportation and Traffic Engineering
- traffic engineering
- traffic management and control
- highway and pavement design
- transportation planning and engineering
- traffic impact assessment

Information Technology
- software technology and engineering
- project management
- IT training
- LAN systems - Ethernet and token-ring

Electrical Engineering
- power system - dynamic and voltage stability and security
- neutral network applications in power systems problem
- load management and energy conservation

Chemical Engineering
- plastic, PVC compounding and processing
- chemical and bio-chemical engineering
- separation processes

Mechanical Engineering
- machine tool technology
- energy - solar; alternative fuels; energy conservation
- vibrations - conditioning monitoring of mechanics
- robotics and manufacturing automation
- foundry technology
- fatigue design
- tribology - friction and wear
- mechanical engineering design

Dentistry
- Public Health Dentistry
- Cleft Lip & Palate Surgery
- Implantology
- Lasers in Oral and Maxillofacial Surgery
- Research and testing of Dental Materials Properties

Medicine
- pathology & histopathology
- industrial health & management
- psychiatry and addiction
- paediatric surgery and urology
- internal medicine - cardiology

Universiti Malaya

Faculty of Science

EXPERTISE

Physical Science

- Molecular modelling and simulation using BIOSYM software
- Courses and training in simulation and molecular modelling and related subjects
- Approach of synthesis of molecules with the aid of molecular modelling

Biotechnology

- Research & Development Projects Consultancy in Animal Genetics and Animal Breeding and Biotechnology, Biometrics work
- Organic analysis, environmental organic and palm oil
- Use of industrial microbiology equipment (fermenters, cooling incubator shakers)
- Provision of suitable strains for industrial fermentation. Strain improvement (mutagenesis and recombinant DNA technology)
- Use of palm oil, palm kernel oil, fatty acids and glycerol for industrial fermentation
- Microbial quality control
- Diagnostic services in bacteriology, mycology and virology
- Protein purification and protein characterisation
- Detection and Quantification of Fine Chemicals from Microbial Sources
- Industrial waste treatment
- Mushroom cultivation
- Microbiological and biochemical analysis
- Design and optimisation of large-scale processes for bioseparations
- Design and optimisation of treatment processes for industrial wastewater containing heavy metals
- Fermentation of penicillins and other antibiotics, extraction and characterisation
- Isolation and maintenance of pure microbial cultures (bacteria, fungi)
- Physiological and biochemical studies

Chemistry

- Transition metal compounds
- Organometallic complexes
- Mechanisms of inorganic/organometallic reactions
- Analytical/environmental problems

Medical & Health Sciences

- Diagnosis of diromosomal abnormalities in prenatal cases as well as in individuals

Solid State Science & Related Technology

- Materials Analysis Characterisation
- Device Analysis
- Coating of Optoelectronic Component
- Reliability and Failure Analysis

Atomic, Molecular, Nuclear, Particles & Plasma Physics

- Indoor, outdoor and soil radon measurement
- Archeological and geological dating
- Identification, measurement and management of environmental radiation
- Nuclear tracks counting
- Thermoluminescence measurements
- Radon calibration

Materials Science and Technologies

- Infrared spectroscopy, scanning election microscopy
- Energy Dispensive Analysis of X-rays
- Absorption spectroscopy
- AC conductivity
- Transference number measurements
- Internal resistance measurements
- Preparation of glass, polymer films, composites

EQUIPMENT

- Barbender
- Dynamic Light Scattering Spectrometer
- Gel Permeation Chromomatograph
- Tensile Tester
- Atomic Force Microscope
- RF Furnace for Crystal Growth
- Scanning Electron Microscope
- XPS
- Tensometer and Accessories
- Ionic Autoanalyser
- Laser Microscope
- Coulter Particle Size Analyzer
- FT-NMR Spectrometer (400 Mhz)
- Liquid Scintillation Counter
- CHN Analyser
- Multithermal Analyser (DSC/TGA/DMA)
- Hot Press, Hot Roller Mill (for ceramics preparation)
- ICP
- Dynamical and Mechanical Analysis Instrument (for impact tensile/compresion, fatigue, shear, creep measurements)

EXPERTISE

Manufacturing and Process Technologies (Chemical Engineering)

- Distillation operation
- Separation using ultrafiltration
- Sieving operation

Material Sciences and Technologies (Chemical Engineering)

- Characterisation and testing of plastics
- Plastics processing and trouble-shooting

Information Systems and Technologies (Chemical Engineering)

- Computer solutions (Database, Fortran & C Programming, Software, Hardware & Installation, Testing & training)
- Consultancy and training of CAD (AutoCAD, ASPEN PLUS, HYSIM)

Industrial Biotechnology (Chemical Engineering)

- Investigation on fermentation process

Mass Transfer Operations (Chemical Engineering)

- Supercritical extraction of natural and edible oils and analysis using supercritical fluid chromatography
- Equilibrium, kinetics of absorption and chemical reaction studies for the removal of CO_2 in fuel using amine solutions

Power Electronics & MicroElectronics (Electrical Engineering)

- Consultations on:
  - Power Electronics
  - Micro-Electronics
  - RF Electronics

Geotechnical (Civil Engineering)

- Slope Stability
- Reinforced Earth
- Soil Improvement
- Environmental Geotechnics

Structural (Civil Engineering)

- Behaviour of High Rise Building
- High Strength Concrete
- Timber in Structural Engineering
- Non-destructive Testing
- Creep and Shrinkage

Transportation and Traffic (Civil Engineering)

- Additives and Fillers
- Computer Methods
- Road Safety

Environmental (Civil Engineering)

- Industrial Waste Treatment
- Biodegradibility and Treatability Studies
- Wastewater Treatment
- Treatment of Hazardous Wastes

Construction and Project Management (Civil Engineering)

- Modelling Construction Process
- Quality Cost in Construction
- Construction Project Management

EQUIPMENT

- GDS Stress Path Testing, Shear
- Consolidation Testing
- Chemical Test, Field Testing
- Flame Photometer
- Chromatograph, UV
- Lever Meter, Photometer
- Universal Testing Machines
- Concrete Materials Testing
- Pressure Ageing Vessel (PAV)
- (RTFOT), Polishing Stone
- Vehicle Data Acquisition
- Acquisition (VDAS)
- Universal Testing Machine
- HP Laser Interferometer system
- CNC lathe
- Cp Engineering computer controlled engine testbed and CADET 10 software
- Strength Testing
- Permeability Testing, Soil
- Atomic Absorbtion Spectrometer
- Spectrophotometer, Gas
- Spectrometer, Jar Test
- UASB, Anaerobic Contact
- Compression Testing Machine
- Structural Frame Testing
- Rolling Thin-film Oven Test
- Apparatus (MATTA), Camera
- (CAMDAS), Vehicle Data
- Plastic Injection Moulding Machine
- TAN and TBN lubricant testing
- Vibrations testing & measuring system
- Precision centre lathe, universal knee-type milling machine, precision grinding machine

Institute of Advanced Studies

EXPERTISE

- Genetic variation in pathogenic bacteria
- Pathogenesis of typhoid fever
- Molecular genetics of coronary heart disease
- Molecular studies of indigenous algal species
- Organotin chemistry
- X-ray crystallography
- Laser and applications
- Electrical breakdown of gases
- Plant molecular biology
- Plant genetic engineering
- Plant hormones and flowering (in oil palm)
- Agronomic aspects and undergrowth (in oil palm)
- Feed resources for small ruminants
- Larval taxonomy and ecology of marine prawns
- Mangroves and coastal fisheries
- Prawn larviculture
- Chemistry of insect secretions
- Natural product chemistry
- 2D-NMR and mass spectroscopy
- Insect mating behaviour and reproductive strategies
- Insect pheromone and chemical communication
- Plant kairomone as insect attractant
- Ultrastructural development in animal embryology
- Taxonomic and ultrastructural studies of higher marine and mangrove fungi
- Electron microscopic applications in material sciences
- Biological electron microscopy
- Taxonomy and biology of mycorrhizal fungi
- Eco-physiology of actinorhizae and phosphate-solubilising microorganisms
- Algal biotechnology
- Algal taxonomy
- Algal ecology
- Wastewater treatment and utilisation
- Bioactive substances from coastal and marine resources
- Waste utilisation by microbes
- Phototrophic bacteria in aquaculture
- Epstein - Barr virus and nasopharyngeal carcinoma
- Molecular biology of heart disease
- Microbial polymers with industrial applications
- Production of antibiotics by fermentation processes
- Freshwater ecology
- Environmental assessment studies
- Waste treatment management
- Development of biological/ecological water quality assessment and classification
- Biomonitoring

EQUIPMENT

- Gas Chromatograph-Mass Pectrometer (Gc-MS)
- Scanning Electron Microscope (SEM)
- Inductively-Coupled Plasma Atomic Emission Spectrometer (ICP-AES)
- Graphite Furnace Atomic Absorption Spectrometer (GFAAS)
- Fourier Transform Nuclear Magnetic Resonance Spectrometer (FTNMR)
- Spectrophotometers
- Gcs
- HPLCs
- IR
- UV-Vis

EXPERTISE

Anatomy
- Nerve-muscle interactions
- Factors affecting motoneurone development
- Alveolar bone loss mechanisms in leprosy
- Periodontal disease patterns
- Development and maturation of motorneurons and muscle

Biochemistry
- Dietary fats in relation to heart disease and cancer
- The role of calmodulin in bone formation
- Activation of alkaline phosphatase from bone
- Anti-inflammatory activity of nutmeg
- Steroid profiling
- Role of calmodulin in bone formation
- Industrial and environmental biochemistry and biotechnology

Pharmacology
- Development of computer softwares for medical education
- Drug interaction with ionic and non-ionic contrast media
- Toxity of pesticides
- Drug metabolism
- Clinical pharmacokinetics
- Traditional medicine and interesting plants from Malaysian forest

Physiology
- Physiology of relaxing and reproduction
- Techniques of immunoassay
- Physiology of thyroid gland
- Physiology of exercise

Medical Microbiology
- Rapid diagnosis of viral diseases
- Antibiotics
- Infactive diarrhoea
- Sexually transmitted diseases
- Clinical use of antibiotics
- Medical mycology
- Virology - hepatitis and HIV infection
- Viral infections in the immunocompromised patients
- Rapid diagnosis of dengue viral infections

Obstetrics and Gynaecology
- Public health
- Epidemiology of endometriosis
- Endometriosis and infertility
- Feto-meternal medicine
- Contraception
- Malignancies of the female genital tract
- Male sterilisation
- Maternal and child health
- Umbilical blood flow in abnormal pregnancy states

Opthalmology
- Anterior chamber implants
- Ocuoplastic surgery
- Corneal diseases and infections
- Contact lens practice
- Lasers in diabetic retiopathy

Otorhinolaryngology
- Endolaryngeal laser surgery
- Head and neck oncology
- Oral cavity cancer
- Photodynamic therapy in cancer
- Nasal deformity treatment
- Otis externa - artiology, presentation and management

Parasitology
- Seroepidemiology of parasitic diseases
- Epidemiology of malaria
- AIDS and opportunistic infections
- Epidemiology of parasitic diseases
- Cryptosporidiosis: biology of parasites and diagnosis of disease

Pathology
- Immunoassay methodology
- Breast cancer
- Pathology of tissue parasites
- Haematological malignancies
- Autologons blood transfusion

Paediatrics
- Child abuse
- Childhood cancer
- Bone marrow transplantation (BMT) in children

- Use of GM-CSF in bone marrow transplantation
- Infections of neonates
- Epidemiology of childhood injuries
- Immunology
- Infectious diseases

Medicine

- Diabetes and pregnancy
- Diabetes and drug trials
- Molecular biology of leukaemia
- Use of CD4 in predicting progression to AIDS
- Squamous cell carcinoma antigen as a tumour marked
- Treatment of adult leukaemia and lymphomia
- Bone marrow transplantation
- Stroke in young
- Paraquat poisoning, a control trial with leucocyte suppression therapy
- Medical care of elderly aged 65 years and above

Social and Preventive Medicine

- Vaccine preventable diseases
- Reproductive health of women
- Child labour
- Epidemiology of worm infestations in children

Psychological Medicine

- Psychosocial rehabilitation
- Psychiatric education
- Drug and alcohol dependence
- General clinical psychiatry
- Liaison psychiatry
- Psychosexual disorders
- Adolescent emotional problems
- Cigarettes used and policy among psychiatric patients
- Health psychology
- Psychiatric illness in adolescence
- The role of criminal justice system in drug dependence problems

Primary Medical Care

- Epidemiology and prevention of injuries in Malaysia
- Epidemiology of diseases in the elderly in the Kuala Langat district

Surgery

- Pain relief after thoracotomy
- Minimal access cardiac surgery
- Monocusp valves for the pulmonary outflow tract

Orthopaedic Surgery

- Operative treatment of scoriosis-prolnostic factors
- Long term outcome of stable vertebral fractures
- Recurrent anterior dislocation of shoulder
- Ultra sound and epiphysial growth in rabbits
- A new operation for torticollis
- Diabetic infections in orthopaedic surgery
- Industrial hand injuries

Biochemistry Practical (Pre-clinical)

Orthopaedic Clinic & Clinical Students

Faculty of Dentistry

EXPERTISE

Oral Pathology, Oral Medicine and Periodontology

- Viruses and oral tumours
- Salivary gland neoplasms
- Tumours of jawbones
- Gingival hyperplasia in periodontal patients
- Guided tissue regeneration to treat periodontal disease
- Association of HLA-DR4 antigen and rapidly progressive periodontitis
- DNA hybridisation of the pathogen-related oral spirochaetes
- Oral mucosal lesions in elderly Malaysians
- Oral health indicators

Children's Dentistry and Orthodontics

- Fluorides and enamel defects
- Oral health on normal/handicapped Malaysian children
- Tooth abnormalities in children
- 'Preventive' restorations

Community Dentistry

- Socio-dental indicators
- Socio-oral health indicators
- Oral health status opf the elderly
- Oral epidemiology
- Health services research
- Dental manpower
- Preventive dentistry
- Oral health of 12-year-old Malaysian children
- Dental beliefs, attitudes and behaviour of 12-year-old Malaysian children

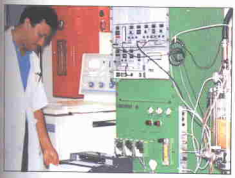
Prosthetic

- Implants - surface treatment - S.E.M. study
- Odontologyforensic
- Titanium alloys - uses in prosthetic dentistry
- Sectional denture
- Magnets - uses in dental prosthesis
- Gerodontic/geniatric dentistry
- Denture cleaning habit
- Prostheses for maxillo-facial defects

University Malaya Medical Centre

UNIVERSITI PERTANIAN MALAYSIA

The mission of UPM is to be a leading centre of learning and research, contributing not only towards human advancement and the creation of knowledge but also to the creation of wealth and nation building.



Programs Study

Bachelor

Bachelor of Economics
Bachelor of Accountancy
Bachelor Business Administration
Bachelor of Science (Honours)
Bachelor of Computer Science
Bachelor of Accountancy with Education
Bachelor of Engineering (Civil)
Bachelor of Engineering (Electronics/Computer)
Bachelor of Engineering (Mechanical/System)
Bachelor of Engineering (Agricultural)
Bachelor of Science (Environmental)
Bachelor of Science (Biotechnology)
Bachelor of Science (Nutrition and Community Health)
Bachelor of Science (Human Development)
Bachelor of Science (Agribusiness)
Doctor of Veterinary Medicine
Bachelor of Science (Biomedical Science)
Bachelor of Science (Marine Science)
Bachelor of Science with Education (Hons.)
Bachelor of Food Science and Technology
Bachelor of Education (Guidance and Counselling)
Bachelor of Education (Physical Education)
Bachelor of Education (Agricultural Science)
Bachelor of Education (Home Science)
Bachelor of Education (Teaching of Bahasa Malaysia as a First Language)
Bachelor of Education (Teaching of English as a Second Language)
Bachelor of Horticulture Science
Bachelor of Forestry Science
Bachelor of Fish Science
Bachelor of Agricultural Science
Bachelor of Art

Post Graduate

Doctor of Philosophy
Master of Science
Master of Business Administration
Master of Agricultural Science

Diploma

Diploma in Computer Science
Diploma in Agricultural (Engineering)
Diploma in Human Development
Diploma in Animal Health and Production
Diploma in Forestry
Diploma in Fisheries
Diploma in Agribusiness
Diploma in Agriculture

Matriculation Center

Matriculation (Science)
Matriculation (TESL)
Matriculation (Accountancy)

For further information, please contact:

Chancellary : Universiti Pertanian Malaysia, 43400 UPM Serdang, Selangor, Malaysia
Tel: 603-9486101-10 Fax: 603-9483244

Director : Research Institute Universiti Pertanian Malaysia, 43400 UPM Serdang, Selangor, Malaysia
Tel: 603-9488314 Fax: 603-9432513

Universiti Pertanian Malaysia

FIELD OF RESEARCH

Aquatic Resources, Environmental, Fisheries, Oceanography and Marine Biotechnology

Name of agency/institution/company

UPM Consultancy Services

Name of group/centre:

Faculty of Fisheries and Marine Science

Name of laboratory/project:

Aquatic Resources, Marine Science and Coastal Zone Management

Person(s) to contact:

- Assoc. Prof. Dr. Hj. Mohd. Zaki Mohd. Said
- Prof. Dr. Mohd. Ibrahim Hj. Mohamed

Office address:

Faculty of Fisheries and Marine Science
Universiti Pertanian Malaysia
43400 UPM Serdang
Selangor, Malaysia

Telephone:

603 - 948 8822 *(Office)* 603 - 948 6101 *ext 2501 / 2509 (Lab)*

Telefax:

603 - 948 2697

Office hours:

8.00 am - 4.15 pm *(Mon-Fri)* 8.00 am - 12.15 pm *(Sat)*

SERVICES OFFERED

- Aquatic animal culture, health, management biology, biotechnology and nutrition consultancy
- Environmental physiology, neurotechnology and fishery technology

SUMMARY OF RESEARCH/CONSULTANCY EXPERIENCE

The group of consultants consists of 32 Ph.D and 12 M.Sc degree holders with experience in all aspects of Fisheries Biology, Aquaculture, Mariculture, Nutrition, Animal Health, Genetics, Physiology, Toxicology, Neurobiology, Microbiology, Virology, Water analysis, Limnology, Ecology, Recreational Fishery, Fishing Technology, Oceanography, Coastal Zone Management and have taken part in numerous consultancy projects both local and international.

HARDWARE FACILITIES / EQUIPMENT

Equipment	Application	Technical specifications
Automatic tissue processor	For processing tissues	Process 100 tissue sampler per cycle
Biofreezer	Rapid cryopreservation of cells etc.	Nicool LM10
Double Distiller and Deioniser	Deiotised water for cell culturing	Hamilton & Barnstead E- pure 17 megaohm-cm
DNA Thermocycler	Amplification of nucleic acids	Perkin Elmer Model 480
Electrophoresis unit	Analysis of nucleic acids and proteins	Mimigel Dual Slab & Minicell
GC	Fatty acid analysis	All fatty acids (%)
Hotpack (Incubator)	Incubating	-20°C -60°C, -20°C -60°C, 0°C -100°C
HPLC	Amino acid analysis	All amino acids (µg)
Infrared spectrometer	Absorbance reader	4000 cm^{-1} - 600 $^{-1}$ cm
Incubator -Low Temperature	Cell cultures & virus propagation	Lr-6000D; Temp. range -2 to + 20°C IS-2200; Temp. range 0 to + 50°C
Inverted & Epi-fluorescence Microscope	Examination of live and fixed cells	Nikon Diphot
Kjeltec	Macro protein analysis	Percent (%)
Liquid nitrogen tanks	Cryopreservation of cells and virus	down to -179°C
Milipore Filtration System	Filtration water sample	Pore Size 0.45micron
Microtome	For tissue sectioning	1-10 µm
Nitrogen regulator	Pressure regulator	0-15 psi
Spectronic 20	Measuring light absorbance	340-960nm
SCT Meter	To obtain salinity, conductivity and temperature values for water	YSI Model 33 S.C.T. Meter
	Measuring the conductivity, salinity and temperature	0 - 500µmhos
Soxtec	Lipid Analysis	Percent (%)
Thermostatable Spectrophotometer	Digestive enzymes, protein, lipid, cholestrol etc.	All digestive enzymes (IU) Protein, lipid, cholestrol(µg)
Ultracold Freezer (-80°C)	Storing samples for enzyme analysis	
Ultrasonicator	Disintegrate cells	Vibra cell; 10 - 90 % duty cycle
Boat UNIPERTAMA I	GRT 25 Net hauler (12 persons)	Gillnet, Longlines, Oceanography, Scuba Diving, Trawl, Traps
UNIPERTAMA II	GRT 27. 45, Net hauler (12 persons)	Gillnet, Longlines, Oceanography, Scuba Diving, Squidnet, Stick held dip net.
UNIPERTAMA V	GRT 476..75t (59 persons) Equipment with: 3 Main Transmitters, 2 Sub Transmitters, 3 Receivers, 1 UHF, 2 VHF, 2 direction Finder, 2 facsimile, Trawl winch, Net winch, General Service winch, Cargo winch, Line Hauler, Trawl Door, Windlass, Fish Detector, Sonar, Belt Conveyor, 3 sets computers (PC), Self recording current meter, Bottom sampler, CTD, Photometer and data logger, Multi parameter water quality, Logging System, Turbidity meter, Water sampler	

SOFTWARE FACILITIES

Programme	Application	Technical specifications
SAS Programme	Regressing Analysis, Multiple Regression, Anova, Correlation	Length-weight relationship, Ecological Study and Taxonomy
ELEFAN Programme	Growth Parameters, Mortality, Recruitment	
MICROBRIAN	Remote Sensing Image Analysis System	

AN ACCURATE AND REALISTIC PACKAGE FROM THE FACULTY OF FISHERIES AND MARINE SCIENCE

AQUATIC ECOSYSTEM MANAGEMENT GROUP is engaged in Management of Malaysian water bodies and their research include Taxonomy, Fish Population Studies, Resource Partitioning, Fish Population, Ecosystem Processes and Management Studies. This group has a wide range of consultancy experience from EIA to pond construction, coral reef management, district development plan, coastal and offshore management, etc.

AQUACULTURE TECHNOLOGY RESEARCH GROUP is presently working to acquire the best and most efficient aquatechnology to meet the demand for fish and prawns needs of the country. This group has undertaken consultancy on EIA of prawn/fish farming projects, seed production, nutrition and feeding of shrimp and fish.

FISH AND PRAWN TECHNOLOGY GROUP conducts research on fish and prawn nutrition and has been involved in feasibility studies into various local ingredients for fish and prawn feeds.

GIANT FRESHWATER PRAWN FARMING GROUP is conducting research at producing a technical package for the farming of giant freshwater prawn and was involved in the feasibility studies and management of marine and freshwater aquaculture projects.

AQUATIC ANIMAL HEALTH MANAGEMENT GROUP is engaged in the identification of pathogens in aquatic animals, development of rapid diagnostic tests for virology and bacteriology and production of vaccines for controlling disease and has the experience of conducting specialised training for health workers and providing disease diagnostic services.

AQUATIC BIOTECHNOLOGY RESEARCH GROUP is presently working on various aspects of aquatic biotechnology of marine and freshwater species.

ENVIRONMENTAL PHYSIOLOGY AND AQUATIC NEUROTOXICOLOGY GROUP has expertise in water borne toxicity using various animal models and bioassays. They have the expertise of undertaking consultancy service on the effects of pesticides and heavy metal contamination on aquatic animals. They also have undertaken consultancy services for Malayan Tobacco Company and with Canadian Companies.

FISHERY TECHNOLOGY GROUP undertakes research on the development of appropriate technology for fish capture, fish aggregating devices, fishery forecasting and development. This group has evaluated deep sea fishing projects for Malaysian Shipyard and Engineering (MSE) and Majuikan Sendirian Berhad.

With more than 18 years of research teaching and consultancy experience in Malaysia, our knowledge in the local and regional aquatic scene provide the strategic advantage in the field.

FIELD OF RESEARCH

Chemistry and Pharmacology of Bioactive Natural Products

Name of group/centre:
Natural Products Group

Name of laboratory/project:
Natural Products Laboratory

Person(s) to contact:

- Prof. Dr. Nordin Lajis
- Assoc. Prof. Dr. Mawardi Rahmani
- Prof. Dr. Ruth Kiew
- Dr. Manaf Ali

Office address:

Department of Chemistry
Universiti Pertanian Malaysia
43400 UPM Serdang
Selangor, Malaysia

Telephone:

603 - 948 6101 *ext. 3585*

Telefax:

603 - 948 6646

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.15 pm *(Sat)*

SERVICES OFFERED

- Chemical analysis of biological materials
- Bioactivity evaluation of natural products or other chemicals
- Botanical studies of plants

SUMMARY OF RESEARCH

Natural Products Group of Universiti Pertanian Malaysia has been actively involved in research leading to the isolation and identification of bioactive compounds extracted from biological resources. This integrated research which involves chemists, botanists, pharmacologists and microbiologists of high caliber has resulted in the discovery of new compounds, the discovery of new plant species, the isolation and identification of bioactive compounds, and the discovery of plants as a new source of high value natural products. For its dedication in research, the team has been appointed as the headquarters for the UNESCO Regional Network for the Chemistry of Natural Products. The laboratory is well-equipped with gas chromatography-mass spectrometer, Nuclear Magnetic Resonance, HPLC, FTIR as well as other basic apparatus for isolation, purification and spectroscopic studies of chemical compounds. Several bioassays including anti-microbial and anti-candida, anti-viral, anti-cancer and insecticidal activities are available.

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Gas Chromatograph-mass spectrometer	Identification of chemical compounds	Mass range 10 to 2,000 amu
Nuclear Magnetic Resonance	Identification of chemical compounds	90 MHz and 60 MHz
Fourier Transformed infra-red spectrometer	Identification of chemical compounds	4,000 cm^{-1} to 600 cm^{-1}
High performance liquid chromatograph	Isolation and purification of chemical compounds and quantitative analysis of mixtures	uv and RI detectors with pressure limit of 6,000 psi
Polarimeter	Optical rotation of molecules	± 90 using Faraday Symmetric angular oscillation by the optical null method
Gas chromatography	Quantitative analysis of mixtures	FID, TCD detectors

FIELD OF RESEARCH

Dielectric Physics, Microwave Physics and Techniques

Name of group/centre:

Centre for Measurements and Testing, Physics Department

Name of laboratory/project:

- Microwaves Lab.
- Dielectrics Lab.
- Thermal Analysis Lab.

Person (s) to contact:

- Dr Kaida Khalid *(Assoc. Prof.)*
- Dr Wan Mohd. Daud Wan Yusof *(Lecturer)*
- Dr Yahya Mat Hassan *(Assoc. Prof.)*

Office address:

Department of Physics
Universiti Pertanian Malaysia
43400 UPM Serdang, Selangor, Malaysia

Telephone:

603 - 948 6101 *ext 3557 (Dept.), 3651 (Room), 3669 (Lab)*

Telefax:

603 - 948 6646

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.15 pm *(Sat)*

SERVICES OFFERED

- Dielectric properties measurement
- Rf/microwave instrumentation and measurement
- Thermal analysis

SUMMARY OF RESEARCH/CONSULTANCY EXPERIENCE

The R & D activities in the laboratories involve the measurements of the dielectric properties and conductivity of agricultural products and some polymers over a frequency range of the DC to microwave region.

The laboratories also provide consulting service and research facilities on the design and application of microwave power especially in the area of moisture content determination.

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Microwave Network Analyser	Reflection/Trans characteristics	120 MHz 20 GHz
Combined Network/Spectrum analysis	Device measurements	10 Hz -500 MHz
Spectrum Analyser	Device measurements	9 KHz - 22 GHz
Dielectric Probe System	Microwave dielectric measurements	120 MHz - 20 GHz -40 °C - 200 °C
Dielectric Spectrometer	Dielectric measurement	10^{-3} Hz to 10^{7} Hz -100 °C to 500 °C

Differential Scanning Calorimeter	Changes of heat flow	-165°C to 700°C
Dynamic Mechanical Thermal Analyser	Rheological properties	-150°C to 500°C 0.01 to 200 Hz tan: 0.0001 to 9.999
Dielectric thermal analyser	Dielectric properties	-150°C to 500°C 20 Hz to 100 KHz
Karl-Fisher titrator	Water content (ppm)	10 microgram - 100mg
Oven	Heating	30 - 200°C
Microwave Oven	Heating	600 Watt
Latexometer	Dry rubber content	Accuracy : 1 %

SOFTWARE FACILITIES

Programme	Application	Technical specifications
PLETA	Thermal analysis measurement and control	Thermal analysis and data
Material Measurement Software	Microwave dielectric measurement	Calculate permittivity and Cole-Cole plot
Dielectric spectrometer software	Automatic experiment control	Calculate permittivity and plotting

OTHER INFORMATION

MICROWAVES-DIELECTRIC-THERMAL LABORATORIES

Low-intensity microwave has been extensively used in industry, science and medicine for non-destructive testing and monitoring of materials. Examples of industrial and agricultural applications include moisture content measurement and monitoring which, in turn, are related to a parameter of interest e.g. quality of the product, degree of ripeness and process control in water-based industry. The research of the group is directed to the analysis and optimal design of new microwave sensor from various types of configurations such as microstrip, waveguide, coaxial line and resonant types. This sensor will be used for the development of a simple, portable, low cost and reliable instrument for quick determination of the quality of the agricultural product at the collecting center. The group has successfully developed the MRT-LATEXOMETER for determination of rubber content and water content in the hevea latex. This instrument can also be calibrated for various lossy liquids.

Customers must know material properties of dielectric properties in order to improve designs, control quality, increase yields, control microwave process or as a research tool for studying the structure of materials at molecular levels. In dielectric lab, the measurement of dielectric properties of material is based on the LF/RF/microwave network analysers and charge-discharged techniques. The main projects currently active are concerned with the investigation of dielectric properties of hevea rubber latex, activated carbon, woods, ceramics and oil palm fruits. Both theoritical and experimental activities involve with the effects of density, chemical composition (water content), temperature and state of water.

In the thermal analysis lab, the researcher can perform the most advanced thermal analyses, such as : differential scanning calorimetry, dielectric thermal analysis and dynamic mechanical thermal analysis. The analyzers are built with exceptional quality and precise temperature control. The thermal analysis plays a major role in the characterisation of materials especially polymer, composite polymer and new semiconductor.

Centre for measurements and testing has been set up to be very much research oriented. However the laboratories have the ability to provide technical services, product development and consulting services.

FIELD OF RESEARCH

Environment

Name of group/centre:
Department of Environmental Science

Name of laboratory/project:

- Air pollution and Noise
- Estuarine & Coastal Studies
- Environmental Information System *(GIS, Environmental Planning)*
- Waste Water Analysis
- Applied Hydrology

Person(s) to contact:
Head, Dept. of Environmental Science

Office address:
Department of Environmental Science
Faculty of Science & Environmental Studies
Universiti Pertanian Malaysia
43400 UPM Serdang
Selangor, Malaysia

Telephone:
603 - 948 6101 *ext. 3573*

Telefax:
603 - 948 6646

Office hours:
8.00 am - 4.35 pm *(Mon - Thurs)*

SERVICES OFFERED

- Environmental Impact Assessment Study & Consultation (EIA)
- Assessment of exposure to environmental pollutants
- Wastewater monitoring, treatment and analysis
- Air quality studies, biomonitoring
- Field hydrologic studies, soil erosion and river sedimentation
- Analysis of lechate contamination generated in landfills
- Estuarine and Coastal Studies

SUMMARY OF RESEARCH

The department is engaged in research projects covering a wide range of environmental problems. These include water quality and waste water treatment processes, air and noise assessment, coastal/Estuarine studies, hydrology & catchment assessment, economic and environmental planning.

The academic staff comprises specialists in a wide number of disciplines from arts and sciences to engineering, has been involved in various consultation and advisory activities both with the government, private sectors and with international agencies such as WHO and Asian Development Bank (ADB).

The department has extensive academic expertise in the field of Environmental Impact Assessment Study (EIA), and consultations. Most of the academic staff are members of the ad-hoc panel on detailed

evaluation on EIA set up by the Department of Environment , Malaysia. Some of the recent EIA consultancy works carried out, relate to land conversion, landfill site assessment, coastal land development and reclamation, soil and water conservation, airport construction, steel mill, petrochemical refineries and power stations.

HARDWARE FACILITIES/EQUIPMENT

The support services available include a wide range of field and laboratory equipment and specialised facilities. These include:

Equipment	Application	Technical specifications
Sound Level meter	Sound Level measurement	Type 3
Total organic carbon analyser	TOC measurement	ppb - ppm range
HACH DR 2000 Spectrophotometer	Measurement of merals and nutrients	-
Global Positioning System (GPS)	To locate geographic location	Accuracy ±50 m
MCSAM	Automobile automatic air quality monitoring stations	TSP (ppb - ppm) O_3 (ppb - ppm) NMHC NO_X Meteorological parameters
Water Quality data logger	In situ water quality	pH, depth, DO, salinity conductivity temperature
Sediment transport channel	Observation of erosion & deposition study suspended sediment transport and bed load transport	Motorised paddle wheel 0 - 100 rpm working section 150 m (ht) 600 m (length) 60 m (depth)
Constant Head permeameter	Field saturated hydraulic conductivity soil sorptivity matric flux potential	Hydraulic conductivity range : 10-4 - 10-8 m/sec.
Gas chromatography	-	-
HPLC (High performance liquid chromatography)	-	-
AAS (Aromic absorption Spectrometer)	-	-
Automatic liquid sampler	Automatic sampling for river and wastewater	200 ml bottle capacity with timer every 10 min, 30 min and 24 hours.
Portable rainfall simulator	Field soil erosion characteristic	Test slope 20° Plot size 0.0625m2

SOFTWARE FACILITIES

Programme	Application
GIS (Geographic Information System)	Mapping and spatial analysis of geographic and environmental data

OTHER INFORMATION

The department has also set up a TAS unit which is involved in technical and advisory services for operation and maintenance of wastewater treatment plants.

FIELD OF RESEARCH

Food Science and Biotechnology

The Faculty of Food Science and Biotechnology started as the Department of Food Science and Technology on 1st March 1976 under the Faculty of Agriculture. On 1st March 1982, it was awarded the status of a faculty with two departments : Food Science and Food Technology. In 1986, the Department of

Biotechnology was founded and the faculty changed its name to the Faculty of Food Science and Biotechnology.

Amongst the main objectives of the faculty are :

- To prepare and provide trained personnel in the various disciplines of Food Science, Technology and Biotechnology to meet national requirements
- To conduct and excel in research activities in various disciplines of Food Science, Technology and Biotechnology
- To provide the necessary expertise to support services for large, medium and small-scale food industries and to collaborate with other research institutions

Currently the Faculty offers two undergraduate programs namely Bachelor of Food Science and Technology and Bachelor of Science (Biotechnology), Graduate programmes leading to the degree of Master of Science and Doctor of Philosophy by research are also offered in various disciplines of food science, food technology and biotechnology. A taught M.S. programme in Food Technology will be offered from 1995/96 session. These programs are supported by 55 academic staff and 60 support staff.

In the early years of the faculty, much effort was concentrated on curriculum development and teaching with less emphasis on research. Since 1985, the faculty was involved in the ASEAN Food Habits Project and the ASEAN Protein Project which were collaborative projects between ASEAN member countries and Australia for 5 years. These funds contributed to the early development of the faculty in terms of its research facilities. Between 1986-1990 under the Fifth Malaysia Plan, the faculty received more than RM2 million to support research and development on various aspects of food science and biotechnology. This injection of research funds created a significant increase in the research activities in the Faculty. Much of these funds were used to develop laboratory facilities making the faculty one of the best equipped food science and biotechnology laboratories in the country. Under the Sixth Malaysia Plan, the faculty received a total of more than RM 9 million under the IRPA mechanism. With such support, it is possible for researchers to investigate further into fundamental and applied sciences of food science and biotechnology.

The faculty received research grants from the government through the IRPA mechanism and the following agencies : Malaysian Cocoa Board, Sarawak State Government, PORIM, RRI, Petronas, The Australian Centre for International Agricultural (ACIAR), Food and Agricultural Organisation (FAO), International Development Research Centre (IDRC), The International Foundation of Science (IFS), Australian Asean Economic Cooperation Program (AAECP) and Japanesse International Cooperation Agencies (JICA).

Currently, various expertise and research groups are available in the faculty as listed below:

Research group	Contact personnel
Fruit Processing Group	Dr. Salmah Yusof
Food Process Engineering Research Group	Prof. Madya Dr. Asbi Ali
Plant Genetic Engineering Research Group	Dr. Suhaimi Napis
Dairy Technology Research Group	Dr. Mohd. Yazid Ab. Manap
Product Development Research Group	Prof. Madya Asiah M. Zain
Food Safety Research Group	Prof. Madya Dr. Gulam Rusul
Post-harvest Technology Fruit Research Group	Dr. Azizah Osman
Sago Research Group	Prof. Madya Dr. Asbi Ali
Starch and Carbohydrate Research Group	Dr. Sh. Kharidah Sy. Muhammad
Fats and Oils Research Group	Prof. Madya Dr. Yaakob Che Man
Cocoa Technology Research Group	Prof. Madya Dr. Jinap Selamat
Fish Processing Research Group	Prof. Dr. Yu Swee Yean/ Dr. Abdullah Abu Bakar

■ Protein Research Group	Dr. Junaidah Abd. Hamid / Prof. Madya Dr. Suhaila Mohamed
■ Fermentation Technology and Bioprocess Engineering Research Group	Prof. Madya Dr. Mohamed Ismail Abdul Karim
■ Food Biotechnology Research Group	Prof. Madya Dr. Hasanah M. Ghazali
■ Molecular Biology and Genetic Engineering Research Group	Dr. Norihan Mohd. Saleh
■ Animal Cell Biotechnology Research Group	Dr. Abdul Manap Ali

FIELD OF RESEARCH

Biotechnology

Fermentation Technology and Bioprocess Engineering

Name of group/centre:

Fermentation Technology and Bioprocess Engineering Group

Person(s) to contact:

- Dr. Mohamed Ismail Abdul Karim
- Mohd. Ali Hassan
- Badlishah Sham Bahrin
- Dr. Baharuddin Ghani
- Dr. Arbakariya Ariff

Office address:

Department of Biotechnology
Universiti Pertanian Malaysia
43400 UPM Serdang
Selangor, Malaysia

Telephone:

603 - 948 6101 *ext. 3406*

Telefax:

603 - 948 5970

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.15 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Bioreactor	Laboratory scale biochemical reactions using microbial, animal and plant cells for the production of metabolites with commercial potential	2, 5 and 10 L fully automated bioreactor with process control
Bioreactor	Pilot Scale study, scaling up operation	50 L fully automated
Continuous Centrifugation System	Continuous cell separation	10 - 100 L capacity
Atomic Absorption Spectrophotometer	Analyses of elements	Fully automated, graphite and flame furnace
HPLC	Analyses of compounds	Isocratic and gradient
Ultra & Ceramic Membrane filtration system	Separation system	Working vol. 1,000 L
Continuous Plate Heat Exchanger Bioreactor	Starch hydrolysis	Continuous flow up to 1L min

SOFTWARE FACILITIES

Equipment	Application	Technical specifications
Process Control for fermentation	To control fermentation parameters	Can run four bioreactors simultaneously

RESEARCH EXPERIENCE

- Microbial fermentation and scaling up operation in the production of useful metabolites
- Agricultural and industrial waste treatment (liquid and solid) by bioprocess system
- Bioseparation technology for industrial application
- Starch bioconversion for industrial feedstock
- Bioprocess modeling system

CONSULTANCY EXPERIENCE

- Fermentation Technology & Bioprocess Control System
- Waste Management and Treatment

SERVICES OFFERED

- Design of Fermentation and Bioprocess System
- Waste Management and Treatment (Agricultural and Industrial)
- Microbial Technology Application

FIELD OF RESEARCH

Food Processing

Fish Handling and Utilisation Technology

Name of group/centre:

Fish Handling and Utilisation Technology

Person(s) to contact:

- Dr. Abdullah Abu Bakar *(Group Leader)*
- Assoc. Prof. Dr. Yu Swee Yean *(Researcher)*
- Dr. Jamilah Bakar *(Researcher)*
- Fatimah Abu Bakar *(Researcher)*

Office address:

Department of Food Technology
Universiti Pertanian Malaysia
43400 UPM Serdang
Selangor, Malaysia

Telephone:

603 - 948 6101

Telefax:

603 - 948 5970

Office hours:

8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.15 pm *(Sat)*

HARDWARE FACILITIES AND EQUIPMENT

Equipment	Application	Technical specifications
Surimi processing equipment	Pilot scale surimi production	100 kg of surimi/hour
Smoke house	Drying and smoking of fish and other food products	Maximum capacity : 50 kg
High performance liquid chromatography	Detection of amines and nucleotides from fishery products	Isocratic and gradient
Texture meter	Determination of texture of muscle and food products	
Air blast freezer	Freezing and chilling of food products	Minimum temperature : -35°C

RESEARCH EXPERIENCE

- Product development
- Spoilage indicator of fish
- Anesthetisation of freshwater and tiger prawn by hypothermia

SERVICES OFFERED

- Product development of fish-based and other food products
- Plant design
- Quality determination of fish and fish products
- Short courses in fish processing and quality control

CONSULTANCY EXPERIENCE

- Development and improvement of fishery and meat products
- Design of processing plant
- Quality control in fish processing plant
- Identification of investment opportunities in the food industry

FIELD OF RESEARCH

Food Science

Carbohydrate Research

Name of group/centre:

Sago Research Group

Research laboratory/project:

Carbohydrate Research Laboratory

Person(s) to contact:

- Dr. Mohd. Nasir Azudin *(Group Leader)*
- Dr. Sharifah Kharidah Syed Muhammad *(Researcher)*

Office address:

Faculty of Food Science and Biotechnology
Universiti Pertanian Malaysia
43400 UPM Serdang
Selangor, Malaysia

Telephone:
603 - 948 6101 *ext.* 3409, 603 - 942 3552

Telefax:
603 - 948 5970, 942 3552

Office hours:
8.00 am - 5.00 pm *(Mon - Fri)*
8.00 am - 12.15 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

- Wesphalia Starch Separator
  This equipment is used in the extraction and purification of starch. Continuous extraction and purification with self-cleaning ability
- Brabender Amylograph
  This equipment is used in the measurement of starch gelatinisation and pasting behaviour
- Brookfield Viscometer
  Used in the monitoring of starch viscosity
- Instron Universal Texture Meter
  Used in the measurement of texture of starch gel

SOFTWARE FACILITIES/EQUIPMENT

- Computer driver equipment
  High Pressure Liquid Chromatography
  Gas Chromatography
  Stevens Texture Meter
  Minolta Colour Meter
  Hunter Lab

RESEARCH EXPERIENCE

- Seven years' experience in sago starch processing and in close collaboration with sago factories in Sarawak
- Collaboration work with MARDI and SIRIM in the development and formulation of the Malaysian Standards on Sago Starch

FIELD OF RESEARCH

Food Science and Technology

Chemistry and Technology of Cocoa and Chocolate

Name of group/centre:
Processing of Cocoa and Chocolate Products Research Group

Research Laboratory:
- Chocolate Laboratory
- Cocoa Laboratory

Person(s) to contact:
Chocolate laboratory:
- Dr. Jinap Selamat *(Group Coordinator/Researcher)*
- Assoc. Prof Asiah Zain *(Researcher)*
- Dr. Asbi Ali *(Researcher)*

Cocoa laboratory:

- Dr. Jinap Selamat *(Group Coordinator/Researcher)*
- Dr. Asbi Ali *(Researcher)*
- Dr. Jamilah Abu Bakar *(Researcher)*
- Dr. Hasanah Mohd Ghazali *(Researcher)*
- Dr. Sharifah Kharidah Syed Muhammad *(Researcher)*
- Assoc. Prof. Dr. Osman Abdul Samah *(Researcher)*

Office address:

Faculty of Food Science and Biotechnology
Universiti Pertanian Malaysia
43400 UPM Serdang
Selangor, Malaysia

Telephone:

603 - 948 6160

Telefax:

603 - 948 5970

Office hours:

8.00 am - 5.30 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Chocolate laboratory :		
Chocolate machine	Mix, refine and conch chocolate mass	Ball mill; 10 kg cap
Three-roll refiner	Refine chocolate mass to 20 u	Fed batch
Runner mill	Mix and conch chocolate mass	7 kg cap
Chocolate temperer	Temper chocolate	Automatic; 25 cap
Chocolate enrober	Enrobe food with chocolate	Automatic; attached to temperer
Humidity chamber	Cool chocolate product after moulding	10,000L cap
Breaker/winnower	Break cocoa beans and separate the shell	small scale
Cocoa Laboratory :		
High Performance Liquid chromatography	Analysis of nonvolatiles	IR & UV detectors
Gas Chromatograph	Analysis of volatiles	FID & NPD detectors
Head-space sampler (attached to GC)	Collection of flavour components	44 vials; 2 ml sample
Purge-trap sampler (attached to GC)	Collection of flavour components	5 ml sample
Simultaneous Distillation Extractor	Collection of flavour components	IL sample
Vacuum oven/pH meter/Rotary evaporator/ Hand-homogeniser/Moisture meter/pH meter	Analysis of chemical components	-
Cocoa depulper	Extract pulp from cocoa bean	Fed batch

RESEARCH EXPERIENCE

Seven years' experience in cocoa related research and product development together with Malaysian Cocoa Board, and Projek Barat Laut Selangor and others.

CONSULTANCY EXPERIENCE

- Have carried out consultancy work on Transfer of Cocoa Technology among Small-holders in Malaysia for Ministry of Agriculture
- Have run 10-week course on processing and Quality Control of Cocoa
- The lab and facilities have been used for Short Course on Processing of Chocolate Products organised by Malaysian Cocoa Board

SERVICES OFFERED

- Development of chocolate and related products
- Development of cocoa pulp drinks
- Chemical and physical properties of cocoa, chocolate and related products
- Flavour analysis for cocoa, chocolate products (physical/chemical/sensory)

FIELD OF RESEARCH

Food Technology

Dairy Technology

Name of group/centre:

Dairy Technology Research Group

Name of laboratory/project:

- Dairy Technology Laboratory
- Fundamental Biotechnology

Person(s) to contact:

- Dr. Mohd. Yazid Abd. Manap *(Group Leader)*
- Dr. Abdullah Sipat
- Dr. Mohd. Yusof Abu

Office address:

Department of Food Technology
Faculty of Food Science & Biotechnology
Universiti Pertanian Malaysia
43400 UPM Serdang, Selangor, Malaysia

Telephone:

603 - 948 6101 *ext. 3414 / 3644*

Telefax:

603 - 948 5970

Office hours:

8.00 am - 5.00 pm *(Mon - Fri)*

HARDWARE FACILITIES/EQUIPMENT

- Batch Pasteuriser

  The batch pasteuriser has a capacity of 300 litres. It was designed to heat liquid products from 4°C up to 90°C and then cooled by tap water to 40°C. The whole sequence of processing is continuous and controlled automatically from a control panel
- Refrigerated liquid storage tank

  300 litres capacity. Direct expansion type DX. Capable to cool liquid products from 30°C to 4°C in 30 minutes. Complete with agitator, 25RPM and centrifugal pumps, 1000LPH

- **Blast freezer**
  Mechanical blast freezing facilities. Specified to freeze 1 kg sample from 30°C to - 30°C in 30 minutes
- **Stevens Texture Analyser**
  Food texture studies
- **Rotofor I.E.F.**
  Isoelectric focussing
- **Purification columns**
  Molecular sieve for enzyme purification
- **Pilot scale ultrafiltration system**
  For milk concentration and components molecular separation. Membrane area 0.7m2 and MW cut-off at 10,000, 20,000 and 100,000

RESEARCH EXPERIENCE

- Isolation and purification of milk coagulating enzyme from kesinai plant
- Production of processed cheese incorporated with palm oil products
- Production of probiotics starter culture
- Ultrafiltration of milk and low lactose dairy products processing and product development

CONSULTANCY EXPERIENCE

- Design and development of multi-products (milk and fruit juice) processing plant
- Technical evaluation panel: Perbadanan Usahawan National Berhad (PUNB)
- Design of fermentation room: Malaysia Milk Sdn Bhd

SERVICES OFFERED

- Enzyme production
- Food (liquid) processing plant design and construction
- Food starter culture technology
- Ultrafiltration processing for food

FIELD OF RESEARCH

Forestry
Optimum Utilisation of Forest Resources

Name of group/centre:
Optimum Utilisation of Forest Resources

Name of laboratory/project:
Wood Processing and Utilisation Research Group

Person(s) to contact:
- Mohd. Hamami Sahri
- Assoc. Prof. Mohd. Zin Jusoh

Office address:
Department of Forest Production
Faculty of Forestry
Universiti Pertanian Malaysia
43400 UPM Serdang
Selangor, Malaysia

Telephone:
603 - 948 6101 *ext. 2418*

Telefax:
603 - 948 3745

Office hours:
8.00 am - 5.00 pm *(Mon - Fri)*
8.00 am - 12.30 pm *(Sat)*

HARDWARE FACILITIES AND EQUIPMENT

Name of equipment and application

- Image Analysis System
  Image Analysis System Q520+, most unique and up to date facilities for wood characteristation and identification. It is also capable of doing repetitive measurements at a fast rate with high accuracy. This equipment is programmable and very user friendly
- Universal Testing Machine (UTM)
  This computerised Zwick 1474 series Testing Machine is capable of testing up to 100kN. Suitable for testing timber and other wood panel products for various strength property assessment such as static bending, shear, compression II to grain tension II to grain, etc.
- Kiln Drying Chamber
  This electric powered kiln drying chamber is capable of drying up to 3 m^3 of timber and is suitable for drying specimens of various dimensions
- Wood Pressure Treatment Chamber
  This laboratory size treatment chamber is suitable to pressure treat non-durable timbers. The chamber 60 cm in diameter and 3 metre in length can be used for small dimension timber
- Wood Working Workshop
  Complete with bandmill, circular saw, planer-thicknesser, sanding machine, wood working machines and wood finishing laboratory suitable for wood processing and wood machining operations

SOFTWARE FACILITIES/EQUIPMENT

- QUIC 520+
  Image analysis software suitable for fibre morfology study, glue failure assessment and other odd-sized area measurements

RESEARCH EXPERIENCE

- Wood development, characterisation and identification
- Wood properties enhancement such as drying, and durability study
- Gluing property of less-used and plantation species
- Assessment and utilisation of wood waste from processing mills

CONSULTANCY EXPERIENCE

- Assessment and utilisation of forest residues from logging and wood processing mills in Pahang
- Rubberwood processing technology
- Wood seasoning and wood preservation techniques

SERVICES OFFERED

- Teaching and training consultancy on the processing and utilisation of new tropical timbers and other forest products
- Improvement on the processing of new wood materials
- Establishment and development of small scale rattan and bamboo industry

- Product development and improvement
- Identification, characterisation and testing services of wood products

FIELD OF RESEARCH

Soft-Ferrites

Name of group/centre:
Materials Science Group, Department of Physics

Name of laboratory/project:
Materials Science Laboratory/Soft-Ferrite Components Development

Person(s) to contact:
- Associate Professor Dr. Abdul Halim Shaari *(Physicist)*
- Dr. Mansor Hashim *(Physicist)*
- Dr. Wan Mohd. Daud Wan Yusoff *(Physicist)*

Office address:
Department of Physics
Faculty of Science and Environmental Studies
Universiti Pertanian Malaysia
43400 UPM Serdang, Selangor, Malaysia

Telephone:
603 - 948 6101 *ext. 3552 (Office)* 603 - 948 6101 *ext. 3540 (Lab)*

Telefax:
603 - 948 6646

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.15 pm *(Sat)*

SERVICES OFFERED

- Formulation and fabrication of NiZn-based and MgZn- based ferrite materials and components for commercial production
- Formulation of MnZn-based ferrite materials for pre-production trials
- Characterisation of Soft-Ferrites Electrical, Magnetic and Thermomechanical Properties
- Determination of particle-size distribution for starting and presintered ferrite powders in 5μm size internals

SUMMARY OF RESEARCH/CONSULTANCY EXPERIENCE

The Materials Science Group at Universiti Pertanian Malaysia Physics Department has sucessfully developed materials formulations, offered advice on processing and performed characterisation of industrial soft-ferrite materials and components. Ferrite cores and sleeves developed by the Group have entered major European and Asian Markets. The group has developed a capability to satisfy changing market demands for bulk ferrite components. The electrical and magnetic characterisation activity spans the range DC to 500MHz.

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Network/Spectrum/Impedance analysers	Electrical and Magnetic Characterisation	10mHz to 500MHz
Dynamic Mechanical Thermal Analyser	Thermomechanical characterisation	Room temperature to 500°C

Analytical sieving apparatus	Determination of particle-size distribution	5µm particle size intervals
Hysteresis measurement set-up	Determination of hysteresis-curve parameters	For all soft magnetic materials at 1 kHz
Apparatus for experimental ferrite preparation by oxide method	Laboratory fabrication of ferrite components	Maximum single batch weight on 1.5kg

SOFTWARE FACILITIES

Programme	Application	Technical specifications
JPDSM search-match programme	Phase identification	Includes all inorganic compounds in JCPDS database

FIELD OF RESEARCH

Technically Enhanced Naturally Occurring Radioactive Materials (Tenorm) Analysis

Name of laboratory/project:
Laboratory for Radiological Quantitative Analysis

Person(s) to contact:
- Prof. Dr. Mohd. Yusof Sulaiman *(Head of UPS)*
- Marzuki Hj. Ismail *(Head of Lab Section)*

Office address:
Unit Perundingan Sinaran (UPS)
Department of Physics
Faculty of Science and Environmental Studies
Universiti Pertanian Malaysia
43400 UPM Serdang, Selangor, Malaysia

Telephone:
603 - 948 6106 *ext. 3552 (Office)* 603 - 948 6101 *ext. 3524 (Lab)*

Telefax:
603 - 948 6646

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.15 pm *(Sat)*

SERVICES OFFERED

- Radiological Impact Assessment
- Advice on Radiation Protection Management
- Training Programme
- Radioactivity Analysis

SUMMARY OF RESEARCH/CONSULTANCY EXPERIENCE

Unit Perundingan Sinaran, Department of Physics, has been granted the licence to engage in TENORM analysis by the Atomic Energy Licensing Board (AELB), Ministry of Science, Technology and Environment of Malaysia. The Unit has thus far undertaken radiological analysis of environmental samples for PETRONAS Research and Scientific, Hulu Kelang and the Department of Environmental Science, UPM.

HARDWARE FACILITIES/EQUIPMENT

Equipment	Application	Technical specifications
Gamma Emmitters Counting System	Identification and quantification of radionuclides	25% HpGe coaxial detector, 8192 channel analyser, 50L dewar, amplifier, lead shield, 500ml Marinelli beaker and PC based system controller
Gross Alpha Beta Counting System	Indication of the total radionuclides activity of sample	Gas flow proportional detector, 100 samples/run, lead cave, 1024 channel analyser, sample changer, motor driver, sample cartridge and PC based controller
Scintrex RDA - 200	Analysis of radon and thoron progeny	Portable zinc sulphide detector, photomultiplier tube and scaler
Eberline External Radiation Monitor	Instantaneous external radiation monitoring	Gamma dose rate monitor with energy compensated hand probe
Eberline Surface Contamination Monitoring	Surface contamination monitoring	Pulse rate meter with alpha scintillation probe
Personal Air Sampler	Evaluate potential doses to environmental populations from inhaled or ingested radionuclides	Negretti personal air sampler with 0.8 µm, 47 mm diameter filter paper
Thermoluminescent dosemeter (TLD) chip	Long term radiation monitoring	TLD-100 type (Calcium Fluoride)
Thermolyne Furnace	Ashing	0 - 1,000°C
Memmert Oven	Heating and Drying	0 - 200°C
AND Electronic Balance	Precision weighings	0.1 - 6,100 g

SOFTWARE FACILITIES

Programme	Application	Technical specifications
GANAAS* programme	Identification and quantification of radionuclides	Developed by International Atomic Energy Agency (IAEA)

*GANAAS - Gamma, Activity and Neutron Activation Analysis System

OTHER INFORMATION

Unit Perundingan Sinaran

The Unit Perundingan Sinaran of Physics Department, Faculty of Science and Environmental Studies, Universiti Pertanian Malaysia, evolved from a purely academic laboratory to a highly specialised applied laboratory for radiological monitoring and analysis. Equipped with the most up to date apparatus, the laboratory is manned by specialised and qualified personnel having Ph.D.'s and B. Sc. qualifications. Backed by several years of research experience, the officers are capable of providing complete consultancy and expert services, advice and training on radiological monitoring and related areas. The Unit also renders the services of field personnel and rental of field equipment.

The Unit Perundingan Sinaran is commited to the provision of quality services in the area of radiological monitoring. The determination to provide the highest quality services will be made possible through the following endeavours

- The procurement and utilisation of high quality equipment
- The involvement of highly qualified consultants and experts
- The assistance of trained personnel
- The enthusiastic reaction to systems and analytical changes
- The enthusiasm to participate in international comparison programmes
- The constant development of quality management system.

The adoption of a quality management system is essential for our ongoing credibility and to continue supporting the organisation in obtaining maximum benefits from the Technically Enhanced Normally Occuring Radioactive Materials (TENORM) industry. The quality management system is based on the requirements of International Organisation for Standardisation ISO/IEC G 25 and Atomic Energy Licensing Board (AELB).

The UPS is indeed a unique and powerful marketing tool which represents UPM's strong commitment to develop a centre for commercialisation of knowledge and technology transfer.

FIELD OF RESEARCH

Veterinary Medicine & Animal Science

Name of group/centre:
Faculty of Veterinary Medicine & Animal Science

Contact person(s):
The Dean of the Faculty of Veterinary Medicine & Animal Science

Address:
Faculty of Veterinary Medicine & Animal Science
Universiti Pertanian Malaysia
43400 UPM Serdang, Selangor, Malaysia

Telephone:
603 - 948 6317

Telefax:
603 - 948 6317

GENERAL INFORMATION

The Faculty of Veterinary Medicine and Animal Science was established in 1972 as one of the foundation faculties in UPM. It has been actively involved in research in animal production and health, and has achieved excellence in several disciplines particularly animal nutrition, reproduction and microbiology. It has excellent infrastructures, an extensive farm and a large number of animals for research investigations and trials. It has a Centre for Studies on Tropical Animal Production and Diseases (CENTRAS) which is widely recognised for its contributions towards research in science and technology and in manpower training.

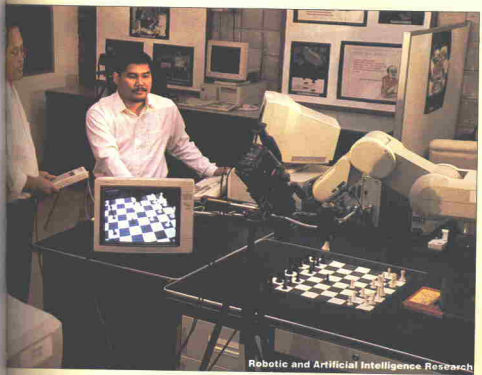
The faculty has been actively involved in collaborative work with local and international agencies such as the ACIAR (Australasian Centre for International Agricultural Research), CICHE (Committee for International Cooperation in Higher Education), CIDA (Canadian International Development Authority) and IAEA (International Atomic Energy Agency). The notable achievements include improved techniques in embryo transfer and in-vitro fertilisation, the discovery of rumen fungi that can efficiently digest crude fibres, the development of new feeds from agricultuural wastes and the development of a heat stable Newcastle Disease vaccine incorporated into feeds which have been developed and commercialised.

FIELD OF SPECIALISATION

The faculty has the following facilities and expertise and welcomes collaborative work with any interested party, particularly private companies for joint research and/or training of manpower:

- Livestock-crops integration systems research and development
- Laboratory diagnosis of animal diseases
- Animal nutrition and feed evaluation
- Veterinary public health and food hygiene
- Animal parasitology
- Deer research
- Avian immunology and diseases
- Health care of companion and farm animals
- Microbiology and molecular biology studies
- Aviary birds
- Animal model in disease studies
- Animal disease studies
- Production system - farm establishment/management
- Electron microscopy
- Equine management and diseases
- Veterinary surgical studies

UNIVERSITI SAINS MALAYSIA



Robotic and Artificial Intelligence Research

Reinforced composites from USM's (School of Industrial Technology) Prototype machine

USM shall lead and innovate for excellence internationally through the advancement and dissemination of knowledge and truth and the nurturing of qualities emphasising academic and professional distinction, the holistic development of the individual and a strong commitment to societal, national and universal aspirations

USM INNOVATION AND CONSULTANCY CENTRE

Provides the means to apply and disseminate knowledge, expertise and research findings for the benefit of the national and international communities

Provides support for commercial-industrial innovations

Provides avenues for non-formal education to support a learning society

Makes available the talents and the cultural and physical resources of the University to enrich the community at large

PARTNERSHIP IN TECHNOLOGY DEVELOPMENT

LEADING & INNOVATING TOWARDS A PROGRESSIVE FUTURE

Universiti Sains Malaysia

Name of agency / institution / company:
Universiti Sains Malaysia

Person(s) to contact:
The Director
Innovation and Consultancy Centre

Office address:
Innovation and Consultancy Centre
Universiti Sains Malaysia
11800 USM Penang
Malaysia

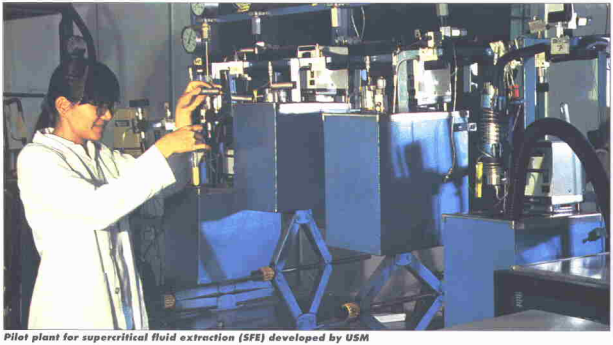
Telephone:
604 - 657 7888 *ext. 3684*
604 - 657 2407 *(Direct line)*

Telefax:
604 - 657 2210

THE UNIVERSITY

Universiti Sains Malaysia (USM) was established as the country's second university in 1969 and its prime mission from the outset has been the pursuit of excellence in teaching and research. The University has sought to be relevant to the times and to the nation's needs and has therefore involved itself in areas judged to be of strategic benefit to the economic and social development of Malaysia. In this connection, special emphasis has been given to recognising the needs of industry and to the establishment of collaborative links with industrial partners.

To achieve and maintain international competitiveness, Malaysian industry requires a total effort and the back-up of skills, expertise and resources across a broad range of technologies. Such skills and expertise are often available within universities, and universities thus have an important role to play in helping the business community to meet the challenges posed by rapid technological change. In developed countries, universities have often enhanced their contribution to industry through the development of Science Parks, Industrial Centres and Business Liaison Offices.



Pilot plant for supercritical fluid extraction (SFE) developed by USM

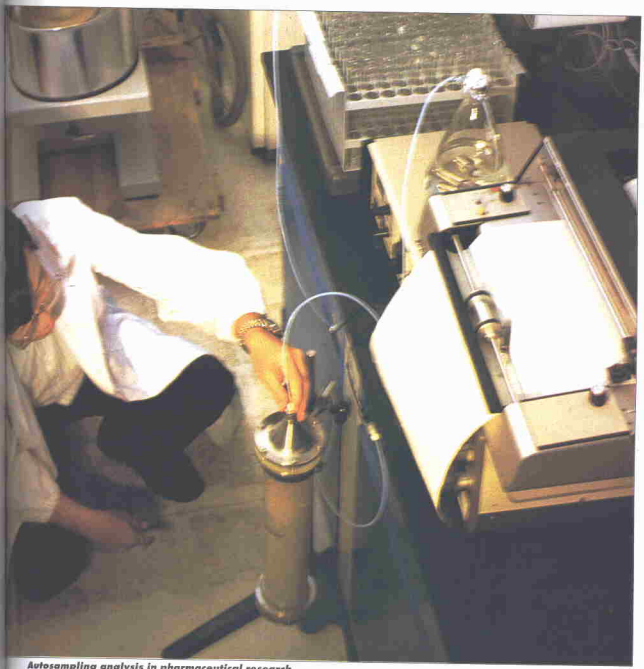
A PIONEER IN INDUSTRIAL LIAISON

In recognition of its potential value to industry, Universiti Sains Malaysia took the initiative, as early as 1980, to establish the Industrial Research and Consultancy Unit, now known as the Innovation and Consultancy Centre (ICC), to provide a formal channel through which the intellectual and physical resources of the University could be applied to the solution of problems in commerce, industry, government and the community in general.

QUALITY SERVICE

USM has to date provided quality service to the business community in areas of :

- Contract research
- Testing
- Usage of sophisticated equipment
- Skills upgrading and human resource development
- Consultancy
- R & D



Autosampling analysis in pharmaceutical research

These services are provided through the ICC, which acts as a "one-contract" agency for the convenience of clients. To further enhance its contribution to the business community, USM has also established an Information and Technology Centre (ITC) with the following objectives:

- To facilitate the exchange and transfer of information technology knowledge among academics and industries
- To encourage the use of IT in industries particularly the SMIs
- To act as a resource centre for IT development
- To act as a reference centre for IT
- To provide linkages with international institutes

EFFICIENT COMMUNICATIONS AND COMPUTING-SERVICES

To further enhance its services to the business community and the public sector, the University has upgraded its communications and computing facilities by installing about 35 kilometres of fibre optic backbone in its three campuses : the main campus in Penang, the medical campus in Kelantan, and the engineering campus in Perak. The three campuses will be linked by high speed leased lines, making it

Wind Tunnel

possible for fast internal communication and data exchange. There will be access to the Internet via Jaring. In addition, the University will be setting up a communication hub and gateway at USM's IT Centre. This hub/gateway will make it possible to provide a variety of services such as e-mail, central depository function and other services that the private and public sector may require.

AREAS OF CONSULTANCY AND R & D

Some of the principal areas of consultancy and industry-oriented R&D are :

- Biomedical, Pharmaceutical and Drug Related Studies
- Chemical/Materials/Polymer Research
- Aquaculture
- Food Technology
- Environmental Science
- Electronic and Semi-Conductor Materials and Devices

BIOMEDICAL, PHARMACEUTICAL AND DRUG RELATED STUDIES

USM's School of Pharmaceutical Sciences is the only comprehensive pharmaceutical training centre in the country, with high academic standing and excellent facilities for practical training and research. These facilities allow work on the development of therapeutic drugs, clinical evaluation of new pharmaceutical agents, biopharmaceutical research, pharmacokinetics, metabolism and efficacy studies.

The University's strength in this area has been strengthened greatly by the work undertaken at the Centre for Drug Research, the Medical School, the School of Biological Sciences and the School of Chemical Sciences. This has enabled the University to establish extensive national, regional and international linkages. In recognition of its expertise in this field, the National Poison Centre and the National Doping Centre have both been located at USM and will provide additional avenues for extending the use of the University's resouces. In addition to this, the University is currently in the final stages of establishing an inter-disciplinary Centre for Pharmaceutical and Biomedical Technology, which will give emphasis to product development and the commercialisation of research findings. USM already enjoys a high reputation for its development of diagnostic kits.

CHEMICAL/MATERIALS/POLYMER RESEARCH

The expertise of the staff within the University covers a wide range that includes: extraction and synthesis of natural products; polymer, natural products and materials chemistry; method development in analytical techniques; palm oil chemistry; electrochemistry; chemical analysis; materials characterisation, and the development of new materials. The major facilities available include a 300 Mhz Supercom FTNMR, GCMS, GPC, FTIR with microscope facilities, SFE, SEM and TEM as well as instruments for elemental analysis and various forms of thermal analysis. Expertise and equipment for process technology, design and compound formulation of plastics, composites, dry rubber and latex products are also available, along with facilities for investigations of mechanical failure and rheological properties in melt processing of plastics.

The services available include:

- elemental analysis and topography studies of metal and ceramic samples, and corrosion studies
- failure analysis of metals and ceramics
- mechanical properties evaluation, non-destructive testing

- microstructural investigation
- phase transformation studies in metals, estimation of retained austenite in steel samples
- powder metallurgy, compacting, powder process, powder characteristics
- residual stress analysis

AQUACULTURE

Aquaculture research at USM has been characterised by a holistic approach which incorporates scientific, economic, environmental and other concerns. The research activities in aquaculture include:

- Feasibility studies for potential sites
- Development of suitable culture system for rice field catfish
- Survey of bacterial pathogens and parasites in marine fishes cultured in Malaysia
- Induced spawning and hatchery production of seeds of cockles and other commercially important bivalve species
- producing more suitable and competitively priced fish feed for farmers

FOOD TECHNOLOGY

Apart from analytical activities, staff of the University are actively involved in promoting quality control and in improving the quality and shelf-life of food products. Research is continuing on improving canning methods and moisture content in foods which would entail drying and dehydration. R & D work is being carried out in the area of starch technology and this is an area very important for some of the country's primary products like sago and oil palm trunks.

ELECTRONICS AND SEMI-CONDUCTOR MATERIALS AND DEVICES

The University has expertise and facilities to provide services in the areas of electronics, computer and communication technology, radio and electromagnetic propagation, microprocessor hardware and software development, computer control manufacturing and design of automatic control systems. Also available are facilities for characterisations and fabrication, high temperature tube furnaces, spinners, aligners, plasma depositing and etching systems. Clean rooms class 100 and 1000 are also available.

ENVIRONMENTAL SCIENCES

Throughout the years USM has been very active in this field. The staff have been involved in various aspects of environmental studies and have carried out extensive consultancy work related to conservation of the environment. Multidisciplinary specialists from various Schools have given much strength and a comprehensive approach to the studies. Over and above this, the Centre for Marine and Coastal Studies (CEMACS) carries out work related to conservation and coastal studies. Many a time modelling studies using mathematical models have assisted in this work. The strength of the environmental work areas are:

- EIA studies
- Effluent treatment
- Atmospheric pollution
- Occupational health
- Marine and coastal pollution
- Preservation of marine and terrestrial ecosystem
- Geographic Information System

SUPPORT SERVICES

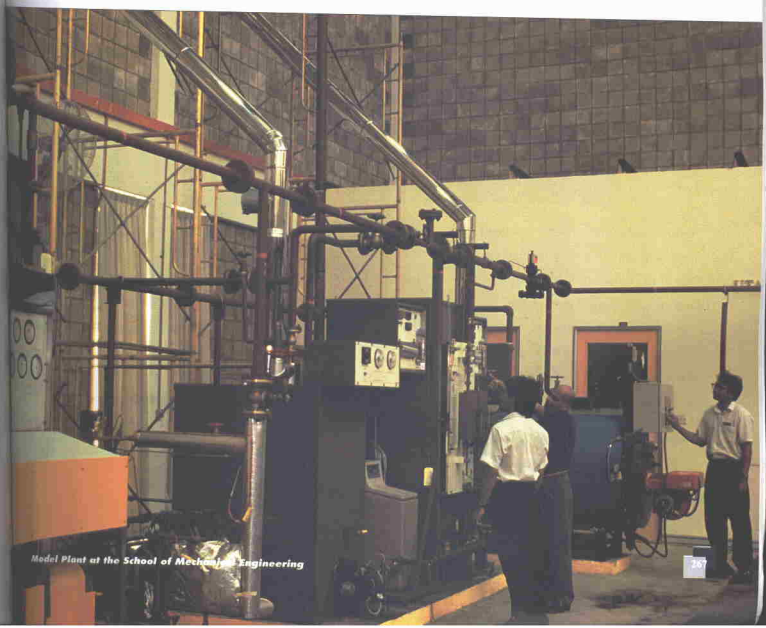
The Library encourages private sector membership, and members receive a bi-monthly bulletin which contains commercial and technical information. Members are entitled to make use of the services of the Library especially loan of books and journals and search for information and data from local and overseas sources. The Library also provides translation and consultancy services. The Centre for Educational Technology and Media offers excellent support for print and electronic presentation.

AN INVITATION TO PARTNERSHIP IN TECHNOLOGY DEVELOPMENT

Universiti Sains Malaysia through its pioneering efforts has established a pragmatic and efficient framework for academia-business sector interaction in the key areas of R & D, training, consultancy and servicing. Through its effort USM has assisted in creating an awareness of new technologies, in upgrading skills to receive these technologies and in providing facilities for R & D to be undertaken. The University has now gone beyond the stage of making formal commitments to interact with the private sector, and is at the stage where it has established firm links with the private sector in the fields of contract research, consultancy, training and R&D.

USM can now confidently invite you to a partnership in technology development.

LEADING AND INNOVATING TOWARDS A PROGRESSIVE FUTURE



Model Plant at the School of Mechanical Engineering

TOWARDS EXCELLENCE IN TECHNOLOGY

The objective of UTM is to become an excellent centre of learning that is pre-eminent and authoritative in the field of technology. This objective can be realised through the determined effort of the academic staff in particular.

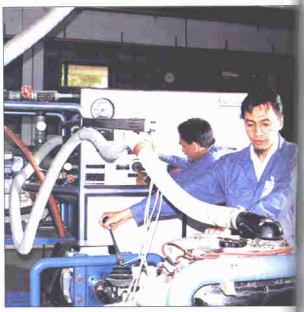
Various expertise and facilities that can be utilised for national technological development are available in UTM. The expertise can be obtained through the academic staff who possess the requisite academic and professional qualifications in the various technological disciplines. Similarly, study facilities are available in the laboratories such as computers, equipment and others. UTM is the only institution that has the most comprehensive and sophisticated equipment that can be exploited for the use and development of our nation's industries. Realising this fact, UTM always encourages its academic staff to actively carry out basic as well as advanced research with emphasis on such thrust areas as:

- advanced manufacturing and processing
- advanced materials and structures
- analytical and graphical computerisation

Through such effort, success has been achieved in several research projects which can now be commercialised for industrial application. One of the university's achievements is the introduction of various fields of specialisation through the setting up of centres of excellence. These institutes will play the role of consolidating and enhancing further the acquisition of knowledge because as a university, UTM has to learn continuously while intensifying its development in research programmes and consultancy.

UNIVERSITI TEKNOLOGI MALAYSIA
JALAN SEMARAK, 54100 KUALA LUMPUR, MALAYSIA
TELEPHONE : 603 - 293 0811 FAX: 603 - 293 5466

UNIVERSITI TEKNOLOGI MALAYSIA
KARUNG BERKUNCI 791, 80990 JOHOR BARU, JOHOR
TELEPHONE : 607 - 550 2359 FAX: 607 - 556 6177



Universiti Teknologi Malaysia (UTM)

Name of agency / institution / company:
Universiti Teknologi Malaysia *(UTM)*

Person(s) to contact:
Associate Prof. Dr. Mohd Noor Musa
(Research and Development Unit)

Office address:

- Universiti Teknologi Malaysia
  Jalan Semarak
  54100 Kuala Lumpur, Malaysia

- Universiti Teknologi Malaysia
  Karung Berkunci 791
  80990 Johor Baru, Johor, Malaysia

Telephone:
603 - 293 0811

Telefax:
603 - 293 5466

Telex:
MA 30090

Cable:
Unitekma

Office hours:
8.00 am - 4.15 pm *(Mon - Fri)*
8.00 am - 12.45 pm *(Sat)*

As a centre of learning in science and technology, UTM offers excellent opportunity in the training and retraining of professionals from Malaysia and overseas. Established as a university only in 1973 UTM has facilities with a total academic staff strength of over 1,300 and well over 12,000 students . It operates from two campuses, the main in Sekudai and the Semarak campus in Kuala Lumpur.

Through its multifarious disciplines, UTM has produced over 23,000 professionals who are required for nation building and who have contributed significantly to the infrastructural development of the country. UTM offers courses in the science, engineering namely civil, mechanical, petroleum, chemical and electrical, land survey, architecture and information science and technology disciplines, at the undergraduate and postgraduate levels.

In giving relevance and right orientation to its graduates and hence upgrading their contribution to the country's development, UTM has set up several creative mechanisms to ascertain university-industry collaboration in pure and applied research. Various consultancy projects with industries have been undertaken to resolve issues of process engineering, technology management and human resource development.

The Business Advanced Technology Centre (BATC) in collaboration with Warwick University, United Kingdom, is given the responsibility to procure various expertise to promote technological and human resource development through the university-industry link. Programmes offered are geared to training and retraining of engineers and managers in the advanced manufacturing fields. Many public listed companies and quasi-government agencies have become members of the Centre and partake actively in the Centre's programmes.

Other centres of excellence such as the Remote Sensing Centre, Technology Design Centre, Information Technology Design Centre and AutoDesk Training Centre, have been set up on

a modular basis to provide research mechanisms and research deepening in specialised fields of technology. The Institute of Noise and Vibration, Institute of Coastal and Offshore Engineering and the Institute of High Voltage and High Current were also set up to spearhead Research and Development and product and services development in the fields of advanced and leading edge technologies. These centres and institutes have successfully managed to induce the best expertise available to undertake research collaboration projects from and around this region and the entire world. Contract research projects have been farmed out from the public and private sectors to these research institutes and centres to undertake R & D projects.

UTM's fully owned companies such as the Institute Sultan Iskandar, Uni-Technologies Sdn. Bhd. and UTM Foundation provide a competitive edge and a mechanism to reach out to industry. Institute Sultan Iskandar, in particular, merits special mention as a company limited by guarantee with established world-wide networking. The focus is in areas related to the building industry through its projects, seminars and fora to discuss specific issues related to the urban habitat of national, regional and international dimensions. As a nucleus and partner to technology development, UTM has proposed the

development of a University-based Science Park with the Johor State Development Corporation to provide innovation park facilities and nurseries for hi-tech development.

Several memoranda of understanding between foreign universities and multi-national corporations and UTM have been signed to undertake specialised research projects and consultancies. This mechanism has facilitated closer cooperation between the two parties and provided a window of opportunity to the industry technology and inter-university link. As a technology-based institution with the best 'state of the art' equipment and facilities, UTM has a competitive edge to attract quality staff, students and projects. UTM's representation on national, regional and international panels is testimony of its premier status as a technology-based university in this region.

Aerospace Technologies & Engineering

Geographic Information & Analysis

Name of group/centre:

Center for Geographic Information and Analysis *(CGIA)*

Name of laboratory/project:

CGIA Laboratory

Person(s) to contact:

- Assoc. Prof. Dr. Taher Buyong
- Puan Hamidah Mokhtar

Postal address:

Center for Geographic Information and Analysis *(CGIA)*
Faculty of Surveying and Real Estate
Locked Bag 791
80990 Johor Bahru
Malaysia

Telephone:

607 - 550 2563 *(direct line)*, 557 6160 *ext. 2904*

Telefax:

607 - 556 6163

HARDWARE FACILITIES/ EQUIPMENT

Name of facilities	Application	Technical specifications
WILD A 10 and PG2 analogue stereoplotters	Mapping from aerial photographs	
WILD AGI Semi analytical stereoplotter	Mapping from aerial photographs	
KERN DSR 11 and WILD B8 analytical stereoplotters	Mapping from aerial and terrestrial photographs	
Digitiser of various sizes	Digital conversion of graphical data	Various resolution
IRM RISC system 6000Workstations (4 units)	Running of various softwares	
PC micro-computers (20 units)	Running of various softwares	486 micro-processor

SOFTWARE FACILITIES/ EQUIPMENT

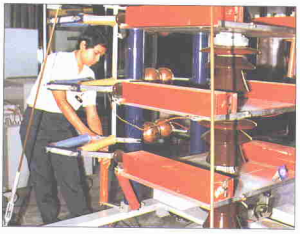
Name of facilities	Application
KERN MAP200 and MAP300	Data collection, compilation, adjustment, editing and presentation from aerial photographs
SDD (Adam Technology)	Data collection, compilation, adjustment, editing and presentation from aerial and terrestrial photographs
GENAMAP GIS software (Unix-based)	Compilation, manipulation, storage, analysis and presentation of spatial/geographical data
ARC/INFO GIS software on workstation and PC	Compilation, manipulation, storage, analysis and presentation of spatial/geographical data
MapInfo for Windows	Desktop mapping
Microstation	Cartographic design

RESEARCH EXPERIENCE

- Legal issues in the selling of digital data
- Format conversion of CALS digital data
- GIS pilot project for Majlis Daerah Kluang Utara
- GIS data input by scanning, videography and GPS technology
- Feature extraction from single aerial photograph

CONSULTANCY EXPERIENCE

- Designing of computer software for point in polygon problems
- Identification of the new 500 kv transmission line corridor from Semenyih, Selangor to Bukit Batu, Johor using GIS
- Digital data conversion of North-South expressway corridor linking KL and the proposed Sepang International Airport
- Digital data conversion of Johor-Singapore second link corridor



SERVICES OFFERED

- Consultant for GIS implementation
- GIS data conversion
- GIS data capture
- Data analysis using GIS for various applications
- Customised short courses and training in GIS and related areas

FIELD OF RESEARCH

Aerospace Technologies & Engineering

Remote Sensing

Name of group/centre:

Centre for Remote Sensing

Name of laboratory/project:

Centre for Remote Sensing

Person(s) to contact:

- Associate Prof. Dr. Mohd Ibrahim Seeni Mohd
- Associate Prof. Mazlan Hashim

Postal address:

Centre for Remote Sensing
Faculty of Surveying and Real Estate
Universiti Teknologi Malaysia
Locked Bag 791
80990 Johor Bahru
Malaysia

Telephone:

607 - 550 2969, 557 6160 *ext. 2940 / 2969*

Telefax:

607 - 556 6163

HARDWARE FACILITIES/ EQUIPMENT

Name of facilities	Application	Technical specifications
Dipix ARIES III Image Analysis System	Digital image analysis	Computer: VAX 4200 RAM: 16 MBytes Storage: 1.2 Gbytes Tape drive: 1600-6250 bpi Scanner: EIKONIX
Intergraph IP225 Image Analysis System	Digital image analysis	Computer: Intergraph IP225 Engine: CLIPPER RAM: 16 MBytes Storage: 330 MBytes Color thermal plotter Quick color recorder (8" x 10" module and 55mm module) Digitising table (44" x 60")
PCI EASI/PACE Image Analysis System	Digital Image Analysis	Computer: NEC 486/33 RAM: 8 MBytes Storage: 670 MBytes Imagraph Graphic Engine 21" NEC Graphic Monitor Matrix Color Recorder
Desktop Mapping System	Digital mapping and image analysis	Computer: COMPAQ 486/33 RAM: 8 MBytes Storage: 670 MBytes NEC Graphic Engine 21" EIZO Graphic Monitor
SPANS Geographic Information System	Manipulation and analysis of geographic information	Computer: TANDON 386/25 RAM: 8MBytes Storage: 670 MBytes 21" VGA monitor
Hand-held Global Positioning system	3-D(X,Y,Z) positioning from satellite	MAGELLAN 5000+ Sub-meter Kit Mobile adapter
Hand-held multispectral field radiometer	Reflectance measurements from ground targets	BARRINGER Landsat TM filters SPOT Panchromatic filter SPOT Multispectral filters PB1000 + data logger Integrating sphere & Fiber-frax
Digitising table	Digitising of analog data such as maps, charts, etc.	Calcomp 9500 Size: 48" x 60" Accuracy: 0.005"
Computer drum plotter	Plotting of plans, maps, etc.	MUTOH 920E Size: A0 oversize Speed: 1,200 mm/s Plotting medium: pen and pencil

SOFTWARE FACILITIES

Software	Application
ARIES III Software	Digital image analysis
Microstation and imager	CAD and digital image analysis
EASI/PACE Software	Digital image analysis
DMS Software	Digital mapping and image analysis
Spatial analysis software	Manipulation and analysis of geographic information data
PC-Giant software	Photogrammetric triangulation and adjustment
Quicksurf software	3-D surfaces interpolation
Modtran software	Atmospheric correction of remote sensing data

RESEARCH EXPERIENCE

- Satellite bathymetry
- Sea surface temperature studies from satellite data
- Sea bottom features mapping from satellite data
- Water turbidity studies from satellite data

- Topographical mapping from stereo satellite data
- Landuse studies from satellite data
- Vegetation index mapping from satellite data

CONSULTANCY EXPERIENCE

- Water depth mapping from satellite data
- Mapping of seagrass from satellite data
- Sea surface temperature mapping from satellite data
- Coastline variations mapping from satellite and airborne data
- Coral reefs mapping from satellite and airborne data
- Landuse mapping from satellite data
- Estimation of water storage volume in reservoirs from satellite data

SERVICES OFFERED

- Remote sensing and digital image analysis
- Digital mapping

FIELD OF RESEARCH

Biotechnology

Industrial Biotechnology

Name of group/centre:

Biotechnology Group

Name of laboratory/project:

Biotechnology Laboratory

Person(s) to contact:

- Dr.Wan Azlina Ahmad
- Dr. Zaharah Ibrahim

Postal address:

Faculty of Science
Universiti Teknologi Malaysia
Locked Bag 791
80990 Johor Bahru
Malaysia

Telephone:

607 - 550 4546, 557 6160 *ext. 4541 / 4122*

Telefax:

607 - 556 6162

HARDWARE FACILITIES / EQUIPMENT

Name of equipment	Application	Technical specifications
Atomic absorption spectrometer	Metal analysis	Philips PU9100 AAS Flame system-Ag, Cu Cd analysis PU 9178 data station
Ultracentrifuge	DNA and protein separation	Beckman L8 M Max speed 70,000 rpm with 70.1 Ti rotor
Ultra low temperature freezer	Storage of bacterial cultures	Temperature range -20° - 5 °C
Polaroid MP4 system transilluminator	Viewing and photography of plasmid preps	Uses type 667/669 Polaroid film
Orbital shaker	Growth of bacteria	Certomat M, B.Braun with temperature control hood
Freeze dryer	Freeze drying	The coils are refrigerated to -50 °C and condensing capacity of 5 litres Sample flasks: 200 ml & 100 ml

SOFTWARE FACILITIES / EQUIPMENT

Name of product	Application	Technical specifications
35mm palette plus	Software to produce slides from the computer	Instant slide maker (35mm slides)

RESEARCH & CONSULTANCY EXPERIENCE

- Biotechnological applications of metal-microbe interactions
- Treatment of hospital waste
- Analysis of sea/river water for heavy-metals and bacteria
- Extraction, characterisation and applications of pigment from oil palm in the food industry

SERVICES OFFERED

- Industrial waste water analysis
- Treatment of hospital waste
- Consultancy services to the mining industries with respect to Biohidrometallurgy

FIELD OF RESEARCH

Chemical Engineering
Process Control

Name of group/centre:
Lipid Applied Science & Engineering Research Group

Research laboratory/project:
Lipid Applied Science & Engineering Research Laboratory

Person(s) to contact:
- Associate Prof. Ramlan Abd. Aziz
- Mustapha Kamal Abd. Aziz

Postal address:
Faculty of Chemical &
Natural Resource Engineering
Universiti Teknologi Malaysia
Jalan Semarak
54100 Kuala Lumpur
Malaysia

Telephone:
603 - 290 4358, 292 9033 *ext. 4317*

Telefax:
603 - 293 4095

HARDWARE FACILITIES/ EQUIPMENT

Name of equipment	Application	Technical specifications
Laboratory scale and pilot scale distillation column using new packings	Palm oil refining	Working volume of 200 litres and packing height of 15ft (maximum)
Laboratory scale and pilot scale filtration equipment	Crude palm oil separation	Drum diameter of 30 mm

SOFTWARE FACILITIES/ EQUIPMENT

Name of equipment	Application	Technical specifications
Physical properties of palm oil mixtures	Design of process equipment	Proprietary information for design of process equipment
Filtration properties of crude palm oil slurry and olein/ stearin mixtures	Design of process equipment	Proprietary information
Material/energy balance software	Design of process equipment	Proprietary information
AspenPlus software	Design of process equipment	Proprietary information

RESEARCH EXPERIENCE

7 years experience in palm oil process and product development together with FELDA, MIMOS SULZER (Switzerland) and others.

CONSULTANCY EXPERIENCE

Have carried out consultancy work on quality and equipment audit of CPO and PKO extraction plants for Palm Oil Registration & Licensing Authority (PORLA).

SERVICES OFFERED

- Energy/equipment audit for palm oil industry
- Performance testing of packing for palm oil refining and oleochemical manufacturing
- Physical properties evaluation
- Particle characterisation (size, shape, density, etc.)
- Filtration performance
- Process simulation

FIELD OF RESEARCH

Chemistry Analysis
Inorganic & Organometallic

Name of laboratory/centre:
Inorganic/Organometallic Laboratory

Name of group/centre:
Inorganic and Organometallic Catalysis Unit

Person(s) to contact:
- Dr. Rose Aini Kamarudin
- Puan Nor Asikin Mohamad Nordin

Postal address:
Department Of Chemistry
Faculty of Science
Universiti Teknologi Malaysia
Locked Bag 791
80990 Johor Bahru
Malaysia

Telephone:

607 - 550 4242

Telefax:

607 - 556 6162

HARDWARE FACILITIES/ EQUIPMENT

Name of product	Application	Technical specifications
Gas chromatograph Hewlett Packard Model 5890 Series II	Analysis of esters, isomers and triglycerides	Capillary column and autosampler for up to 100 samples
Column chromatograph with super fraction collector model SF-2120	Separation of components	Super fraction collector up to 120 tubes
Semi-micro fractional distillation system Fischer Model D-5309 Series 59568	To separate liquids based on their boiling points at high vacuum and low temperature	Multiple collectors
Slide Maker Macintosh compatible Avia FR-1000	Preparation of slides for presentation	
Macintosh LC II computer with personal laser writer	Words processing and drawing softwares available	

RESEARCH EXPERIENCE

- Fatty acid alkyl esters analysis
- Triglyceride analysis

AREA OF SPECIALISATION/ SERVICES OFFERED

- Synthesis and characterisation of hexanuclear clusters
- Synthesis and characterisation of organotin carboxylates
- Esterification of fatty acids using tin chlorides as catalyses
- Metathesis of palm oil and its derivatives
- Analysis of fatty acid alkyl esters and triglycerides using gas chromatography

FIELD OF RESEARCH

Coastal Engineering

Name of group/centre:

Coastal Engineering Laboratory

Research group/institute:

Institute of Coastal & Offshore Engineering

Person(s) to contact:

- Prof. Dr. Ir. Abd. Aziz Ibrahim
- Dr. Noraieni Hj. Mokhtar

Postal address:

Institute of Coastal & Offshore Engineering
Universiti Teknologi Malaysia
Jalan Semarak
54100 Kuala Lumpur
Malaysia

Telephone:

603 - 290 4290

Telefax:

603 - 292 9033 *ext. 4906 / 4966*

HARDWARE FACILITIES/ EQUIPMENT

Name of equipment	Application	Technical specifications
Computer-controlled random wave generator (Delft Hydraulics)	Generation of regular random and deterministic wave for hydraulic testing-physical modelling ● Coastal Structures ● Port/harbours ● Siltation models ● Simulation Studies	● Wave generator type WL 77 ● Electronic wave controller ● Wave synthesizer - 380 V supply ● Length of waveboard: 0.5m Ht. of waveboard: 0.55m Stroke: 0-30m Waveboard movement: translating, rotating or both translating and rotating range: DC to 2.5 Hz ● Wave signal generator - external source connectors + safety circuits IBM-PC-Computer type Hyundai Super 386D/33L AD/DA Converters Monitor-HCM-421E Super VGA Potentiometer Cabinet Control panel for hydraulic Wave Generator
Wave basin	Physical wave model for hydraulic testing	(16x64x3.5)-galvanised Iron slabs (5x5) attached to wave generator WL 77
Test-Channel (Flume)	Test-Flow facility	(15x3x3.5) equipped with wave-maker (wave paddle)
Wave height meters	To measure wave heights	
Current meters	For current metering (laboratory and site work)	

SOFTWARE FACILITIES/ EQUIPMENT

Name of product	Application	Technical specifications
AUKE PC-Wave Generator	Software for wave signal sampling and analysis	Hydraulic and hydrodynamic studies
UNIBEST	Sediment transport analysis software	
REFRAC	Refraction of waves software	
CURPAT, TIDEWAY	Current pattern and transport analysis software	
BREAKWATER	Breakwater design software	

RESEARCH EXPERIENCE

- Studies of scour (erosion) around marine pipelines
- Stability of coastal protection facilities
- Computer software development

CONSULTANCY EXPERIENCE

- Hydraulic studies
- Land reclamation
- Design and construction of jetties and breakwater
- Dredging around ports
- Marina, EIA

SERVICES OFFERED

- Coastal and marine testing
- Hydraulic studies - fieldwork and computational studies
- Civil engineering and EIA

FIELD OF RESEARCH

Electrical & Electronic Engineering

Data Communication

Name of group/centre:

Data Communication Laboratory Group

Research laboratory/project:

Telematic Research Laboratory

Person(s) to contact:

- Associate Prof. Jaafar Hj. Mohamad
- Dr. Norshela Fisal

Postal address:

Faculty of Electrical Engineering
Universiti Teknologi Malaysia
54100 Kuala Lumpur
Malaysia

Telephone:

603 - 292 9033 / 4357

Telefax:

603 - 293 4095

HARDWARE FACILITIES/ EQUIPMENT

Name of equipment	Application	Technical specifications
Protocol analyser (HP4951)	Test and measure the datacommunication protocols	Protocols supported: RS-232, X.21 and X.25
ISDN express card	Training and understanding of MITEL ISDN components	MITEL ISDN components complete with digital switch and ISDN interfaces according to CCITT standards
Digital storage scope	Measurement of high-speed signals	100 MHz, 4-channels, digital with storage capability
ISDN Protocol analyser (Chameleon 32)	Test and measure ISDN protocols	Protocols supported: Basic rate and primary rate including SS#7
Logic analyser	Analyse digital logic signal	Support 32 channels

SOFTWARE FACILITIES/ EQUIPMENT

Name of equipment	Application	Technical specifications
SIMSCRIPT II.5	Simulation software used for simulating queueing networks	English-like programming language with animation features

RESEARCH EXPERIENCE

- Designing Integrated Services Switching System (ISSS) based on ISDN standards
- Broadband Integrated Services Digital Network (BISDN)
- Congestion control in Asynchronous Transfer Mode (ATM) networks
- Teletraffic studies in Metropolitan Area Network (MAN)
- Multimedia communications
- Rural telecommunication
- Remote Telephone Controller (RTC)

CONSULTANCY EXPERIENCE

- Training in ISDN for industry personnel
- Training in signalling system No. 7 for industry personnel
- Training in data communication for industry personnel
- Training in SIMSCRIPT II.5 for university personnel

SERVICES OFFERED

- Networking solutions
- Data communications solutions
- Teletraffic studies in Metropolitan Area Network (MAN) and Aynchronous Transfer Network (ATM)
- Designing ISDN systems and application

FIELD OF RESEARCH

Electrical & Electronic Engineering

High Voltage Technology

Name of group/centre:

Institute of High Voltage and High Current

Research laboratory/project:

Institute of High Voltage and High Current

Person(s) to contact:

- Associate Prof. Dr. Ahmad Darus
- Associate Prof. Dr. Hussein Ahmad

Postal address:

Institute Of High Voltage & High Current
Faculty Of Electrical Engineering
Universiti Teknologi Malaysia
54100 Kuala Lumpur
Malaysia

Telephone:

603 - 290 4219, 292 9033 / 4685

Telefax:

603 - 291 5348

HARDWARE FACILITIES/ EQUIPMENT

Name of equipment	Application	Technical specifications
Impulse high voltage generator Haefely series E.S.N. 53597-3	High voltage testing of insulation material	1000kV, 10kJ
Reference impulse calibration Haefely Model RIC 422	Precision monitoring and calibration of impulse measuring system	Continuously variable of output voltage (80-1600) V complyto IEC 1083 and IEEE 1122
Reference divider Haefely Model RCZ 900	Reliable calibration at high voltage dividers	Impulse : 5000 kV AC/DC:180kV Measurement Uncertainty: +-%
Transformation Ratio Meter Haefely type 430	Measuring and checking up of voltage divider and terminal network	Range: 1-9999 Accuracy: +-%
High Resolution Impulse Analysing System Haefely Model HIAS 742	Computerised analysing of the impulse testing of high voltage distribution transformer and switchgear. Also for computerised analysing of impulse calibration	Bandwidth: DC to 15 MHz Amplitude resolution: 10 bits Sampling rate: 10KS/s to 60MS/s Electromagnetic Compatability: IEC 1083 and IEEE 1122
High Voltage AC System MWB Germany	AC High Voltage Testing And Calibration of AC High Voltage Voltmeter, KWh meter	Single stage : 100kV, 5KVA 2 stage : 200 kV, 5kV
High Voltage DC System MWB Germany	DC High Voltage Testing Calibration of DC High Voltage Voltmeters	Single stage : 100kV, 5 mA 2 stage : 200 kV, 5 mA
Partial Discharge Detector Biddle Model 66108(0)-01	Measurement of Corona & Partial Discharge Magnitudes	Bandwidth: 25Hz - 115kHz Amplifier Accuracy : +-4%
Schering Bridge Tettex Type 2801	Measurement of capacitance, dielectric loss, dissipation factor of cables, insulator, bushing, solid and liquid insulating material	Frequency : 40-60 Hz Galvanometer Sensitivity : 5x 10 $^{-10}$ A
Spectrum Analyser HP Model 3588A	Analysing signal generated by coronating source. Analysing of insulator or arrester leakage current	Range : 10Hz-150 MHz Absolute accuracy : +-0.5dB at 150MHz +-dB at 10 Hz

Auto Earth Tester Megger DET 2/2	Measurement of earth electrode resistance and soil resistivity	Earth resistance range : 0.01 Ω to 19.99 KΩ at 1 m radiation Accuracy : ±5% Variable frequency : 105 Hz to 160 Comply to standards : BS CP 1013 (1965) VDE 0413 Part 7 (1982)
Portable Transformer Henry Patterson U.K	Use in research, test and calibration works	20 kV, 50 mA continuous rating
AC Voltage Regulator Henry Patterson U.K	Use in research, test and calibration works	Variable 20 kV, 100mA
Portable megohmmeter with adjustable voltage model 2957	Measuring insulation resistance of rotating machinery, transformers, absorption testing	Adjustable voltage: 0-10kV resistance range 0.5 Ω to 200 M Ω
Tracking resistance test system (in-house set-up)	To test tracking resistance property of solid insulating material	Conform to ASTM D2303
Custom shaped impulse waveform (in-house set-up)	For the impulse testing of medium voltage equipment	Conform to the required standards

SOFTWARE FACILITIES / EQUIPMENT

Name	Application	Technical specifications
Beasy Boundary Element Software	To study electric field distribution of electrical and high voltage apparatus	Analysis software based on the boundary element technique
Power point	Lecture & seminar presentation	-
Macromain Director	Lecture & seminar presentation	-
Pspice	To be used in the study and of design lightning induced suppressor circuit	-
I Basic	Interfacing hardware and software	-
AC System Grounding software	To study the effectiveness of substation and other installation	-

RESEARCH EXPERIENCE

- Condition monitoring under polluted environmental condition
- Lightning phenomena and its effect on man-made system
- Performance of vacuum insulated equipment
- Performance of Gas-Insulated switchgear apparatus
- Use of local timber as transmission tower cross-arm
- Surge arrester design

CONSULTANCY EXPERIENCE

- Improving Telekom Malaysia Berhad Earthing System
- Test on prototype product - eg. transformers, switch gear etc.
- Helping solve the technical production problems faced by manufacturers of apparatus such as power transformers, switchgear, high voltage tubes, etc.

SERVICES OFFERED

- Accredited test and calibration of high voltage apparatus and equipment based on ISO/IEC G 25
- Non-accredited test and calibration conforming to international standards

FIELD OF RESEARCH

Electrical & Electronic Engineering

Power Electronics

Name of group/centre:

Power Electronics Group

Research laboratory/project:

Power Electronics Laboratory

Person(s) to contact:

- Dr. Abdul Halim Mohd Yatim
- Zainuddin Abd. Razak

Postal address:

Faculty of Electrical Engineering
Universiti Teknologi Malaysia
54100 Kuala Lumpur
Malaysia

Telephone:

603 - 292 9033 *ext. 4589 / 4684*

Telefax:

603 - 293 4844

HARDWARE FACILITIES / EQUIPMENT

Name of product	Application	Technical specifications
Textronic High current Probe Model Am 503 S	AC/DC Current measurement and analysis	Sensitivity: Scope @ 10mV/div, 10mA/div to 50A/div Bandwidth: DC to 15 MHz Rise time: 25ns Max. peak current: 500A
Data acquisition system and control (Keithley)	Waveform and harmonic analysis Circuit design and testing	8 diff/16 single-ended channel. 16 digital I/O line 2 analog output with 150K conversion/sec 100,000 samples/sec 12 bits 2 counter/timer channels
DC regulated power supply Model GPR 3030	Circuit design and testing	Dual tracking with 5V fixed V=DC 0-32V I=DC 0-32A
Model GPR 3060	Circuit design and testing	Analog V=DCO-35V I=DCO-7A
Storage digital scope Model Yokogawa DL1100	Circuit design and testing	2 channel 100 MHz. Single shot Bandwidth: > 40Mhz Max input voltage > 250 Vrms. Sampling rate 200ms/sec
Model Yokogawa 1200	Circuit design and testing	4 channel 100MHz. Single shot Bandwidth: >40Mhz. Max input voltage >250 Vrms. Sampling rate 100 ms/sec.
Terco training system	DC drive systems training	DC machine: Generator 2.5 Kw @ 1500rpm. Motor 2.0 Kw @ 1500 rpm. Exitation 220v Armature 220V, 12A
	AC drive systems training	AC machine: 3-phase power 1.5kW. Speed 1415 rpm Stator voltage 120V/240V current 4A (Y), 7A (delta) 50Hz.
Lybold didactic training system	Basic training for design and operation of power electronic circuits and drive systems	This system includes the study of ● Circuit engineering ● Self commutated converter circuit, turn off valves and DC chopper ● DC drives ● Switching technology

SOFTWARE COMPONENTS / PRODUCTS

Name of product	Application	Technical specifications
PSPICE Design center	CAD and simulation of electronic and power electronic circuits and systems	Version 5.3 Library includes many ICs and power devices
Magnet	Simulation of electromagnetic circuits including transformers and electrical machines	Design optimisation based on finite element analysis

RESEARCH EXPERIENCE

- Power converters and electrical machines
- Power electronics applications, electrical drives
- Switching mode power supply (SMPS), power factor correction and filtering

CONSULTANCY EXPERIENCE

- Training in basic and advanced power electronics for industry personnel and academics
- Collaborative/sponsored research for industry

SERVICES OFFERED

- CAD and simulation of power electronic circuits
- Switching Mode Power Supply (SMPS)
- AC and DC drives

FIELD OF RESEARCH

Geotechnical Engineering

Name of group/centre:

Geotechnical Research Group

Name of laboratory/project:

Advanced Geotechnical Laboratory

Person(s) to contact:

- Dr. Md. Azman Md. Amin
- Dr. Ramli Nazir

Postal address:

Geotechnical Research Group
Department of Geotechnics & Transportation
Faculty of Civil Engineering
Universiti Teknologi Malaysia
Locked Bag 791
80990 Johor Bahru, Malaysia

Telephone:

607 - 550 3251 / 3184, 557 6160 *ext. 3251 / 3254*

Telefax:

607 - 556 6157

HARDWARE FACILITIES / EQUIPMENT

Name of facilities	Application
GDS Hydraulic Triaxial Stress Path Testing System	Monitoring of stress/responses of soil in lab under various conditions such as monotonic or cyclic, compression or extension, isotropic or

(Fully Automated)	anisotropic and undrained or drained
ELE Triaxial Testing System (Fully Automated)	Monitoring and evaluation of isotropic compressibility and shear strength of soil under monotonic drained/undrained condition
Rowe Cell Consolidation & Swelling Testing System (Fully automated)	Monitoring and evaluation of deformation & permeability of large diameter soil specimens as well as pore water response during testing. Able to test non-uniform deposit
Oedometer testing system (Fully automated)	Monitoring and evaluation of one dimensional compressibility of 50 mm diameter soil specimen without pore pressure response
Seismic wave propagation data acquisition system	Geophysical survey in soil mass for insitu soil boundary layer
Roctest Pressuremeter model Texam	Estimation of insitu soil properties and stresses induced such as horizontal stress, soil modulus and undrained shear strength

SOFTWARE FACILITIES/ EQUIPMENT

ELE data system Geotechnical testing software (DS6)	Analysis of geotechnical parameters for design purpose such as the shear strength and consolidation parameters
GDSEBP	Analysis of advanced geodata which include cyclic loading effect and parameters due to anisotropic conditions
Reinforced earth retaining structure design	Design of earth retaining wall using reinforcement such as geotextile and steel strip
Earth embankment design	Design of compacted fill for engineering purpose including the analysis of slope stability

RESEARCH EXPERIENCE

- Assessment of Atterberg limits on Malaysian soil and factors affecting them
- Study on the properties of major Malaysian soil with emphasis on soft soils, crushable soils and peat
- Study on the properties of Malaysian weak rocks
- Study on the feasibility of using local pozolonic materials in stabilising Malaysian soils
- Study on the properties of cemented soils in Malaysia

CONSULTANCY EXPERIENCE

- Evaluation and selection of field and soil testing for engineering purposes
- Application of soil parameters for engineering design
- Profiling of insitu soil properties for tendering purposes
- Verification of soil properties for V.O. during construction progress

SERVICES OFFERED

- Study and testing of problem soil and recommendation for the soil improvement
- Complete soil investigation work and report
- Joint research with other organisations of mutual interest
- Training of engineers on the advanced testing methods for soil

FIELD OF RESEARCH

Information System & Technologies

Information System Management

Research group/centre:
Information Technology Group

Research laboratory/project:
CD-ROM Laboratory

Person(s) to contact:
Puan Wardah Zainal Abidin
Associate Prof. Sarudin Kari

Postal address:
Information Technology Division
Universiti Teknologi Malaysia
Jalan Semarak
54100 Kuala Lumpur
Malaysia

Telephone:
603 - 290 4720, 294 6692

Telefax:
603 - 294 6687

HARDWARE COMPONENTS/ PRODUCTS

Name of equipment	Application	Technical specification
Computer Apple Macintosh SE (Amount:2)	Data entry	Memory :4MB Hard disk: 80MB
Computer Apple Macintosh IICX (Amount:1)	System development	Memory :4MB Hard disk: 200MB
Computer Apple Power Book (Amount: 3)	System documentation	Memory :4MB Hard disk: 120MB

Computer IBM PS 2 (Amount: 2)	System development	Memory: 6MB Hard disk: 80MB
Computer Apple Power Book (Amount: 6)	System development	Memory: 4MB-6MB Hard disk: 170MB
Laser printer (Amount: 2)	Documentation	Memory: 2MB

SOFTWARE FACILITIES/ EQUIPMENT

Facilities	Application	Technical specifications
Microsoft Word	Word Processor	Documentation
Microsoft Excel	Spreadsheet	Chart, Table
C Compiler	System development	Compiler
Pascal compiler	System development	Compiler

SOFTWARE COMPONENTS/ PRODUCTS

- **Quranic Information System**
  Quranic database systems that can retrieve any verses of the Quran by subject or verse and phrase number. This can be linked with translations of the verse in any language
- **Quranic Word Processor**
  An Arabic Word Processor that can display all characters and symbols conforming to the Osmani convention
- **Quranic Fonts**
  Arabic Fonts for Word Processor that conforms to the Osmani convention for use on any Apple Macintosh microcomputers for desk-top publishing
- **Quranic Verses Display System**
  Quick selection of any Al-Quran verses and mixed with other video inputs for transmission over television network or projected over big screen. Recent involvements: RTM's Tilawah Al-Quran (International and National) and Tadarus Al-Quran for Ramadan
- **Banking and Financial System**
  A computerised networked banking system operational at the Bank Persatuan Kerjasama Seberang Perai (BPSP). Share, Savings, Fixed Deposit and Loans. Also applicable to other banks
- **Housing Development Information System**
  Computerised system to allocate houses for buyers in housing development projects
- **Human Resource Management System**
  An integrated system involving personnel system, payroll and staff loans
- **Government Financial Information System**
  An information system to monitor financial system at Ministries. (Case study: Ministry of Land & Co-operative Development)
- **Management Information System for Maktab Kerjasama Malaysia**
  An integrated management information system encompassing all aspects of Maktab Kerjasama Malaysia. Applicable to other academic institutions dealing with training, hotel management and advisory functions
- **Management System for Perbadanan Kemajuan Kraftangan Malaysia**
  An integrated management information system encompassing all aspects of Kraftangan Malaysia. Applicable to other statutory bodies dealing with regulatory, marketing and supervisory functions
- **Financial System for Private Enterprises**
  An integrated financial system encompassing accounts payables, billing, account receivables, general ledger fixed assets, inventory and payroll facilities
- **Management Information System for Airports**
  Involves in analysis and designing an integrated management information system encompassing all aspects of Malaysia Airports Berhad. Applicable to other corporate entities dealing with management and services of airports

- Payroll System
  A computerised system for payroll and staff loans
- Personnel System
  A computerised personnel management
- Multi-media System for Presentation
  A computerised system presentation using multimedia applications. This technique incorporates image, voice and text
- Vocational Information System
  A computerised system for managing and monitoring vocational institutions for Majlis Latihan Vokasional Kebangsaan

RESEARCH EXPERIENCE

- 15 years involvement in IT consultancy for both Government and private sector
- 7 years involvement in the field of Arabic Text software development on IBM-PC and Apple Macintosh computers
- Development of multi-lingual databases
- Quranic display system for transmission of Quranic verses over television network during religious programmes developed jointly with TV Malaysia (RTM)
- Development of large text data bases system
- Development of computerised animations for an RTM show (teaching of Arabic to children)
- Market survey for IT development in Malaysia for NT & T of Japan

CONSULTANCY EXPERIENCE

- The problem of system integration in the public sector
- Feasibility study of computerisation in public and private sectors (over 20 projects)
- Re-engineering information technology
- Co-operative banking system
- Islamic banking system
- Reverse engineering on application softwares

SERVICES OFFERED

- Application of Arabic text in desk-top publishing
- Multi-lingual data base development
- Development of Islamic information system
- Systems integration and re-engineering
- Management information system planning and development
- Strategic information system planning
- Information technology and software training
- Computer networking design and development
- Development of document retrieval system

FIELD OF RESEARCH

Manufacturing & Process Technology

Membrane Technology

Name of group/centre:
Membrane Research Unit

Research group/institute:
Membrane Research Laboratory

Person(s) to contact:
- Associate Prof. Dr. Hamdani Saidi
- Associate Prof. Ramlan Abd. Aziz

Postaladdress:
Faculty of Chemical &
Natural Resource Engineering
Universiti Teknologi Malaysia
54100 Kuala Lumpur
Malaysia

Telephone:
603 - 292 9033 *ext. 4866 / 4823*

Telefax:
603 - 293 4095

HARDWARE FACILITIES/ EQUIPMENT

Name of equipment	Application	Technical specifications
Membrane gas separation pilot plant (MGSPP)	Gas separation performance	This pilot plant consistsof twodistinct units, the main MGSPP (Unit A) and the permeation cell (Unit B) Specification for Unit A: Range throughput: 0-200 Nl/hr Max. pressure: 70 bar Max. temperature: 90 °C Instrumentation: • Membrane module consisting of Hollow Fibre (HF)/Spiral Wound (SW) module • Measuring device • Safety system • Data acquisition system

		• Water hydrocarbon saturators • Purging system Specification of Unit B Range throughput: 0-20 NL/hr Max. pressure : 70 bar Max. temp: 90 °C Instrumentation: Permeation cell has the following major components: • Membrane flat sheet • Measuring devices • Safety system Both units will be enclosed in an oven for temperature control
Membrane module	Gas separation	Length: 2 ft Model: UFP-5-C-6 Type:5000/10000 NMWC Max. Operating pressure: = 25 psig Max operating temp = 165°F Flow pattern: co-current and counter-current flow

SOFTWARE FACILITIES / EQUIPMENT

Name of equipment	Application	Technical specifications
NAG PC Graphics library	All engineering applications	NAG PC Graphics Library is a graphical software for Fortran 77 programmers using IBM PC and PC compatible systems. It is full implementation of the widely used NAG Fortran Graphical Supplement Mark 2. It comprises two distinct types of routines; high level (plotting package independent) and low level (plotting package dependent)

RESEARCH EXPERIENCE

- Development of gas membrane system
- Carbon dioxide removal from natural gas (research contract with PETRONAS)
- Oxygen enrichment (air separation)
- Reduction of heavy metals from photographic waste using membrane
- Palm kernel oil clarification

CONSULTANCY EXPERIENCE

Consultancy work with Department of Environment (DOE), Ministry of Science, Technology and Environment to deal with the treatment of heavy metals that exist in photographic wastes.

Latex concentration

SERVICES OFFERED

Material characterisation using Scanning Electron Microscope (SEM), membrane performance test, porosity test system, membrane manufacturing for specific purposes.

FIELD OF RESEARCH

Material Sciences & Technologies

Concrete Structures

Name of group/centre:

Construct Team

Name of laboratory/project:

Material Research Laboratory

Person(s) to contact:

- Dr. Salihuddin Radin Sumadi
- En. Mohammad Ismail

Postal address:

Structural and Material Department
Faculty of Civil Engineering
Universiti Teknologi Malauysia
Locked Bag 791
80990 Johor Bahru
Malaysia

Telephone:

607 - 580 3090, 576 160 *ext. 3090 / 3081*

Telefax:

607 - 556 6157

HARDWARE FACILITIES/ EQUIPMENT

Name of equipment	Application	Technical specifications
Autoscan 60 Mercury Intrusion porosimeter (software installed)	Control of porosity in terms of pore volume, size and pore size distribution of industrial products: cement based materials, ceramics, fabric, fibres, composites, cosmetics, oil bearing rock, ores, building materials, electrodes, catalysts and many others	Pressure ranges: 20.0 - 60 000 PSIA (0.14-8.3 MPA)
Thermogravimetry TG) 500 (software installed)	TG and DTG of cement-based materials: ● monitor the degree of hydration of cement ● degree of pozzolanic activity of pozzolans and blended cements Transition temperature (TG & DTG)	Temperature range: ambient to 1500°C sample size - up to 100 mg loading of balance

Basic concrete /structural lab equipment such as:

● Moulds	Cube, cylinder and flexural tests of concrete	Various sizes
● Tonipac compression test machine	Strength tests of (compression and flexural)	Compression 3000 kN
● Dartec universal testing machine (software installed)	Strength tests for concrete, steel timber and building materials	Tension: 2000kN Compression: 500kN 5000kN
Non-destructive testing equipment	Inspection of concrete durability	
● schmidt ● ultrasonic pundit ● cover meter ● bore drilling equipment ● permeameter ● half cell ● resistivity meter	- strength of "in-situ" - general concrete deterioration of existing structures	

RESEARCH AND CONSULTANCY EXPERIENCE

- Engineering properties, microstructures and pozzolanicity of blended cements: Pfa, RHA, POFA and slag cements
- Verification of strength of slag cement for the drafting of Malaysian standard (SIRIM)
- Porosity and permeability of structures: e.g. city of Melaka bridges and a structure in Sabah
- Ferrocement testing and construction e.g. ferrocement canoe

SERVICES OFFERED

- Investigation of concrete deterioration for repairs
- Durability of concrete structures
- Pore structures of materials - porosity, pore size distribution of industrial products: cement-based materials, ceramics, fabrics, fibres, composites, cosmetics, rocks, building materials and porosity controlled items (materials and product development)
- Pozzolanicity of cement replacement materials and blended cements
- Construction of ferrocement products
- Strength testing of concrete and steel reinforcement
- Strength testing of masonry unit
- Time-dependent information of masonry
- Short course on load bearing masonry

FIELD OF RESEARCH

Material Sciences & Technologies

Polymer Compounds

Name of group/centre:

Macromolecule Group

Name of laboratory/project:

Macromolecule Laboratory

Person(s) to contact:

- En. Md. Nasir Katun
- Dr. Ahmedy Abu Naim

Postal address:

Macromolecule Unit
Department of Chemistry
Universiti Teknologi Malaysia
Locked Bag 791
80990 Johor Bahru
Malaysia

Telephone:
607 - 557 6160 *ext. 4502 / 4505 / 4545*

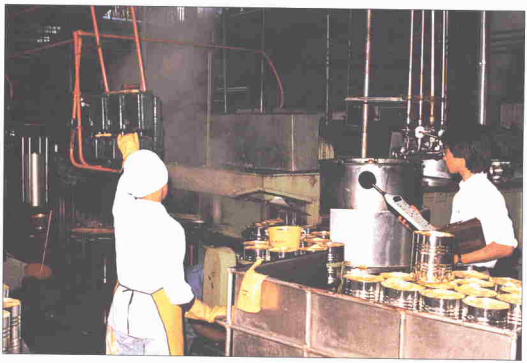
Telefax:
607 - 556 6162

HARDWARE FACILITIES/ EQUIPMENT

Name of equipment	Application	Technical specification
Brabender plasticorder: Lab. mixer, extruder and compounding system	Compounding/ mixing/ processability of plastics or rubber	Computer controlled; Power output: 6.5kW (8.8hp); Torque: 400Nm; Speed range: 5-120rpm
FTIR spectrometer c/w search library (polymers); film-maker and grinder	Identification of polymer functional groups	Computer-controlled; Wavenumber range: 400-7800 cm -1; microbeam focus; search software; ATR, DRIFT for powder, liquid, film etc.
Gel Permeation Chromatography (GPC)	Molecular weight & molecular weight distribution of polymer	Computer-controlled; RI and UV detector
Thermal Analysis System:DSC,DMA & TMA	Thermal properties of elastomer, thermoplastic thermoset, Tg, Tm; mechanical (viscoelastic); DMA: properties dimensional changes	Computer-controlled. DSC: Temp. range: ambient to - 725 °C. Freq. 0.01 - 51 Hz. Furnace Temp: ambient - 500 °C TMA: Temp. range: ambient - 1000 °C. Sample type: solid, liquid, powder, film, fiber
Melt Flow Indexer c/w automatic loading and analysis	Melt flow of thermoplastic	Manual & computer-controlled operation; Temp. range: 150 - 300 °C. ▶
▶ Densitometer	Measuring bulk density; specific gravity	Solid, film, elastomer, plastic, thermoset
2 Roll-Mill	Blending/mixing elastomer formulation	Electrically heated, single speed, variable nips
Hydraulic Hot Press	Sample preparation (elastomer)	Electrically heated platen; 35 ton
Machanical Stability Tester (MST)	Latex stability tester	
Material Testing Machine	Tensile & compression testing of materials (rubber/plastic)	Manual & Computer-controlled operation; Load cell: 5 kN & 10 kN
Vapour Pressure Osmometer	Molecular weight determination	Molecular weight, Mn < 35,000; thermistor probes
Dumbell Specimens Cutter	Specimen cutter for dumbell round shapes, various sizes	Rubber or soft plastic
Karl Fischer Titrator	Trace water determination e.g. polyol	Automatic reading
Laboratory Viscometer	Viscosity determination, rheological properties of test material	Various spindles and speeds

AREA OF SPECIALISATION

- Compounding/mixing/processability of plastics or rubber
- Identification of polymer functional groups
- Molecular weight and molecular weight distribution of polymer



RESEARCH EXPERIENCE

- Polymer Networks, Interpenetrating Polymer Networks (IPN)
- Elastomer and thermoplastics blending
- Rubber and plastics processing behaviour
- Polyurethanes syntheses
- Thermal properties of elastomer & plastic
- Molecular weight and molecular weight distribution
- Mechanical properties of rubber & plastic

CONSULTANCY EXPERIENCE

- Technical problems solving on polymer characterisation
- Mechanical properties of rubber gloves
- Rubber gloves staining
- Polyol characterisation
- Adhesion of elastomer on metals
- Reclaim of industrial polymeric wastes

SERVICES OFFERED

- Blending/compounding of rubber & plastic
- Mechanical properties of plastic & rubber
- Thermal properties of rubber & plastic
- Thermomechanical properties of plastic and rubber
- Polymer characterisation

FIELD OF RESEARCH

Mechanical & Industrial Engineering

Noise & Vibration

Name of group/centre:

Noise & Vibration Group

Name of laboratory/project:

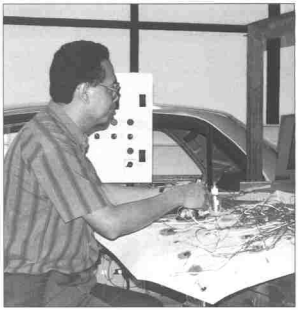
Institute Of Noise & Vibration

Person(s) to contact:

- Prof. Dr. Mohd Salman Leong
- S. Mathivanan

Postal address:

Institute of Noise & Vibration
Universiti Teknologi Malaysia
Jalan Semarak
54100 Kuala Lumpur
Malaysia



Telephone:

603 - 290 4931

Telefax:

603 - 293 2854

HARDWARE FACILITIES/ EQUIPMENT

Name of equipment	Application	Technical specifications
On-line vibration monitoring unit	Continuous and periodic monitoring of vibration in rotating machines and structures	16 channels, Frequency Response 1 Hz to 10 kHz (Machine Speeds 60-10,000 rpm)
Real time vibration and noise analysers (Hewlett Packard HP 3569A, Rion SA27)	Spectral analysis of vibration and noise (Industrial, environmental and product development)	2 Channels, DC to 20kHz Displacement, velocity and acceleration transducers and microphones input
Vibration exciters (B & K Exciter Systems, Type 4801, Type 4808)	Vibration testing of products and samples to various test standards	Various sizes and shaker, 10Hz to 10kHz, Max. load 400N
Sound level meters and analysers (Bruel & Kjaer, Rion, Various models)	Noise measurements (industrial, environmental acoustics)	dB, dBA, Octave and one third octave, All standard acoustical parameters
Acoustic intensity analyser (Bruel & Kjaer, Ono Sokyi)	Acoustic intensity measurements, development and product testing for noise and vibration	Two and four microphone input. Narrow band and octave bandwidths
Wear debris analyser	Wear particles analyser and counter for bearings and gearbox	5 and 50 microns particles

Reverberant room and transmission loss suites	Sound power rating, acoustic absorption testing and sound transmission loss testing	Test room volume 80m³ Sample size 2m x 2m

SOFTWARE FACILITIES / EQUIPMENT

Name of equipment	Application
SMS-STAR	Structural testing and reporting in structural dynamics. Product development and trouble shooting.
RBTSM DyRoBes	Vibration rotodynamic analysis of rotor bearing systems. Prediction of critical speeds, unbalance response and stability. Lateral and torsional analysis
ENM	Environmental noise and modelling of outdoor noise propagation
INV-Noise	Noise prediction and modelling of indoor and outdoor industrial noise, and noise control analysis
COSMOS-M, MSC-PAL	Finite element analysis of mechanical and structural systems. Static and dynamic analysis
ADGURY	Vibration and condition monitoring analysis software

RESEARCH EXPERIENCE

- New modelling techniques for noise and vibration propagation
- Investigations of flow induced vibrations
- Rotordynamics analysis

CONSULTANCY EXPERIENCE

- Prediction and assessment of industrial noise/ environmental noise
- Industrial noise control design
- Vibration control design
- Vibration failures trouble shooting
- Assistance in product development (noise & vibration reduction)

SERVICES OFFERED

- Noise and vibration predictions and modeling
- Industrial assignments in noise and vibration control
- Testing and measurement services in acoustics, noise and vibration
- Training for industry in noise and vibration measurements and control

FIELD OF RESEARCH

Mining & Mineral Processing

Petroleum Engineering

Name of group/centre:

Drilling Fluid & Cement Research Group

Research laboratory/project:

Drilling Fluid & Cement Laboratory

Person(s) to contact:

- Associate Prof. Dr. Ariffin Samsuri
- Shahrin Shahrudin

Postal address:

Faculty Of Chemical &
Natural Resource Engineering
Universiti Teknologi Malaysia
Jalan Semarak
54100 Kuala Lumpur
Malaysia

Telephone:

603 - 290 4513, 292 9033 *ext. 4510 / 11 / 13*

Telefax:

603 - 293 4095

HARDWARE FACILITIES / EQUIPMENT

Name of equipment	Application	Technical specification
Specification for drilling fluid materials	Determination of physical properties for material manufactured for use in oil/gas well drilling fluid	API Spec. 13A
Recommended practice standard procedure for field	Physical properties rheology	API Spec. 13B-1

testing water-based drilling fluids	determination of water based drilling fluids formulation	
Recommended practice standard procedure for field testing oil-based drilling fluids	Physical properties/ rheology/ determination of oil-based drilling fluids formulation	API Spec. 13B-2
Specification for material testing for well cements	Standards for well cements, well cement additives and well cement formulation testing	API Spec. 10

RESEARCH EXPERIENCE

- Study of perforation stability by physical and numerical modelling
- A comparison between the drillers and engineers method for well kick solution
- Optimisation of WOB and RPM Cemara Field Drilling Operation
- The study and viability of palm oil methylester system, palm oil butylester systems in comparison with current mineral oil systems
- Feasibility study of using local cement materials in oil and gas-wells cementing operation
- Wellbore stability study

CONSULTANCY EXPERIENCE

- Padang cement testing : API Spec. 10
- Bentonite testing : API Spec. 13A

SERVICES OFFERED

- Laboratory testing for drilling fluid and cement material and formulation
- Consultancy in petroleum engineering (cement, drilling fluid and borehole stability)

FIELD OF RESEARCH

Water Resources

Name of group/centre:
Water Resources Research Group

Research laboratory/project:
Water Resources Research Laboratory

Person(s) to contact:
Associate Prof. Dr. Amir Hashim Mohd Kassim

Postal address:
Faculty of Civil Engineering
Universiti Teknologi Malaysia
Locked Bag 791
80990 Johor Bahru
Malaysia

Telephone:
607 - 580 3003

Telefax:
607 - 566 157

SOFTWARE FACILITIES / EQUIPMENT

Name of equipment	Application	Technical specification
HYDATA	Hydrological database	HYDATA 3.01
RAFT-XP	A model that can runoff hydrographs at defined points throughout a watershed for a set of catchment conditions and specific rainfall events. It is an integrated program to design and analyse urban and rural stormwater drainage systems	RAFT-XP Runoff Analysis and Flow Training Simulation WP-Software
HEC-6	A simulation program designed to analyse scour and deposition by modeling the interaction between water-sediment mixture, sediment material forming the stream's boundary and the hydraulics of flow	HEC-6 Scour and Deposition in Rivers and Reservoirs

HEC-2	A program to calculate water surface profiles for steady gradually varied flow in natural or man-made channels	HEC-2 Water Surface Profile	▶	submergence from downstream tailwater depths and corrections for approach velocities	
SEDIMOT-II	A program to calculate water surface profiles for steady gradually varied flow in natural or man-made channels	SEDIMOT-II A Hydrologic Watershed Model By: Bruce N. Nelson Billy J. Barfield Ian D. Moore Department of Agriculture Engineering University of Kentucky Lexington, KY	KYPIPES	This program can be used to analyse state flows and pressures for pipe distribution system	KYPIPES Computer Analysis of Flow in Pipe Networks including Extended Period Simulations By: Don. J. Wood Department of Civil Engineering University of Kentucky Lexington, Kentucky 40506
HEC-3	A program that can simulate the operation of reservoir system for such conversion purposes as water supply, navigation, recreation, low- flow augmentation and hydro electric power.	HEC-5 Reservoir Analysis for Conservation US Army Corp of Engineers The Hydrologic Engineering Center 609 Second Street Davis, CA 95616	MIKE-II	MIKE-II is a user-friendly software package for simulation of flows, sediment transport and water quality in estuaries, rivers, irrigation systems and similar water bodies	MIKE-II and MIKE-II UD A macrocomputer based modeling system for rivers and channels Danish Hydraulic Institute Agern Alle 5 Horsholm, Denmark
DAMBRK	The model computes the reservoir outflow hydrograph resulting from the breach via a broad-crested weir approximation, which includes effects of	DAMBRK NWS and Break Analysis By: D.L Fread Senior Research Hydrologist *Hydrologic Research Lab* *Office of Hydrology* National Weather Services (NWS), NOAA Silverspring Maryland 20910 ▶	POND-2	This software consists of several major detention functions that can be used for detention pond design and analysis	Pond-2 Detention Pond Design Analysis Haestad Methods Inc 37, Brookside Road Waterbury, CT 06708
			HEC-PLOT	It is a programs to provide a	HEC-PLOT Willing and Partners

	quick and simple graphical display of cross section data and computed results from HEC-1 and HEC-2	8-10 Purdue Street Belconnen ACT 2617
QUICK HEC-12	This program automates calculations for finding the interception capacity of roadway and median inlets QUICK HEC-2 will calculate the pavement spread and required length of the drop inlet slot to intercept all flow	QUICK HEC-12 Drop Inlet Design and Analysis Haestad Methods, Inc. 37 Brookside Rd. Waterbury, CT 06708
ResQ	ResQ simulates the monthly operation of a water resources system that includes a reservoir and a downstream demand point	ResQ Single Reservoir System Operation Simulation Haestad Methods, Inc., Software System Design and Development 37 Brookside Rd. Waterbury, CT 06708
EXTRAN-XP	It is a dynamic flow routing model that inflow hydrographs through an open channel and/or closed conduit	EXTRAP-XP WP Software 8-10 Purdue Street Belconnen ACT 2617
SURGE 5	SURGE5 is the latest version of SURGE software that deals with the analysis of both steady and unsteady flow in pipelines using the wave plan approach	SURGE 5 Steady and Unsteady Flow Analysis WP Software 8-10 Purdue Street Belconnen ACT2617
CYBERNET Version 2	CYBERNET software is a water distribution modeling software that integrates the use of Autodesk's Auto CAD, pressure network modeling algorithms and water quality analysis procedures	CYBERNET Version 2 Haestad Methods, Inc Software System Design & Development 37 Brookside Road Waterbury, CT 06708

RESEARCH EXPERIENCE

- Field infiltration and testing of GIS based urban runoff model over Anak Sg. Keroh Catchment, Kuala Lumpur
- Stormwater control and flow modeling along the upper Klang River
- Modelling bioenvironmental hydraulics impact of stormwater diversion in the Batu Pond, Kuala Lumpur
- Spatial IT-based automation of water management in KADA areas
- Stormwater investigation for small/new residential catchment in Johor
- Microcomputer methods for urban storm drainage using modified time-area
- Testing of GIS based urban runoff model in the Klang Valley subcatchments
- Saltwater movement in multilayered aquifer, Tanjong Mas, Kelantan

CONSULTANCY EXPERIENCE

- Muar town flood mitigation project
- Conceptual drainage masterplan for Tanjung Tokong reclamation project
- Sartelite and IT-based environmental management study for the Sg. Sintok/Sg. Badak Basins, Kedah
- Water reticulation project
- Feasibility study for the proposed new crossing across Sg. Bintangor, Sarawak

SERVICES OFFERED

- Water hammer analysis
- Urban drainage planning and analysis
- Hydrologic and water resources assessment
- Ground water study
- Water supply distribution network planning and analysis
- Water supply reservoir planning
- Dam break forecasting
- Flood forecasting
- Reservoir planning and management
- Flash flood control/management
- Simulation of reservoir for irrigation, hydropower and domestic purposes

YTL Corporation Berhad

Name of agency / institution / company:
YTL Corporation Berhad

Person(s) to contact:
Roger Bambrough *(Director of Corporate Affairs)*

Postal address:
Yeoh Tiong Lay Plaza
55 Jalan Bukit Bintang
55100 Kuala Lumpur
Malaysia

Telephone:
603 - 242 6633

Telefax:
603 - 241 2703

Office hours:
9.00 am - 5.00 pm *(Mon - Fri)*
9.00 am - 1.00 pm *(Sat)*

SUMMARY OF EXPERIENCE / SERVICES OFFERED

The YTL Group has graduated with over four decades of intense experience from a builder to an organisation with BOT capabilities. As the country's first licensed Independent Power Producer, it successfully launched the power stations at Paka and Pasir Gudang seven months ahead of schedule, establishing itself as a capable and reliable infrastructure developer.

The variety of projects that represents our experience ranges from social housing to luxury condominium developments; from hospitals, hotels and resorts to airports; from schools to tertiary education institutions. The development and operation of the Eastern & Oriental Express train service added depth and breadth to that experience. We have also successfully completed projects overseas and are continuing to extend our involvement in that sector.

To support our core activities we are also involved in a number of manufacturing ventures. Our fully owned subsidiary Buildcon Berhad holds the record in this region for the biggest continuous pour of concrete in the laying of the foundation of the Kuala Lumpur City Centre twin towers involving 13,000 cubic metres of concrete. YTL/Buildcon is engaged in a joint-venture with the State Government in the setting up of a 1 million tonne cement plant in Pahang.

With such a wide palette of experience the YTL Group is well placed to serve our clients with the assurance of tasks being completed on Time, within Cost (budget) and with Quality with our management of the 4M's of Methodology, Materials, Machinery and Manpower.

PAHANG: THE CENTRAL STATE THAT IS AS ABUNDANT IN NATURAL RESOURCES.

AS IT IS IN INDUSTRIAL RESOURCES.

Support resources is key to the success of industries. Realising that Pahang is going full swing into industrialisation, Perbadanan Kemajuan Negeri Pahang or PKNP will add 19 new industrial estates to its existing 10 thriving industrial zones to fully support any industrial endeavour.

accessible ready-markets, and more importantly, an investment Service Centre that offers investors a personalised service right from the start.

Pahang is now gearing itself towards attracting RM4 billion of new investments, whilst creating almost 7,000 new job opportunities.

projects and a long-term vision to create a Bumiputra Commercial and Industrial Community.

Being an investment centre, PKNP welcomes prospective investors to seek investment opportunities in Pahang. At the same time, ensuring existing investors of its unwavering support, always.

What kind of support?

Competitively-priced industrial land, good infrastructure built-up, abundant labour force, easy availability of raw materials.

Being the nerve of the state's industrial development, PKNP and its two subsidiaries, Pasdec Corporation & Pascorp Holdings are actively developing new townships, housing, commercial complexes, manufacturing, mining, tourism and tourism-related

SO COME TO US, YOU'RE IN VERY GOOD HANDS.

PERBADANAN KEMAJUAN NEGERI PAHANG

PKNP

Group Head Office

Pahang State Development Corporation
16th Floor, Menara Teruntum, Jalan Mahkota,
25000 Kuantan, Pahang Darul Makmur.
Tel: 09 - 505566 Fax: 09 - 500510

Subsidiary Companies

PASDEC

Pasdec Corporation Sdn Bhd
14th Floor, Menara Teruntum, Jalan Mahkota,
25000 Kuantan, Pahang Darul Makmur
Tel: 09 - 515888 Fax: 09 - 515988

PASCORP HOLDINGS SDN. BHD.

Pascorp Holdings Sdn Bhd
19th Floor, Menara Teruntum, JalanMahkota,
25000 Kuantan, Pahang Darul Makmur
Tel: 09 - 504000 Fax: 09 - 504940