KDN PP 1050/12/2012 (030192) ISSN 0126-9909

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JURUTERA

Number 01, JANUARY 2021 IEM Registered on 1 May 1959

THE INSTITUTION OF ENGINEERS, MALAYSIA
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46720 Petaling Jaya, Selangor Darul Ehsan.
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JURUTERA is published and printed monthly by
Dimension Publishing Sdn. Bhd.

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COVER NOTE

TAKING A LOOK AT FOOD SECURITY

by Ir. Vasan Mariappan
Chairman, Agricultural & Food Engineering Technical Division

Food security is the state of having reliable access to a sufficient quantity of affordable and nutritious food. High population growth and rising urbanisation are putting a strain on the food system in certain parts of the world.

In some countries, scarce natural resources (particularly arable land and water) and climate change are factors that limit sufficient food production, so these have to rely increasingly on food imports to meet demand.

The Food & Agriculture Organisation of the United Nations is looking seriously into effective food security and nutrition governance mechanisms as well as the reduction of food waste and food loss. On a broader scope, food security is not only about production but also about trade, food quality, safety, marketing, distribution and, most importantly, livelihoods.

For successful implementation, food security requires cooperation at national and international levels and cooperation in areas such as scientific research, knowledge exchange and investment.

Malaysia is blessed with fertile soil, natural resources and good climate, so we can grow our own food and be sustainable. However, as we move towards being developed country, focus is leaning towards industrialisation, side-tracking the importance of food safety and security.

Food security is crucial for any nation to get healthier and to flourish, so in this month's *JURUTERA*, the Agricultural & Food Engineering Technical Division (AFETD) takes a look at food security and highlights a few points. ■

EDITOR'S NOTE

TOWARDS SELF-SUSTAINABILITY IN FOOD PRODUCTION

by Ir. Dr Bhuvendhraa Rudrusamy
Principle Bulletin Editor

I hope everyone is feeling good and refreshed after returning from the holidays and is ready to start the year 2021 filled with hope and faith. In this month's bulletin, the highlight is on food safety, environment and sustainability.

According to projections by the United Nations, the world's population is expected to rise to 10 billion by the year 2057 and, simultaneously, the current trend shows an uprise in food insecurity.

In addition to climate change, locust threat and political conflict, the COVID-19 pandemic has been another major threat to food systems. Small-scale food producers continue to be hit hard by these crises.

While agriculture production has been targeted to double by the year 2030, engineering can be the key solution to maintaining our food security.

In Malaysia, a recent report by Bank Negara has indicated an increase in certain imports for food dependency. With the 4IR initiative, it is hoped that modern technologies such as smart sensor, IoT, cloud computing, drones, etc., will provide a breakthrough transformation to smart farming and precision agriculture for self-sustainability. ■

FOOD Safety, Sustainability & The Environment

The Director General of Malaysian Agricultural Research & Development Institute (MARDI), Y.Bhg. Datuk Dr Mohamad Roff bin Mohd Noor, highlights the institute's R&D work in advancing Malaysia's agro-food sector.

The Director General of the Malaysian Agricultural Research & Development Institute (MARDI), Y.Bhg. Datuk Dr Mohamad Roff bin Mohd Noor, holds a PhD in Plant Virology from University of Reading, UK. He has won many awards for research work such as Tetracropping-Effective technique in combating virus infestations in chilli and Knowledge-Molecular epidemiology of whitefly-transmitted gemini-viruses in horticultural crops in Peninsular Malaysia. His other research works include evaluation and screening of papaya germplasm for PRSV resistance and delayed ripening, habitat management strategies for control of Aphis gossypii in chilli and the development of biosensors for agro-based, industrial and environmental applications.

To achieve national food safety and a continuous supply of food, the agriculture and agro-based industry requires greater transformative measures to address current and foreseeable challenges, including the necessity to ensure environmental sustainability within the context of agricultural activities. Several Government bodies and agencies under the purview of the Ministry of Agriculture & Agro-based Industry (MOA) bear the responsibility of moving the industry forward; 2019 contributed RM101.5 billion (7.1%) of the Gross Domestic Product (GDP), making it the third highest contributor to the national income. Palm oil was the major contributor to the value added of agriculture sector at 37.7%, followed by other forms of agriculture (25.9%), livestock (15.3%), fishing (12.0%), forestry & logging (6.3%) and rubber (3.0%).

One government body that plays an integral role in transforming the country's agriculture and agro-based industry is the Malaysian Agricultural Research and Development Institute (MARDI), which conducts R&D and undertakes transfer of technology as well as commercialisation of its products and technologies.

Established 52 years ago on 28 October 1969, MARDI carries out projects that fall under three broad categories, namely public development projects spearheaded by MOA, collaborative projects with the private sector and contract research projects with private companies. Technological advancement is also high on the list of its priorities, with a focus on food safety and sustainability as well as protection of the environment.

TECHNOLOGY DEVELOPMENT AND COMMERCIALISATION

According to its Director General, Datuk Dr Mohamad Roff bin Mohd Noor, MARDI had developed some 1,000 technologies since its inception. The technologies are applied not only to the development of public goods which are given free to farmers and entrepreneurs, but also to the development of commercial goods under MARDI's collaboration with industry players. These come with MARDI's intellectual property (IP) rights.

"We charge parties which want to buy our IP rights. These have high commercial value as can be attested by the success of many agro-food sector entrepreneurs which have collaborated with us and received our guidance. Success stories include Ramli Burger, Kicap Kipas Cap Udang and Brahim's food products," says Datuk Dr Roff.

In terms of commercialisation of goods, he says the rate is about 15% of commercial technologies developed annually but the total varies every year, depending on the projects carried out.

"In 2020, for example, our target was to develop 90 technologies and products, of which some would go to public goods and 15% to commercialised goods," he says.

MECHANISATION & AUTOMATION

MARDI has been proactive in extending the technologies related to mechanisation and automation in the agro-food sector. In projects that involve engineering, MARDI's work encompasses the development of machinery for food processing, such as those required by small and medium-sized enterprises (SMEs). These include machinery for making lemang and satay and for peeling coconuts.

Development work also involves field machinery, with a focus on work specific to padi fields with various soil conditions, such as peat and porous soil. Its field machinery can be used for requirements from land preparation to fertilising, harvesting and transportation.

Datuk Dr Roff says mechanisation and automation technologies are important as they can drive the country's agro-food sector development further. The advantages include the capability to produce a constant supply of agro-food products, reduce production costs, improve production rates and lower labour cost.

The National Agro-Food Policy 2011/2020 emphasises the importance of mechanisation and automation as well as outlines the strategic direction for R&D, innovation and use of technology. In so far as MARDI is concerned, its Engineering Research Centre is at the forefront of developing mechanisation and automation technologies which can provide solutions to issues faced by SMEs in the agro-food sector.

"Take, for example, pineapple cultivation. We have developed the machinery for transplanting and harvesting as well as applying liquid fertiliser and pesticide. For tuber

Fertiliser application system using Variable-rate technology (VRT) in rice production

crops such as sweet potato, we have produced machinery for preparing planting beds, applying granule and liquid fertilisers as well as weeding," says Datuk Dr Roff.

AGRICULTURE 4.0

Besides undertaking R&D in farm mechanisation as well as post-harvest and food processing mechanisation, MARDI is also focusing on smart farming innovation and the development of technology applications, such as the Internet of Things (IoT) relevant to the agriculture and agro-food sector. Precision farming involves the development and use of new technologies to increase crop yields and profitability while lowering the levels of traditional inputs needed to grow crops, including land, water, fertiliser, herbicides and insecticides.

Datuk Dr Roff explains that farmers who use precision farming technologies are able to use less to grow more. Robotics, big data analytics, cloud computing, machine learning and IoT are some technologies which can be implemented parallel to the 4th Industrial Revolution (4IR) and these open up competitive advantages through increased productivity, flexibility, efficiency and customisation. Agriculture 4.0, which is a segment of 4IR, has a framework with 3 pillars: Automation, connectivity and intelligence.

1. Automation involves not only the application of technologies which can help monitor, control and execute various processes but which also allows for the customisation of many agricultural processes such as seeding, weeding, cutting, harvesting, storing and packing of agro-products.
2. Connectivity technologies facilitate communication, engagement & data collation and exchange. This covers farm IoT systems where data derived from sensors that monitor farm conditions are sent to cloud-based computing platforms with built-in algorithms. These are also capable of supplying other data, including weather reports, to support decisions on when to harvest or to apply pesticides as well as market pricing information.
3. Intelligence, the third pillar, encompasses the process of analysing data collected from various sources and processing them into actionable decisions. This process is important in farm management.

MARDI plays an integral role in the above by bringing innovations in agriculture, from developing new crop varieties and livestock breeds to disease management methods, which contribute towards engineering solutions required under all the 3 pillars.

FOOD WASTE MANAGEMENT

MARDI is also involved in agriculture and food waste management. "Our initiatives in this area include the MySafe food campaign, in which we have collaborated with SWCorp, non-governmental organisations (NGOs) and a few private companies. In our collaboration with SWCorp, we have developed a machine that converts food waste into compost fertiliser for crops. Our collaboration with NGOs and private companies involve the collection of untouched food which we then distribute to the homeless and the needy," says Datuk Dr Roff.

ENVIRONMENT AND SUSTAINABILITY

In contributing towards the environment and sustainability, Datuk Dr Roff says Mardi focuses on the production of greenhouses to help reduce methane and hydrogenous gases produced through agricultural activities.

"We are also looking at reducing water usage in rice planting, as water is now scarce in some areas. We are developing bacteria which, when applied into the soil, can help transport water to reach the plant roots. This can also help store water below the ground and will be particularly useful in areas which lack water. We also have a rice gene that can be planted in drought conditions. Our focus is on developing the drought-tolerant rice gene and the possibility of planting padi on troughs floating in the sea. The latter will require a rice gene that is tolerant to salty water," says Datuk Dr Roff.

Another problem the agriculture sector faces is soil erosion, especially in Cameron Highlands and in areas with steep slopes such as Kundasang (Sabah) and Lojing (Kelantan). Cameron Highlands records high annual rainfall, so soil erosion continues to be a serious problem and sedimentation in rivers and drains is very high.

"It takes 100 lorries to remove and transport the sediment out. There is also a lot of incoming mud sediment. If this flows into the rivers, it is not within MARDI's jurisdiction. So we plant trees to stop the soil erosion and vetivar grass on hill slopes for the same purpose," he says.

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Illegal farming is another problem that plagues Cameron Highlands. "We urge the farmers to not ravage the jungles for farming activities as this will only worsen soil erosion. Land for agriculture there have been fully utilised. This is why more farmers are moving to Lojing, where the climate is similar to that in Cameron Highlands," says Datuk Dr Roff.

MARDI has a station in Tanah Rata, the main town in Cameron Highlands. With the need for more environmental sustainability efforts in the highlands, the station has been converted to focus on conducting research on green farming.

"Our plan is to develop the concept of green farming, using green technology which will encompass the expansion of organic farming. We want farmers in Cameron Highlands to reduce the use of pesticides and inorganic fertilisers which are presently used intensively. One of our current efforts is introducing biological agents which can control/get rid of harmful insects. It involves the use of beneficial insects, which is a pest control strategy often used in organic farming or gardening as well as in integrated pest management," he says.

MARDI has reared three types of beneficial insects – *Diatechmaus, Patellis Coitesia* and tiger moths – to protect vegetables such as cabbage and broccoli, from damage by plant pests and from diseases like flutella. MARDI has also developed bio-pesticides containing virus which can kill flutella and fungus. Datuk Dr Roff says MARDI encourages farmers, both in the highlands and lowlands, to use bio-pesticides as well as organic fertilisers.

"We also want them to undertake multiple cropping or crop diversification by planting several crops in their plots. Our studies show that with single crops, insects and pests congregate on that single crop, causing widespread damage. But if farmers practise crop diversification, they can produce different volatility for different crops which will 'confuse' the insects, hence deterring them from attacking the crops," he says.

According to him, MARDI's engineering expertise in agriculture includes vegetable planting in an enclosed environment, without using insecticide, weedicide and pesticide. MARDI wants to expand this technology to integrate IoT eventually which will enable the use of artificial intelligence (AI) to help farmers in modern crop planting. This includes autonomous farming such as driverless tractors which will reduce the need for manual labour.

"We have developed the technology to grow a massive number of plants, amounting to 16,000 in an area measuring 30m x 80m, which will make planting much more lucrative. In future, more farmers will be IT savvy. We want to attract the next generation of farmers and to achieve this, we must develop new technologies which they will like and can use. For example, farmers will no longer have to toil on their land for eight hours a day; instead, they can monitor what is going on in their farms via mobile phone applications. We also want to introduce in food plant factories the concept of safe food which is free of harmful pesticides. The production of safe food is an important target," says Datuk Dr Roff.

PUBLIC DEVELOPMENT PROJECTS

For public development projects, MARDI is mandated to work on crop commodities with the exception of rubber, cocoa, palm oil and fisheries as these come under the purview of the Rubber Research Institute, Malaysia Cocoa Board, Malaysian Palm Oil Board and Department of Fisheries Malaysia, respectively.

"Last year, we celebrated our 50th anniversary. Since 1969, our greatest contribution to the nation so far is the development of 50 rice varieties. Development of rice varieties is one of MARDI's main mandates. Padi planters in the country have been growing and cultivating our rice varieties over the years," says Datuk Dr Roff.

RICE DEVELOPMENT

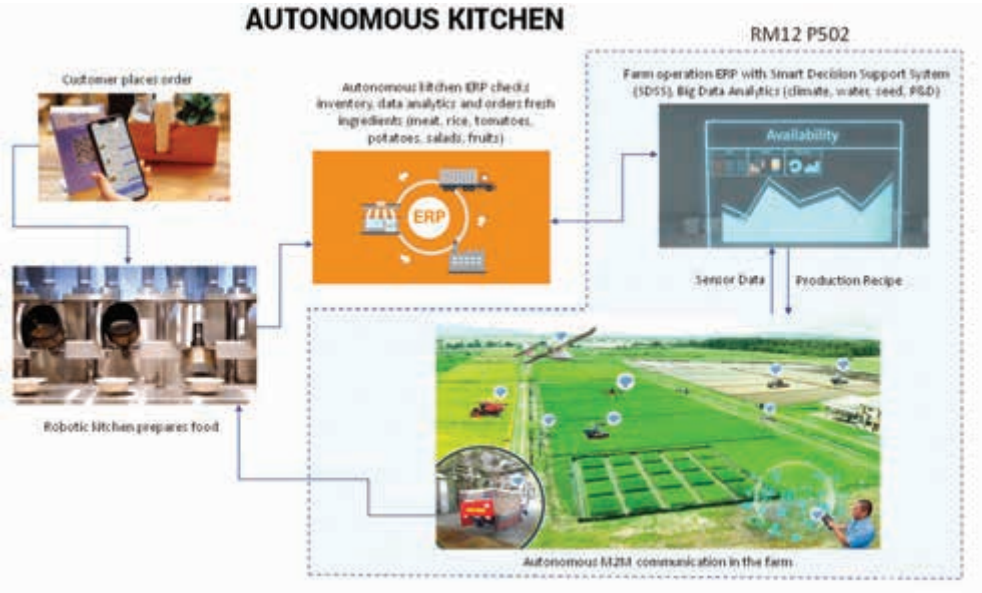
In the 1970s, early rice varieties developed by MARDI included Murni, Masria and Jaya. In the next decades, with improved infrastructure

and enhanced technological knowledge, new, short maturity rice varieties that allowed for double cropping annually were developed. Improved irrigation systems, high germination percentages and mechanisation for work from land tilling to harvesting, resulted in the production of high yield inbred and hybrid varieties with good resistance and eating quality. These included MR219, MR303, MR307 and MR279 as well as the currently more popular varieties of MR220, CL1 and CL2. Datuk Dr Roff says the government is encouraging rice farmers to plant these varieties as they will be entitled for subsidies such as fertilisers and pesticides as well as greater support from the government in terms of pricing. In 2019, the total land area for padi planting was 689,268 hectares, of which 90% were planted with MARDI rice varieties. "In terms of varietal development, we have also developed specialty rice including basmati (MRQ74) and fragrant rice (MRQ76)," he adds.

Besides focusing on rice varietal development, MARDI also emphasises on R&D work which covers the full spectrum of rice production system and nutrient management, pest and disease management, post-harvest management, mechanisation and automation, seed production and biodiversity.

"In rice cultivation and production, we look into good harvesting practices, which have seen significant improvements. In 1985, losses from the harvesting stage to transportation and milling was 28.5%. In 2016, we reduced this to 7.9%. We aim to reduce this further," says Datuk Dr Roff.

Tractors are now used in pineapple farms



Industry 4.0 concept in the agricultural crops production
Source: MARDI

An important contribution by MARDI was the successful production of 150kg of rice foundation seeds which were sold to nine companies approved by MOA. These companies then produced 4,000 metric tonnes of registered seeds annually, followed by the production of 72,000 metric tonnes of certified seeds which were distributed to and used by farmers throughout the country. Datuk Dr Roff says MARDI issues Standard Operating Procedures for the rice industry service providers by providing them with the necessary training to ensure successful delivery.

HORTICULTURE CROPS AND LIVESTOCK PRODUCTS DEVELOPMENT

Apart from rice, MARDI has also made developments in horticulture crops such as papaya, pineapple and rambutan. Its papaya variety, Exotica, is exported to Hong Kong and the Middle East, while its popular Josephine pineapple (a cross between Johor and Sarawak pineapple) is exported to the Middle East, Canada, Europe and Hong Kong.

In 2018, MARDI launched two rambutan varieties, Mutiara Wangi and Mutiara Merah, which were also of export quality. At the development stage, research respondents regarded these new varieties as superior to the currently popular rambutan Anak Sekolah. Datuk Dr Roff foresees both Mutiara varieties overtaking Anak Sekolah in popularity.

As for livestock, he takes pride in MARDI's development of the popular Omega LTK designer eggs. "We are now working with the industry to develop the highly demanded ayam kampung and will again work with the industry to push it in the market," he adds.

Datuk Dr Roff stresses that MARDI will place greater emphasis on agricultural sustainability, which rests on the principle that the country must meet the needs of the present without compromising the ability of future generations to meet their own needs. MARDI will continue to be part and parcel of Malaysia's long-term plans to advance the agro-food sector, with greater focus on consumer health and safety both in the present and the future. ■

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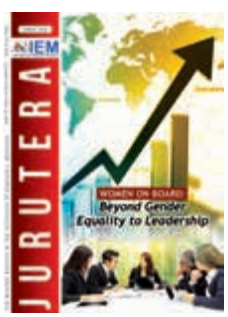

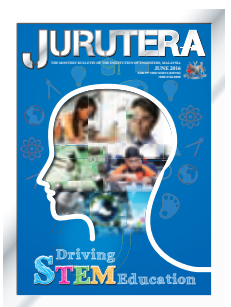

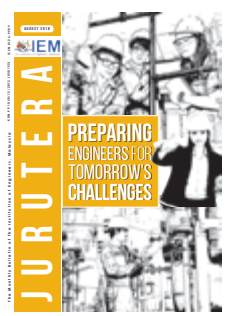

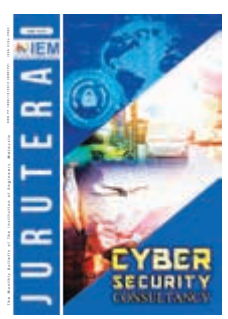

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ICE CREAM: FROM GASTRONOMY TO ENGINEERING

by Dr Nur 'Aliaa Abd Rahman

Ice cream is one of the most popular desserts in the world and the global ice cream market is forecasted to grow at a compound annual growth rate (CAGR) of 4.9% from 2020 until 2025 (Mordor Intelligence, 2020).

In its broadest sense, the term "ice cream" covers a wide range of frozen dessert. The main ones are dairy ice cream, non-dairy ice cream, gelato, frozen yoghurt, milk ice, sorbet, sherbet, water ice and fruit ice (Clarke, 2012). What all these have in common is that they are sweetened, flavoured, contain ice and, unlike any other frozen food, are normally eaten in a frozen state.

Today, ice cream is found in almost any restaurant or corner store and is recognised globally as the perfect summer treat. It can be categorised based on fat content, i.e. low-fat (3-5% fat), light (6-8%) and hard/soft frozen ice cream (more than 10% fat) (Parid *et. al.,* 2020).

Generally, ice cream is a complex food which is sometimes called frozen aerated emulsion (oil in water) and consists of partially coalesced fat globules, air bubbles, ice crystals and unfrozen serum, together with polysaccharides contents, mineral salts, proteins and water as the main ingredients.

The ingredients are the main factors that affect the development of the desired structure, texture, dryness, shape retention after freezing process, melting and smoothness after hardening as well as palatability of the final product (Akbari *et al.,* 2019). Apart from the ingredients, the steps involved in ice cream production – critical pasteurisation, homogenisation, ageing, freezing and hardening processes – are important factors which determine the quality of the ice cream.

The science of ice cream consists of understanding the ingredients, processing, microstructure, texture and crucially, the links between these (Clarke, 2004). It has been called "just about the most complex food colloid of all", because it's an extremely complex, intricate and delicate substance. The ingredients and processing create the microstructure.

GASTRONOMY OF ICE CREAM

In Malaysia, consumption trends have evolved from traditional ice confections made by simply freezing a mixture of flavoured syrup and water, to churned gelato and premium artisanal ice cream. Consumer lifestyles today have given rise to different types of ice cream being sold in shops and via online platforms. International premium brands such as Häagen-Dazs, Baskin Robbins and Ben & Jerry have been in our market for a long time and now, there are local premium ice cream brands too, such as The Ice-Cream Project, Softsrve and Inside Scoop (TallyPress, 2016).

Typically, ice cream has more than 10% milk fat by legal definition and generally between 10% and 16% fat in some premium ice creams, 9-12% milk-solid-non-fat (also known as serum solids) which consists of proteins (caseins and whey proteins) and carbohydrates (lactose) found in milk, 12-16% sweeteners or sweetening agents (usually a combination of sucrose and glucose-based corn syrup sweeteners), 0.2-0.5% stabilisers and emulsifiers and 55-64% water, which comes from milk or other ingredients (Clarke, 2004; Goff, 2020).

Almost all local ice cream manufacturers use palm oil as their source of fat. Ice cream made with palm oil has a rich texture and a shiny appearance, two preferred attributes of ice cream. By adjusting the percentage of palm oil content, manufacturers are able to produce premium ice cream at a lower cost than if they are to use fat from dairy sources.

In 2019, the Malaysian Palm Oil Council (MPOC) organised a road tour called Love My Palm Oil Carnival which also promoted an innovation by a research team from the Department of Process & Food Engineering, Universiti Putra Malaysia. Red palm oil was used as one of the ingredients in ice cream.

The team, Putra Creamery, led by the author, Dr Nur 'Aliaa Abd Rahman, infused red palm oil into the ice cream formulation which was based on their innovation of

instant ice cream mix powder and turned it into a creamy and delicious soft serve ice cream. The vitamins and beta-carotene rich red palm oil contributed to the creamy texture and appetising appearance of the ice cream.

Apart from texture, the taste of ice cream is extremely important too. To promote good health, manufacturers use real fruits such as durian, jackfruit, coconut and mango to flavour their ice cream. In 2016, Dr Nur 'Aliaa

Soft serve ice cream made with red palm oil at Love My Palm Oil Carnival organised by MPOC

At the Love My Palm Oil Carnival organised by MPOC

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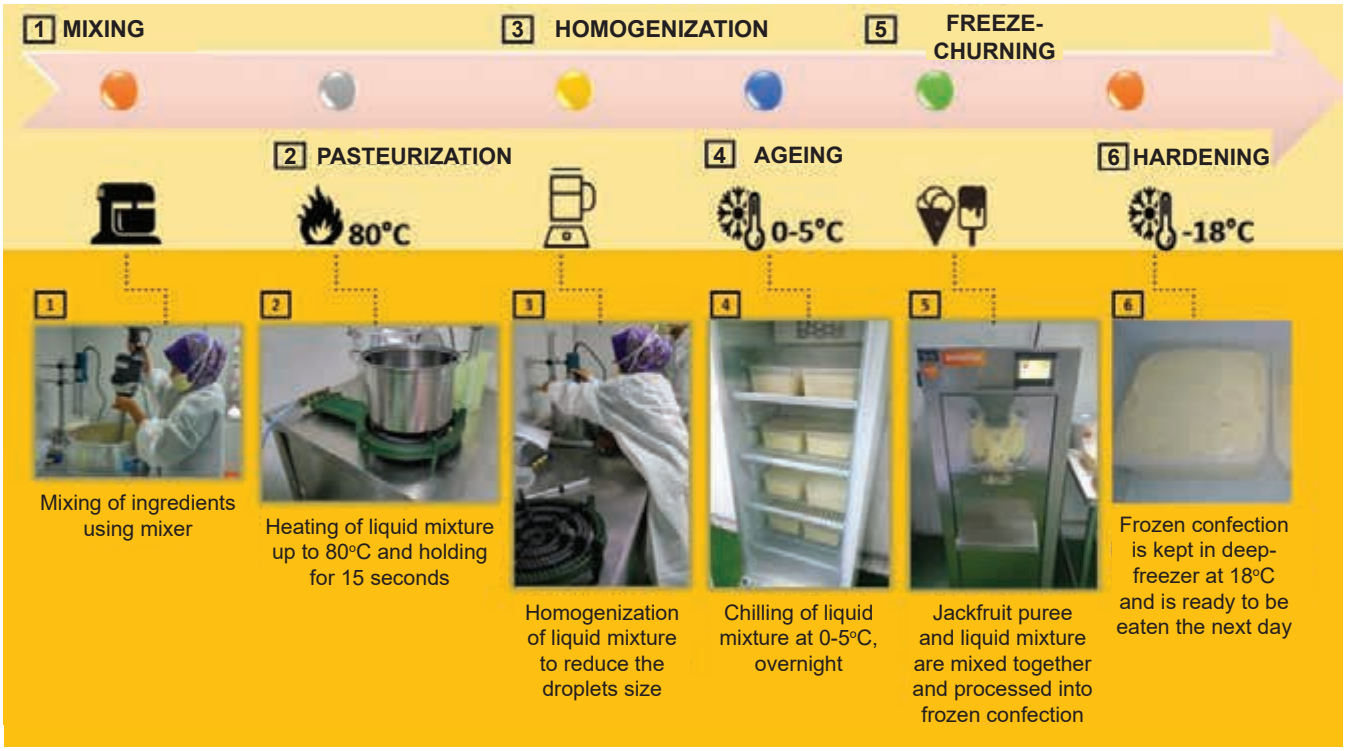


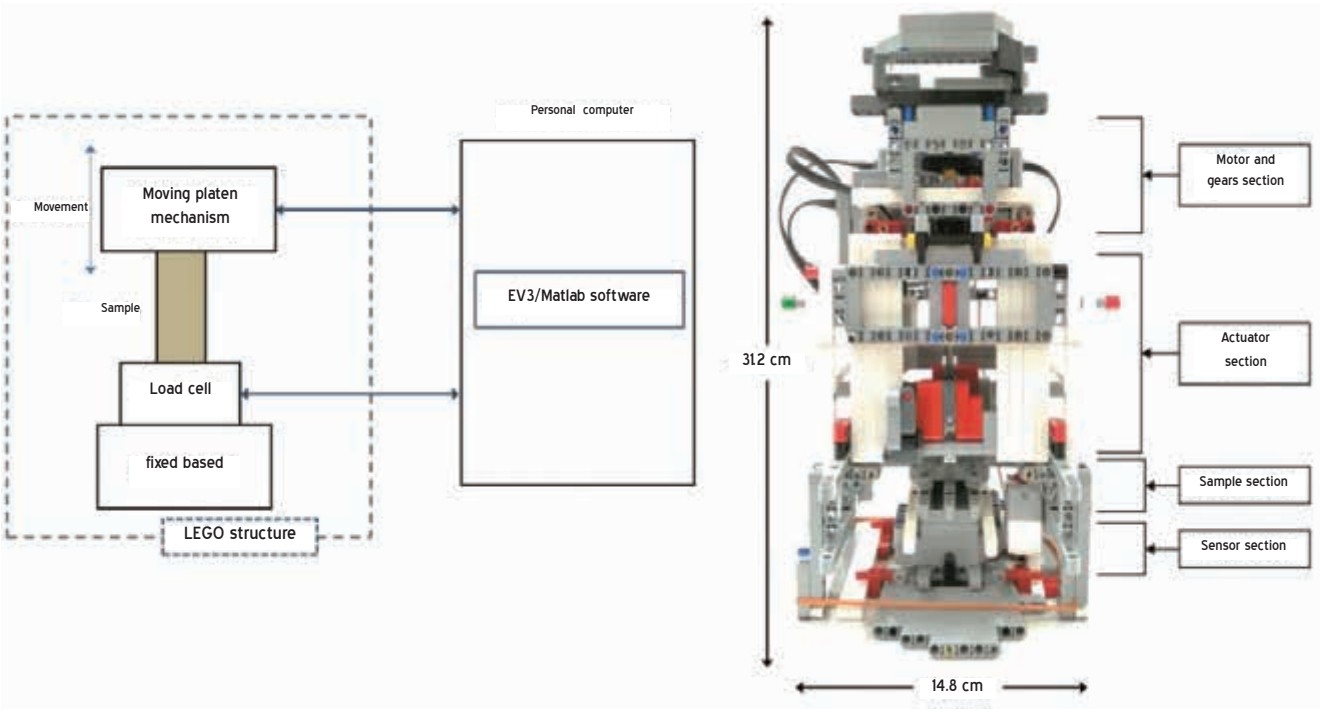
Processing Mastura J37 jackfruit ice cream (Johari, 2020)

helped the Pahang State Farmers Association (PASFA) convert a surplus of jackfruit (Mastura J37 variety) into ice cream (Johari *et al.,* 2020).

ENGINEERING TEXTURAL MEASUREMENT OF ICE CREAM

Desirable ice cream texture is one that's not too firm nor too slushy. The measurement of texture can be somewhat challenging because of the temperature sensitivity of ice cream. It is necessary to avoid melting during sample preparation (Clarke, 2004), wherein any change in the temperature will affect the structure and mechanical properties of ice cream (Leducq *et al.,* 2015).

Dr Nur 'Aliaa and her team established a technique to measure the texture of ice cream in-situ inside a freezer by using a mini compression tester made with Lego



Ice cream compression tester made with Lego (Rahman et al., 2019)

(Rahman *et al.,* 2019). In this study, a miniature texture test device was developed to overcome this limitation while performing the experimental work using the commercial mechanical compression test device. The device had to be placed inside the freezer for conducting the tests under temperatures of –20°C. The device comprised the Lego EV3 Mindstorm motor mechanism for sample movement under compression and a miniature load cell (FUTEK LSB200, USA).

The measurement done was able to produce data which could be translated into viscoelasticity of ice cream. The test device was able to replicate the test results conducted with a more expensive commercial mechanical test device. The mini compression test was able to imitate the movement of ice cream in the mouth, which was interesting in relating the gastronomy and engineering aspects during food consumption.

HANDLING OF ICE CREAM BY-PRODUCT

Food sustainability is very important nowadays, not only to ensure all raw materials are converted into food for consumption but also to recycle leftover food. Apart from studying the conversion of wastewater created during ice cream post-production in a factory (Enteshari and Martinez-Monteagudo, 2018), a solution was also needed to handle leftover ice cream, if any.

An innovated product created with leftover or unfinished food is a good alternative to throwing it away. Dr Nur 'Aliaa and her team conducted a study to convert leftover ice cream into cake. The formulated cake had properties comparable to conventional ones, based on the physical and sensory evaluations conducted (Jamaluddin, 2020). The use of leftover ice cream as the base ingredient to make other foods would be a tremendous help in solving food waste created by the ice cream business and turning it into profit.

SAFETY ASPECT IN ICE CREAM PRODUCTION

The biological control point during ice cream processing is pasteurisation which is required to destroy pathogenic microorganisms, thereby safeguarding the health of consumers (Marshall & Arbuckle, 2000). It reduces the number of spoilage organisms such as psychotrophs and helps to hydrate some of the components such as proteins and stabilisers.

There are two basic methods: Batch or low-temperature long-time (LTLT) and continuous or high-temperature short-time (HTST).

Batch pasteurisation is done by heating the ice cream mix in large jacketed vats equipped with some means of heating, usually steam or hot water to at least 69°C and held for 30 minutes to satisfy legal requirements for pasteurisation. Continuous pasteurisation is usually performed in a heat exchanger at 80°C for 25 seconds. Other than eliminating the pathogens, pasteurisation also aids in blending by melting the fat and decreasing the viscosity.

CONCLUSION

Knowledge of the interaction between gastronomy and engineering aspects of ice cream is interesting and important for those dealing in ice cream research and production, to create a total solution for the whole system. As the manufacturing technology and innovation of ice cream products continue to evolve, beneficial and profitable opportunities are being created for everyone in the field. ■

REFERENCES

[1] Akbari, M., Eskandari, M.H. & Davoudi, Z. (2019). Application and Functions of Fat Replacers in Low-Fat Ice Cream: A Review. Trends in Food Science & Technology, 86: 34-40. https://doi.org/10.1016/j.tifs.2019.02.036

[2] Clarke, C. (2004). The Science of Ice Cream. Cambridge, UK: The Royal Society of Chemistry.

[3] Clarke, C. (2012). The Science of Ice Cream, 2nd ed.; The Royal Society of Chemistry, UK.

[4] Dickinson, E. (1992). An Introduction to Food Colloids. Oxford University Press.

[5] Enteshari, M. & Martinez-Monteagudo, S.I. (2018). Subcritical hydrolysis of ice-cream wastewater: Modeling and functional properties of hydrolysate. Food and Bioproducts Processing, 111: 104-113. https://doi.org/10.1016/j.fbp.2018.08.002

[6] Goff, H.D. (2020). Ice cream ingredients. Dairy Science and Technology Education. Accessed on 13th August 2020. Available from: https://www.uoguelph.ca/foodscience/book-page/ice-cream-mix-ingredients

[7] Jamaludin, N.S. (2020). Conversion of Unutilized Ice Cream from Production Process into Value-Added Product. Final Year Project Thesis. Universiti Putra Malaysia.

[8] Johari, A.M. (2020). Application of Low Temperature Storage of Mastura (J37) Jackfruit Bulbs on Ice Confectionery Processing. Master's Thesis. Universiti Putra Malaysia.

[9] Johari, A.M., Rahman, N.A.A., Baharuddin, A.S., Kadir Basha, R., Mohammed, M.A.P., Parid, D.M., Abdul Razak, S.Z. & Wakisaka, M. (2020). Effects of low temperature storage of Mastura (J37) jackfruit bulbs on the physical quality of jackfruit frozen confection. Journal of Agricultural and Food Engineering, 1: 1-6. http://doi.org/10.37865/jafe.2020.0009

[10] Marshall, R.T. and Arbuckle, W.S. (2000). Ice Cream (Fifth Edition). 5 Edn.: Aspen Publishers, Inc.

[11] Mordor Intelligence (2020). Ice cream market - growth, trends, and forecasts (2020 - 2025). Available online: https://www.mordorintelligence.com/industry-reports/ice-cream-market (accessed on August 13, 2020).

[12] Parid, D.M., Rahman, N.A.A., Baharuddin, A.S., Kadir Basha, R., P. Mohammed, M.A., Mat Johari, A., Abd Razak, S.Z. (2020). Effects of carboxymethyl cellulose extracted from oil palm empty fruit bunch stalk fibers on the physical properties of low-fat ice cream. Food Research, In Press.

[13] Rahman, N.A.A., Parid, D.M., Razak, S.Z.A, Johari, A.M., Talib, A.T., Mohammed, M.A.P., Baharuddin, A.S., Wakisaka, M. (2019). In-situ viscoelastic characterization and modeling of ice cream. Journal of Food Engineering, 263: 96-101. https://doi.org/10.1016/j.jfoodeng.2019.05.039

[14] TallyPress (2016). Malaysia's Top 10 Local Ice Cream Brands. Available online: https://tallypress.com/malaysia-top-10s/malaysias-top-10-local-ice-cream-brands/ (accessed on August 13, 2020).

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LOVE THE GREENS, FILTER THE WASTE

by Dr Mohd Zuhair Mohd Nor

Typical agro-food waste[1]

The current world population of 7 billion is estimated to grow to over 9 billion by 2050. This means there will be an increasing demand for food. Humans consume about 72 billion metric tonnes of food materials per annum; unfortunately, one-third of this is lost or wasted.

Most food waste is in the food processing and agricultural industries. The current global production of fruit and vegetables is recorded at 1.74 billion metric tonnes but more than 50% of the total production loss is primarily due to harvesting and processing activities. Waste consists of fruit and vegetable trimmings, peelings, stems, seeds, shells, cereal residues (such as bran), starch, sugar and juice extraction and off-spec or damaged products. This waste is organic in nature and may cause soil and water pollution. The waste can also lead to greenhouse gas emission, a serious environmental issue.

The conversion of agro-food waste into useful by-products of higher value or for use as raw material in other industries as well as food or feed/fodder after biological treatment, is a potential avenue for turning waste into profit.

Based on the points given, bioconversion of agro-food industry residues is an attractive environmental sustainability solution since these residual matters can be potentially converted into useful products. Recently, there are numerous reports on waste utilisation, especially waste from fruit and vegetables, for further industrial processes including fermentation and bioactive compounds extraction. Some high-value compounds can be extracted from the agricultural and food wastes such as proteins, antioxidants, phenolic compounds, polysaccharides, fibre, flavour compounds and phytochemical ingredients. These potentially marketable compounds can be used in various applications such as pharmaceutical, cosmetic, food and non-food areas.

The recovery of these high-value compounds is a smart way to utilise waste streams, as well as being economically

attractive. Nevertheless, methods of extraction and purification using hot water, solvents, enzymes, irradiation, adsorption, ultrasound, supercritical fluid or chromatography, among others, have not produced feasible positive results, mostly due to the incapacity for large-scale production, use of non-biocompatible chemicals, high cost and difficulty in obtaining high bioactive compounds recovery in the final mixture. As the extraction and purification process represents up to 80% of the total production cost, a suitable technique for big-scale bioactive compounds production should be chemical-free, economically viable, highly efficient and practical.

MEMBRANE FILTRATION TECHNOLOGY

Membrane filtration is a promising alternative as this is a green, up-scalable and high-throughput technology that requires minimal production cost. It is suitable for bioactive compounds extraction and purification due to its outstanding ability in size and/or charge-based component separation with high purity and throughput. In general, membrane filtration is a separation process of particulate matters in a liquid by using semi-permeable materials. It is a pressure-driven process that can be classified as either microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) or reverse osmosis (RO), depending on the membrane pore size (Figure 1). The membrane pore size is determined by the absolute size of the rejected particles (normally in μm). Besides, the membrane pore size can also be classified according to molecular weight cut off (MWCO) which is defined as the lowest solute molecular weight that can reach 90% membrane retention and is typically expressed in Dalton (Da) unit.

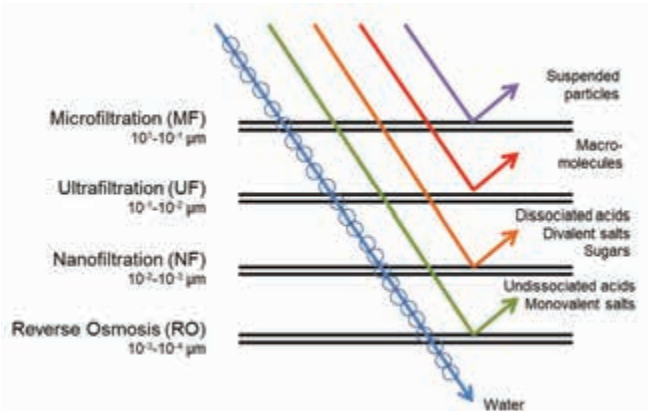

Figure 1: Different types of membrane filtration[2]

A membrane process involves the separation of feed into permeate and retentate. Feed is the raw sample that needs to be filtered. Permeate is the portion of the fluid which passes through the membrane while the remainder in the feed stream is called retentate. The retentate contains a high component concentration retained by the membrane.

APPLICATIONS OF MEMBRANE FILTRATION FOR BIOACTIVE COMPOUNDS SEPARATION

Due to its unique size separation principle, the pressure-driven membrane technology is used for the recovery of high-added-value compounds from agro-food by-products. These compounds come in different sizes. Figure 2 shows some of the various compositions and their respective size groups typically existing in agro-food waste. The separation of these compounds by the membrane process can be adjusted according to size.

Depending on the size of the targeted bioactive compounds, the membrane system can be set up at multistage to separate those compounds (Figure 3). To separate compounds of different sizes, the membrane process may involve the combination of different membrane types, i.e. MF, UF or NF. The targeted compounds may be separated in the permeate or retentate stream, depending on the operation set-up.

There have been many reports on the success of using the membrane process for extraction and purification of different compounds from agro-food waste such as enzymes (e.g. bromelain from pineapple waste), polysaccharides (e.g. pectin from citrus fruit) and phenolic contents (e.g. anthocyanins and flavonoids) from agro-food wastes such as orange press liquor, olive mill wastewater, artichoke wastewater, soya processing and grape pomace.

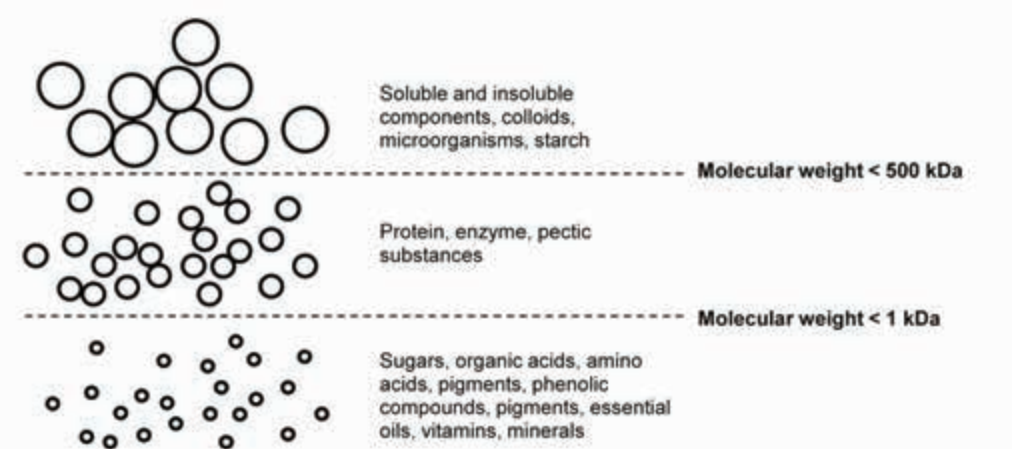

Figure 2: Molecular weights of various compositions in plant extract[3]

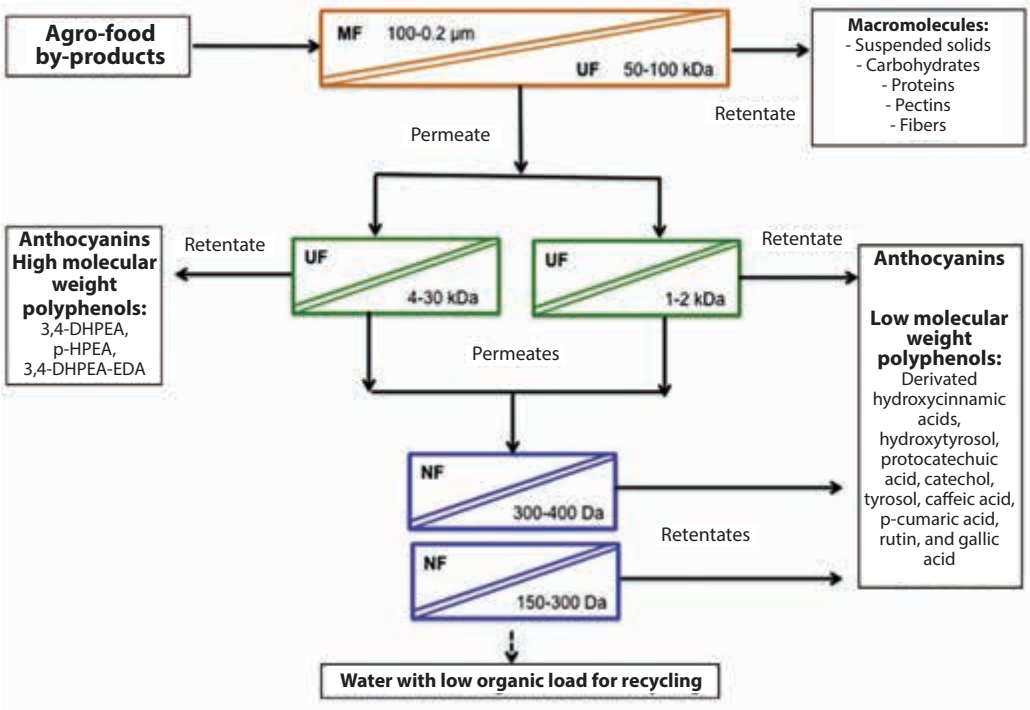

Figure 3: Fractionation of agro-food wastes with a suggested integrated membrane system[4]

Successful membrane processing depends on two keys: Flux profile (indicated by the filtration rate of the membrane) and separation efficiency (reflected by the recovery and purity of the separated compounds). For these two to work as desired, the following factors need to be considered (Figure 4).

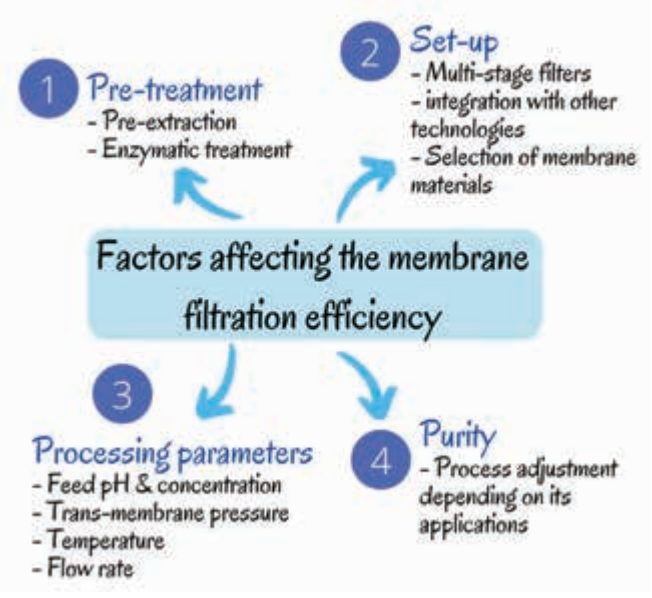

Figure 4: Factors affecting membrane filtration efficiency for the separation of bioactive compounds from agro-food waste

1. **Pre-treatment:** Agro-food waste needs to be pre-extracted to get the raw liquid extract. Typically, this extract may consist of various compounds including soluble and insoluble complexes, colloids, microorganisms and starch, so pre-treatment such as course filtering process and enzyme treatment may be necessary to remove unwanted large compounds. Normally, the raw extract of the agro-food waste will be treated with pectinase and cellulase enzyme to hydrolyse polysaccharides which may cause a blockage (known as fouling) on the membrane surface during the membrane filtration process.
2. **Operation set-up:** To ensure the filtration process is successful, multi-stage membrane processing should be arranged according to the molecular sizes of the targeted bioactive compounds. This may involve a few stages of microfiltration, ultrafiltration and nanofiltration. A further concentration step by reverse osmosis stage is also possible to prepare the bioactive-rich extract for the drying process. Besides, to achieve a higher purity of the targeted compounds, the membrane set-up can be integrated with other purification technologies such as aqueous two-phase or reverse micellar system. Membrane configuration and material are also important factors to ensure a high separation efficiency. Membrane configuration refers to the geometry shape and position of the filter such as plate-and-frame, spiral wound, tubular and hollow fibre. The membrane may

be of polymeric materials such as polysulfone, polyvinyl fluorite and cellulose acetate or ceramic membranes such as alumina (α-Al_2O_3 and β-Al_2O_3), zirconia (ZrO_2), titania (TiO_2), glass (SiO_2) and silicon carbide (SiC). The selection of the membrane configuration and material depends on the feed properties, processing pressure, temperature and chemical compatibility.

3. **Processing parameters:** Several processing parameters such as feed pH, feed concentration, trans-membrane pressure, processing temperature, flow rate and cross-flow velocity will affect the filtration rate of a membrane process. As lower viscosity will favour a better filtration rate, the feed pH can be adjusted away from its natural isoelectric point to reduce its viscosity. The viscosity can also be reduced by increasing the processing temperature. However, the stability of the targeted bioactive compounds must be considered if the process is performed at an elevated temperature. Higher trans-membrane pressure, flow rate and cross-flow velocity will normally lead to a higher filtration rate, up to the critical limits. However, the effect of the high shearing condition may impact the stability of the bioactive compounds. Hence some limitations should be considered.

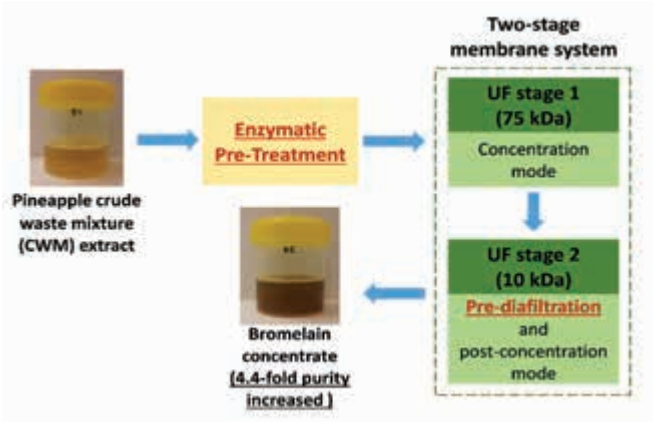

Figure 5: Bromelain enzyme purification from pineapple waste through membrane processing[5]

4. **Bioactive component purity considerations:** The main purpose of the extraction and purification stage is to separate and increase the purity of the targeted bioactive compounds. By using the membrane process, the purity of the compounds is expected to increase, depending on the separation process efficiency. For example, bromelain enzyme purity can be increased up to 4.4-fold by using a two-stage ultrafiltration (Figure 5).

The purity is expected to further increase if the membrane process is combined with other purification technologies. Nevertheless, since some applications do not have a high purity requirement, the purification process can be adjusted depending on the destination of the separated bioactive compounds.

CONCLUSION

Despite the promising potential of membrane filtration for the extraction of bioactive compounds from agro-food waste, some limitations have been identified, including a long separation process, membrane fouling and low purity compared to other purification technologies. These limitations require further exploration to fill the gaps in this area, such as by understanding the composition and properties of the agro-food waste extract to relate to the functional membrane properties.

Economic consideration such as production cost should also be highlighted. Nevertheless, the application of membrane technology on an industrial scale is possible because it has been well established in the water treatment industry. The technology has a promising future in the utilisation of agro-food waste for the production of bioactive compounds. As the industry progresses, it is up to us to manage food waste properly to ensure a sustainable environment and to protect Mother Nature. So, love our greens but do not forget to filter the waste. ■

REFERENCES

[1] https://pixabay.com/photos/compost-garbage-biological-waste-3663514/

[2] Nor, M. Z. M (2017). Membrane based process for the extraction of bromelain from pineapple waste [Doctoral dissertation, Victoria University]

[3] Nor, M. Z. M., Ramchandran, L., Duke, M., & Vasiljevic, T. (2017). Application of membrane-based technology for purification of bromelain. International Food Research Journal, 24(4), 1685-1696.

[4] Castro-Muñoz, R., Yáñez-Fernández, J., & Fíla, V. (2016). Phenolic compounds recovered from agro-food by-products using membrane technologies: An overview. Food chemistry, 213, 753-762

[5] Nor, M. Z. M., Ramchandran, L., Duke, M., & Vasiljevic, T. (2018). Performance of a Two-Stage Membrane System for Bromelain Separation from Pineapple Waste Mixture as Impacted by Enzymatic Pretreatment and Diafiltration. Food Technology and Biotechnology, 56(2), 218-227.

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Updated May 2018

BIOGAS CAPTURE & CONVERSION INTO BIO-CNG IN PALM OIL SECTOR

by Ir. Ooi Ho Seng

On 28 July 2020, the Agricultural & Food Engineering Technical Division organised a webinar on "Overview of Biogas Capture & Conversion into Bio-CNG in Palm Oil Sector".

The session was present by Ir. Ooi Ho Seng and moderated by Ir. Goh Su Kin. The following is a summary of the webinar.

EMISSION OF BIOGAS & BIOGAS CAPTURE

Biogas is produced when organic matter in POME (palm oil mill effluent) breaks down anaerobically and is released to the atmosphere. Biogas comprises 50-70% methane (CH4), 30-45% carbon dioxide (CO2), 1500-2500 ppm hydrogen sulphide (H2S), traces of moisture and other minor impurities. The first-generation biogas plants were designed primarily for biogas capture to reduce the emission of greenhouse gas (GHG). All palm oil mills in Malaysia were required to install biogas capture system by 2020.

BIOGAS PRODUCTION & CONVERSION TO BIO-POWER

Second-generation biogas plants are designed to maximise biogas production. Production of biogas is increased through the optimisation of the four processes involved in the anaerobic digestion of POME, namely hydrolysis, acidogenesis, acetogenesis and methanogenesis.

After it is scrubbed to remove hydrogen sulphide (H2S), biogas is combusted in a gas engine to generate electricity (bio-power) which can be sold to the national grid as presented in Figure 1.

Feed-in-tariff programme and other incentives are being provided by the government to support the generation of electricity (conversion of biogas into bio-power) through SEDA (Sustainable Energy Development Authority).

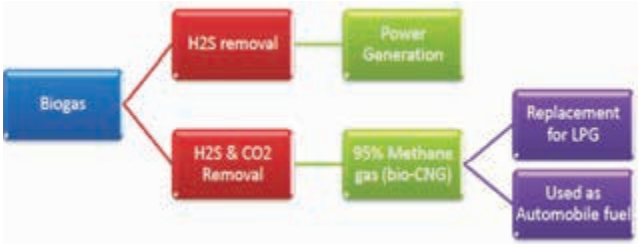

Figure 1: Conversion of biogas into bio-power or bio-CNG

BIOGAS PRODUCTION & CONVERSION TO BIO-CNG

Biogas can also be converted into bio-CNG. Biogas is scrubbed to remove hydrogen sulphide and moisture. Then carbon dioxide is removed to attain a purity of 94% methane. The purified gas is then compressed at 250bar into bio-CNG.

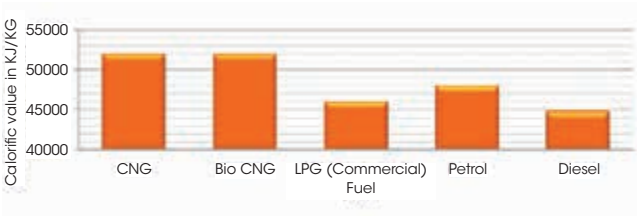

Figure 2: Calorific values of bio-CNG and other fuels

Bio-CNG has a calorific value equivalent to that of CNG (compressed natural gas) as shown in Figure 2. It has all the properties and benefits of CNG. It is a green, renewable fuel and it can replace CNG and LPG (liquified petroleum gas) in the motoring, industrial and commercial sectors.

BIO-CNG PILOT PLANT

A bio-CNG pilot plant is located in Sungai Tengi, Kuala Kubu Baru, Selangor. Commercial testing was carried out since 2014, prior to a successful launch on 28 October 2015.

Bio-CNG pilot plant in Sungai Tengi, Selangor

THE CHALLENGES

The challenges in bio-power production are:

- Location of mill not suitable for connection to grid
- Limited quota issued by SEDA
- High capital expenditure and operating expenses of biogas capture facilities.

The challenges in bio-CNG production are:

- High capital expenditure and operating expenses in biogas production
- High capital expenditure and operating expenses to purify and compress the biogas to produce bio-CNG
- Lack of market demand for the use of bio-CNG (to replace CNG) as motoring fuel
- Lack of government support, incentives and subsidies for the production and use of bio-CNG.

CONCLUSION

Oil palm plantations in remote areas often face problems in getting a regular supply of diesel and gasoline to generate energy for their own consumption. Converting the biogas into bio-CNG at the mills will give oil palm plantations owners independence and control of their energy needs. ■

UPCOMING ACTIVITIES

WEBINAR - Talk on Grid Connected Solar PV (GCPV) System

Date	: 21 January 2021 (Thursday)
Time	: 3.00 p.m. to 5.00 p.m.
Venue	: Digital Platform
Approved CPD	: 2
Speaker	: Ir. Tan Seng Khee

WEBINAR - Introduction To Electrical Design In Building Services - Part 1

Date	: 23 January 2021 (Saturday)
Time	: 9.00 a.m. to 1.00 p.m.
Venue	: Digital Platform
Approved CPD	: 4
Speaker	: Ir. Mohd Taufik bin Mohammed Rathi

WEBINAR - Introduction To Electrical Design In Building Services - Part 2

Date	: 31 January 2021 (Sunday)
Time	: 9.00 a.m. to 1.00 p.m.
Venue	: Digital Platform
Approved CPD	: 4
Speaker	: Ir. Mohd Taufik bin Mohammed Rathi

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AWARENESS OF HALAL FOR INDUSTRIAL SECTOR

by Ir. Prof. Dr Yus Aniza Yusof

The Agricultural & Food Engineering Technical Division (AFETD), supported by the Halal Products Research Institute (HPRI), Universiti Putra Malaysia (UPM), invited Dr Puziah Hashim to provide training on Awareness of Halal for the Industrial Sector on 4 November 2020. The half-day event was the first webinar training conducted by AFETD and was attended by 32 participants.

With over 30 years' experience in halal food, cosmetics and pharmaceuticals, Dr Puziah had conducted many public and in-house training, consultancy and audit for the industrial sector in Malaysia. She had served on the panel approval committee for Halal Industry Development Corporation (HDC) and Selangor State Islamic Department (Jabatan Agama Islam Selangor, JAIS), was a researcher for Standard & Industrial Research Institute of Malaysia (SIRIM) and a research fellow at HPRI. Later, she was a freelance halal expert, trainer and auditor for various companies, including auditor for SIRIM QAS International and Department of Standard Malaysia (DSM).

One of the slides presented during the training session

Her programme covered the halal market, basic Syariah Law, halal laws and an overview of Malaysia's halal certification. The halal market looks at market demand and halal ecosystem. Globally, the demand for halal products is increasing and Malaysia has complete halal ecosystems which include production, services, infrastructure, government support and human capital to promote the industry. Among the production areas discussed were halal food, pharmaceuticals, ingredients and cosmetics industries. Scope of services was covered in the aspect of halal logistics, Islamic banking and takaful, healthcare and tourism. Infrastructure was presented in terms of development of halal industry park, halal R&D and testing lab, standard and certification as well as traceability and system. Government support comprised encouragement and assistance from the Department of Islamic Development Malaysia (Jabatan Kemajuan Islam Malaysia, JAKIM), Ministry of International Trade and Industry (MITI), HDC and DSM. Human capital in the halal sector involved halal knowledge workers, halal executives and auditors. The development of a syllabus in universities and colleges related to halal studies was considered to be a contributing factor to human capital enhancement.

Basic Syariah and halal laws gave an insight into Syariah Law, source of Syariah Law, halal and toyyib, permitted sources, universal sources, types of najs, concept of maqasid al-syariah and principles of halal and haram.

Halal meant permissible for consumption and utilisation by Muslims. Toyyib meant good or wholesome such as having high quality, safety ensured (microbiologically safe, free from chemical, free from toxin, or free from other hazardous additives, or contaminant and physical hazards), hygienic and clean, nutritious, not adulterated (pure, genuine, authentic) and effective products. The idea of food and drinks, as well as ingredients permitted under Syariah Law were also presented. Classification of halal and haram food in Islam was also discussed in the aspects of animals (land and aquatic), plants, mushroom and microorganism, natural minerals and chemical elements, drinks and Genetically Modified Organisms (GMO). Halal slaughtering concepts, including livestock slaughtering and stunning, were discussed based on MS 1500:2009 Halal Food - Production, Preparation, Handling, and Storage - General Guidelines (Second Revision).

The overview of Malaysia's halal certification covered halal certification Malaysia, certification body (JAKIM), halal logo or mark, and related regulations relating to halal certification and labelling (Trade description Act 2011, Food Regulation 1984, Control of Drugs and Cosmetics Regulation 2007, and Guidelines for Control of Cosmetic Products in Malaysia (2nd Rev) 2009). There are 7 halal certification schemes in Malaysia:

1. Food product/Beverages/Food supplement
2. Food premise/Hotel
3. Consumer goods
4. Cosmetic & personal care
5. Slaughterhouse
6. Pharmaceutical
7. Logistics.

The session also presented different categories of certification fees, conditions for certification, non-eligible applicants, application procedures, halal certification process flow, general requirements, conditions for the use of halal logo and certificate, examples of conformance and non-conformance offences, audit procedures, monitoring and enforcement. ■

UPCOMING ACTIVITIES

WEBINAR - 1-Day Virtual Workshop on "Introduction to Autocad" - Rescheduled from 9 January 2021

Date	: 30 January 2021 (Saturday)
Time	: 9.00 a.m. to 5.00 p.m.
Venue	: Digital Platform
Approved CPD	: 0
Speaker	: En. Mohamad Nazmi bin Ismail

WEBINAR - Talk on "Carbon Footprint Practices in Organisation"

Date	: 3 February 2021 (Wednesday)
Time	: 3.00 p.m. to 5.00 p.m.
Venue	: Digital Platform
Approved CPD	: 0
Speaker	: Mr. Ahmad Rosly Abbas, Mrs. Radin Diana R. Ahmad & Mrs. Sazalina Zakaria

DIVERSITY & INCLUSION IN ENGINEERING EDUCATION

by Ir. Prof. Dr Leong Wai Yie

The World Federation of Engineering Organisation (WFEO) and the International Network of Women Engineers & Scientists (INWES) jointly hosted the Consultation Webinar on Diversity & Inclusion in Engineering Education on 31 July 2020 which attracted more than 100 participants worldwide. Ir. Prof. Dr Leong Wai Yie was an invited panellist.

The Science, Technology, Engineering & Mathematics (STEM) field is suffering from a lack of diversity. Yet there is growing evidence that more diverse organisations are more successful and effective. There is also a global shortage of manpower with STEM and engineering skills but this can be tackled by addressing the lack of diversity in the field.

One obvious way to view this problem is to look at gender. Women make up 50% of the population but in Engineering, the number of female students and professionals is clearly less than this and may only be about 10-25% in many parts of the world. This under-representation of women leads us to think about other groups that are under-represented in Engineering.

The webinar discussed a number of approaches to support diversity and inclusion so as to encourage a higher uptake of engineering by under-represented groups and to retain people in the sector.

The webinar brought together technical experts from WFEO, UNESCO, INWES and International Engineering Alliance to address the importance of diversity and inclusion in future engineering education and graduate attribute. All speakers agreed to instil these elements in the newly-revised engineering knowledge, syllabus, curriculum, attribute and teaching.

Teaching to engage diversity, to include all learners and to seek equity is essential for preparing civically engaged adults and for creating a campus and society that recognises the contributions of all people. Teaching for diversity refers to acknowledging a range of differences in the classroom. Teaching for inclusion signifies embracing difference.

Front row: Left to Right: Marlene Kanga (WFEO Past President), Leong Wai Yie, Jacques de Mereuil (WFEO)
Second row: Bulent Ozguler (Chair UNESCO-WFEO-IEA Working Group), WFEO secretariat, Gail Mattson (INWES President)
Third row: Gong Ke (WFEO President), Peggy Oti-Boateng (UNESCO), Yetunde Holloway (WFEO-WiE)

Teaching for equity allows the differences to transform the way we think, teach, learn and act such that all experiences and ways of being are handled with fairness and justice. These ideas complement each other and enhance educational opportunities for all students when simultaneously engaged.

Three imperatives make it essential for us to actively practise teaching for diversity, inclusion and equity. Diversity and inclusion improve teaching and learning. People learn and enrich their abilities to think critically and creatively as they engage in conversations across difference, especially when all learners' abilities and attributes are embraced.

Inclusive teaching strategies are intended to ensure that all students feel supported such that they freely learn and explore new ideas, feel safe to express their views in a civil manner and are respected as individuals and members of groups.

Intentionally incorporating inclusive teaching strategies will help students view themselves as people who belong in the community of learners in classroom and university. ■

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BEAN BAG SESSION WITH PETRONAS

by Ir. Ahmad Nazari Ashari, FIEM ACPE MIET P. Eng

Ir. A. Karim A. Rahman, MIEM P. Eng

Group photo of participants who attended in person

Graduate engineers from PETRONAS Gas Bhd's GPU YPC (PETRONAS Gas Processing & Utilities Unit Young Professionals Club) and IEM Terengganu branch held a bean bag session on Wednesday, 26 Aug 2020.

The term "bean bag" refers to a casual, unconventional learning environment where a large percentage of the time is allocated for information sharing between the participants as well as questions and answers. The session was preceded by a brief talk titled "Introduction to IEM" by Ir. Ahmad Nazari.

Another unconventional facet of the bean bag session was that it was also broadcast online via Microsoft Teams to about 15 participants. This was done via 3 video cameras which fed live video as well as a big projector screen which displayed the screen of one of the PCs in use. This simulated the experience of a live event for participants of the video conference. Indeed, the Senior GM of PGB GPU, Tuan Haji Zabidi Ahmad, delivered his opening speech on-line to all participants, from his office.

In his speech, he emphasised the significance of talented young executives to the growth and future of PETRONAS and how attaining professional recognition from an authorised body not only elevates their career prospects but will also boost self-confidence. He further encouraged members of the YPC to leverage professional networking by using IEM as the platform as part of their continuous learning and contribution to the community.

The President of the GPU YPC, Cik Nur Zahidah, also gave a vibrant speech.

Then, during the Q&A session, a few salient matters were raised.

A fair percentage of the participants sought to clarify the roles of BEM and IEM, such as "Do I register with the BEM or the IEM?"

Some participants asked about their job scopes which were purportedly considered as "acceptable experiences". These included: "I am doing project management and very little engineering work. Is that acceptable?"

A few participants questioned the rationale behind the eligibility for registration as an engineer, specifically those who had been rejected and who were prompted to register as technologists instead. They were disgruntled to learn that their route towards gaining a PE was now hindered because of the university degree courses they had completed.

One example was "I wanted to be an engineer. I enrolled to read for a degree in Bachelor of Engineering Technology in Manufacturing, only to find out after graduation that I do not qualify to be an engineer. This is not fair. Universities must make it clear to students before they accept them for these courses….." ■

LOGO DESIGN CONTEST

by Ir. Goh Yong Sheng

IEM-UTM Student Section held an online logo design contest to encourage its members to design an official logo for the section. The contest, which started on 10 September and ended on 8 October 2020, received 64 entries from 54 participants.

The winners were Lee Jia Ying and Tan Ying Wei who collaborated to design the logo which comprised a gear and the main gate of UTM. The gear represented the various engineering disciplines while the main gate symbolised UTM.

The logo also indicates that as the gear turns, time is passing and the country needs young engineers from UTM to spearhead its development by turning creative ideas into reality. ■

Winner's Logo Design

Poster to Announce Winning Logo

IEM Council Elections Session 2021/2022

ELECTRONIC BALLOTING

As approved by Council and announced at the Annual General Meeting, IEM will be conducting the Council Elections for session 2021/2022 via electronic balloting.

This is to facilitate and enable more members to be able to participate in selection of members to represent them in the IEM Council.

However, to facilitate the smooth implementation of the electronic balloting, all Corporate Members are required to update their record in the IEM portal with their latest email addresses and mobile phone numbers.

TUGU NEGARA: THE UNFORGOTTEN NATIONAL WAR MEMORIAL

Ir. Dr Oh Seong Por

***Ir. Dr Oh Seong Por** is the immediate past chairman of IEM Negeri Sembilan Branch.*

Last year, I was at the Board of Engineers' office in Kuala Lumpur to renew my annual Professional Engineer's registration. On the way back, I decided to visit the nearby Tugu Negara or National Monument. I had read about this monument in history textbooks and seen it on television. Even the old one ringgit note carried a picture of the Tugu Negara on the back. However, I had never visited Tugu Negara. When I arrived, there were already 3 busloads of tourists at the site, taking pictures of the historical monument. The surrounding environment was pleasant and refreshing; we were surrounded by beautiful greenery and landscaped gardens.

Those born after the 1960s might have learnt briefly about Tugu Negara during their history lessons in school. I did some fact-finding and managed to gather some interesting information which I'd like to share with readers here.

Tugu Negara is located on high ground near Parliament House, in a spacious open area measuring 48,562 sq. m. Apart from the National Monument, there are also a pavilion, fountains, the well-kept garden and a cenotaph. The back portion is covered with natural greenery while the front overlooks the modern skyscrapers that dominate the cityscape of Kuala Lumpur.

Tugu Negara was built at a cost of RM1.5 million and was officially unveiled on 8 February 1966 by the then Yang di-Pertuan Agong, Sultan Ismail Nasiruddin Shah. Our first Prime Minister, the late Tunku Abdul Rahman was inspired to build the monument after a visit to the Marine Corps War Memorial in Virginia, United States, in October 1960. He believed it was essential to have a monument to commemorate those who had perished while defending the nation's freedom, particularly against the Japanese Occupation during World War II (1941-1945) and the communist insurgency during the Malayan Emergency which lasted for 12 years, from 1948 to 1960. It was reported that about 11,000 civilians and security personnel were killed during this period. So Tunku invited the late Tan Sri Felix de Weldon, an American of Austrian origin (also the architect for the construction of the Marine Corps War Memorial), to design the Tugu Negara.

Work began in 1963 and the monument was completed in 1966. The bronze-based sculpture comprises seven statues. Slumped at the base are two statues which depict dead enemies. On the right and left are two soldiers holding machine guns in an ever-ready posture to defend the country. In the centre, a soldier is helping a wounded companion in his arms and at the top is a soldier standing tall in a victory pose, holding the national flag in his right hand.

The monument is 15m tall, making Tugu Negara the biggest free-standing bronze sculpture in the world. The 7 statues also symbolise leadership, suffering, unity, vigilance, strength, courage and sacrifice. The statues are placed on stones imported from the small coastal city of Karlshamn in southeastern Sweden. The base is made from granite and bears the Malayan Coat of Arms, flanked by inscriptions in English and Jawi which read:

"Dedicated to the heroic fighters in the cause of peace and freedom. May the blessing of Allah be upon them"

Tugu Negara suffered a tragic moment on 27 August 1975, just four days before the anniversary of our Independence Day. An explosive device, set off by a communist terrorist, caused serious damage to the monument, resulting in a few statues being damaged and dislocated from the base. At that time, I was still in primary school but I remembered watching the evening news broadcast over Radio and Television Malaysia or RTM, during which the government appealed to the public to donate generously to restore the damaged statues.

The restoration work took almost 2 years before the Tugu Negara was unveiled again on 11 May 1977. Today, it stands tall and mighty as the nation's iconic war memorial, even though Warriors' Day commemorative services are no longer performed at this particular location.

As I was leaving the site, a thought came into my mind. Tugu Negara reminded me of the blockbuster movie, Transformers, in which the protector robot, Optimus Prime, passionately defended Earth by defeating the invading robot Megatron, and declared "I Rise, You Fall". This underscores the message that our sovereignty has been protected through the sacrifices of our patriotic fighters. ■

Tugu Negara standing majestically near Parliament House

Tarikh: 10 Disember 2020

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MOHD DASUKI BIN YUSOFF	BE HONS (UTM) (MECHANICAL -AUTOMOTIVE, 2005) MPhil (UTM) (2019)
NIK MOHAMAD AMIRUDIN BIN NIK LAH	BE HONS (UiTM) (MECHANICAL, 2012)
NOOR HAFIZ BIN NOORDIN	BE HONS (UTM) (MECHANICAL-INDUSTRY, 2009) MSc (UiTM) (MECHANICAL, 2018)
KEJURUTERAAN POLIMER	
NOR AZURA BINTI ABDUL RAHIM	BE HONS (USM) (POLYMER, 2007) MSc (USM) (POLYMER, 2010)
KEJURUTERAAN SUMBER AIR	
HOO SHYAN SHYAN	ME WITH MERIT (PORTSMOUTH) (CIVIL, 2003)

PERMOHONAN BARU / PERPINDAHAN MENJADI AHLI KORPORAT

Nama	Kelayakan
KEJURUTERAAN AWAM	
HASNIDA BINTI ABDUL RAZAK	BE HONS (UTM) (CIVIL, 1996)

PERPINDAHAN AHLI

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
44403	KHAIRUL ANWAR BIN HATTA	BE HONS (UiTM) (CIVIL, 2011) MSc (UTP) (CIVIL, 2016)
87400	LAU JOE JIUNN	BE HONS (UPM) (CIVIL, 2015)
93929	LAW CHENG YANG	BE HONS (SWINBURNE) (CIVIL, 2014)
93543	LIEW KHANG YUEH	BE HONS (UTAR) (CIVIL, 2016)
86156	ONG CHUN SHAN, DAVID	ME HONS (NOTTINGHAM) (CIVIL, 2015)
KEJURUTERAAN BAHAN		
93687	NIK MOHAMAD AMRI HAFIZ BIN ZULKIFLI	BE HONS (IIUM) (BE HONS MECHANICAL-AUTOMOTIVE, 2015)
KEJURUTERAAN ELEKTRIKAL		
90347	AHMAD SAIFUDDIN BIN IBRAHIM	BE HONS (UiTM) (ELECTRICAL, 2016)
77925	BAVANATHAN A/L SELVAMANY	BE HONS (UNITEN) (ELECTRICAL POWER, 2015)
26942	CHARLES RAYMOND A/L SARIMUTHU	BE HONS (MALAYA) (ELECTRICAL, 2006) ME (MALAYA) (2010) PhD (UNITEN) (2019)
70312	MAHENDRAN A/L BATUMALAY	BE HONS (UPM) (ELECTRICAL & ELECTRONICS, 1999)
21203	MUZAMIR BIN ISA	BE HONS (UTM) (ELECTRICAL, 2001) ME (UTHM) (ELECTRICAL, 2004) PhD (AALTO UNIVERSITY) (2013)
94032	SHANGAR EAGAMATHAN	BE HONS (NANYANG) (ELECTRICAL & ELECTRONIC, 2011) MSc (NANYANG) (POWER, 2016)
112188	WOOI CHIN LEONG	BE HONS (UMS) (ELECTRICAL & ELECTRONICS, 2011) ME (UTM) (ELECTRICAL, 2013) PhD (UTM) (ELECTRICAL, 2017)
KEJURUTERAAN INDUSTRI		
90159	IZZUDIN BIN IBRAHIM	BSc HONS (STATE UNIVERSITY OF NEW YORK AT BUFFALO) (INDUSTRIAL, 2015)
KEJURUTERAAN MEKANIKAL		
112483	AB AZIZ BIN MOHD YUSOF	BE HONS (UTM) (MECHANICAL, 2010) ME (UTM) (BIOMEDICAL, 2013) PhD (UTM) (BIOMEDICAL, 2017)
70605	GOH DES SOH	BE HONS (UTAR) (MECHANICAL, 2014)
74201	KOH WEI HAO	ME HONS (BATH) (MECHANICAL, 2014)
80742	LOH KWAN JOU	BE HONS (UTAR) (MECHANICAL, 2012)
35147	MOHAMMED ALIFF BIN MOHD ZAIN	BE HONS (UiTM) (MECHANICAL, 2011)
49372	RIFQI IRZUAN BIN ABDUL JALAL	BE HONS (OKAYAMA) (MECHANICAL, 2008) PhD (LOUGHBOROUGH) (2018)
90037	TOH ZHI WEI	BE HONS (MMU) (MEHCANICAL, 2012)
38785	WONG SIONG BING	BE HONS (MONASH) (MECHANICAL, 2008)
KEJURUTERAAN PENGANGKUTAN		
61124	NOORFAKHRIAH BINTI YAAKUB	BE HONS (UTP) (CIVIL, 2010)
KEJURUTERAAN PERSEKITARAN		
58825	YAP YI SHEN	BE HONS (UTAR) (ENVIRONMENTAL, 2017)

PERMOHONAN BARU / PERPINDAHAN MENJADI AHLI KORPORAT

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
56636	AHMAD FAISAL BIN MOHD GHAZALI	BE HONS (UTM) (CIVIL, 2013) ME (UTM) (CIVIL-STRUCTURE, 2016)
19884	ILANCHELVAN A/L POLANIPPAN	BSc HONS (UTM) (CIVIL, 2001) ME (UTM) (GEOTECHNICS, 2020)
41070	NORASPALELA BINTI ABDULLAH	BE HONS (UiTM) (CIVIL, 2008)
75261	SHAHIRON BIN SHAHIDAN	BE HONS (UNISEL) (CIVIL, 2007) ME (UPM) (STRUCTURAL & CONSTRUCTIONS, 2010) PhD (USM) (2014)
KEJURUTERAAN ELEKTRIKAL		
28991	LEE WAI YIN	BE HONS (UTP) (ELECTRICAL & ELECTRONICS, 2004)
KEJURUTERAAN KIMIA		
32600	NG KOK SUM	BE HONS (UTM) (CHEMICAL, 2006) PhD (NOTTINGHAM) (2009)
KEJURUTERAAN MEKANIKAL		
43670	MURRALITHARAN A/L RAJANDRAN	BE HONS (UNITEN) (MECHANICAL, 2009)

ERRATA

Adalah dimaklumkan bahawa terdapat satu kesilapan atas kelayakan calon berikut dalam senarai yang diluluskan untuk menduduki Temuduga Profesional dalam buletin bulan Disember.

PEMINDAHAN AHLI

Nama	Kelayakan
KEJURUTERAAN PETROLEUM	
KOH JUNG HUNG	BE HONS (UTM) (CHEMICAL, 1999) MSc (GREENWICH) (FACILITIES MANAGEMENT, 2004)

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PEMINDAHAN AHLI KEPADA AHLI KORPORAT

No. Ahli	Nama	Kelayakan
KEJURUTERAAN KIMIA		
54032	HASSIMI BIN ABU HASAN	BE HONS (UKM) (BIOCHEMICAL, 2007) PhD (UKM) (CHEMICAL & PROCESS, 2012)
KEJURUTERAAN KOMUNIKASI		
56975	ANG CHUNG HUI	HE NONS (UniMAP) (COMMUNICATION, 2014)
KEJURUTERAAN MEKANIKAL		
49786	AZNIZAM BIN AHMAD	BE HONS (UTM) (MECHANICAL, 2012)
28618	AZROL BIN JAILANI	BE HONS (UTHM) (MECHANICAL, 2007)
71681	ERWIN EFFENDY BIN SAJALI	BE HONS (UTP) (MECHANICAL, 2001) MSc (CURTIN UNIVERSITY) (PROJECT MANAGEMENT, 2014)
104274	MAARUF BIN MOHAMAD	BE HONS (UTP) (MECHANICAL, 2010) MSc (UTM) (PETROLEUM, 2015)
41194	MOHD KHAIRUL BIN MAHTAR	BE HONS (UiTM) (MECHANICAL, 2000)
93827	MUHAMMAD SIDDIQ BIN SALLEHUDDIN	ME (SHEFFIELD) (MECHANICAL, 2013)
78865	NG KEAN ENG	BE (MURORAN INSTITUTE OF TECHNOLOGY) (MECHANICAL SYSTEM, 1998) ME (MURORAN INSTITUTE OF TECHNOLOGY) (MECHANICAL,SYSTEMS, 2000) PhD (MURORAN INSTITUTE OF TECHNOLOGY) (2003)
81850	ONG TENG CHUAN	BSc (NATIONAL TAIWAN) (MECHANICAL, 2005)
70568	TAN CHEE HSIANG	BE HONS (UTAR) (MECHANICAL, 2014)
88325	TEO KAI PENG	ME HONS (BRISTOL) (MECHANICAL, 2013)
37607	TEO KOK THYE	BE HONS (UKM)) MECHANICAL, 2010)
36312	YEE CHEN VEE, TEDDY	BE HONS (UiTM) (MECHANICAL, 2005)
KEJURUTERAAN TELEKOMUNIKASI		
62164	MOHD FAZRI BIN ABD LATIF	BE HONS (UiTM) (ELECTRICAL, 2008)

PEMINDAHAN KEPADA AHLI (MELALUI PEPERIKSAAN PENILAIAN PROFESIONAL)

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
50674	CHAN KHUNG LEI	BE HONS (UNISEL) (CIVIL, 2008)
79262	CHOW MING FAI	BE HONS (UTM) (CIVIL, 2007) PhD (UTM) (CIVIL, 2012)
KEJURUTERAAN ELEKTRIKAL		
20105	ZUHAINA BINTI ZAKARIA	BE HONS (UTM) (ELECTRICAL, 1989) MSc (NAPIER UNIVERSITY) (INFORMATION TECHNOLOGY CONTROL, 1997) PhD (STARTHCLYDE) (2005)
KEJURUTERAAN ELEKTRONIK		
45842	MOHD SHAH RIZAL BIN SAMSUDIN	BE HONS (UTM) (ELECTRICAL-ELECTRONICS, 2009) MSc (UTP) (ELECTRONICS SYSTEM, 2015)
KEJURUTERAAN MEKANIKAL		
37531	CHEW CHIEN LYE @ MERVIN	BE HONS (UKM) (MECHANICAL, 2011)
65199	CHONG KAI FENG	BE HONS (MMU) (MECHANICAL, 2013)
33782	HUA SHIJIE, NORMAN	BE HONS (USM) (MECHANICAL, 2005) MSc (MALAYA) (MECHANICAL, 2017)
25673	MD FAHMI BIN ABD SAMAD @ MAHMOOD	BE HONS (UTM) (MECHANICAL, 2000) ME (UTM) (ENGINEERING MANAGEMENT, 2002) PhD (UTM) (MECHANICAL, 2009)
24328	YAP TZE CHUEN	BE HONS (UTM) (MECHANICAL, 2000)

PERMOHONAN MENJADI AHLI KORPORAT

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
108218	AMER BIN MOHAMAD HUSIN @ HUSSAIN	BE HONS (USM) (CIVIL, 2001)
108319	CHEAH SHI YUN	BE HONS (PORTSMOUTH) (CIVIL, 2012) MSc (PORTSMOUTH) (CIVIL WITH STRUCTURAL, 2013)
108039	ELIZA SUFINAH BINTI MAT SEPIN	BE HONS (UiTM) (CIVIL, 2000)
108221	HONG EI SHENG	BE HONS (ILLINOIS) (CIVIL, 2008)
108047	IZWAN SHAH BIN IBRAHIM	BE HONS (UiTM) (CIVIL, 2009)
53592	KEW CHUEN FATT	BE HONS (UKM) (CIVIL & STRUCTURAL, 2013)
108223	MOHAMMED IBNI BIN ABDUL SABUL	BE HONS (UiTM) (CIVIL, 2007)
108320	MOHD SHAHRUL NIZAM BIN MARZUKI	BE HONS (UPM) (CIVIL, 2006)
108041	MUHAMMAD RUZI BIN YAAKUB	ADV.DIP (UiTM) (CIVIL, 1995)
108046	MUHAMMAD ZAMRI BIN UZNI	BE HONS (UiTM) (CIVIL, 2012)
17760	NOOR AZLINE BINTI MOHD NASIR	BE HONS (UiTM) (CIVIL, 1999)
108038	NORAINI BINTI SULIMAN	BE HONS (UiTM) (CIVIL, 2006)
108214	SABIRIN BIN HASSAN	BSc (NORTH CAROLINA) (CIVIL, 1987)
108314	TAJUDDIN BIN YAHAYA	BE HONS (UiTM) (CIVIL, 2002)
108317	THULASI A/P GOVENDRAN	BE HONS (KLiUC) (CIVIL, 2011)
95805	WAN FADLI BIN WAN MOHAMAD	BE HONS (UiTM) (CIVIL, 2001)
28197	ZAINAL ABIDIN BIN HASAN	BE HONS (MALAYA) (CIVIL, 2007)
108213	ZAKARIA BIN MASRUR	BE HONS (UTM) (CIVIL, 2005)
KEJURUTERAAN ELEKTRIKAL		
108316	JAYVARMAA A/L RAJARAM	BE HONS (UTP) (ELECTRICAL & ELECTRONICS, 2014)
108222	KHAIRUN SYAZMIN BINTI ISMAIL	BE HONS (UPM) (ELECTRICAL & ELECTRONICS, 2003)
108318	LEE TIAN GIAP	BE HONS (HERTFORDSHIRE) (ELECTRICAL & ELECTRONIC, 1997)
108040	MOHAMAD RUZAINI BIN ABDUL RASHID	BE HONS (UniMAP) (ELECTRICAL SYSTEM, 2014)
36884	MOHD FATHI NADWI BIN MOHD FAUZI	BE HONS (UTeM) (ELECTRICAL POWER ELECTRONIC & DRIVE, 2007)
108210	MOHD MOHYDDIN BIN MOHAMED NOR	BE HONS (UTM) (ELECTRICAL, 1995)
108037	MURSYID BIN ABD GHANI	BE HONS (UiTM) (ELECTRICAL, 2008)
KEJURUTERAAN ELEKTRONIK		
108217	FIDELIA OLGA FRED	BE HONS (UiTM) (ELECTRICAL, 2004)
108216	YU SIAW CHEUN, ARIUS	BE HONS (UNI OF LEEDS) (ELECTRONIC & ELECTRICAL, 1998)
KEJURUTERAAN KIMIA		
108220	NAZEEM BIN ZAHARI	BE HONS (UPM) (CHEMICAL, 2005)
KEJURUTERAAN MEKANIKAL		
108215	ASRUL EFFENDY BIN ISMAIL	BE HONS (UNIMAS) (MECHANICAL, 2005)
108212	SAYUTI BIN NASHIR	BE HONS (UiTM) (MECHANICAL, 2006)
108315	SERPICO ANAK BARI	BE HONS (UNIMAS) (MECHANICAL, & MANUFACTURING SYSTEM, 2000)
79351	YAP LEE LIP	BE HONS (MALAYA) (MECHANICAL, 2014)
KEJURUTERAAN SUMBER AIR		
108211	MUHAMMAD ISKANDAR BIN SAPONG	BE HONS (UPM) (CIVIL, 2003)

PERMOHONAN MENJADI AHLI (MELALUI PEPERIKSAAN PENILAIAN PROFESIONAL)

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
108044	AZMI BIN ALADDIN @ ALLADIN	BE HONS (PORTSMOUTH) (CIVIL, 1997)
108045	MOHAMED BIN DAUD	BSc HONS (LOUGHBOROUGH UNIVERSITY OF TECHNOLOGY) (CIVIL, 1983)
108042	SAIFFUDDIN BIN SHEAFI	BE HONS (UTM) (CIVIL, 2006)
KEJURUTERAAN ELEKTRIKAL		
108043	NAS NAWEERAH BINTI RAHIM	BE HONS (UTHM) (ELECTRICAL, 2006)
KEJURUTERAAN MEKATRONIK		
108219	MOHAMED ZAFRAN BIN HAJA MOHIDEEN	BE HONS (IIUM) (MECHATRONICS, 2005) Mtech (CURTIN) (PETROLEUM TECHNOLOGY, 2011)

PEMINDAHAN KEPADA AHLI 'COMPANION'

No. Ahli	Nama	Kelayakan
KEJURUTERAAN MEKANIKAL		
64800	RAJA MUHD ABDULLAH BIN RAJA SHAH RIMAN	BE HONS (UTP) (MECHANICAL, 2007)
KEJURUTERAAN PEMBUATAN		
52498	AHMAD DZULKARNAIN BIN SALEHUDDIN	BE HONS (IIUM) (MANUFACTURING, 2011)

PERMOHONAN MENJADI AHLI 'COMPANION'

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
107807	ABDUL AZIZ BIN JOHARI	BE HONS (UiTM)(CIVIL, 2005)
107806	MOHD NORHAFIDZ BIN KEFLY	BE HONS (UTP)(CIVIL, 2008)
108127	MOHD ZULHAIRI BIN SOBRI	BE HONS (UTP)(CIVIL, 2008)
108126	NOR RIZAN BIN MOHD AKHIR	BE HONS (UNI. OF MALAYA, 1982)
107810	SUHAIMI ABD AZIZ	BE HONS (UNITEN)(CIVIL, 2009)
108132	ZAID ISKANDAR BIN JARAIEE	BE HONS (UTHM)(CIVIL, 2008)
KEJURUTERAAN ELEKTRIKAL		
107808	MARCO P. KISSOL	BE HONS (UTHM) (ELECTRICAL, 2003)
108129	MUHAMMAD SANJAY BIN ABDULLAH	BE HONS (UTHM) (ELECTRICAL, 2009)
KEJURUTERAAN ELEKTRONIK		
107803	GOH CHOOI CHUAN	BE HONS (UNI. OF STRATHCLYDE) (ELECTRICAL & ELECTRONIC, 1988)
107805	MOHD ABDUL HADI BIN OSMAN	BE HONS (MMU) (ELECTRONICS, 2004) ME (UMP)(2018)
107812	YONG SOON FUAN	BE HONS (UTHM) (ELECTRICAL, 2003)
KEJURUTERAAN KIMIA		
108128	HEE TIT SHAN	BSc (MICHIGAN TECHNOLOGICAL UNI.) (CHEMICAL, 1992)
107811	NURLEYNA BINTI YUNUS	BE HONS (UTM) (CHEMICAL, 1999) PhD (UKM)(CHEMICAL & PROCESS, 2015)
KEJURUTERAAN KOMPUTER		
108130	MOHD SHAIFUL AZHAR BIN SAAD	BE HONS (UTM) (COMPUTER, 2005)
KEJURUTERAAN MEKANIKAL		
108391	AMIRUL IMAN BIN AZIZDIN	BE HONS (UTP) (MECHANICAL, 2009)
108131	HASZEME BIN ABU KASIM	BE HONS (UiTM) (MECHANICAL, 2007) MSc (UiTM)(MECHANICAL, 2014)
107809	MOHD YUZAINI BIN HUSSIN	BE (MEIJI UNIVERSITY) (MECHANICAL, 2010)
108390	WAH SHIH LEON	BE HONS (UTAR) (MECHANICAL, 2010)
107804	YONG MAHMOD ISKANDAR BIN AB WAHAB	BE HONS (UTeM) (MECHANICAL-THERMAL FLUIDS, 2007)

PERMINDAHAN KEPADA AHLI SISWAZAH

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
35693	NUR SYAMIMI BINTI ZAIDI	BE HONS (UTM)(CIVIL, 2010) PhD (UTM)(CIVIL, 2016)
40329	AMYRHUL BIN ABU BAKAR	BE HONS (UTM)(CIVIL, 2011) ME (UTM)(CIVIL-HYDRAULICS & HYDROLOGY, 2013)

KEAHLIAN

89071	AWANGKU ASYRAF BIN AWANGKU HIDUP	BE HONS (SEGi UNI.)(CIVIL, 2018)
79238	BONG KHI YII, CHESTER	BE HONS (SWINBURNE UNI. OF TECH.)(CIVIL, 2018)
104635	CHOW YEE FONG	BE HONS (CURTIN UNI.) (CIVIL & CONSTRUCTION, 2019)
33087	DG. RAZLINAH BINTI ABD RAZAK	BE HONS (UiTM)(CIVIL, 2009)
90740	KUEK CHAI JIAN	BE HONS (THE UNI. OF ADELAIDE)(CIVIL & STRUCTURAL, 2018)
99039	LIM CHU CHENG	BE HONS (UTAR)(CIVIL, 2019)
68984	MOHAMAD SYAMSUL HIZHAM BIN SABLEE	BE HONS (UiTM)(CIVIL, 2016)
47341	MOHAMAD ZULBAHARI BIN MOHAMAD ZU	BE HONS (UTP)(CIVIL, 2013)
57669	MOHAMMAD AMRI B. ABD HAMID	BE HONS (USM)(CIVIL, 2016)
33212	MOHD MUSTAQIM BIN MOHD NORDIN	BE HONS (UiTM)(CIVIL, 2010) ME (UiTM)(CIVIL, 2013)
78915	MUHAMMAD ASYRAF BIN MASRI	BE HONS (UTM)(CIVIL, 2019)
89402	NG SUI LYN	BE HONS (MONASH UNI.) (CIVIL, 2019)
57617	NOORAIZEE BT. MOHD SALIM	BE HONS (UTM)(CIVIL, 2013)
69813	NURUL NADZATUL FARHANA BINTI ABDUL HALIM	BE HONS (UNIMAS)(CIVIL, 2017)
80206	ONG LI CHOO, ELIZABETH	BE HONS (UTM)(CIVIL, 2016)
66283	PRAVIN A/L PELANISAMY	BE HONS (IUKL)(CIVIL, 2018)
32093	RAFIUDDIN BIN YEOB RAMLI	BE HONS (USM)(CIVIL, 2011) ME (CHULALONGKORN UNI.) (CIVIL, 2013)
80413	TAN CHENG YUAN, SHANON	BE HONS (UTAR)(CIVIL, 2019)
55057	TAN SOCK FUNG	BE HONS (UTHM)(CIVIL, 2016)
96086	TAN YIN BOEY	BE HONS (UniMAP)(CIVIL, 2018)
74814	WONG SUI HIENG	BE HONS (UTM)(CIVIL, 2018)
84764	YEOH KHAI HUNG	BE HONS (UNI.OF MALAYA) (CIVIL, 2016)
61845	YUSMIN B. YAAKUB	BE HONS (UTHM)(CIVIL, 2014)

KEJURUTERAAN ELEKTRIKAL

84990	LAI ZHI YIN	BE HONS (UTAR) (ELECTRICAL & ELECTRONIC, 2019)
64899	MUHAMMAD NUR HAZZIM B. ABU HANIPAH	BE HONS (UTeM) (ELECTRICAL, 2018)
36155	NORSURAYA BINTI RADZUAN	BE HONS (UTM) (ELECTRICAL-TELECOMMUNICATIONS, 2012)
58290	NURUL MUSILIMAH BT. LAHAJI	BE HONS (UTHM) (ELECTRICAL, 2013)
48710	NURUL SYAZWANI BINTI MOHD AZAMI	BE HONS (UTHM) (ELECTRICAL, 2012)
34555	OSMAN BIN ABU BAKAR	BE HONS (UTeM) (ELECTRICAL-CONTROL, INSTRUMENTATION & CONTROL, 2009) ME (UTM)(ELECTRICAL POWER, 2017)
45930	TAN SOON THEAM, ADRIAN	BE HONS (USM) (ELECTRICAL, 2014)
79748	TAN ZHONG YIH	BE HONS (UNITEN) (ELECTRICAL POWER, 2018)
80311	YEE WEI SHEN	BE HONS (UTAR) (ELECTRICAL & ELECTRONIC, 2019)

KEJURUTERAAN ELEKTRONIK

84837	AMIRAH ATHIRAH BINTI ROHAZAM	BE HONS (UiTM) (ELECTRONIC, 2017)
62255	KAN PEI EN	BE HONS (MONASH UNI.) (ELECTRICAL & COMPUTER SYSTEMS, 2016)
58388	MUHAMMAD SYAHMI B. SHAHROL	BE HONS (UNIMAS) (ELECTRONICS-TELECOMMUNICATIONS, 2016)
64880	NURUL IZZETY BT. HAMDAN	BE HONS (UTHM) (ELECTRONIC, 2018)

KEJURUTERAAN KIMIA

68551	GOH CHUN JIE	BE HONS (UMS)(CHEMICAL, 2017)
35999	NOR ERNIZA BINTI MOHAMMAD ROZALI	BE HONS (UTM)(CHEMICAL, 2011)
67343	NURUL HAZWANI BT ROHALIM	BE HONS (UiTM)(CHEMICAL & PROCESS, 2016)
47145	SHARIFAH NURUL FAZILLA BINTI GHAZALI	BE HONS (UNIMAS) (CHEMICAL, 2013)
80232	YOGESSVARAN A/L VEKNESVARAN	BE HONS (UTP)(CHEMICAL, 2017)

KEJURUTERAAN MEKANIKAL

75886	ABDUL HALEM HAFIDZ BIN ABDUL KADIR	BE HONS (UiTM) (MECHANICAL, 2018)
55087	ABDUL RAHMAN BIN NASUSHARDIN	BE HONS (UTHM) (MECHANICAL, 2016)
51891	ANTONY REY O WAN KEN NYEE	BE HONS (UNIMAS) (MECHANICAL & MANUFACTURING, 2015)
81867	ARAN PASUPATHI A/L PASUPATHI	BE HONS (IUKL) (MECHANICAL, 2016)
94750	LIM MENG YAO	BE HONS (UTAR) (MECHANICAL, 2018)
80326	LIM ZHI YI	BE HONS (UTAR) (MECHANICAL, 2017)
35267	MASRUL ANUAR BIN MAHMOOD	BE HONS (UiTM) (MECHANICAL-MANUFACTURING, 2011)
37497	MOHD ARIEF FIRDAUS BIN MOHD YUSOF	BE HONS (UKM) (MECHANICAL, 2009)
49083	MOHD SHAHRIZAL BIN MOHD ALI	BE HONS (UiTM) (MECHANICAL, 2012)
51752	MUHAMMAD HELMY HUSSAINY BIN KHAZALI	BE HONS (UKM) (MECHANICAL, 2016)
36518	NORAZREEN BINTI SAMSURI	BE (UMP) (MECHANICAL, 2012) MPhil (UTM)(2017)
66663	VICKNESWARAN A/L PANNEERSELVAN	BE HONS (UNITEN) (MECHANICAL, 2018)

KEJURUTERAAN MEKATRONIK

62948	CHAI MAU SHERN	BE HONS (UTeM) (MECHATRONICS, 2017)

KEJURUTERAAN PEMBUATAN

50503	ABBAS BIN GHAZALI	BE HONS (UiTM) (MECHANICAL-MANUFACTURING, 2016)
60367	SYARFADILA EZURIDA BT. SHAARI	BE HONS (UTeM) (MANUFACTURING-MANUFACTURING DESIGN, 2013)

PERMOHONAN MENJADI AHLI SISWAZAH

No. Ahli	Nama	Kelayakan

KEJURUTERAAN AEROANGKASA

107826	MOHAMAD HIZAMI BIN MOHAMAD HILMI	ME HONS (THE UNI. OF BATH)(AEROSPACE, 2018)

KEJURUTERAAN AWAM

108023	ABDUL HAFIZH BIN ABDUL NASIR	BE HONS (UTM)(CIVIL, 2015)
107772	AHMAD FIRDAUS BIN MELAN ZUBIR	BE HONS (UTM)(CIVIL, 2015)
108431	ALVY BARTHOLOMEUS PHILIP	BE HONS (UTHM)(CIVIL, 2003)
108277	ARIVALAGAN A/L REVICHANDRAN	BE HONS (IUKL)(CIVIL, 2017)
108008	AZULAIKHA BT AZANI	BE HONS (THE UNI. OF ADELAIDE)(CIVIL & ARCHITECTURAL, 2014)
108462	BONNIE LAU	BE HONS (UCSI UNI.)(CIVIL, 2018)
108411	CHAN CHYUN SHENG	BE HONS (UTM)(CIVIL, 2013)
108032	CHANG TING WAI	BE HONS (UMP)(CIVIL, 2014)
108186	CHEAH BIN YUI	ME HONS (THE UNI. OF NOTTINGHAM)(CIVIL, 2019)
108432	CHEAH YONG CHEAN	BE HONS (UNI. OF MALAYA) (CIVIL, 2005)
108449	DINESH KUMARAN A/L PALANIANDY	BE HONS (UTP)(CIVIL, 2012) MSc (UTP)(CIVIL, 2015)
108406	DOROTHY DOU	BE HONS (UMS)(CIVIL, 2011)
108418	Dr MARZUKI BIN AB. RAHMAN	BE HONS (UTM)(CIVIL, 1990) MSc (USM) (STRUCTURE, 2002) PhD (UiTM)(CIVIL, 2009)
108010	Dr MAZLIN BTE JUMAIN	BE HONS (UTM)(CIVIL, 2012) PhD (UTM)(CIVIL, 2017)
108034	DYANDRA SAKO ANAK DERALD KUWANG	BE HONS (SWINBURNE UNI. OF TECH.)(CIVIL, 2019)
108022	FADZREN BIN HIPNI	BE HONS (UNIMAS)(CIVIL, 2014)
108273	FAHRUZALI BIN RASHID	BE HONS (UiTM)(CIVIL, 2005)
7765	FAZRUL AMZAR BIN KHAIRY	BE HONS (CARDIFF UNI.)(CIVIL, 2014) MSc (UiTM)(WATER RESOURCES, 2018)
108004	FIRDAUS EKAPUTRA BIN MARZUKI	BE HONS (UiTM)(CIVIL, 2012)
108206	FREDRIK PHANGKAWIRA	BE HONS (SWINBURNE UNI. OF TECH.)(CIVIL, 2014)
108003	FUANG SIEW LU	BE HONS (UTM)(CIVIL, 2007)
108450	GUNASEELAN A/L NADARAJAN	BE HONS (UTHM)(CIVIL, 2012)
108054	HASRUL BIN MOHD ARIFIN	BE HONS (UiTM)(CIVIL, 2007)
108253	HO CHEN YANG, PHILIP	BE HONS (SWINBURNE UNI. OF TECHNOLOGY)(CIVIL, 2010)
108407	HO WEE KHOON	BE HONS (UCTS)(CIVIL, 2018)
108405	IRENA BINTI NAUBI	BE HONS (UTM)(CIVIL, 2012) ME (CIVIL-HYDRAULICS & HYDROLOGY, 2016)
108420	JAZLAN BIN MOHAMED AMIN	BE HONS (USM)(CIVIL, 2001)
108174	KHOR HAI CHUAN	BE HONS (UPM)(CIVIL, 2003)
108049	KII YII HENG	BE HONS (CURTIN UNI.) (CIVIL & CONSTRUCTION, 2010)
108263	LAM WAI KIN	BE HONS (UTM)(CIVIL, 2001) MSc (UNI. OF NEWCASTLE UPON TYNE) (ENVIRONMENTAL, 2003)
108057	LEE JIA HUAN	BE HONS (THE UNI. OF WESTERN AUSTRALIA) (CIVIL, 2013)
108456	LEE KANG SHENG	BE HONS (THE UNI. OF ADELAIDE)(CIVIL & STRUCTURAL, 2016)
108031	LEE WEI LOON	BE HONS (SEGi UNI.) (CIVIL, 2013)
108190	LENG YEE HUI	BE HONS (UMP)(CIVIL, 2018)
107999	LEONG CHING YI	ME HONS (ICL)(CIVIL, 2019)
108024	LIM JUN JIE	BE HONS (CURTIN UNI.) (CIVIL & CONSTRUCTION, 2018)
108447	MARLIZAIHA BINTI MOHD NOOR	BE HONS (UTM)(CIVIL, 2008)
108265	MARSHALL ANAK MINGGU	BE HONS (UTM)(CIVIL, 2016)
108400	MASLINDA BT MOHIDDIN	BE HONS (UNI. OF MALAYA) (CIVIL, 2005)
107815	MOHAMAD LUQMAN BIN MAHADZIR	BE HONS (UTP)(CIVIL, 2018)
108422	MOHAMAD RUJHAN BIN ABDULLAH	BE HONS (UTM)(CIVIL, 2013)
108013	MOHD ANUAR BIN MOHAMAD	BE HONS (UTM)(CIVIL, 2010)
108448	MOHD HANIZAN BIN BAHARI	BE HONS (UiTM)(CIVIL, 2008)
108460	MOHD NOOR SHAFIQUE BIN A RAHMAN	BE HONS (UKM)(CIVIL & ENVIRONMENTAL, 2015)
108178	MUHAMMAD FAIZ BIN AHMAD SHAFI	BE HONS (UniMAP)(CIVIL, 2015)
108201	MUHAMMAD HILMI BIN HASSAN	BE HONS (UTM)(CIVIL, 2016)
108293	MUHAMMAD RIZAL BIN ABDUL RAHIM	BE HONS (UPM)(CIVIL, 2008)
108187	MUHAMMAD THAQIF BIN TAMUNIF	BE HONS (UNITEN)(CIVIL, 2017)
108176	MUHAMMAD ZULFADHLI BIN BOHANI	BE HONS (UiTM)(CIVIL, 2013)
108205	NARONGRIT A/L SOM MAI	BE HONS (SWINBURNE UNI. OF TECH.)(CIVIL, 2018)
108014	NEOH XIAO BINN	ME HONS (ICL)(CIVIL, 2018)
108185	NG SOO DIN	BE HONS (INTI INT. UNI.)(CIVIL, 2015) ME (UNI. OF BRADFORD) (CIVIL, 2016) MSc (UNI. OF THE WEST OF ENGLAND BRISTOL) (CONSTRUCTION PROJECT MANAGEMENT, 2016)
107824	NIK FIRDAUS BIN NIK AB HADI	BE HONS (UiTM)(CIVIL, 2009)
108275	NORSHAHRIAH BINTI BAHARI	BE HONS (UTM)(CIVIL, 2012) MSc (ICL)(ENVIRONMENTAL, 2015)
108182	NUR DIYANA BINTI HAJIJI	BE HONS (UiTM)(CIVIL, 2009) MSc (ICL)(SOIL MECHANICS & BUSINESS MANAGEMENT, 2011)
108455	PIRABAGARAN A/L BALASINGAM	BE HONS (UTM)(CIVIL-ENVIRONMENTAL, 2003)
108427	RAJA ROSENANI BINTI RAJA ABDULLAH	BE HONS (UTP)(CIVIL, 2018)
108033	SANDRA JUJANE ANAK JUTIM	BE HONS (UiTM)(CIVIL, 2010)
108397	SHAHRIL IQMAL BIN JOHARI	BE HONS (UiTM)(CIVIL, 2017)
107996	SHAMIL BIN AHMAD	BE HONS (UiTM)(CIVIL, 2011)
108438	SHAZLAN BIN MUHAMAD SUGANDI	BE HONS (UTM)(CIVIL, 2018)
108444	SIM POH KUI, STEVEN	BE HONS(UNIMAS)(CIVIL, 2011)
108006	SITI HASMAH BINTI MUSTAPHA	BE HONS (UTHM)(CIVIL, 2008)
108416	TAN CHIN SIONG	BE HONS (UPM)(CIVIL, 2000)
108398	TAN WEI TECK	BE HONS (UCSI UNI.)(CIVIL, 2018)
108050	TENGKU NUR DALILA BINTI TENGKU ENDUT	BE HONS (UiTM)(CIVIL, 2013)
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108030	TING HUONG HUN	BE HONS (UCTS)(CIVIL, 2016)
108025	TING ZHI HONG, TIMOTHY	BE HONS (CURTIN UNI. OF TECH.)(CIVIL & CONSTRUCTION, 2015)
108440	WEE CHIANG KIAT	BE HONS (CURTIN UNI. OF TECH.)(CIVIL & CONSTRUCTION, 2009)
108252	WONG SOOK WEI	BE HONS (UNI. OF MALAYA) (CIVIL, 2017)
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108439	WONG WEI KIAN, CELDRIC	BE HONS (CURTIN UNI. OF TECH.)(CIVIL & CONSTRUCTION, 2015)
108286	WONG YEW SHAN	BE HONS (SWINBURNE UNI. OF TECHNOLOGY)(CIVIL, 2012)

108441	YEE WAI FUNG	BE HONS (UKM)(CIVIL & ENVIRONMENTAL, 2004)
108442	YEK NAI CHUANG	BE HONS (UTM)(CIVIL, 2011)
108199	ZULKHAIRI BIN MOHD ZAID	BSc (UTM)(CIVIL, 2002)

KEJURUTERAAN BAHAN

108036	WOO MUN EE	BSc (UNI. OF MINNESOTA)(MATERIALS, 2010) MSc (MASSACHUSETTS INST. OF TECH.)(MATERIALS SC. & ENGINEERING, 2013)

KEJURUTERAAN BIOPERUBATAN

108052	ANNAPOORNA CHANDRASEKHAR	BE HONS (UNI. OF MALAYA)(CIVIL, 2013)
108434	Dr SOON GINNY	BE HONS (UNI. OF MALAYA)(BIO-MEDICAL, 2014) PhD (UNI. OF MALAYA)(2018)

KEJURUTERAAN ELEKTRIKAL

107825	AHMAD FARIS BIN BAHRUDDIN	BE HONS (UNITEN)(ELECTRICAL POWER, 2010)
108200	AHMAD SHAHNON BIN AZINUN	B.E.Tech.(HONS.)(UNIKL)(ELECTRICAL, 2009) BEM GE REGISTRATION BRIDGING COURSE (UniKL BET) (ELECTRICAL, 2019)
108430	AMINUDIN BIN ANUAR	BE HONS (UniMAP)(ELECTRICAL SYSTEMS, 2013) MSc (UniMAP)(ELECTRICAL POWER, 2015)
108414	AMIRUL AMMAR BIN MOHD AZMI	BE HONS (UTM)(ELECTRICAL, 2018)
107814	CHIENG KAH THAI, ANDERSON	BE HONS (CURTIN UNI.)(ELECTRICAL POWER, 2019)
108284	CHONG TZE FOONG, HOSEA	BE HONS (UNI. OF MALAYA)(ELECTRICAL, 2007)
108195	CHOONG YIT VOON	BE HONS (UPM)(ELECTRICAL & ELECTRONICS, 2003)
108452	Dr SITI HAJAR BINTI YUSOFF	ME HONS (THE UNI. OF NOTTINGHAM)(ELECTRICAL, 2009)
108207	ELIAKIM BIN CHE YAACOB	BE HONS (UTeM)(ELECTRICAL-INDUSTRIAL POWER, 2013)
108184	HARITHARAN A/L M. NANTHAKUMARAN	BE HONS (SWINBURNE UNI. OF TECH.)(ELECTRICAL & ELECTRONIC, 2018)
108446	HEMA CHANDRAN A/L JAYASEELAN	BE HONS (UKM)(ELECTRICAL & ELECTRONIC, 2017)
108254	HENG JING LEI	BE HONS (TAYLOR'S UNI.)(ELECTRICAL & ELECTRONIC, 2016)
108000	HESHALINI A/P RAJAGOPAL @ RAMASAMY	BE HONS (UNI. OF MALAYA)(ELECTRICAL, 2013) MESc (UNI. OF MALAYA)(SIGNAL & SYSTEMS, 2016)
108012	HUSNULBAZLI BIN MAKHTAR	BE HONS (UTHM)(ELECTRICAL, 2010)
108413	JI CHOU CHEN	BE HONS (CURTIN UNI.)(ELECTRICAL POWER, 2019)
108027	LAW SEI JING	BE HONS (UNITEN)(ELECTRICAL & ELECTRONICS, 2017)
108421	LOI MING JIUNN, JOHANNES	BE HONS (UNITEN)(ELECTRICAL POWER, 2017)
108051	MAHMOOD ANIS SAEED MADHI	BE HONS (UniMAP)(ELECTRICAL SYSTEM, 2017)
108285	MOHAMAD HALIMI BIN KOLAN	BE HONS (UPM)(ELECTRICAL & ELECTRONIC, 2001)
108191	MOHAMAD IZWAN BIN MOHAMAD YUSOP	BE HONS (UNITEN)(ELECTRICAL POWER, 2017)
108433	MOHD ADIB BIN KERYA @ ZAKARIA	BE HONS (UTHM)(ELECTRICAL, 2015)
108257	MOHD FAIZ BIN OMAR	BE HONS (UTM)(ELECTRICAL-INSTRUMENTATION & CONTROL, 2009)
108401	MOHD FAIZUL SHAZRIN BIN SHUKOR	BE HONS (UTeM)(ELECTRICAL-CONTROL, INSTRUMENTATION & AUTOMATION, 2007)
108028	MOHD KHAIRUL ASHRAF BIN MOHD NAZRI	BE HONS (UTM)(ELECTRICAL, 2012)
107822	MOHD ZUHRIE BIN MUSTAMAM	BE HONS (UTM)(ELECTRICAL-INSTRUMENTATION & CONTROL, 2004)
108288	MOK JI YIONG, AARON	BE HONS (UNI. OF MALAYA)(ELECTRICAL, 2017)
108274	MUHAMAD AKRAM IZZUDDIN BIN RAZALI	BE HONS (UMP)(ELECTRICAL-POWER SYSTEM, 2016)
108291	MUHAMMAD LUQMAN BIN MOHD ZAIDEE	BE HONS (UiTM)(ELECTRICAL, 2018) MSc (BRUNEL UNI. LONDON)(SUSTAINABLE ELECTRICAL POWER, 2016)
107645	MUHAMMAD SYAKIR BIN MOHD SHAARI	BE HONS (UNITEN)(ELECTRICAL POWER, 2015)
108194	MUHAMMAD ZULHILMI BIN MOHD NOH	BE HONS (UTeM)(ELECTRICAL-INDUSTRIAL POWER, 2016)
108255	NADRAH BINTI MOHAMMED ANNAS	BE HONS (UTeM)(ELECTRICAL-INDUSTRIAL POWER, 2017)
107821	NORAFIZAN BINTI SAMIN	BE HONS (UMP)(ELECTRICAL-POWER SYSTEM, 2018)
108271	NUR FARHANA BINTI FUADI	BE HONS (UTHM)(ELECTRICAL, 2009)
107823	NUR MUHAMMAD FAZRUR ASYIQ BIN NORDIN	BE HONS (UNITEN)(ELECTRICAL POWER, 2018)
108048	ONG CHUI LING, PEARL	BE HONS (UTM)(ELECTRICAL-INSTRUMENTATION & CONTROL, 2007)
108197	PRAVINAH NAIR A/P SHASIDHARAN	BE HONS (UniMAP)(ELECTRICAL ENERGY SYSTEMS, 2014)
108198	SEKAR ALLO PILLAI SHANMUGAM	BE HONS (UNI. OF MALAYA)(ELECTRICAL, 1989)
108281	SHARUHASAN BABA	BE HONS (UNITEN)(ELECTRICAL POWER, 2008)
108402	SIVANESWARI SAMI-IYAH	BE HONS (UTeM)(ELECTRICAL-INDUSTRIAL POWER, 2006)
108011	SUJENDRAN A/L VARATHARAJOO	BE HONS (UNITEN)(ELECTRICAL & ELECTRONICS, 2012)
108412	SUMAIYAH BINTI MOHD SALAHUDDIN	BE HONS (THE UNI. OF MANCHESTER)(ELECTRICAL & ELECTRONIC, 2011) MSc (THE UNI. OF MANCHESTER)(ELECTRICAL POWER SYSTEMS, 2012)
108269	TEO JIAN HONG	BE HONS (TAYLOR'S UNI.)(ELECTRICAL & ELECTRONIC, 2016)
108404	TEO WEE YAN	ME (THE UNI. OF MANCHESTER)(ELECTRICAL & ELECTRONIC, 2018)
108417	TINAGARAN A/L PERIASAMY NAIDU	BE HONS (UTM)(ELECTRICAL, 2012)
108294	ZULFAHMI BIN ZULHASNI	ME HONS (UNI. OF SOUTHAMPTON)(ELECTRICAL, 2012)

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108437	AHMAD KAMIL ZAHIDI BIN MUSTAFFA	BE HONS (UTS)(ELECTRICAL, 2019)
107813	Dr TAN JIAN DING	BE HONS (UTHM)(ELECTRICAL, 2008) ME (UNI. OF MALAYA)(BIOMEDICAL, 2011) PhD (UNI. OF MALAYA)(AUTOMATION, CONTROL & ROBOTIC, 2017)
108266	MOHAMMAD AMRI BIN ZAINAL	BE HONS (UTM)(ELECTRICAL-MECHATRONIC, 2007) ME (UTM)(ELECTRICAL-MECHATRONICS & AUTOMATIC CONTROL, 2011)
107816	MUHAMMAD FADZIL BIN MASHOR	BE HONS (UTM)(ELECTRONIC SYSTEM, 2017)
108058	MUHAMMAD HAFIZAN BIN ABD RAHIM	BE HONS (UKM)(COMMUNICATION & COMPUTER, 2013)
108287	NUR HIDAYAH BINTI SULAIMAN	BE HONS (UTeM)(ELECTRONIC-TELECOMMUNICATION ELECTRONICS, 2016) MSc (UTeM)(ELECTRONIC, 2018)
108451	RAZAK BIN MOHD ALI LEE	BE (NAGAOKA UNI. OF TECH.)(ELECTRICAL & ELECTRONIC SYSTEMS ENGINEERING COURSE, 1999)
108002	TAN XIAO JIAN	BE HONS (UniMAP)(BIOMEDICAL ELECTRONICS, 2016)
108203	TAUSEEF RASHEQ AHAD	BE HONS (MMU)(ELECTRONICS-TELECOMMUNICATIONS, 2019)
107773	THIAKU A/L RAMALINGAM	BE HONS (MMU)(ELECTRONICS-TELECOMMUNICATIONS, 2003)

KEJURUTERAAN KIMIA

108183	AKMAL BIN ANUAR BATCHA	BE HONS (UNSW)(CHEMICAL, 2018)
108259	ANG SO KHAI	BE HONS (TAYLOR'S UNI.)(CHEMICAL, 2018)
108021	BEH ZI QI	ME HONS (THE UNI. OF NOTTINGHAM)(CHEMICAL, 2018)
108290	CHIEW SHU CHING, CHRISTINE	BE HONS (UMS)(CHEMICAL, 2011)
108196	Dr LOCK SOW MUN, SERENE	BAppSc (UNI. OF TORONTO)(CHEMICAL, 2012) MSc (UTP)(CHEMICAL, 2014) PhD (UTP)(CHEMICAL, 2019)
108428	Dr SUAZLAN BIN MT AZNAM	BE (YOKOHAMA NATIONAL UNI.)(CHEMICAL, 2005) PhD (YOKOHAMA NATIONAL UNI.)(CHEMICAL & ENERGY, 2017)
108443	Dr VEKES A/L BALASUNDRAM	BE HONS (UMP)(CHEMICAL, 2015) PhD (UTM)(GAS-2018)
107764	JOEL CHUNG	BE HONS (CURTIN UNI. OF TECHNOLOGY)(CHEMICAL, 2009)
108055	LEE CHOONG LEK, BRIAN	ME HONS (THE UNI. OF NOTTINGHAM)(CHEMICAL with ENVIRONMENTAL, 2018)
107817	LIM MAY TENG	ME HONS (THE UNI. OF NOTTINGHAM)(CHEMICAL, 2016)
108267	LOK CHOON THOW	BE HONS (UTAR)(CHEMICAL, 2016)
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107995	MEOR AHMAD NAUFAL ZIKRI BIN MEOR ABD AZIZ	BE HONS (UTM)(CHEMICAL PROCESS, 2018)
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108208	NG TZE SHYAN	BE HONS (MONASH UNI.)(CHEMICAL, 2017)
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108276	PEGGY @ TEH PEY GI	BE HONS (UTAR)(CHEMICAL, 2019)
108457	SAFRI BIN AHMAT	BE HONS (UTP)(CHEMICAL, 2007)
108429	TAN JU KHENG	BE HONS (MONASH UNI.)(CHEMICAL, 2018)
108015	TAY SZE YEE	ME HONS (HERIOT-WATT UNI.)(CHEMICAL-OIL & GAS TECH., 2019)
108179	THIYAGARAJ A/L RAMAN	BE HONS (CURTIN UNI. OF TECH.)(CHEMICAL, 2014)
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