JURUTERA

The Institution of Engineers, Malaysia

APRIL 2024

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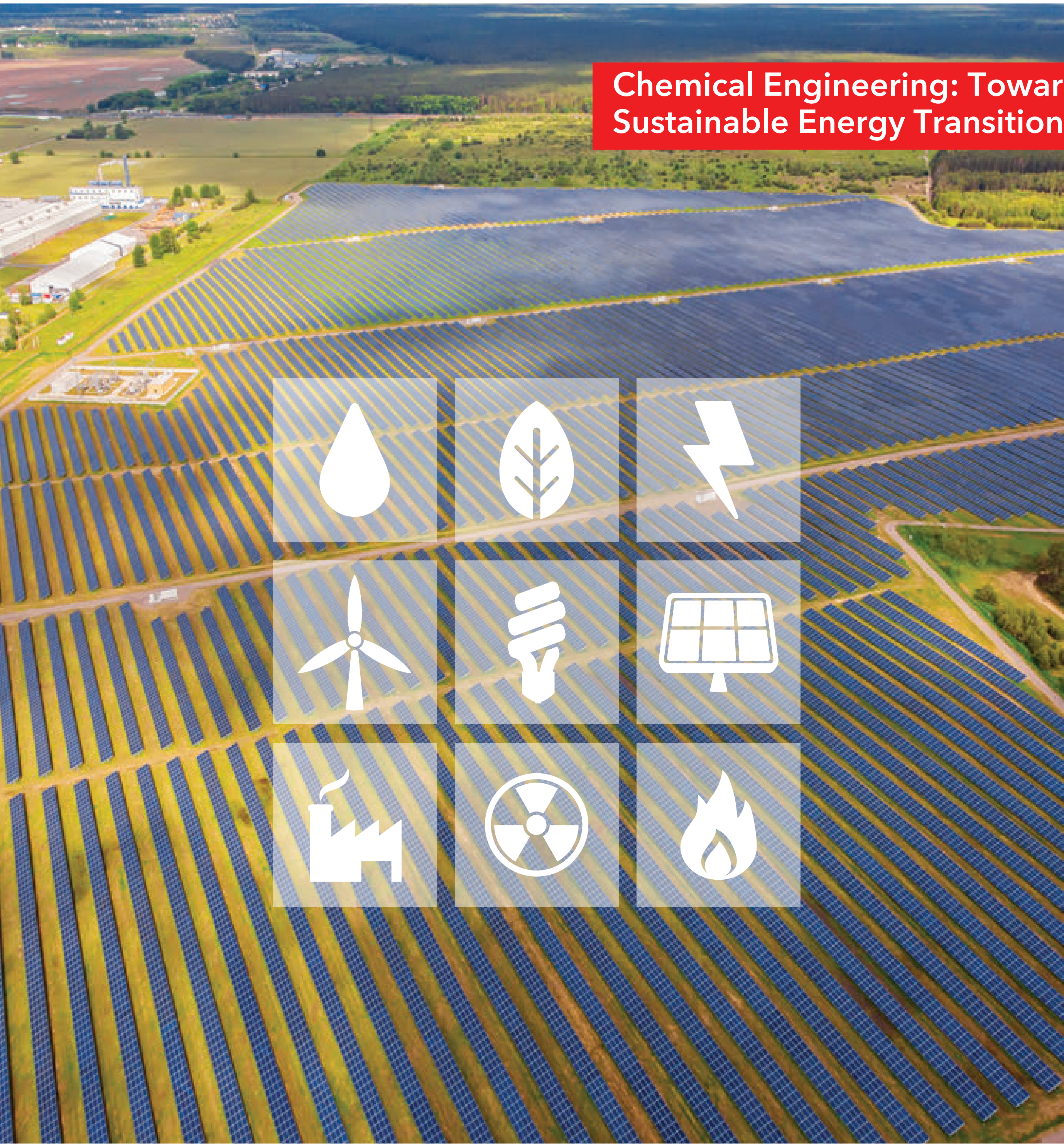
Chemical Engineering: Towards Sustainable Energy Transition



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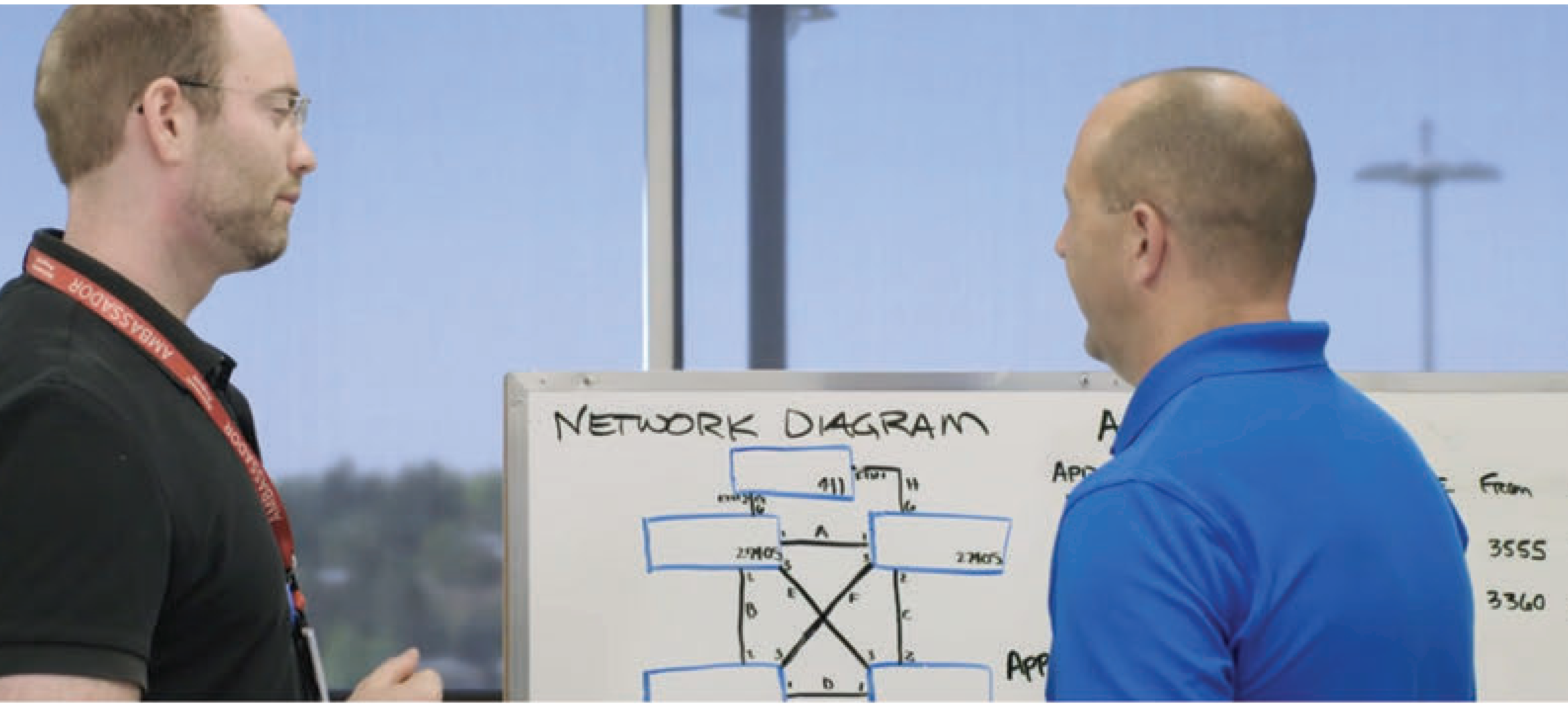

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COVER *Note*

by Ir. Mohamad Anwar Ahmad
Chairman, Chemical Engineering Technical Division (CETD)

Chemical Engineers

Chemical Engineering is not only about chemicals but it also covers many aspects of our life, such as food and beverage, energy, pharmaceutical, semiconductors, waste management, sustainability and more. It is a part of crucial division that really needs involvement from the beginning of the development to the end of execution and even beyond, to the application of the developed technologies.

At the Chemical Engineering Technical Division of IEM, or CETD, our members come from various fields of Chemical Engineering and contribute to the global recognition of our nation and ultimately catalysing its development. When products are being made for industrial or domestic use, the process will definitely produce residual or final waste which will need to be disposed of and Chemical Engineering definitely plays a significant role in sustainability by promoting the repurposing of "waste" and implementing waste management. Furthermore, bio-based products, which are biodegradable and thus more environmental friendly, are being introduced globally in every sector.

Let us join hands in protecting our globe! ■

EDITOR'S *Note*

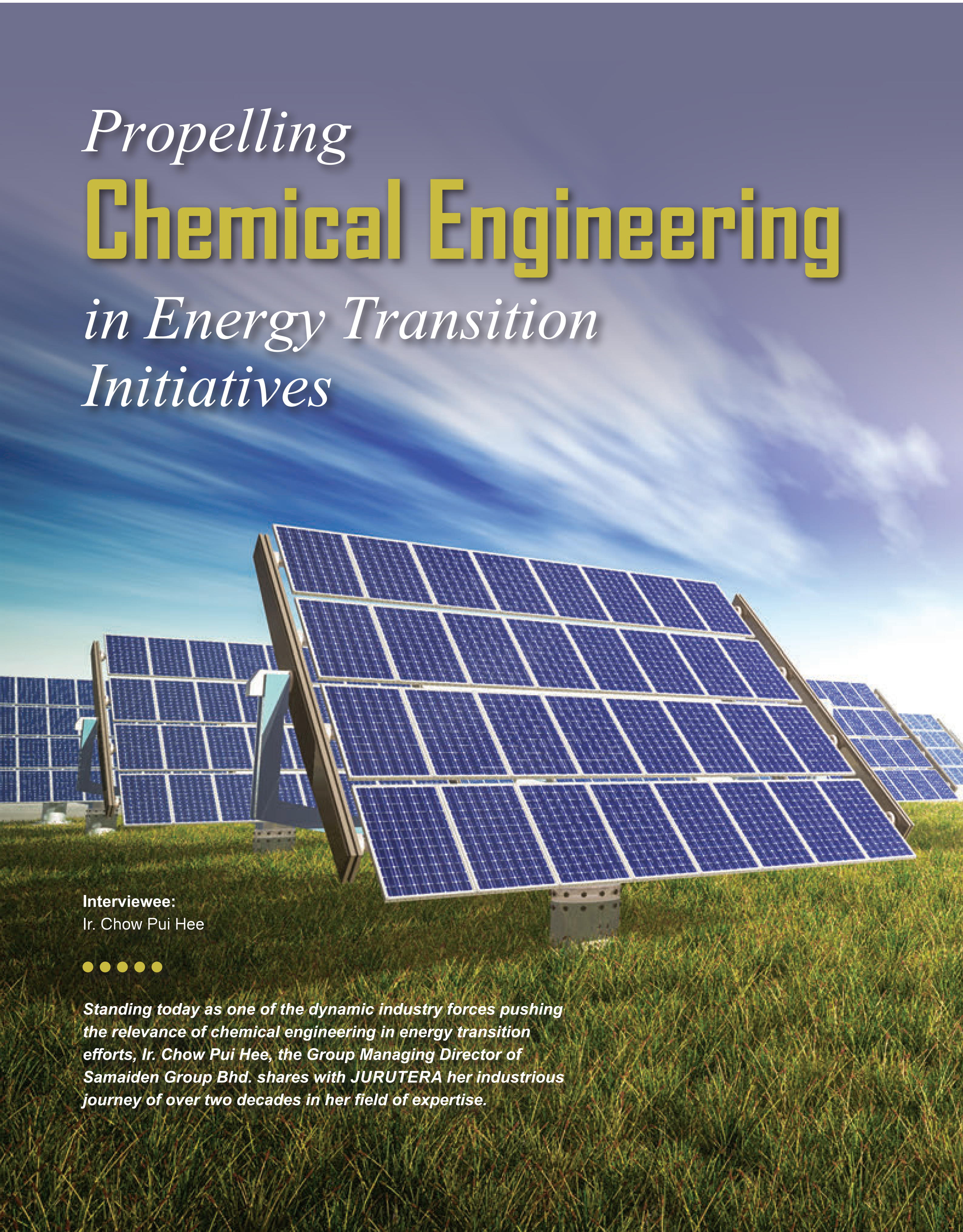
by Ir. Razmahwata Mohamad Razalli
Principal Bulletin Editor

Secretariat Operations

The IEM Secretariat, with its team of 38 staff members, manages over 50,000 members and nearly 70 Committees of the Institution. Despite their efforts to ensure tasks are completed accurately and punctually, occasional lapses may occur due to workload and the urgency of ad hoc issues. The understanding of IEM members regarding these constraints is highly valued.

IEM secretariat

Members encountering any issue or problem can direct these to the IEM Honorary Secretary, who supervises the operations of the Secretariat. ■



Propelling Chemical Engineering *in Energy Transition Initiatives*

Interviewee:
Ir. Chow Pui Hee

Standing today as one of the dynamic industry forces pushing the relevance of chemical engineering in energy transition efforts, Ir. Chow Pui Hee, the Group Managing Director of Samaiden Group Bhd. shares with JURUTERA her industrious journey of over two decades in her field of expertise.

Long before the Malaysian government launched the National Energy Transition Roadmap (NETR) in July 2023 that outlined its efforts towards achieving a sustainable energy system, Chemical Engineer Ir. Chow Pui Hee had begun to chart her career path in this direction. At the time, she was primarily driven by her interest in environmental engineering, particularly involving renewable energy (RE).

It was a choice way ahead of time and a farsighted one. Even as a student in chemical engineering at Universiti Putra Malaysia (UPM), she had chosen process engineering and environmental engineering as her final-year elective subjects. That was 23 years ago, in 2001. She found it even more interesting to be delving deeper into environmental engineering.

She recalls with a chuckle: "People ask me, 'you are a chemical engineer, how come you are doing energy?'. To me, it's still the same. Energy is also about processes, similar to chemical engineering. When we understand about processes and applications, we can see that they are similar, whether it's energy, electrical or chemical. It's like accounting. There's the balance sheet with 'in' and 'out'. Similarly, in chemical engineering for example, we talk about water flow and pressure. In electrical engineering, current is the flow and voltage is the pressure. Both also have 'in' and 'out'."

She adds that as a chemical engineer, she multitasks and working in the real world has reaffirmed her knowledge that the basics of engineering disciplines are the same.

Specialising in both fields of chemical engineering and environmental engineering has been worth it for Ir. Chow. The decision taken back in the day to also develop the skills and knowledge related to the environment had proven right today as it aligned with the current global focus on environmental issues, particularly climate change and the need to reduce carbon emissions.

The NETR specifies Malaysia's target to achieve net-zero emissions by 2050, with gradual increase in RE shares, targeting 31% by 2025, 40% by 2035, and 70% by 2050. It is a strategic plan to drive the nation's energy systems towards cleaner, more sustainable alternatives, with lesser reliance on energy sources based on conventional fossil fuel. Ir. Chow says the energy transition plan has seen greater adoption of RE and other emerging energy technologies.

Valuable Early Exposure

Many companies and entrepreneurs have jumped on the RE bandwagon but Ir. Chow has had a headstart with her early foray into environmental engineering. Since leaving university, she did job stints in various companies and this provided her with a host of exposures, initially more specific in chemical engineering before her career path began to branch out to cover environment-related projects and services.

Unlike most chemical engineering graduates who eyed positions in either petro-chemical or oleo-chemical companies, she applied for a position as Application Engineer at Waterfield Sdn. Bhd. in 2001 instead and began to get involved mainly in specifying pumping systems for water and wastewater treatment plants. A year later, she joined Aquakimia Sdn. Bhd. as Environmental Sales Engineer.

Safe work environment during equipment maintenance

"I was mainly responsible for engineering design and project management. It was very interesting to me because I had wanted to do design for wastewater treatment plants. It was like being a wastewater treatment 'doctor' who goes out to collect, analyse, conduct on-site tests and treat wastewater. I felt satisfied to be able to apply my laboratory skills and then I upskilled to do actual plant designs and proposed these to customers, making sure the entire system, from equipment to treatment to discharge, met the standards requirements of the Department of Environment," she says. Five years into the job, she was promoted to Manager of the company's Environmental Division. She took to designing and building wastewater treatment plants like duck to water.

"It was a very interesting journey – from lab to design, to drafting proposals and then presenting them to customers. Closing deals with customers was even more satisfying, followed by taking charge of the project and getting the project team to start construction. Upon completion, site installations would begin and the role of the engineers came in at the testing and commissioning stage. At this point of my career, I was tackling environment-related issues directly," she says.

Ir. Chow believes it is important for young engineers to get involved in the total flow of engineering and its applications. "Learn the entire process from conducting lab tests to upskilling your testing ability and tackling the actual system – design, build, test on site and then commission the system. It is also important to be aware that details at the design stage may change on the actual site. So, you will need to change, fine tune or upgrade at site. You can't follow exactly what you have initially designed. Engineers must adapt to the actual condition and make adjustments on site. These are my experiences from my younger days," she says.

Foray into Carbon Reduction

Ir. Chow says the commitment to global carbon reduction had already started in 2008. It was in line with the Kyoto Protocol which was adopted as early as 1997 but due to the complexity of issues, it only came into force in 2005, with 192 parties making a commitment to the Protocol. She adds that the Clean Development Mechanism (CDM) also took off during the period. CDM is a carbon offset scheme run by the United Nations which allows countries to fund greenhouse gas emissions-reducing projects in other countries

Monthly maintenance check done by qualified personnel

and claim the saved emissions as part of their own efforts to meet international emissions targets. "It was too expensive, especially for developed countries, to carry out CDM-related projects in their own countries, so they undertook such projects in developing countries like Malaysia and Indonesia," she says. The Kyoto Protocol binds developed countries and places a heavier responsibility on them as they are largely responsible for the current high levels of greenhouse gas (GHG) emissions in the atmosphere.

Ir. Chow says: "CDM projects involved methane capturing to reduce methane emission. Companies which were doing this then sold the saved emissions, giving carbon credit to the developed countries which engaged them. When I first knew about this arrangement, I found such a business module very interesting. That was why I moved from wastewater company to a company that was already doing CDM projects."

Leaving Aquakimia in 2009, Ir. Chow joined Climate Change Group Sdn. Bhd. as the Technical Manager responsible for providing technical advisory services of contaminated land management, solid waste and wastewater management as well as the management of the closure of landfills. Methane gas was extracted and flared from these landfills. The carbon reduction achieved by doing so was sold as carbon credit.

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Ir. Chow Pui Hee

With a Bachelor's Degree (Honours) in Engineering (Chemical) from UPM in 2001, Ir. Chow Pui Hee has more than two decades of experience in the engineering field, renewable energy and the environmental sectors. She is a member of IEM since 2014 and is registered as a Professional Engineer with Practicing Certificate in Chemical Engineering with the Board of Engineers Malaysia since 2016. She is also an Environmental Impact Assessment (Wastewater) Subject Consultant with the Department of Environment Malaysia since 2010 and a Registered Electricity Energy Manager (REEM) with Energy Commission Malaysia since 2016. She holds a Certificate of Competency for Grid-Connected Photovoltaics (PV) Systems Design by Sustainable Energy Development Authority (SEDA) issued in 2014.

"But unfortunately, the global economy was impacted by the global financial crisis and subsequently, in 2010, the demand on developed countries to reduce carbon emissions became non-mandatory. So there was sluggish demand issue for carbon credit and the whole carbon market crashed. By then, my company had already secured 16 landfill projects, including in Johor, Negeri Sembilan, Perlis and Terengganu. Towards the completion of the carbon credit project, we had to close the 16 landfills," she says.

"My boss then said there was a need for an environmental assessment of these landfills, so I took up the challenge by setting up a team to do this. The team did all the environmental work such as collecting wastewater samples and studying methane gas characteristics, inclusive of monthly monitoring. It took us about three years to complete the assessment and concurrently, some of the landfill sites had become dump sites, so the government allocated funds to mitigate environmental risks, preventing wastewater from contaminating the soil, lakes and rivers."

She says some of the sites were in good condition and she was involved in shaping and turfing them. "From a distance, they looked like little hills on a big piece of land. At that time, my director asked me what could be done with the brown landfills so I conducted numerous research studies and tried to discover all possibilities. Eventually a proposal of converting the closed landfills to generate renewable energy was landed. I applied my knowledge of extracting biogas to generate electricity from the land. We packaged it with RE, involving solar panels and biogas," says Ir. Chow, who surmounts challenges with vigour, turning ideas into workable solutions and grabbing opportunities with sharp business acumen.

Solar panel donation

RE The Way Forward

That period saw Ir. Chow going fully into the area of RE, in particular solar energy. She says: "I like continuous learning and exploring new areas of knowledge. I attended courses and learnt to design solar energy systems. I passed the competency test and started to design such systems for the landfills. I proposed to my company to invest in solar energy projects and, in the process, I was also involved in some of the financial modelling for this investment."

Seeing the potential for greater progress in solar energy specialisation, Ir. Chow left Climate Change Group in 2010 and became the Senior Technical Manager at Strec Sdn. Bhd. where she was responsible for providing environmental consulting services.

"The timing to go into solar energy was also good. The government was already looking into it and introduced the Renewable Energy Act in 2011," she says, adding that the Act facilitates the implementation of a special tariff system to catalyse the generation of RE and other related matters. At that time, the government also formed the Sustainable Energy Development Authority (SEDA) Malaysia, which administers and manages the implementation of the tariff mechanism mandated under the RE Act.

The special tariff system lured investors to invest in solar energy systems and so began Ir. Chow's venture into designing, building, marketing and commissioning rooftop solar energy systems. She secured and completed many rooftop solar energy projects which kept her occupied from 2012 to 2014. As she found it easier than wastewater projects, she could even find time then to look into her own professional development.

"It was only at this time that I applied to IEM for the Ir. credential," she says. Having the Ir. tag would identify her as having met the highest engineering professional standards. Subsequently, she joined Teknik Edisi Sdn Bhd as Assistant General Manager, overseeing the implementation of the company's solar PV system projects. Her stint at this company lasted three years, from 2011 to 2014.

Driven by Entrepreneurial Spirit

For her next challenge, she boldly decided she would become her own boss. "I wanted to do things that I liked. So I formed Samaiden Sdn. Bhd.," she says. That was in July 2014 and she headed the company as its General Manager.

"My initial intention was to focus on small scale consultancy in solar energy and environmental-related concerns. But opportunities arose in the first two years and we secured numerous projects, especially in solar energy. That was how the company grew so fast," says Ir. Chow.

She went on to helm the company as its Managing Director in 2018 and since then, spearheaded its growth and expansion, building it from strength to strength – from a contractor of solar PV system to providing end-to-end services for solar PV power plant projects covering front-end consultancy, Engineering, Procurement, Construction & Commissioning (EPCC) and Operation & Maintenance (O&M) services.

She was instrumental in turning Samaiden Sdn. Bhd. into a public-listed company. "In 2019, I made the aggressive move to go for public listing on Bursa Malaysia. We went for it more for the branding and to expand the company as well as to attract talents to join our team. The company was listed in 2020," she says.

That was the birth of Samaiden Group Bhd. and Ir. Chow became its Group Managing Director. Within four years, the group has achieved a landmark position by getting listed on Bursa Malaysia's main market.

From a fledgling company with merely two people, Samaiden now has about 100 employees. It has been a momentous journey since its humble beginnings about a decade ago. Samaiden Group has also won numerous awards, including Asian Photovoltaic Industry Association (APVIA) Awards for Photovoltaic Application – Enterprise 2021, Malaysia Excellence Business Award 2018, Star Outstanding Business Award 2018 – Best Green Initiative and ASEAN Energy Awards 2017.

Ir. Chow herself is an award-winner, testimony to her excellence in her fields of expertise. Among her awards are:

Star Outstanding Business Award 2018

– Female Entrepreneur of the Year

Distinguished Representative of 3rd Women in Renewables of the Year Awards 2020

– Woman in Renewables Asia.

She says moving from being merely an engineer to being an entrepreneur was a big change. "To me, the application of engineering is more important. Equally important is to keep updated on the latest technologies. Technology is constantly evolving and whether we are engineers or entrepreneurs, we must always think of innovative ways to apply technology for certain usage and to generate benefits – financially, commercially and technically. It does not matter how good an engineering design is. If the returns cannot be balanced with the investment, the project is still 'no go'. Every investor will always want to look at the returns."

She says engineers must look at the business perspective, not only from that of the business owners and investors but also from the point of view of bankers. Engineers must also understand the financing scheme and explore how banks can, for example, finance RE projects. Most often, she says, we need to share more RE industry insights with the bankers so that they will be clear about what they are financing and how they can mitigate their risks.

Ir. Chow's capabilities as an engineer and an entrepreneur do not stop at her own company. True to her belief in self-development, she is also enthusiastic about sharing her expertise, knowledge and experience by serving on the industrial advisory panel for chemical engineering in Xiamen University and Universiti Tunku Abdul Rahman (UTAR). She is also a registered Environmental Impact Assessment (Wastewater) Subject Consultant for the Department of Environment and a Registered Electricity Energy Manager (REEM) with the Energy Commission of Malaysia.

A role model and an inspiration for aspiring engineers and entrepreneurs, Ir. Chow has proven that with knowledge, skills, determination and exceptional leadership, engineers can scale greater heights, not only in their profession but also in becoming credible specialists and successful entrepreneurs.

Her own specialisation in RE has seen her making a tremendous impact and huge contributions to Malaysia's RE industry. Her international business expansion via Samaiden to foreign countries, namely Vietnam, Cambodia and Singapore, has also put the spotlight on Malaysia in the pursuit of sustainability and advancement of RE solutions, all of which align with the nation's energy transition roadmap. In addition, she leads numerous international collaborations, extending Malaysia's RE reach globally and helping underdeveloped countries to access RE solutions for future energy sustainability. Directly or indirectly, she has contributed to attracting foreign investments which has also helped spurred the local economy. ■

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Can Natural Rubber Pave the Way for Decarbonisation & Sustainable Construction?

As the world faces escalating climate challenges, decarbonisation has emerged as an important global initiative, aiming for a significant reduction in carbon emissions through a strategic shift from dependency on fossil fuel to renewable resources. Malaysia, in its progress towards environmental sustainability, has leveraged its rich natural resources, showcasing a commitment to both economic growth and ecological balance.

This is where natural rubber can potentially bridge the gap! The global natural rubber market, valued at US$31.68 billion in 2023, is forecasted to expand at a compound annual growth rate (CAGR) of 3.5%, reaching approximately US$43.18 billion by 2032. This growth underscores the increasing recognition of natural rubber as a sustainable material in various industries, from automotive to manufacturing.

Asia-Pacific, with leading producers such as Malaysia, Thailand and Indonesia, dominates this market due to significant export-oriented manufacturing capacities and substantial domestic demand across a range of end-user industries. Thailand, in particular, plays a crucial role, not only as a major producer but also through initiatives aimed at enhancing natural rubber production and sustainability. These efforts include substantial investments in rubber plantations and technology advancements, aimed at improving productivity and market competitiveness.

This backdrop creates a unique opportunity for natural rubber in Malaysia's decarbonisation journey, providing a renewable resource that supports global sustainability goals while driving national economic prosperity. Through strategic cultivation and innovative applications, natural rubber can stand at the forefront of Malaysia's contribution – if not all of the rubber producing nations – to a greener planet, embodying the nexus of economic resilience and environmental stewardship.

Natural Rubber vs. Synthetic Rubber from a Sustainability Perspective

The sustainability of natural rubber compared to synthetic rubber can be assessed from multiple perspectives, namely environmental, economic and overall sustainability.

Natural rubber, extracted from *Hevea brasiliensis* trees, has a significantly lower embodied carbon footprint compared to its synthetic counterpart. As per the image provided below, natural rubber hypothetically has an embodied carbon value of 0 kg CO_2e, if not accounting for the transportation life-cycle. This can potentially be a net negative value when we consider its ability to sequester carbon during its growth phase. In contrast, synthetic rubber, derived from petrochemicals, carries a much heavier carbon disadvantage. For example, to produce 1 kg of synthetic rubber (butadiene), 6 kg of oil are required, resulting in an embodied carbon value of 432.77 kg CO_2e per kg of oil and leading to a total of 2,921 kg CO_2e. The production process of synthetic rubber is inherently energy-intensive, relying on finite fossil fuel resources, which contributes to greenhouse gas emissions and global warming.

Economically, the natural rubber industry supports the livelihoods of millions of smallholder farmers, especially in Asia, contributing significantly to the economies of countries like Malaysia, Thailand and Indonesia. The labour-intensive nature of natural rubber production ensures employment and supports local economies. Conversely, synthetic rubber production is more mechanised and relies heavily on the volatile pricing of oil, leading to fluctuating costs that can impact both manufacturers and consumers.

Natural rubber, as a renewable resource, presents a compelling case for sustainability, especially in the context of engineering and construction. Mature rubber trees are capable of sequestering approximately 81 MT of CO_2 per hectare annually, with a total of 1,296 MT of CO_2 sequestered over a 24-year lifespan, making them an effective tool for carbon sequestration. This ability to absorb carbon from the atmosphere and store it within the biomass of the tree throughout its productive lifecycle is a notable contribution to climate change mitigation efforts.

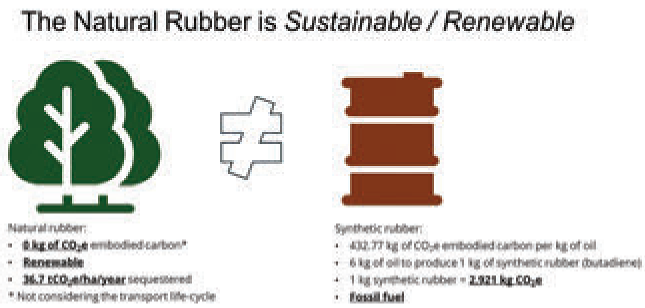

Figure 1: Natural rubber vs synthetic rubber

In the context of sustainable construction, the use of rubberwood harvested after the latex-producing phase offers a low-carbon alternative to conventional building materials. Projects like the timber skyscrapers in Canada demonstrate the innovative use of wood, including rubberwood, to lower embodied carbon in construction materials. These structures, leveraging the strength and carbon-storing capacity of wood, exemplify a shift towards more sustainable building practices, with rubberwood playing a vital role.

Integrating rubber trees into the built environment aligns with the growing trend of green architecture, where the emphasis is placed on minimising environmental impact. By utilising rubberwood, engineers and architects can significantly reduce the embodied carbon of their projects, contributing to a more sustainable future. This practice not only aligns with global sustainability targets but also opens new economic avenues for rubber-producing countries by adding value to the "end-of-life" phase of old rubber trees.

Synthetic rubber, while indispensable in certain applications, poses greater environmental challenges and is less favourable from a sustainability perspective.

Social Impact & SDG Alignment for Rubber Smallholders

The cultivation of natural rubber has substantial socioeconomic benefits for smallholders, particularly in developing countries where it is often a key agricultural export. These small-scale farmers are the backbone of the natural rubber industry, making significant contributions to their local and national economies. Natural rubber cultivation also offers employment opportunities in rural areas where alternative jobs may be scarce. This sector also contributes to the development of rural communities by fostering related services and industries, from transportation to processing.

Aligning with the United Nations' Sustainable Development Goals (SDGs), natural rubber cultivation addresses several key targets. Most notably, it supports Goal 1 (No Poverty) by providing a source of income, Goal 8 (Decent Work & Economic Growth) through job creation and Goal 12 (Responsible Consumption & Production) by promoting a sustainable resource. Additionally, rubber plantations can contribute to Goal 13 (Climate Action) by acting as carbon sinks and Goal 15 (Life on Land) by maintaining ecological balance when managed sustainably.

Rubber smallholders play a critical role in achieving these goals. However, they face challenges like prolonged low rubber prices, ageing farmers, market volatility, lack of access to finance and the need for sustainable farming practices. Addressing these challenges through supportive policies, fair trade practices as well as investments in sustainable technologies and education can enhance their livelihoods and contribution to the SDGs. Thus, the cultivation of natural rubber by smallholders is a key factor in the pursuit of a more sustainable and equitable future.

Role of Natural Rubber in Malaysian Economy

Natural rubber plays an integral role in the Malaysian economy, serving as one of its main agricultural produces. It contributes to the country's economic development, contributing to its export revenues. As a commodity, it has traditionally (and dare I say, romantically) been one of the pillars of the Malaysian agricultural sector, alongside palm oil and timber.

The Malaysian natural rubber industry, while historically a significant employer and economic contributor, faces contemporary challenges that must be acknowledged. Ageing smallholder farmers and a disinterest among the youth in pursuing agricultural livelihoods present a demographic challenge. Prolonged periods of low rubber prices have worsened poverty among these smallholders, emphasising the need for economic and social interventions.

Recognising these challenges, the industry's potential to support the Malaysian workforce, particularly in rural economies, remains substantial. With strategic investments and policy support focused on enhancing the profitability and appeal of natural rubber cultivation, there is potential to reinvigorate this sector. It can be transformed into a vibrant, sustainable industry that attracts the younger generation and provides a stable income for families, bolstering local economies.

Initiatives can include modernising cultivation practices, diversifying income through intercropping, providing better access to markets and

developing value-added rubber products to increase profitability. Moreover, aligning the industry with sustainable practices can enhance the global competitiveness of Malaysian rubber, opening new opportunities for growth and employment.

By addressing the current socioeconomic challenges head-on, the natural rubber industry in Malaysia has the potential to once again become a thriving sector that contributes to rural development and national economic growth. The Malaysian government should recognise the strategic importance of natural rubber and continue to support the industry through research and development, aiming to improve yield and quality and through initiatives to bolster the market and expand international trade. By enhancing productivity and sustainability, Malaysia can again secure and grow its position in the global natural rubber market, ensuring that this sector continues to be a significant contributor to the national economy.

Natural Rubber in Engineering & Chemical Engineering

The versatility and unique properties of natural rubber have cemented its role as a pivotal material in engineering and chemical engineering sectors. Its applications span a broad spectrum, from simple household goods to complex engineering components. The inherent qualities of natural rubber — such as flexibility, tensile strength, resilience and fatigue resistance — make it an indispensable material in the manufacture of a wide array of products, including tyres, gaskets, hoses and belts.

In the realm of sustainable engineering practices, natural rubber offers significant advantages. Its biodegradability and renewable source contrast sharply with synthetic polymers derived from petrochemicals, aligning with the current push towards environmentally-friendly materials. The use of natural rubber contributes to a reduced environmental footprint, particularly in terms of carbon emissions and end-of-life disposal.

Innovations in rubber technology have further expanded its applications in engineering. Chemical modifications and compounding with other materials have led to the development of specialised rubber composites with enhanced properties like improved heat resistance, reduced permeability and increased durability. These advancements have opened new doors for natural rubber in engineering, including in vibration isolation systems, seismic bearings for earthquake-resistant structures and even in aerospace engineering for components that require shock absorption and flexibility.

The drive for sustainable development has placed natural rubber in the spotlight within engineering circles, with its applications expanding in tandem with the evolution of green technology. As the world leans more towards sustainability, the role of natural rubber in engineering is expected to grow, further integrating this natural material into the fabric of modern technological advancements.

Final Thoughts

Natural rubber stands as a testament to the potential of sustainable materials in our ongoing quest for decarbonisation. Its cultivation and processing tout a lower carbon footprint compared to synthetic alternatives, playing a crucial role in global efforts to mitigate climate change. In Malaysia, the significance of natural rubber goes beyond environmental benefits, bolstering the economy through substantial export revenue and providing employment across its extensive value chain.

The applications of natural rubber in engineering emphasise its adaptability and the innovation it invites. As engineers continue to refine rubber technologies, natural rubber is becoming increasingly integral in sustainable construction practices, offering a renewable resource for green building materials.

The journey towards a more sustainable future is complex and multi-dimensional and natural rubber is a key player in this transition. To harness its full potential, continued research and collaboration across scientific disciplines, industries and borders are imperative.

As we move forward, the natural rubber industry must adapt and evolve to meet the demands of both the market and the environment, ensuring that this versatile material continues to stretch the boundaries of sustainability. ■

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NOTICE OF IEM (SOUTHERN BRANCH) OFFICE BEARERS 2024/2025

The Institution of Engineers, Malaysia (IEM) Southern Branch had its 51st Annual General Meeting on 9 March 2024 and we are pleased to introduce the new IEM Southern Branch Office Bearers for session 2024/2025:

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Young Engineers Section Representative	Dr Yip Bao Fang

NOTICE OF IEM (PERAK BRANCH) OFFICE BEARERS 2024/2025

The Institution of Engineers, Malaysia (IEM) Perak Branch had its 40th Annual General Meeting on 9 March 2024 and we are pleased to introduce the new IEM Perak Branch Office Bearers for session 2024/2025:

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Unveiling the Connection Between Plastics & Sustainability

Plastics and packaging play a crucial role in our daily purchases. While these are often associated with adverse environmental effects, effective management can mitigate the impacts. Embracing sustainability principles allows for the transformation of plastic and packaging practices through innovative design solutions. The journey towards sustainable packaging innovation typically involves four primary initiatives, as illustrated in Figure 1:

Figure 1: Sustainability initiatives and approaches of plastics and packaging

1. Application initiative: Typically, innovators focus on minimising waste or repurposing waste materials for other industries within the application approach. For example, packaging is engineered to serve dual purposes, such as PET beverage bottles being recycled to produce polyester fibre for textiles used as curtains. Once these textiles reach the end of their lifespan, they are repurposed into rugs before ultimately being sent for energy recovery through incineration. The key objective of product fabricators at each stage is to create items that can continue to be utilised as inputs for new products, thus contributing to a circular economy. This process includes energy recovery from the incineration process, which is utilised by households for activities such as lighting. The concept of a circular economy is to maximise benefits by ensuring that each stage of the process generates value while minimising environmental impacts. Designers play a crucial role in ensuring that products introduced to the market facilitate this circular movement, ultimately reducing environmental impacts.
2. Institutional initiative: This approach focuses on how legislation, laws, regulations and policies influence the decision-making of packaging producers and product manufacturers when launching products into the consumer market. For instance, countries within the European Union have implemented bans and levies on unsustainable packaging. To comply with these legislative requirements and access respective markets, producers are compelled to enhance their plastic packaging. While laws and regulations can have immediate effects on industrial operations, the long-term outcomes depend on the effectiveness of their implementation.
3. Stakeholders' initiative: Stakeholders encompass parties with interests that influence producers' decision-making processes, including investors, bankers, customers, suppliers, material suppliers, brand owners and recyclers. For example, investors and bankers, as providers of capital, may prioritise financing sustainable packaging initiatives. Additionally, brand owners may seek to enhance their product images through sustainable packaging designs to meet consumers' long-term expectations. These stakeholder initiatives indirectly pressure producers to transition towards environmentally friendly products.
4. Technological modernisation initiative: Technology advancements offer opportunities for industries to improve competitiveness, reduce costs, and conserve resources. Successful technological modernisation for sustainability hinges on government support and the necessity for industrial players to mitigate competitor risks and expand within local and global markets. For example, plastic industry players may opt for environmentally-friendly biopolymers as packaging materials or source packaging materials locally to minimise carbon footprint from long-distance transportation. Moreover, innovations such as honeycomb or polyethylene air cushioning can reduce material usage and requirements during transportation (Figure 2). While innovative solutions are often readily available in the market, industry players must proactively select options which benefit their business while promoting environmental sustainability.

Several common practices address sustainable plastic usage including recycling, return & reuse, selection of eco-friendly designs, selection of eco-friendly materials and selection of eco-friendly systems. Recycling, return & reuse practices are widely recognised but the success rate depends on individual willingness to participate. It's crucial for communities to adopt these practices as norms, not only for plastics but also for other materials. Introducing recycling, return & reuse concepts at preschool age is essential. An exemplary model is Japan, where effective education on plastic recycling has resulted in remarkably clean rivers and drainage systems.

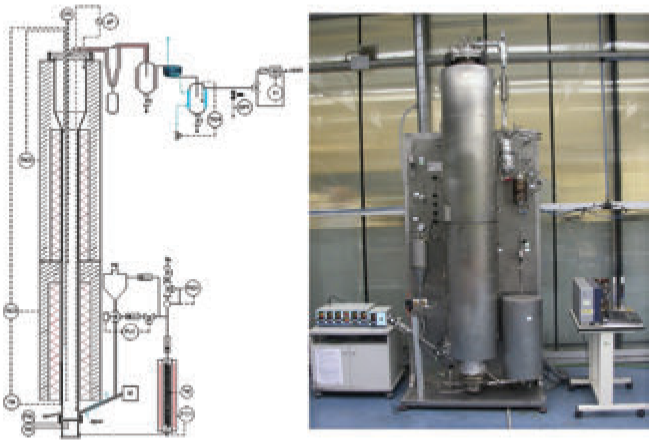

Figure 2: Process instrumentation diagram and actual picture of pyrolysis pilot plant. Adapted from Lee & Bee (2023) with permission of Elsevier

Conversely, selecting eco-friendly designs, materials and systems presents more complex challenges to achieving plastic packaging sustainability. These practices require higher levels of innovation by industrial players. Brand owners and consumers with heightened awareness can advocate for products with sustainability features. Consumers can reject products with excessive packaging and opt for thinner thermoforming products over injection moulding plastics for single-use items such as drink cups and utensils. Thermoforming containers typically have lighter weights compared to injection moulding containers. Biodegradable plastics with renewable attributes can substitute fossil-based plastics. Additionally, manufacturers and brand owners can incorporate recycled plastics into their products, such as using recycled HDPE bottles for engine oil packaging. These efforts and initiatives by consumers and manufacturers are crucial to achieving sustainability in plastic materials.

Method of Recycling, Opportunities & Challenges

There are two general types of plastic recycling methods: Physical recycling (also known as melt recycling) and chemical recycling. Of the two, physical recycling remains the most straightforward as it involves segregating plastics based on their types (see Table 1). In contrast, chemical recycling is more complex and requires advanced technology to convert waste plastics into monomers or pyrolysis oils before further processing into valuable substances. Plastic waste recycling is often referred to as valorisation of waste to wealth, aimed at reducing environmental pollution. Table 2 compares the advantages and disadvantages of physical and chemical recycling of plastics.

Table 1: Resin Identification Code for recyclable type of plastics

Code	Plastic Type
1	Polyethylene terephthalate
2	High density polyethylene
3	Polyvinyl chloride
4	Low density polyethylene
5	Polypropylene
6	Polystyrene
7	Others

General Operation Principle of Physical Recycling

Physical recycling, also known as the melt recycling method, is outlined in Table 2 as the straightforward approach to plastic recycling. The initial step involves segregating plastic waste based on the Resin Identification Code. Following this, the collected items must undergo cleaning, a process that presents significant challenges when sourced from municipal waste. The items are often contaminated with leftover food, liquids, soils and potentially hazardous unidentified chemical compounds. Both plastic collectors and processors must exercise discernment to reject heavily contaminated plastic waste from unidentified sources to prevent contamination of recycled products. Moreover, cleaning the collected plastic items necessitates substantial water usage, with wastewater requiring proper treatment before it is discharged into rivers. However, the cleaning process may be circumvented when plastics originate from reputable sources. For example, defective HDPE bottles produced by a beverage bottle manufacturer can be repurposed by another manufacturer into engine oil bottles; as they were rejected during quality sorting, they would not contain any beverage residue.

Once cleaned, the plastics undergo crushing or shredding to transform them into pellet-sized particles for compounding and moulding processes. Recycled plastics, typically coloured, would be more suitable for producing dark or black-coloured products, unless they were originally colourless. However, compared to virgin plastics, recycled or reprocessed plastics often exhibit visible yellowing, indicating degradation, which can affect the colour consistency of end products when mixed with virgin plastics during moulding. Recycled plastics are commonly blended with virgin plastics due to the fluctuating quality of recycled materials depending on the source. This blending stabilises the processability of recycled plastics, addressing issues such as a higher melt flow index (MFI) resulting from the degradation of macromolecules. By adding recycled plastics to virgin plastics, the melt viscosity can be maintained at an acceptable level without requiring adjustments to processing parameters. Recycled plastics are typically integrated into existing plastic processing facilities, including blow moulding, injection moulding and extrusion processes. Additionally, some plastic processors produce recycled plastic compounds to reduce processing costs for manufacturers without compounding facilities in their factories. These recycled plastics offer guaranteed quality and can be customised to meet manufacturers' requirements. Physical recycling, with its straightforward procedures, is widely adopted in industries involved in valorising plastic waste.

Table 2: Comparison of physical and chemical recycling of plastics

Recycling Method	Advantages	Disadvantages
Physical	• Well established technology with acceptable cost of capital (starting cost can be as low as US$100,000 with a single screw extruder). • The process can be easily adopted in any existing plastic manufacturing factory to recycle self-produced reject products. • Ability to handle small quantities of wastes, i.e. less than 200kg/day. • Moderate knowledge is needed through practitioners' experience in plastic materials. • Acceptable quality of recycled plastics depends on the quality of segregated plastics.	• Limited to recycling only well-known types of plastics. Unable to recycle plastics with different composition of additives. • Preferable to recycle virgin source of plastics. • Plastic segregation is required, according to type of plastics. Poor quality of segregation can cause low quality of recycled plastics produced. • Operators may not be aware about appropriate operations of factories which can lead to soil, sound, air and water pollutions resulting from the segregation and residue handling stages. • The selling prices of recycled plastics are low and usually, recycled plastics can only be used to blend with similar type of plastics with compromised quality. • Usually, commodity plastics can be recycled up to 3 times.
Chemical	• Most of the plastics can undergo the pyrolysis process and break down at high temperatures into monomer or pyrolysis oil. • Acceptable quality of pyrolysis oil depends on the quality of segregated plastics. • Pyrolysis products, i.e. low molecular weight chemicals can be used for wider industries to produce new/virgin materials. • Better operations unlikely to cause substantial pollution.	• Requires high technical knowledge to manage the pyrolysis process. • Very complicated and costly set-up process with estimated capital cost of over US$1 million. • Consistency of raw material quality is required. • Process/technology is set up for limited types of input. • More attention to the emission handling process is required to prevent air pollution.

General Operation Principles of Chemical Recycling

Chemical recycling of plastics, also known as pyrolysis, involves heating waste plastics at high temperatures in an inert environment. This process transforms the plastics into pyrolysis oil, which can be recovered for energy through combustion or separated into valuable chemicals.

The pyrolysis of plastics is influenced by several key factors: Reactor type, type of fluidising gas and its rate, residence time and feedstock, temperature, pressure and catalyst. Lee & Bee (2023) have summarised the typical outputs of pyrolysis corresponding to different plastic types in Table 3 as well as compared the properties of pyrolysis oil with conventional fuel in Table 4.

Table 3: Plastic pyrolysis product yield corresponding to process parameter. Adapted from Lee & Bee (2023)

Polymer	Thermal Decomposition Mode	Reactor Type	Pyrolysis Process Parameters				Product Yield		
			Temp. (°C)	Heating Rate (°C/min)	Pressure	Duration (min)	Gas (wt%)	Liquid (wt%)	Solid (wt%)
PET		Fixed bed	500	10	--	--	76.9	23.1	0
		--	500	6	1 atm	--	52.13	38.89	8.98
HDPE	Random chain scissioning resulting in monomers and oligomers)	Horizontal steel	350	20	--	30	17.24	80.88	1.88
		Batch	450	--	--	60	5.8	74.5	19.7
		Semi-batch	400	7	1 atm	--	16	82	2
			450	25	1 atm	--	4.1	91.2	4.7
		Fluidised bed	500	--	--	60	10	85	5
			650	--	--	20–25	31.5	68.5	0
LDPE		Batch	430	3	--	--	8.2	75.6	7.5
			500	6	1 atm	--	19.43	80.41	0.16
			550	5	--	--	14.6	93.1	0
		Pressurised batch	425	10	0.8-4.3 MPa	60	10	89.5	0.5
		Fixed bed	500	10	--	20	5	95	0
		Fluidised bed	600	--	1 atm	--	24.2	51	0

Polymer	Thermal Decomposition Mode	Reactor Type	Pyrolysis Process Parameters				Product Yield		
			Temp. (°C)	Heating Rate (°C/min)	Pressure	Duration (min)	Gas (wt%)	Liquid (wt%)	Solid (wt%)
PVC	Chain-stripping (side chain reactions of substituents eliminating reactive substitutes (HCl), dehydrogenation and cyclisation)	Vacuum batch	520	10	2 kPa	--	0.34	12.79	28.13
		Fixed bed	500	10	--	--	87.7	12.3	0
PP	Random chain fragmentation	Horizontal steel	300	20	--	30	28.84	69.82	1.34
		Batch	380	3	1 atm	--	6.6	80.1	13.3
			740	--	--	--	49.6	48.8	1.6
		Semi-batch	400	7	1 atm	--	13	85	2
			450	25	1 atm	--	4.1	92.3	3.6
			500	6	1 atm	--	17.76	82.12	0.12
PS	Combination of chain rupture and unzipping, formation of oligomers	Batch	500	--	--	150	3.27	96.73	0
			581	--	--	--	9.9	89.5	0.6
		Semi-batch	400	7	1 atm	--	6	90	4
		Pressurised batch	425	10	0.31–1.6 MPa	60	2.50		

Table 4: General properties of pyrolysis oil derived from plastics and comparison with conventional fuel. Adapted from Lee & Bee (2023)

Source	High Heating Value (MJ/kg)	Density (g/cm³)	Viscosity (mm²/s)
PET	28.2	0.90	-
HDPE	45.86	0.79	2.1
LDPE	38 - 39	0.78	1.89
PVC	43.22	0.84	6.36
PP	40.8	0.86	4.09
PS	43.0	0.85	1.4
Diesel	46.67	0.81 - 0.87	2.0 - 5.0
Kerosene	43.0 - 46.2	0.81 - 0.87	-
Gasoline	43.4 - 46.5	0.71 - 0.77	1.17

To extract valuable chemicals from the pyrolysis oil, a refined separation process is necessary. Figure 2 depicts a typical pyrolysis pilot plant. Despite the maturity of pyrolysis technology, numerous obstacles still impede the chemical recycling of plastics through the pyrolysis process to achieve desirable product yields and quality results from collected solid plastic waste. Particularly challenging is the diverse array of additives present in plastics, such as mineral fillers (e.g., calcium carbonate), flame retardants, plasticisers, weathering stabilisers, colorants and lubricants, which necessitate different pyrolysis parameters. Furthermore, the presence of additives can potentially deactivate catalysts in catalytic pyrolysis processes. Consequently, proper segregation of solid plastic waste feedstock is essential to optimise process conditions while minimising the production of undesirable products, particularly toxic emissions that pose risks to operators and environment. The neutralisation and treatment of carcinogenic compounds generated during the pyrolysis process incur significant costs.

In summary, achieving plastic sustainability necessitates comprehensive efforts involving users, manufacturers, technological advancements and educators. This article aims to raise awareness among IEM readers regarding the type of approaches to be adopted to reduce environmental impacts of plastics. The authors have also provided an in-depth discussion on this topic in their latest published books, launched in conferences organised by IEM and available in the IEM Library. Ultimately, the authors urge all IEM members to take the initiative starting today to protect our environment from the detrimental effects of irresponsible plastic disposal and waste management. ■

REFERENCES

[1] Lee Tin Sin and Bee Soo Tueen (2023). Plastic & Sustainability (ISBN 978-128244890) published by Elsevier, launched at 19th Asian Pacific Confederation of Chemical Engineering 2022 (APCChE 2022). Available in IEM Library from April 2024.

[2] Lee Tin Sin and Bee Soo Tueen (2024) Microplastics Pollution & Worldwide Policies on Plastic Use (ISBN 978-1032482026) published by CRC Press, to be launched at Process System Engineering Conference 2024. Available in IEM Library from August 2024.

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Unmanned Aerial System (UAS) in Overhead Lines Distribution Network

The Unmanned Aerial System (UAS or commonly known as drone) has emerged as an invaluable tool in various industries and utility sectors, including TNB Distribution Network (DN) where it has been used widely for aerial inspections, detection and monitoring[1]. Apart from that, UAS has also been used for measurements, data collections, image and video recordings as well as activity surveillance[2].

With recent developments, the applications of UAS have been linked to the enhancement of medium voltage overhead line (MV OHL) systems maintenance regime in TNB DN. Its use for vertical asset visual inspection, rectifying inspection and condition-based maintenance[3] is the new paradigm as a Smart Utility Infrastructure.

UAS Overview in TNB DN

Patrolling and visual inspection using binoculars have been the conventional techniques for visual inspections for MV OHL. However, there is always the probability that a defect spot may be missed by single point of view compared to using the UAS with its 360° view angle of visual inspection. One of the most important maintenance regimes in MV OHL is Condition Based Maintenance (CBM) using infrared thermography (IRT) and ultrasound. With conventional IRT techniques, a handheld infrared thermal imaging camera is used to detect a hotspot. But UAS technology enables combining visual inspection using binoculars with a handheld thermal imaging camera in one device.

Moreover, with UAS maturity, improved performance of MV OHL systems with failure rate reduction through more effective visual inspection and CBM maintenance has been proven[4]. Visual data, CBM data and criticality matrix with traffic light coding are integrated into a centralised web-based application to help asset managers decide on the best maintenance regime for MV OHL improved performance.

On 5 April 2017, TNB Distribution Network started a pilot project for the concept adoption of new technology using UAS for visual inspection and infrared thermography CBM. In March 2018, it approved the full adoption of UAS in the maintenance regime of MV Bare OH Line and MV ABC.

Based on TNB DN's 7 years of experience, there are 3 major benefits to the use of UAS compared to conventional techniques visual inspection. Primarily, UAS improves operational efficiency by enabling 360° visual inspection, with low probability of missing defective spots due to capability of UAS hovering with 360° view.

Furthermore, the use of UAS results in improved productivity in visual inspection and IRT scanning, especially where it is necessary to pass through challenging terrain or inaccessible paths of the MV OHL such as hilly regions, river crossings and remote areas.

In addition, UAS providing improved reporting and data processing by using advanced analytics and artificial intelligence (AI) for image and IRT processing, contributes to customer experience enhancement. All analytics are transferred to web-based reporting platform such as pole coordinate, pole numbering, asset criticality matrix with traffic light coding and defect picture.

Figure 1: The application of UAS in the regime maintenance of overhead lines in TNB Distribution Network

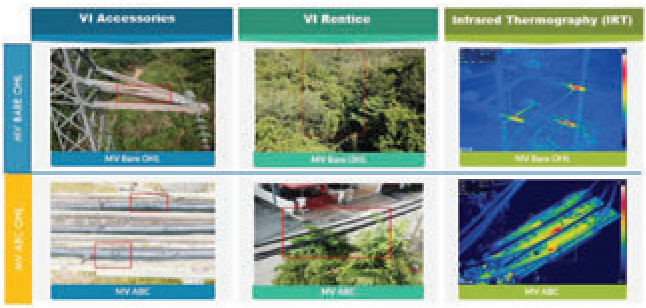

Figure 2: Capability and effectiveness of UAS

Figure 3: Data Management Platform Vertikaliti for UAS

Figure 4: UAS applications

With the advancement of UAS technology, TNB DN is focusing on the most exciting technology that can be implemented in UAS, which is Advance Analytic by utilising Artificial Intelligence (AI) for image processing. AI technology helps process the image and pinpoints the defect to help the pilot of the UAS identify defects such as breaks in the structure of a wooden crossarm. In addition, AI technology can assist in processing analytic analyses of hot spots during each phase of these MV ABC Joint.

Finally, digitalisation in UAS will enable the development of a Smart Utility Programme for TNB DN by monitoring MV OHL vertical asset data using a web-based application that's aptly named Vertikaliti, online anytime.

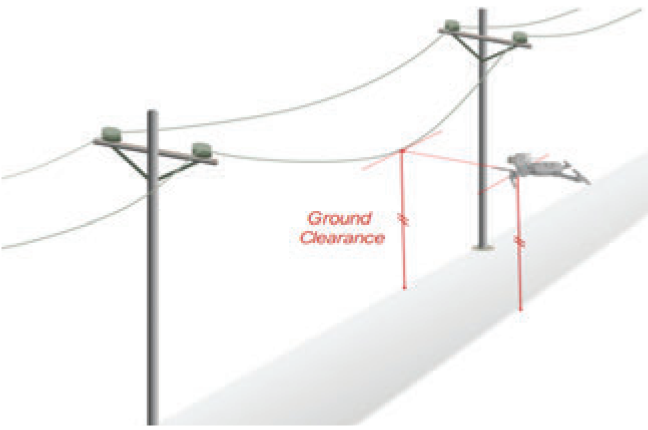

Figure 5: Ground clearance measurement by using UAS

Future of UAS Technology

With the variety of capabilities, UAS technology can be used in many ways for overhead line maintenance within the TNB DN, such as ground clearance measurement by using technology single point LIDAR, data collection overhead line equipment, visual inspection when tripping occurs in MV bare overhead line, inspection after vegetation management works or a new project, live monitoring of assets during disasters and animal colony detection[5].

By using UAS Single Point LIDAR technology, various geographical problems which cannot be mitigated by traditional height measurements at the site can be resolved and safety concerns involving the TNB employees or contractors who take ground clearance measurements in high-risk areas, can be eliminated.

To conclude, UAS technology has changed the way we work, particularly for TNB Distribution Network. ■

REFERENCES

[1] Michael Gerke, 2014, Visual inspection of power lines by UAS, IEEE, DOI: 10.1109/ICEPE.2014.6970074

[2] Kamran Bodl, Design and Implementation of a UAV for Power System utility Inspection, 2015

[3] A. S. Tehrani, A. M. R. Eslami, M. R. Shahbazi, Early applications of unmanned aerial vehicles for overhead power line inspection, 2011

[4] J. A. Martinez, L. E. Fisher, R. B. Melton, An Early Survey of Best Practices for the Use of Small Unmanned Aerial Systems by the Electric Utility Industry, 2016

[5] Faris Ariffin, Fazli Nozlan, 2021, Towards Distribution Network Enhanced Maintenance Regime for Medium Voltage Overhead Line with the Deployment of Extended Applications of Unmanned Aerial System in TNB, CIRED 2021, Paper 1114.

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Shirley Tham **(+6) 016 283 3013**

First Aid for the Practising Engineer: EPAC, The Engineering Practice Advisory Committee of IEM

In response to the many requests from IEM members and branches in 2020, the then President, Ir. Ong Ching Loon, had mooted the formation of an Advisory Committee on legal matters. The task was delegated to the Standing Committee on Professional Practice.

It was felt that the Advisory Panel should not be for legal matters only but that it should, more appropriately, also cover the whole gamut of engineering practice matters including preliminary or general advice on legal matters relating to engineering practice. For specialised advice on legal matters, members would need to consult their own lawyers.

After much discussion within the Standing Committee on Professional Practice, EPAC (Engineering Practice Advisory Committee) was launched in 2021 with the following scope:

1. To advise IEM members on practice-related matters, with opinions, procedures and practices of a general nature
2. To discuss other matters with members if necessary
3. To publish FAQs which will guide members on practice matters.

The current members of EPAC are as follows:

Ir. Lee Weng Onn	Chairman	Standing Committee on Professional Practice
Ir. Yam Teong Sian	Main Representative	Standing Committee on Admission and Practical Training
Ir. Hj. Mohd Radzi Salleh	Alternate Representative	Standing Committee on Admission and Practical Training
Ir. Yap Soon Hoe	Alternate Representative	Standing Committee on Admission and Practical Training
Ir. Gunasagaran Kristnan	Main Representative	Standing Committee on Examination & Qualification
Ir. Wong Chee Fui	Alternate Representative	Standing Committee on Examination & Qualification
Ir. Jeffrey Lee Sheu Tiong	Main Representative	Sub-Committee on Engineering Contracts
Ir. Chong Chew Fan	Alternate Representative	Sub-Committee on Engineering Contracts
Ir. Zafrul Mahmood	Main Representative	Sub-Committee on Dispute Avoidance and Resolution Practices
Ir. Sreedaran A/L Raman	Main Representative	Scale of Fee IEM Representative to BEM
YBhg. Dato' Paduka Ir. (Dr) Hj. Keizrul Abdullah	Main Representative	Disciplinary committee of BEM
Ir. Yim Hon Wa	Main Representative	Expert in CCC

As the name implies, EPAC does not expect to resolve disputes but instead, will give direction and advice. The information provided to EPAC is normally from one party alone and that is usually insufficient to resolve a dispute. EPAC listens, tries to understand the problem, points out matters and tries to provide the next step.

To widen the learning experience to benefit more members, EPAC will maintain the FAQ in the IEM website as well as publish case studies periodically. Please submit your enquiries to *advisorypanel@iem.org.my* or call IEM at 03-7890 0140. ■

Case File

IEM received a query from a member, Ir. A, who was appointed engineering consultant for a project. The project had been completed almost 3 years prior, culminating in the issuance of the CCC. About 30 months after the issuance of the CCC and after the expiry of the defect liability period, the client asked Ir. A to print and endorse for submission, certain plans which were required by ST and which were apparently missing.

The client still owed a substantial portion of the consultancy fees to Ir. A who had already requested resolution by arbitration a few months prior. Can Ir. A refuse the client's request?

The response from EPAC was as follows:

1. At first glance, the proposed course of action is tantamount to a case of withdrawal of service. In contemplating this course of action, you need to consider your contractual obligations as well as public interests and/or professional responsibilities, among other things. As far as contractual obligations are concerned, you need to, firstly, scrutinise your contract of engagement to determine whether it is still in force, especially in view of the dates provided. If it is, you need to determine whether there are express or implied provisions for such withholding of service due to non-payment. Failure to fulfill your contractual obligations will render you susceptible to legal action. As a professional, you also need to ensure that your actions do not compromise public interests and safety as well as your professional responsibilities.
2. You will also need to determine whether endorsement of the MSB room single line diagram is part of your scope of work in your contract of service and whether your claims made for fees include that. The withholding of services, the inability to carry out contractual service(s) as a consequence of the client's non-payment of fees and the making up for work missed out, but for which a claim for fees had been made, are all different matters and should be considered differently. A consultant needs to determine which case applies when he contemplates doing or not doing something.
3. Please consult your lawyer if you are still in doubt or are in need of further legal assistance. ■

Chemical Engineering: Catalyst in Malaysia's Sustainable Energy Revolution

Chemical Engineering Technical Division

Malaysia is moving towards sustainable energy, addressing environmental sustainability and climate change as underscored by COP 28 resolutions to catalyse transformative climate actions and elevate ambitions. Chemical engineering plays a crucial role too, not just as a field of academic study but also as a practical bridge to implementing the resolutions aimed at fostering a more resilient and greener energy landscape. This is particularly relevant as nations are reminded of the need for substantial support from developed countries to provide the means of implementation, such as climate finance, technology development and transfer as well as capacity-building, which are vital for developing countries to adapt and enhance resilience against climate change impacts.

Chemical engineers are at the forefront of dynamic research projects, engaging in collaborative partnerships with the industry and contributing to the development of a skilled workforce proficient in tackling contemporary energy challenges, developing new materials and energy-efficient processes as well as renewable energy technologies.

Institutions of higher education in Malaysia have risen as central pillars of innovation, especially in chemical engineering. This ensures the nation remains at the cutting edge of the global shift towards more sustainable energy solutions, aligning with its commitment to fostering a resilient and greener energy framework.

Our geographical location endows us with an abundance of renewable energy resources, presenting a unique opportunity for chemical engineers to apply their expertise in harnessing these natural assets. The strategic utilisation of sunlight, wind, hydropower and biomass waste not only diversifies Malaysia's energy portfolio but also enhances national energy security and minimises harmful carbon footprint. Chemical engineering offers a role in optimising these resources, through the development of efficient conversion technologies and sustainable processes which reduce reliance on imported fossil fuels.

Despite the optimism, Malaysia faces challenges such as infrastructural limitations, financial constraints and a general lack of public awareness about the benefits of renewable energy. Chemical engineering can contribute towards addressing these challenges through the innovation of smart grid technologies, advancements in energy storage and the development of community-based initiatives which enhance public engagement and the understanding of sustainable energy benefits.

The transition to sustainable energy, contributed by chemical engineering, carries significant implications for environmental conservation, economic growth and social well-being. The sector is a fertile ground for job creation, driving economic development and attracting international investments. Moreover, it promises to enhance public health through reduced air pollution, to improve energy accessibility in rural and remote areas and to cultivate a communal sense of ownership and responsibility towards energy resources.

Looking ahead, the integration of artificial intelligence, the Internet of Things (IoT) and big data analytics into energy management systems, aided by chemical engineering innovations, is set to revolutionise energy production, distribution and consumption. These advancements promise to elevate the efficiency and reliability of renewable energy sources and to open new horizons for optimising energy use and reducing costs.

In conclusion, chemical engineering can effectively contribute to Malaysia's sustainable energy future, possibly embodying the nation's determination to confront climate change and environmental degradation head-on. The country can be navigating a significant path towards achieving its sustainability ambitions. As we continue to innovate and possibly serve as a role model, our journey may offer invaluable insights and inspiration for other nations embarking on their sustainable energy transitions, emphasising the transformative potential of chemical engineering in this global endeavour. ■

Prepared by:

Fauzi Zanil

11th IEM Chemical Engineering Design Competition: Urea Synthesis with Green Ammonia Technology

Chemical Engineering Technical Division

The 11th IEM Chemical Engineering Design Competition showcased groundbreaking solutions to the challenges of urea synthesis using Green Ammonia Technology. The competition, which was spread over a total of 7 months, brought together some of the brightest minds to compete in and to collaborate on sustainable engineering designs. The competition finale was held on 13 September 2023. Participating teams had to design a plant capable of producing 50 metric tonnes per day (mtpd) of commercial-grade urea, with a minimum purity of 99.5% (by mass), stored in both crystalline and granular variants.

Central to the theme was the requirement for the ammonia production process to be 100% renewable and carbon-free, aligning with global efforts to reduce greenhouse gas emissions and to combat climate change. The competition attracted teams of students from renowned public and private universities, including such as Universiti Malaysia Pahang Al-Sultan Abdullah, Universiti Kebangsaan Malaysia and SEGI University.

Finalist teams group photo

The competition unfolded in two stages. In the first stage, participating teams submitted progress reports showcasing their sustainability concepts, process flow diagrams and mass and energy balances (MHB). This initial phase laid the groundwork for the innovative solutions that were to come.

After that, the teams were invited to participate in a full-day virtual training with 3 training sessions led by reputable and experienced industrial trainers who covered the topics of project management, safety & governance and process engineering design.

Following that, they were tasked with submitting their final reports with refining their designs, focusing on equipment design for at least one major unit operation, preparing Piping & Instrumentation Diagrams (P&ID) and conducting an economic evaluation of the overall process.

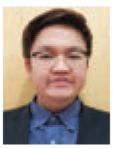
Training course on occupation safety & regulation governance in hazardous substances

Final competition presentation

After a meticulous evaluation by a panel of expert assessors from both industry and academia, six teams were selected to advance to the final stage. The final showdown took place at Wisma IEM, where the shortlisted teams pitched their ideas to the judges. The teams had to present their innovative solutions, highlighting the technical prowess and creativity that defined their designs. After a rigorous evaluation process, the team from SEGI University emerged champion, impressing the judges with its innovative approach, efficiency and commitment to sustainability. The team's success underscored the importance of education and innovation in advancing sustainable engineering solutions.

The 11th IEM Chemical Engineering Design Competition was not just a showcase of technical excellence; it was also a testament to the power of collaboration, innovation and sustainable engineering practices. As the world continues to grapple with environmental challenges, events like this serve as a beacon of hope, inspiring future generations of engineers to push the boundaries of what is possible and to create a more sustainable future for all. ■

Prepared by:



Ir. Vincent Khaw Wei Chuen

15th Malaysia Chem-E Car Competition 2023

Chemical Engineering Technical Division

On 4-5 November 2023, the 15th Malaysian Chem-E-Car Competition, organised by the Chemical Engineering Technical Division (CETD), was held at UiTM Shah Alam. It was a spectacular showcase of theoretical knowledge and practical application in the field of chemical engineering. The competition required students to tackle complex engineering problems by designing and building shoebox-sized cars powered by chemical reactions. The car must autonomously travel a specific distance, carry a designated water load and perform precision tasks like hitting bowling pins and scoring goals with a golf ball.

Group photo after the event

The competition was a vibrant testament to the fun and excitement inherent in applying theoretical concepts to real-world challenges. Teams were required to navigate intricate engineering problems, creatively using their academic learning from courses such as Reaction Engineering, Process Control and Material Science. The hands-on experience provided a valuable platform for students to bridge the gap between classroom theory and practical application, demonstrating the fun and intrigues of engineering problem-solving.

Adding to the educational and competitive spirit of the event was a poster competition. Participants created detailed A1-sized posters, communicating the nuances of the development of their car, including the power mechanism, safety features, economic considerations and environmental impacts. This aspect of the competition highlighted the importance of clear, effective communication in engineering, a skill as crucial as technical expertise.

In the main event, the Pocalunar Kairos 3.0 team from Diponegoro University emerged champion, followed by Pocalunar Arcade 2.0, also from Diponegoro University and the Nawasena team from Brawijaya University. In the poster competition, DPHX from Herriot-Watt University Malaysia, Pocalunar Auriga 1.0 from Diponegoro University and Reactics Abiyasa from Universitas Gadjah Mada won the top 3 positions, respectively.

The event was graced by Prof. Dr Hj. Mohd Sazili Shahibi, Deputy Vice Chancellor of Student Affairs of Universiti Teknologi MARA, Ir. Prof. Dr Norlida Buniyamin, President of IEM, Prof. Dr Hamidah Mohd Saman, Assistant Vice Chancellor of College of Engineering Universiti Teknologi MARA and Ir. Prof. Dr Zuhaina Zakaria, Honorary Secretary of IEM.

The competition was not just a showcase of engineering skills but also a celebration of the joy and excitement in applying complex theories to solve real-world problems.

We look forward to the next Chem-E-Car competition which will be held at University Perlis Malaysia where we anticipate another round of innovative solutions, demonstrating the continuous evolution and fun of Chemical Engineering. We would like to express our sincere appreciation to UiTM University, the judges and all participating universities for fostering a culture of creativity and innovation in engineering education. ■

Prepared by:

Mohd Fauzi Zanil

How Energy Transition is Put Into Education Structure at Malaysian Universities

Chemical Engineering Technical Division

Energy transition is a critical topic that universities around the world are incorporating into their education structures. Malaysian universities are also actively integrating the topic into their curricula, either as a new course or embedded in a course and through research and collaborative initiatives, to ensure our future generations are well prepared to navigate the evolving energy landscape.

With the aim of accelerating the progress of net zero carbon emission by 2050, Malaysian universities have taken several strategies to navigate the energy transition topic. One is through curriculum enhancement. Each programme offered by local universities is registered with the Malaysian Qualifications Agency (MQA) which has established comprehensive standards and guidelines to ensure the quality of education and training in the country.

One of the guidelines is the policy and mechanism for programme monitoring and reviewing the curriculum. This process can be achieved through constructive engagement with stakeholders, including the alumni and employers, as well as external experts whose views are considered for continuous quality improvement (CQI).

The relation between courses needs to be considered – whether they should be offered as dedicated courses or as embedded topics to support the implementation strategy on energy transition. The courses or topics are renewable energy, energy efficiency, sustainable practices, circular economy, carbon emission calculations and energy audit.

Students learn about the technical, economical and environmental aspects of transitioning from fossil fuels to cleaner energy sources, to the latest technology adopted to have zero venting, zero flaring and zero emission, and to Carbon Capture, Utilisation & Storage (CCUS) technology. Curriculum developers will also have to ensure that effective teaching & learning processes, supporting materials and assessments are aligned with course learning outcomes (CLO) and programme learning outcomes (PLO).

Another strategy that can be a part of CQI is through interdisciplinary programmes. Since energy transition is a multidisciplinary field, universities encourage collaboration of academic staff and supporting materials across faculties or departments. This strategy is highly effective in optimising resources such as the academic staff and the learning facilities schedule. Interdisciplinary programmes can bring students of engineering, social science, management and humanities together in one class for the same topic/course on energy transition. This strategy can foster a holistic perspective among the students when discussing or conducting projects relating to energy challenges.

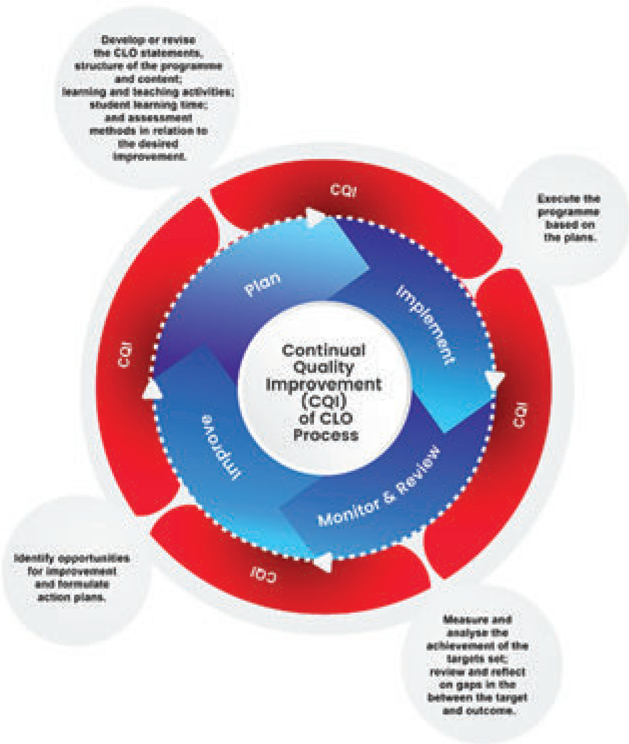


Figure 1: Monitoring and reviewing courses in programmes offered by local universities (Reference: MQA Guidelines to good practices: Curriculum design & deliver)

The establishment of research centres and institutes in universities allows cutting-edge research, innovation, invention and knowledge dissemination focusing on energy transition. The findings on the latest renewable energy technologies, grid integration and policy frameworks have been commonly showcased for the past two decades on national and international platforms such as the Malaysian Technology Expo (MTE), an annual event highlighting ground-breaking innovative products and solutions. When researchers from local universities collaborate and harness their collective expertise, innovation emerges as the lynchpin to propel progress toward the achievement of the United Nations Sustainable Development Goals (UN SDGs).

Apart from conducting research based on Technology Readiness Level (TRL) 1 to TRL 3 (see NOTE below), collaborations with industry players enhance practical learning and increase the TRL research level to be higher than 3. This is conducted through industry partnership where Memorandums of Understanding (MoUs) are signed and universities partner with energy companies, utilities and start-ups.

Through this strategy, students gain real-world experience through internships, joint projects and industry-sponsored research. This is because industry partnership strategy can create a dynamic environment where theoretical knowledge meets real-world applications. Students benefit from exposure to practical scenarios, hands-on experiences and industry-specific challenges. By working alongside professionals, students gain insights into industry practices, problem-solving techniques and the intricacies of their chosen field.

Students are our future leaders, so student-led initiatives through student organisations play a vital role. Energy clubs, sustainability groups and learned society student chapters are essential components of university life. These organisations provide platforms for students to engage actively in energy-related discussions, initiatives and projects. By participating in these groups, students not only learn from their peers but also contribute to sustainable practices on university campus and beyond.

Competitions challenge students to come up with energy transition solutions. Essay and debate competitions on energy transition are some examples where students can increase their awareness. By actively participating in these activities, students gain insights beyond textbooks. They learn about global energy challenges, climate change and the importance of sustainable practices. Exposure to real-world problems motivates students to take action, advocate for change and contribute to a greener future.

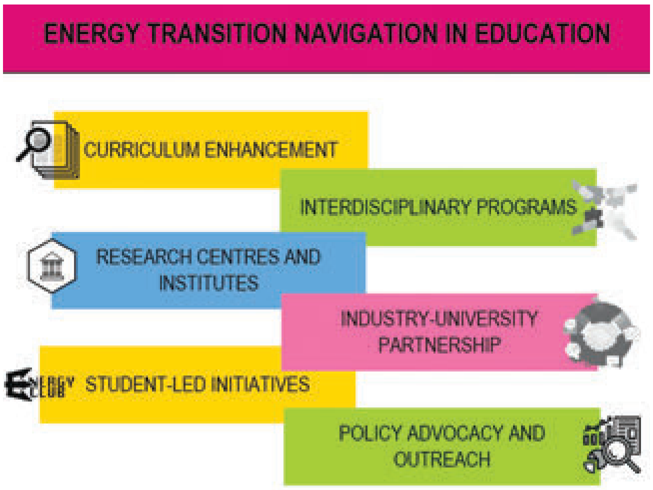


Figure 2: Overview strategies on energy transition navigation in the Malaysian education system

The final strategy is through policy advocacy and outreach initiatives. Since our universities recognise the importance of collaboration beyond their academic walls, they engage with government officials and policymakers to influence energy-related policies. They provide research insights, propose sustainable strategies and advocate for effective regulations. Collaboration with Non-Governmental Organisations (NGOs) allows universities to tap into grassroots efforts. NGOs often work closely with communities and have a pulse on local energy needs.

Malaysian universities also organise seminars, workshops and public forums to advocate the energy transition topic and address the energy challenges together. Often, this strategy is implemented with consideration for the intended audience and so, may fall into categories such as basic awareness, intermediate or advanced levels. One example of advocacy effort in influencing energy policies is by having an academia arm as part of the focus group during the term review of Malaysian National Energy Policy led by the Director of Energy Division, Economy Planning Unit, Prime Minister's Office. In summary, Malaysian universities are fostering a generation of energy-conscious graduates who can drive sustainable change. ■

Note:
TRL 1: Basic principle research,
TRL 2: Formulation of concept,
TRL 3: Research proof of concept,
TRL 4: Research findings validated in lab,
TRL 5: Research findings validated in real environment,
TRL 6: Site testing for viability,
TRL 7: Pilot scale prototype)

Prepared by:

Ir. Dr Hazlina Husin

NOTICE OF IEM (MIRI BRANCH) OFFICE BEARERS 2024/2025

The Institution of Engineers, Malaysia (IEM) Miri Branch had its 25th Annual General Meeting on 9 March 2024 and we are pleased to introduce the new IEM Miri Branch Office Bearers for session 2024/2025:

IEM Miri Branch Executive Committee 2024/2025	
Chairman	Ir. Meheron Selowara Joo
Immediate Past Chairman	Ir. Chong Boon Hui
Vice Chairman I	Ir. Dr Wong Kwong Soon
Vice Chairman II	Ir. Prof. Dr Stephanie Chan Yen San
Honorary Secretary	Ir. Nelson Ng Soon Hee
Honorary Treasurer	Ir. Yee Wen Jye
Committee Members	Ir. William Chien Hui Liang Ir. Geoffery Ranggu Anak Thomas Ir. Dr Liew Kuo Fung Ir. Abang Nizamuddin Abg Mohd Khalid

SEACETUS 2024

Innovation and Sustainable Underground Space Development

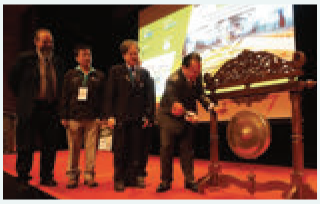
Kuala Lumpur Connvention Centre, Kuala Lumpur, Malaysia
5 - 7 March 2024

The South-East Asian Conference & Exhibition on Tunnelling & Underground Space (SEACETUS 2024)

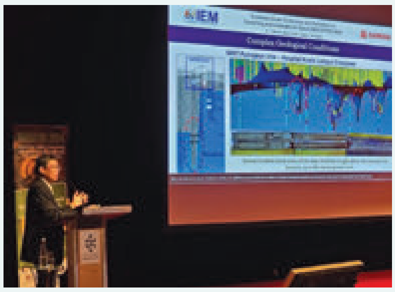
The South-East Asian Conference & Exhibition on Tunnelling & Underground Space (SEACETUS 2024) was held on 5-7 March 2024 at Level 3, the West Wing, Kuala Lumpur Convention Centre. A total of 200 delegates attended the conference where a total of 16 technical papers were presented, spread over 2 half-day parallel sessions with 7 Special Lectures, 6 Keynote Lectures and 2 Keynote Addresses by Prof. Arnold Dix (Australia) and Prof. Jenny Yan (China).

The event started with a welcome speech by Organising Chairman Ir. Dr Ooi Teik Aun, followed by IEM President's speech, read by IEM Deputy President Ir. Prof. Dr Jeffrey Chiang Choong Luin. Next was a speech by Prof. Arnold Dix, the President of the International Tunnelling Association (ITA). The event was endorsed by ITA.

The SEACETUS 2024 was officiated by the Honorable Minister of Works, Y.B. Dato' Sri Alexander Nanta Linggi. Y.B. Dato' Sri Alexander Nanta Linggi then visited the exhibition booth, where 20 exhibitors from local and international industrial players participated in the conference. The keynote address from Prof. Arnold Dix was the highlight of the event; he gave a fascinating lecture on his role in the rescue mission of 41 workers who were trapped when the Silkyara Tunnel, India, collapsed in November 2023. He shared the challenges and difficulties in finding solutions to bring all the workers alive. The second keynote address by Prof. Jenny Yan, ITA Immediate Past President. She enlightens on the topic of Tunnelling Updates, Innovations, and Way Forward.



Opening ceremony by Honorable Minister of Works YB. Dato' Sri Alexander Nanta Linggi accompanied by Organising Chairman of SEACETUS, Ir. Dr Ooi Teik Aun, Ir. Prof. Dr Jeffrey Chiang Choong Luin, the IEM Deputy, Prof. Arnold Dix, the President of the International Tunnelling Association (ITA), the chairman of TUSTD, Ir. Ong Sang Woh and Ir. Khoo Chee Min.



Group photo of the Session A Parallel section speaker for Innovation and Ground Investigation. Left to right: Dato Danny Cheng, Cik Nursyahirah Mohd Saleh, Ir. Dr Ooi Teik Aun, Ir. Ong Sang Woh, Ir. Khoo Chee Min, Ir. Neo Boon Kheng and Ir. Dr Rini together with Ir. Dr Ooi Lean Hock as keynote lecture.

In addition to it, the Keynote and Special Lecturers were presented by prominent speakers from the United Kingdom, Korea, Taiwan, Singapore, Australia, India and China with various interesting topics. Four parallel sessions with the sub-themes of Innovation and Ground Investigation, Monitoring and Instrumentation, Case study and Lesson Learned, and Numerical Modelling and Simulation. The best presenter awards were nominated for each session.

The two field trips were organised on the third day of SEACETUS 2024. The first site was a visit to the ECRL Tunnel project in Serendah, with 28 participants. The visit started at 9.30 a.m. when the coach arrived and was completed by noon. The Contractor China Communications Construction Company (CCCC) and the Malaysia Rail Link (MRL) were the hosts, and the participants were briefly explained on the construction work before entering the tunnel.

Meanwhile, a parallel visit was made to the Pantai 2 Underground Sewage Treatment plant, where the oxidation pond in the area had been filled up. A plant was built in the underground tunnel, and the top of the tunnel was turned into a playground/eco-park. It was also held from 9.30 a.m. to noon, and this visit attracted 15 participants. The visit was hosted by Indah Water Konsortium Sdn. Bhd.

Group photo of exhibition area visit by Honorable Minister of Works Y.B. Dato' Sri Alexander Nanta Linggi accompanied by organising chairman of SEACETUS, Ir. Dr Ooi Teik Aun, Ir. Prof. Dr Jeffrey Chiang Choong Luin, the IEM Deputy President, Prof. Arnold Dix, the President of the International Tunnelling Association (ITA), the chairman of TUSTD, Ir. Ong Sang Woh and Ir. Khoo Chee Min.

As the SEACETUS 2024 concluded, it delivered a successful event highlighting the Innovation and Sustainable Underground Space Development. Throughout the SEACETUS 2024, this conference has been a triumph, bringing together brilliant minds from diverse fields to exchange ideas, foster collaboration, and chart a path toward a brighter field of underground space. Finally, we extend our heartfelt gratitude to all the speakers, participants, sponsors, exhibitors, and all who dedicated their time and expertise to making this conference a resounding success. ■

Prepared by:

Ir. Assoc. Prof. Dr Rini Asnida Abdullah

Secretary / Treasurer of TUSTD of the IEM. She is the head of Geotechnical Research Group (GRG) in Faculty of Civil Engineering, Universiti Teknologi Malaysia (UTM).

Ir. Frankie Cheah

Deputy Chairman of the Tunnelling and Underground Space Technical Division. Currently working as Technical Director in the Geotechnical team of AECOM Perunding Sdn. Bhd.

*Group photo of site visit to East Coast Rail Link (ECRL) (ETunnel Project in Serendah. *The 665-km East Coast Rail Link (ECRL) will traverse the East Coast states of Kelantan, Terengganu, and Pahang before linking the Klang Valley on the West Coast of Peninsular Malaysia. As a national infrastructure, the ECRL will link cities and towns as well as upgrade public transportation along its rail network. At speeds of up to 160km/h, the ECRL passenger trains will significantly cut travel time from Kota Bharu to ITT Gombak to approximately 4 hours. The ECRL is also expected to spur commercial activities, drive investments, increase job opportunities, and boost tourism activities along its rail network. The ECRL Project is expected to be completed by end of 2026. *Quote from: MRL - Enriching Lives, Prospering The Nation.*

Risk Against the Machine Modernisation

In today's dynamic landscape, equipment modernisation is essential to align with sustainable technologies. The decision to do so is often driven by cost considerations, as modernisation tends to be more cost effective than investing in entirely new machinery, which can entail substantial expenses.

Modernising equipment or machinery not only enhances efficiency but also reduces energy loss. However, despite the many advantages, there are also inherent risks to operators. It is crucial to consider all factors when modifying machinery or equipment, particularly for public use or those handling such equipment. Uncontrolled modernisation can pose risks that may jeopardise the safety of property and lives.

In one accident case, a machinery main control panel was changed during modernisation. The change involved would provide a better setup to control the machine, better detection of the mechanical parts movement, which eventually would improve the control of the older system. However, the modernisation solution required an additional sensor switch installation to detect the mechanics of the machine and to convert the input to the main controller.

In this case, the older system used a mechanical system to detect a plunger shaft of a solenoid brake movement (an important safety feature of the said machinery). An additional universal switch was added to the system to adapt to the new controller mechanism. After a few thousand cycles of operation, the additional switch had detached from the solenoid break due to the attachment bracket failure, which was improperly designed and fabricated. The machine continued to operate for a few days until the equipment failed and caused injury to the user. Lessons learnt from this case study pointed to inadequacy in risk assessment during the machinery modernisation where essential components, functioning of the old system and mechanism, were inadequately assessed and designed.

Machine modernisation may provide a better solution and improve the operation process but it can also pose risks to the user. After certain upgrades, a machine may not work correctly. Even worse, when the modernised machine cannot be used properly but is still forced to operate through the use of inappropriate methods, it increases the risk of injury. Thus, to combat or minimise any associated safety risk through modernisation, the following are helpful tips to protect from any harm or injury:

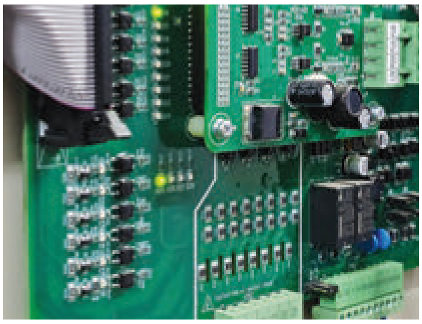
1. **Risk identification.**
   The benefits of modernisation, while improving the safety aspects of old machinery, also entail certain safety risks. The need to assess the compatibility of modern replacement components without compromising their original functions and safety is crucial in modernising equipment or machinery. Risk assessment should consider all stages of modernisation, from the planning, improvement and operational phases. Thorough assessment such as site inspection, observation of actual equipment and review of any available original maintenance manual or design documents may help the assessor foresee any possible risk of harm when it is put back in action.
2. **Compatibility.**
   When replacing modern and more advanced components in the modernisation process, one must consider the compatibility of these systems with the old equipment. From a compatibility standpoint, it is crucial to ensure that any modification does not affect the primary functions and safety features.

   An example of machinery modernisation is the replacement of control panels on lifting machines such as elevators. This mechanically based machine is usually integrated with electrical and electronic systems that operate to control the movement of elevators. Mistakes happen when the replaced electrical components are the wrong type. Accidents can be triggered by the incompatibility of AC power components with DC power components. Mixing different types of components that are not compatible can lead to various issues such as electrical malfunction, equipment damage or even fire. It's crucial to ensure compatibility between AC and DC components to prevent accidents and to ensure the safe operation of electrical systems. Even if a machine is modified or upgraded with improper components or parts with compatibility issues, it may still function but with missing safety elements. Maintenance personnel or upgraded technicians will typically refrain from questioning the functioning of any modernised equipment in the absence of any reported issues. This can result in modernised machinery being operated without essential safety features until issues arise or accidents occur, particularly involving user injuries.

3. **Legal Compliance.**
Only some modernisation projects can be implemented without compliance with specific standards or legislation. Proper design modification or changes may need to be approved by relevant authorities. Planning or arrangements with subject matter experts on any particular equipment are vital to ensure critical regulations are met. The laws or regulations exist to ensure safety and health, especially for the public. Moreover, recent standards and codes have been published to cope with new technology and improved safety. Undertake conformity assessment and meet all relevant requirements if changes are made to the design, function or safety of machinery.

4. **Adequate Resources.**
An upgrading project can be as good as having sufficient resources, including replacement parts and competent technical personnel. The modern part may be better, but essential fitting should be in place. Otherwise, a shoddy upgrade with cables tight around here and there can pose more serious safety concerns in the long run against vibration issues or anything harmful.
In addition to having sufficient replacement components, the sufficiency of human resources is equally vital. Competent and skilled workers are crucial to ensure the successful implementation of modernisation projects. Those engaged in the process should anticipate human-related challenges, such as the absence of technical experts due to factors like illness, death, resignation or other unforeseen circumstances. These issues can impact the project, leading to improper adjustments in the upgraded machine. Such oversights may contribute to unexpected failures in the future, posing a risk to the safe operation of the specific equipment.

5. **Conformity label.**
For machinery modernisation safety, conformity labels are crucial. Most equipment come with a conformity declaration and label indicating their safety. Unless the manufacturer anticipates or agrees to the modernisation scope determined by the manufacturer and covered by the manufacturer's risk assessment, technical documentation and Declaration of Conformity, the original markings and labels remain valid. The modifier needs to communicate any change to the user to prevent them from mistakenly assuming the conformity is still valid by removing the label or by any other means.
Machine modernisation can encompass a spectrum of modifications, ranging from minor alterations to complete replacement of main components.



Modernisation involves applying contemporary technology to solve obsolete equipment or components, which improves efficiency, productivity and improves data monitoring

However, changes such as replacing motors, guards or safety-critical parts with essentially identical new ones or integrating modern, higher-quality interlocks wired into the control system in the same manner as before, do not constitute substantial changes.

In conclusion, while modernising machinery offers numerous benefits such as improved efficiency and performance, it also introduces inherent risks, particularly concerning operator safety. By prioritising safety and implementing comprehensive risk management strategies, we can minimise the likelihood of accidents and ensure the safe operation of modernised equipment and machinery. ■

REFERENCES

[1] Guide to machinery and equipment safety, Workplace Health and Safety Queensland, www.worksafe.qld.gov.au

[2] Refurbished and modified machinery, HSE UK Guidance, www.hse.gov.uk

[3] How to ensure the safety of the modernised machine? Afry.com

[4] Buying new machinery, A short guide to the law and your responsibilities when buying new machinery for use at work, HSE, www.hse.gov.uk/pubns/indg271.pdf

Prepared by:

Ir. Tajul Ariffin Mohamed Nori

NOTICE OF 65TH ANNUAL GENERAL MEETING (HYBRID) SATURDAY, 20 APRIL 2024 AT 9.00 A.M.

In accordance with Section 7.5 of the Bylaws, notice is hereby given that the 65th Annual General Meeting of The Institution of Engineers, Malaysia shall be held on Saturday, 20 April 2024 at 9.00 a.m. at Wisma IEM / Zoom.

The AGENDA for the HYBRID Annual General Meeting is as follows:-
1. Welcome Address by the President for Session 2023/2024.
2. Confirmation of Minutes of the 64th Annual General Meeting held on 15 April 2023.
3. Matters Arising.
4. Annual Report / Financial Statements for Session 2023/2024.
5. Proposed Amendments to the IEM Constitution.
6. Discussion on written issues from members of which written notice is submitted to reach IEM Secretariat by 13 April 2024. *(Please note that no matters under this item shall be discussed, unless prior written notice is received by 13 April 2024. This is in accordance to the IEM Constitution & Bylaws).*
7. Presentation of Results of Election for Council Session 2024/2025.
8. Presidential Address 2024/2025.

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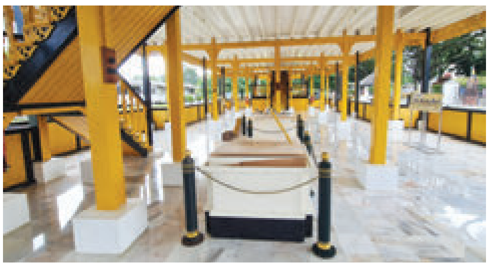
Istana Kenangan

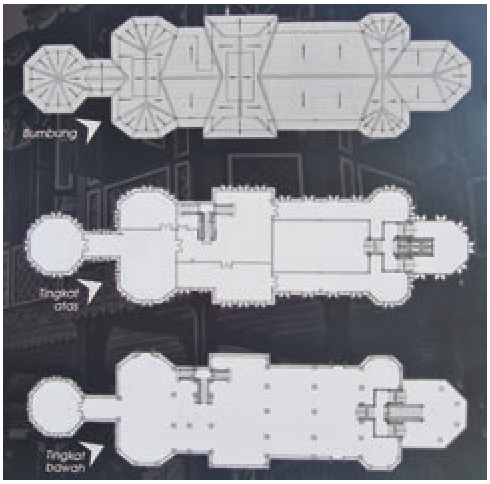
Ir. Dr Oh Seong Por

Past Chairman of IEMNS and Director of Samsung SDI Energy (M). Sdn. Bhd.

On the way to attend a function at IEM Perak Branch, I stopped by Kuala Kangsar and visited the iconic Royal Museum, painted in bright colours of yellow, white and black to match the 3 official colours of the Perak Flag.



The palace is built on 60 pillars



Top view drawings of the Istana Kenangan shows its resemblance to a sword in its scabbard

This was actually a palace named Istana Kenangan (Remembrance Palace), built in 1926 as a temporary residence for Sultan Iskandar while awaiting the completion of Istana Iskandariah. Sopian, a Malay carpenter from Bukit Mertajam, and his two sons, Zainal Abidin and Ismail, constructed the wooden palace without using any nail or blueprint. It was decorated with intricate Malay traditional carvings.

The two-storey palace, measuring 42m long and 11m wide, was built on 60 pillars. When view from the top, the palace looks like a sword in its scabbard. It has several sitting rooms, bed chambers, main audience hall and throne room. Besides being used as a royal residence, it also housed students from the Sultan Idris Teacher Training College during World War II. ■

Exploring with Passion

Ir. Mohamad Anwar Ahmad

Chairman, Chemical Engineering Technical Division, IEM

Travelling can be both very exciting and exhausting. This starts with the excitement we feel even before the journey begins. Obviously, as plans are made by humans, there will naturally be good moments and bad but ultimately the aim is to optimise the journey so that more benefits can be reaped.

Exposure to something new will certainly boost our energy and desire to explore further and appreciate the perspectives in connection with not only the landscape but also the engineering aspects which may illuminate or catalyse the development of our nation.

My adventure started just before COVID-19 hit Morocco in North Africa. Morocco is a subcontinent country in North Africa. Despite influences from some neighbouring European countries such as Spain and France, Morocco remains very rich in its own cultures and traditions.

One unique aspect of the country is that almost everyone is able to converse in five languages, namely Arabic, Berber, Spanish, French and English. The main foreign languages spoken, Spanish and French, have a significant impact on the technology transfer and development from north to south and from east to west of Morocco. We can see the significant impacts in its architecture and the transportation system. The diversified development in Morocco also plays a huge role to boost its tourism industry and tourists come from all over the world to visit.

One thing I take great personal delight in when travelling is sampling the local cuisine. This is something to ponder on and while we may find certain similarities among the cuisine of countries within the same continent, we are also amazed by the differences in the taste. I call it the evolution of the food and beverage industry. ■

Kasbah in Rabat, Morocco

The other side of the continent (Spain)

Train station in Rabat, capital of Morocco

Temuduga Profesional

Tarikh: 22 Mac 2024

Kepada Semua Ahli,

SENARAI CALON-CALON YANG LAYAK MENDUDUKI TEMUDUGA PROFESIONAL TAHUN 2024

Berikut adalah senarai calon yang layak untuk menduduki Temuduga Profesional bagi tahun 2024.

Mengikut Undang-Undang Kecil IEM, Seksyen 3.8, nama-nama seperti tersenarai berikut diterbitkan sebagai calon-calon yang layak untuk menjadi Ahli Institusi, dengan syarat bahawa mereka lulus Temuduga Profesional tahun 2024.

Sekiranya terdapat Ahli Korporat yang mempunyai bantahan terhadap mana-mana calon yang didapati tidak sesuai untuk menduduki Temuduga Profesional, surat bantahan boleh dikemukakan kepada Setiausaha Kehormat, IEM. Surat bantahan hendaklah dikemukakan sebulan dari tarikh penerbitan dikeluarkan.

Ir. Prof. Dr Zuhaina Zakaria
Setiausaha Kehormat, IEM

PERMOHONAN BARU

Nama	Kelayakan
KEJURUTERAAN AWAM	
DIRAYAH BINTI DOLLAH	BE (UTM) (CIVIL, 2009)
NURHAIDAH JAMIL	BE HONS (INSTITUT TEKNOLOGI MARA) (CIVIL,1997)
KEJURUTERAAN ELEKTRIKAL	
MOHD HISHAMUDDIN BIN ZAKARIA	BSc (RENSSELAER) (ELECTRICAL POWER, 2009)
P KALAI CHELVAM A/L J. PUSPANATHAN	BE (UTM) (ELECTRICAL-ELECTRONICS, 2010)
MOHD ZAMRI BIN HUSSIN	BE (UTM) (ELECTRICAL, 2014) ME (UMP) (ELECTRICAL - SUSTAINABLE ENERGY, 2023)

PERMOHONAN MENJADI AHLI KORPORAT

Nama	Kelayakan
KEJURUTERAAN AWAM	
TAN JEREMY WEN LEONG	BE HONS (SOUTH WALES) (CIVIL, 2012)
HAZRIN HAZIZI BIN HUSSAIN SABRI	BE HONS (UTM) (CIVIL, 2010) MSc (UTM) (CIVIL (CONSTRUCTION), 2015)
YUSNI BIN SHAHADAN	BSc (ALABAMA) (CIVIL, 1988)

PERPINDAHAN AHLI

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
119979	CHIN CHIUN HUNG, TERENCE	BE HONS (CURTIN) (CIVIL AND CONSTRUCTION, 2016)
72602	MUHAMMAD MUSTAQIM BIN OMAR	BE HONS (UTM) (CIVIL, 2011)
90781	ONG SIAW WEE	ME HONS (NOTTINGHAM) (CIVIL, 2016)
117056	AHMAD SYAKIR BIN ZAKARIA	BE HONS (UTM) (CIVIL, 2017) ME (UTM) (STRUCTURE, 2019)
KEJURUTERAAN ELEKTRIKAL		
79082	AHMAD KHAIRUL HAFFIZ BIN ISMAIL	BE HONS (UTM) (ELECTRICAL, 2015)
86960	LEE CHEE HIUN	BE HONS (UTAR) (ELECTRICAL AND ELECTRONIC, 2019)
88448	MOHAMMAD AFFANDI BIN ABDULLAH	BE HONS (UTEM) (ELECTRICAL - POWER ELECTRONIC & DRIVE), 2012)
93832	YEOH CHEE KEONG	ME HONS (NOTTINGHAM) (ELECTRICAL AND ELECTRONIC, 2017)
KEJURUTERAAN ELEKTRONIK		
38365	JUNAIDI BIN HARDONO	BE (UPM) (ELECTRONIC COMPUTER, 1997)

PERPINDAHAN MENJADI AHLI KORPORAT

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
80729	HASLINDA BINTI MOHAMAD HAMRAN	BE HONS (UM) (CIVIL, 2005)
119967	CHOU ZHAO YAO	ME HONS (NOTTINGHAM)(CIVIL, 2018)
93771	AZAM SYARIFF BIN ZAHAR	BE (NAGOYA) (ARCHITECTURE & CIVIL, 2002)
49333	CHUA TECK LIANG	BE HONS (UTAR) (CIVIL, 2013)
24846	KONG WENG KEONG	BE HONS (SALFORD) (CIVIL, 2000) MSc (UTM) (CONSTRUCTION MANAGEMENT, 2003) MSc (SINGAPORE UNI.) (BUILDING SCIENCE, 2005) PhD (WALES UNI.) (2023)
33123	MOHD AZAM BIN ZANAL ABIDIN	BE HONS (UTM) (CIVIL, 2008)
40007	MUHAMMAD ZAMRI BIN MUSA	BE (ITM) (CIVIL, 1998) ME (UKM) (CIVIL, 2009)
125986	WAN AMIRA BINTI WAN AHMAD	BE HONS (UTM) (CIVIL, 2016)
KEJURUTERAAN MEKANIKAL		
41105	KHAIRUL HAFEZ BIN IBRAHIM	BE (UTM) (MECHANICAL-INDUSTRIAL, 2009) ME (UPM) (MANAGEMENT, 2011)
KEJURUTERAAN KIMIA		
50757	LEE SHIAW JIEN	BE HONS (CURTIN) (CHEMICAL, 2007)

Pengumuman yang ke-185

SENARAI PENDERMA KEPADA WISMA DANA BANGUNAN IEM

Institusi mengucapkan terima kasih kepada semua yang telah memberikan sumbangan kepada tabung Bangunan Wisma IEM. Ahli-ahli IEM dan pembaca yang ingin memberikan sumbangan boleh berbuat demikian dengan memuat turun borang di laman web IEM *http://myiem.org.my* atau menghubungi secretariat di +603-7890 0130 / 136 untuk maklumat lanjut. Senarai penyumbang untuk bulan Februari 2024 adalah seperti jadual di bawah:

No.	No. Ahli	Nama
1	22936	Ir. Liaw Wei Loong
2	22421	Mr. Amiruddin Saad
3	87693	Mr. V Saravana Kumar A/L Veeriah
4	03452	Ir. Abd. Rahim Shamsudin
5	103798	Sdr. Beh Heng Yew
6	21275	Mr. Yong Kok Hoong
7	12279	Ir. Chew Ai Beng
8	02659	Ir. Wee Kim Siang
9	12373	Ir. Arul Hisham Abdul Rahim
10	43718	Ir. Abu Bakar Abd Aziz
11	125269	Mr. Nor Azmi M. Salleh
12	102476	Mr. Hazran Husain
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97106	CHOOI JIA SHENG	BE (UTARC) (MECHANICAL, 2018)
103799	H MUHAMMAD UMAR ALI	BE HONS (TAYLOR'S UNI.) (MECHANICAL, 2022)
37558	MOHD ALIFEE BIN OTHMAN	BE HONS (UKM) (MECHANICAL, 2010)
103994	MOHAMAD LOKFI BIN LATIFF	BE HONS (UMP) (MECHANICAL, 2022)
79913	MUHAMMAD BASYEER BIN ZAINUL 'ABIDIN	BE HONS (UNITEN) (MECHANICAL, 2019)
24664	SHAHRIL AZHAR BIN MOHAMED	BE HONS (USM) (MECHANICAL, 2007)
102612	LOO QAI WEI	BE HONS (UTeM) (MECHANICAL, 2022)
84497	BRYAN CHAI YEN BOON	BE HONS (UTM) (MECHANICAL, 2019)
112538	OOI TENG HAO	ME HONS (HERIOT-WATT UNI.)(MECHANICAL, 2021)
97638	WOON TIAN FOONG	ME HONS (THE UNI. of NOTTINGHAM) (MECHANICAL, 2021)
KEJURUTERAAN MEKATRONIK		
105881	AU JIN CHENG	BE HONS (UTAR SG LONG) (MECHATRONICS, 2023)
KEJURUTERAAN PETROLEUM		
42120	MOHAMAD SYUKRANI BIN ADDI SAIFUL RIZAL VOON	BE HONS (UTM) (PETROLEUM, 2018)

PERMOHONAN MENJADI AHLI SISWAZAH

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AEROANGKASA		
119986	MAT KASRI BIN MAT KASSIM	BE HONS (UPM) (AEROSPACE, 2009)
121090	LIEW JENN HUEI	DCAM Part 66 AIRCRAFT MAINTENANCE LICENSE CATEGORY C HOLDER (2019)
KEJURUTERAAN AERONAUTIKAL		
121091	ANG TECK WAH	DCAM Part 66 AIRCRAFT MAINTENANCE LICENSE CATEGORY C HOLDER (2019)
KEJURUTERAAN ALAM SEKITAR		
119935	AMMAL FAIZ BIN MOHD YUSOF @ SUBERI	BE HONS (UniMAP) (ENVIRONMENTAL, 2021)
KEJURUTERAAN AWAM		
121069	NOR HAFIPAH BINTI MOHAMED DASUKI	BE (UMP) (CIVIL, 2013)
119922	AHMAD RUZAINIE BIN YAACOB	BE HONS (CARLETON UNI.) (CIVIL, 2012)
119934	CHONG WEI WEN	BE HONS (CURTIN UNI.) (CIVIL & STRUCTURAL, 2015)
119917	PANG YIE RUEY	BE HONS (INTI INTERNATIONAL UNI.) (CIVIL, 2020)
121087	YOW HUN LM	BE HONS (MONASH UNI.) (CIVIL, 2021)
119933	CHAN PEI QING	BE HONS (MONASH UNI.) (CIVIL, 2022)
119806	ANTON IWAN DANDOT	BE HONS (ROYAL MELBOURNE INS. OF TECH.) (CIVIL & INSFRASTRUCTURE, 2014) ME (STRUCTURES & FORENSICS, 2015)
119909	LEE JIA NI	BE HONS (SWINBURNE UNI. OF TECH.) (CIVIL, 2017)
121085	EVA WONG SHU WEN	BE HONS (SWINBURNE UNI. of TECH.) (CIVIL, 2019)
121086	KUEH TSING LING	BE HONS (SWINBURNE UNI. of TECH.) (CIVIL, 2019)
119928	PANG ZI HAO	BE HONS (THE UNI. HONG KONG) (CIVIL, 2022)
119916	THONG LIH HERNG	BE HONS (UCSI) (CIVIL, 2020)
121078	ARIF FAHMI BIN MOHAMED NOR	BE HONS (UiTM) (CIVIL, 2008)
119923	NADZMI BIN AZIZI	BE HONS (UiTM) (CIVIL, 2017)
121071	MOHD AFIQ BIN MOHD ZIHAN	BE HONS (UiTM) (CIVIL, 2018) MSc (UiTM) (HIGHWAY ENGR., 2021)
119969	ARIEF IZZUDDIN BIN ABDUL JAMIL	BE HONS (UiTM) (CIVIL, 2021)
121080	DAYANG NUR ERLIYANA ALIAH BINTI ERWAN	BE HONS (UiTM) (CIVIL, 2021)
120962	AHMAD SYAFIQ AMIRUDDIN BIN AHMAD TARMIZI	BE HONS (UiTM) (CIVIL, 2022)
121079	FAIQAH BINTI FAISAL	BE HONS (UiTM) (CIVIL, 2022)
121114	NUR ZUBAIDAH BINTI ZAMANI	BE HONS (UKM) (CIVIL & STUCTURAL, 2015) ME (UKM) (CIVIL, 2017)
119975	TAN EE HONG	BE HONS (UM) (CIVIL, 2007)
119927	LEE BIN FENG	BE HONS (UM) (CIVIL, 2021)
121073	AFIQ FAHMI BIN MOHD FARID	BE HONS (UNITEN) (CIVIL, 2015)
119936	LENG KUAN SEUL	BE HONS (UNITEN) (CIVIL, 2017)
119983	PUAY HOW TION	BE HONS (USM) (CIVIL, 2001) ME (KYOTO UNI.) (ENGINEERING, 2007) PhD (KYOTO UNI.) (ENGINERING, 2010)
121081	CHAI CHEN CHU	BE HONS (USM) (CIVIL, 2006) MSc (USM) (STRUCTURAL, 2007) PhD (USM) (SHELL & SPATIAL STRUCTURE, 2018)
121285	LEE KAH SHENG	BE HONS (UTAR SG LONG) (CIVIL, 2023)
121092	SHUKRI BIN IDRIS	BE HONS (UTM) (CIVIL, 2004)
121126	NOR ASNI BINTI AZIZAN	BE HONS (UTM) (CIVIL, 2009)
119920	MOHD FEDLLY BIN ZAKARIA	BE HONS (UTM) (CIVIL, 2010)
119966	WELFRED CHAI KHAI HUNG	BE HONS (UTM) (CIVIL, 2010) MSc (UTM) (CONSTRUCTION MANAGEMENT, 2011)
119692	NUR MASITAH BINTI NORDIN	BE HONS (UTM) (CIVIL, 2016)
121116	SYAMSUL AZWAN BIN ADNAN	BE HONS (UTM) (CIVIL, 2016) ME (UTM) (CONSTRUCTION MANAGEMENT, 2021)
121084	MUHAMMAD AMRI BIN GAPAR	BE HONS (UTM) (CIVIL, 2017)
121115	MOHD FAIRUZNIZAM BIN YUNUS	BE HONS (UTM) (CIVIL, 2017)
121083	MICKLY IRAI ANAK JAWA	BE HONS (UTM) (CIVIL, 2017)
119654	MOHAMAD SHAHRUL IZWAN BIN AZMAN	BE HONS (UTM)(CIVIL, 2017)
119930	MUHAMMAD RAFIUDDIN BIN ARJIMI	BE HONS (UTP) (CIVIL, 2011)
119926	SHEERIL HAFIZA BINTI HAMIDI	BE HONS (UTP) (CIVIL, 2016)
119976	SEOW ZHEN QUAN	BE HONS (UTP) (CIVIL, 2019)
119773	WAN NUR ELIANA BINTI WAN HUSNI	BE HONS (UTP) (CIVIL, 2019)
121106	WONG KAI XIAN	BE HONS (UTP) (CIVIL, 2020)
121124	ONG ZHEN HONG	ME HONS (THE UNI. of NOTTINGHAM) (CIVIL, 2020)
119982	LIN SHENG KAI	ME HONS (UNI. NEWCASTLE) (CIVIL, 2020)
KEJURUTERAAN BAHAN		
119987	LIM RUO XUEN	BE HONS (USM) (MATERIALS, 2021)
KEJURUTERAAN BIO-PERUBATAN		
121283	TAN CHIA WEN	BE HONS (UTAR SG LONG) (BIO-MEDICAL, 2023)
121284	PEK HUI TING	BE HONS (UTAR SG LONG) (BIO-MEDICAL, 2023)
KEJURUTERAAN ELEKTRIKAL		
119944	BARANITHARAN A/L CHANDRA SEKARAN	BE HONS (MMU) (ELECTRICAL, 2019)
119914	RAFIDAH NOOR BINTI MD NOOR	BE HONS (UiTM) (ELECTRICAL, 2012)
121112	NAZIRUL MUBIN BIN NORMANSAH	BE HONS (UiTM) (ELECTRICAL, 2016)
119653	MUHAMAD HAZIQ BIN ROSNI	BE HONS (UNI. OF NICE) (ELECTRICAL, 2017) ME HONS (UM) (POWER SYSTEM, 2021)
121099	MUHAMMAD SHAHRUL BIN SANORDI	BE HONS (UniMAP) (ELECTRICAL, 2022)
119985	ZETTY ADIBAH BINTI KAMARUZZAMAN	BE HONS (UniMAP) (INDUSTRIAL ELECTRONIC, 2011) ME (UNITEN) (ELECTRICAL, 2013) PhD (UKM) (ELECTRICAL,ELECTRONIC & SYSTEMS, 2017)
119929	KEK WOEI SHYONG	BE HONS (UNITEN) (ELECTRICAL AND ELECTRONICS, 2012)
119939	MUHAMMAD AZIM BIN MOHD SIZA	BE HONS (UNITEN) (ELECTRICAL POWER, 2017)
119932	LIM DONG CHEN	BE HONS (UNITEN) (ELECTRICAL POWER, 2018)
121120	VASUDEVAN A/L MANI	BE HONS (UNITEN) (ELECTRICAL POWER, 2019)
121123	EMY AZY AZYRA BINTI MOHD ZAMRI	BE HONS (UNITEN) (ELECTRICAL POWER, 2020)
121282	TEOH WAI SEONG	BE HONS (UTAR SG LONG)(ELECTRICAL & ELECTRONIC, 2023)
121113	MOHD ZIKRIL HAKIM BIN ISMAIL	BE HONS (UTHM) (ELECTRICAL, 2016)
121068	LAU CHOO CHIN	BE HONS (UTM) (ELECTRICAL, 2005)
121125	MOHAMMAD SHAHRIL BIN ARDIANSHAH	BE HONS (UTM) (ELECTRICAL, 2008) ME HONS (UTM) (ELECTRICAL POWER, 2010)
121117	LUQMAN HAKIM BIN NORESHAM	BE HONS (UTM) (ELECTRICAL, 2017)
119981	MOHD. ARIFFEN BIN AMIRUL	BE HONS (UTM) (ELECTRICAL, 2021)
119980	HEARREN BIN EBIN	BE HONS (UTM) (ELECTRICAL, 2021)
119910	NOR AMIRAH AFIQAH BINTI YAZID	BE HONS (UTP) (ELECTRICAL & ELECTRONICS, 2015)
121095	MOHAMMAD AMIRULSHAFIQ BIN MOHAMMAD AMIRRUDIN	ME HONS (THE UNI. of MANCHESTER)(ELECTRICAL & ELECTRONIC, 2021)
121111	OOI CHUN WEI	ME HONS (THE UNI. of NOTTINGHAM) (ELECTRICAL & ELECTRONIC, 2018)
KEJURUTERAAN ELEKTRONIK		
121118	ATIKAH BALQIS BINTI BASRI	BE HONS (IIUM) (COMMUNICATION, 2014)
121109	KHOO MENG TZE	BE HONS (MMU) (ELECTRONIC IN TELECOMM., 2002) MSc (MUST) (MATERIALS SCIENCE, 2007)
121110	EIZZUDDIN BIN NAWAWI	BE HONS (UMP) (ELECTRICAL-ELECTRONIC, 2022)
121093	ZAHID BIN ZAINUDDIN	BE HONS (UNITEN) (ELECTRICAL & ELECTRONIC, 2008)
119978	MUHAMMAD REDZUAN BIN ISMAIL	BE HONS (UPNM) (ELECTRICAL & ELECTRONIC - COMMUNICATIONS, 2007)
119984	NUR EMANINA BINTI KAMARUDIN	BE HONS (UPNM) (ELECTRICAL & ELECTRONIC - COMMUNICATIONS, 2020)
121096	SARAH AISHAH BINTI MOHAMED RAFIK	BE HONS (UPNM) (ELECTRICAL & ELECTRONIC-COMMUNICATIONS, 2022)
121094	HAMIDI BIN ROZEMIN	BE HONS (UTM) (ELECTRICAL - MECHATRONICS, 2005)
KEJURUTERAAN KIMIA		
121060	YUVENDRRA A/L MANIAM	BE HONS (SEGI COLLEGE) (CHEMICAL, 2022)
121065	AHMAD HAZIQ BIN MOHD NOOR	BE HONS (UMP) (CHEMICAL, 2018)
121286	BARON YEAP THIEN YIEW	BE HONS (UTAR SG LONG) (CHEMICAL, 2023)
121070	MUHAMMAD FITRY BIN AB RASID	BE HONS (UTM) (CHEMICAL, 2018)
119908	NUR ATIKAH BINTI MOHIDEM	BE HONS (UTM) (CHEMICAL-BIOPROCESS, 2008) ME (UTM) (CHEMICAL, 2011) PhD (UTM) (CHEMICAL, 2018)
121074	NOR SYUHADAH BINTI MD SAID	BE HONS (UTP) (CHEMICAL, 2008)
119931	YEOW KHAI ZHI	BE HONS (UTP) (CHEMICAL, 2022)
121058	MOVIIN DAMODARAN	BE HONS (UTP)(CHEMICAL, 2020)
KEJURUTERAAN KOMUNIKASI		
121076	LOGENDRAN A/L VELLASAMI	BE HONS (UniMAP) (COMMUNICATION, 2015)
KEJURUTERAAN MEKANIKAL		
121059	CHIN BEI YI	BE HONS (CURTIN UNI.) (MECHANICAL, 2019)
119924	MUHAMMMAD LUQMAN NULHAKIM BIN FAIZAL	BE HONS (IIUM) (MECHANICAL - AUTOMOTIVE, 2021)
119921	CHUA FONG SHEN	BE HONS (MMU) (MECHANICAL, 2018)
119940	HOOI ZI YANG	BE HONS (MMU) (MECHANICAL, 2018)
119968	TAN LEE YI	BE HONS (MONASH UNI.) (MECHANICAL, 2018)
121121	DANES KUMAR A/L MUNIANDI	BE HONS (MONASH UNI.) (MECHANICAL, 2022)
119918	AHMED HAMEED ANSARI SYED ALI	BE HONS (TAYLOR'S UNI.) (MECHANICAL, 2020)
121108	VETRI THILLAGAN A/L GUNASEELAN	BE HONS (UM) (MECHANICAL, 2016)
121097	MOHD HUZAYEV BIN MOHD HANIF	BE HONS (UM) (MECHANICAL, 2019)
121122	HENDISON ANAK JERALSON LINANG	BE HONS (UNIMAS) (MECHANICAL & MANUFACTURING SYSTEM, 2000)
121066	MUHAMMAD AMIRUL SHAHRIN BIN ZOLKPLI	BE HONS (UPNM) (MECHANICAL, 2016)
121102	LIM KONG BOON	BE HONS (UTAR) (MECHANICAL, 2018)
121103	MUHAMMAD ASLAM BIN ABD GAFAR	BE HONS (UTeM) (MECHANICAL, 2021)
119915	JOSEPH TIONG KING ING	BE HONS (UTeM) (MECHANICAL, STUCTURE & MATERIAL, 2010)
121119	DAYANG FAKHZAWATI BINTI HJ BUANG	BE HONS (UTeM) (MECHANICAL,THERMAL - FLUIDS, 2011)
121067	MOHAMAD NOR SHARIEF BIN MOHD SALLEH	BE HONS (UTeM) (STURCTURE & MATERIAL, 2016)
121105	SITI ZULAIKHA BINTI ZULKIFLY	BE HONS (UTM) (MECHANICAL - MATERIAL, 2022)
121223	MOHD FARID BIN MOHD RAZALI	BE HONS (UTM) (MECHANICAL, 2013)
121082	MOHAMAD RAZIF BIN MOHAMED ROSLY	BE HONS (UTM) (MECHANICAL, 2019)

Keahlian

121101	KOGHEEN SARVESH VARMAN A/L SARAVANAN	BE HONS (UTM) (MECHANICAL, 2022)
121098	YONG SIEN WAE	BSc (PURDUE UNI.) (MECHANICAL, 2005)
119925	YONG TZEN WAE	BSc (PURDUE UNI.) (MECHANICAL, 2017)
121089	LEE KENG CHYE	BSc (THE UNI. OF TOLEDO) (MECHANICAL, 1989)
121107	MOHD ZAIRUL BIN MOHAMMAD ZIN	BSc HONS (ILLINOIS INS. of TECH.) (MECHANICAL, 2015)
121100	PUA ZI RUI	BSc HONS (IOWA STATE UNI.) (MECHANICAL, 2013)
121104	YAP JIN HAO	ME HONS (THE UNI. of NOTTINGHAM) (MECHANICAL, 2022)

KEJURUTERAAN METALLURGY

121075	KANAGASAUTARI A/P PERUMAL	BE HONS (UniMAP) (METALLURGICAL ENG., 2019)

KEJURUTERAAN NUKLEAR

119919	ABDURRAHMAN HAIKAL BIN HUSAINI	BE HONS (UTM) (NUCLEAR, 2021)

KEJURUTERAAN PEMBUATAN

121072	NOR AZMAN BIN MOHD HAIRI	BE HONS (UTeM) (MANUFACTURING PROCESS, 2016)

KEJURUTERAAN PERTANIAN

119971	OW SHYEN NYEN	BE HONS (UPM) (BIOLOGY & AGRICULTURAL, 1999)

KEJURUTERAAN PETROLEUM

121077	IKHWAN ALIF BIN AB AZIZ	BE HONS (UiTM) (OIL & GAS, 2018)

KEJURUTERAAN SISTEM PEMBUATAN

119911	KOH ZHEE FUNN	BE HONS (UNI. HERTFORDSHIRE) (MANUFACTURING SYSTEM ENGR., 2000)

PERMOHONAN KEPADA AHLI "ENGINEERING TECHNOLOGIST GRADUATE MEMBER"

KEJURUTERAAN ELEKTRIKAL

No. Ahli	Nama	Kelayakan
119905	BALYA BIN DAROHINI	BTECH HONS (UMP) (ELECTRICAL, 2016)
120964	MUHAMMAD FAIZWAN BIN MUSA	BTECH HONS (UTHM) (ELECTRICAL ENGINEERING - ELECTRICAL POWER, 2019)

KEJURUTERAAN KIMIA

120965	FARAH NABILAH BINTI ROSLEE	BTECH HONS (UniMAP) (CHEMICAL- INDUSTRIAL CHEMICAL PROCESS, 2019)

KEJURUTERAAN MEKANIKAL

120963	MOHD IZUAN NIZAM BIN YAHYA	BTECH HONS (UNIKL-MIMET) (NAVAL ARCHITECTURE & SHIPBUILDING, 2013)

PERMOHONAN MENJADI AHLI 'INCORPORATED'

KEJURUTERAAN AWAM

No. Ahli	Nama	Kelayakan
120941	LIAU CHAI SING	B Sc(NATIONAL CHENG KUNG UNI)(CIVIL,1988)

KEJURUTERAAN MEKANIKAL

119808	DEEBANTH SOONTHARAMOORTHY	BE HONS (SUNDERLAND UNI.)(MECHANICAL, 2021)

PERMOHONAN MENJADI AHLI 'ASSOCIATE'

KEJURUTERAAN ELEKTRONIK

No. Ahli	Nama	Kelayakan
119807	IZZRUL FAZLEE BIN ABD AZIZ	DIPL. (UiTM)(ELECTRICAL-ELECTRONIC, 2002)

Dear Members,

The 436th Council meeting was held during the AGM day and there were no lists presented for Council's endorsement. Thank you.

PERMOHONAN BARU / PEMINDAHAN AHLI

Persidangan Majlis IEM yang ke-**437** pada **17 Julai 2023** telah meluluskan sebanyak 1,584 ahli untuk permohonan baru dan permindahan ahli. Berikut adalah senarai ahli mengikut disiplin kejuruteraan:

DISIPLIN	GRED KEAHLIAN											
	FELO	SENIOR	AHLI	SENIOR GRADUATE	SISWAZAH	"ENGINEERING TECHNOLOGIST GRADUATE MEMBER"	"ENGINEERING TECHNICIAN GRADUATE MEMBER"	"INCORPORATED"	"AFFILIATE"	"ASSOCIATE"	SISWA	JUMLAH
Aeronautikal						3						3
Aeroangkasa			1		4						2	7
Automotif											1	1
Biokimia					1						2	3
Bioperubatan											8	8
Bangunan										1		1
CAD/CAM											59	59
Kimia			7	4	14					2		27
Awam	3	1	43	19	158			2		2	275	503
Komunikasi			1		1							2
Komputer											8	8
Elektrikal & Elektronik								2			15	17
Elektrikal		3	36	11	77	2					163	292
Elektronik		1	7	3	29	2					116	158
Elektromekanikal						1						1
Alam Sekitar					6						2	8
Proses											1	1
Geoteknik			1									1
Industri								1				1
Pembuatan			1		6	1				1	4	13
Marin			1		2							3
Bahan					2						2	4
Mekanikal	1		36	8	72	1		2		2	295	417
Mekatronik			2		6	1					24	33
Mikroelektronik											1	1
Sumber Mineral			1		1							2
Perlombongan					2							2
Arkitek Naval					1					1	1	3
Petroleum			1	1	2							3
Polimer											1	1
Nuklear											1	1
Integrated					1							1
JUMLAH	**4**	**5**	**138**	**46**	**385**	**11**	**-**	**7**	**-**	**9**	**981**	**1584**

Senarai nama ahli dan kelayakan adalah seperti di bawah. Institusi mengucapkan tahniah kepada ahli yang telah berjaya.

Ir. Prof. Dr Zuhaina Zakaria

Setiausaha Kehormat, Institusi Jurutera Malaysia, Sesi 2023/2024

Note:
Continuation would be published in May 2024. For the list of approved "ADMISSION TO THE GRADE OF STUDENT", please refer to IEM web portal at http://www.myiem.org.my.

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- ☐ Engineering/Design (including chief engineer, chief designer, civil/highway/mechanical/planning engineer, other engineering/design title)
- ☐ Buying/Purchasing (including chief buyer, buyer, purchasing officer, other buying/purchasing title)
- ☐ Titles allied to the field (architect, consultant, surveyor, research and development professor, lecturer, supervisor, superintendent, inspector or other allied title)
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What type of organisation do you work in? *(Tick one box only)*

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- ☐ Sub-contractor specialist
- ☐ Design and build contractor
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- ☐ Petroleum producer
- ☐ International/national authorities
- ☐ National/regional/local government
- ☐ Public utilities (electricity, gas, water, deck and harbour, other)
- ☐ Manufacturer
- ☐ Distributor/importer/agent
- ☐ Construction department of large industrial/Commercial concern
- ☐ Association/education establishment/research
- ☐ Construction equipment hire/rental company
- ☐ Project/construction management consultancy
- ☐ Others (please specify) ____________________

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☐ Pipelines/refineries	☐ Construction equipment
☐ Structures/steel work	☐ Construction materials
☐ Building (commercial, industrial)	☐ Hire/rental of construction equipment
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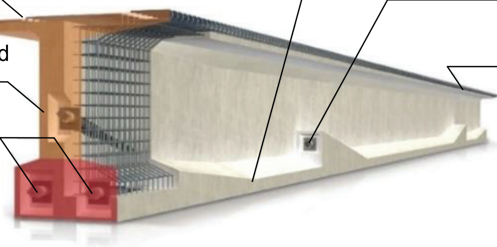

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