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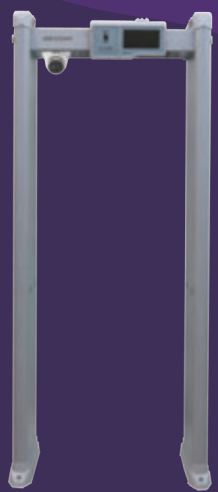

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COVER NOTE

ARTIFICIAL INTELLIGENCE IN MARINE INDUSTRY

by Ir. Roznan bin Abdul Rashid
Chairman, Marine Engineering and Naval Architecture Technical Division

Artificial Intelligence (AI) is currently a popular topic of discussion in the industry. Although the concept may sound futuristic, AI applications are already shaping parts of our daily lives and the world of oceans and seas is no exception. Indeed, AI is helping the marine industry to become more efficient.

Controlled by sophisticated AI systems, the shipping fleets of the future will dramatically improve by reducing the impact of human error, optimising the best routes automatically, and even cutting down on emissions by improving the efficiencies of various onboard systems. The most obvious application for AI in shipping is autonomous ships and, in addition, some applications are being developed to optimise vessel maintenance, augment and upgrade vessel operations, navigation and collision avoidance. Other areas which will benefit from AI are automated processes at shipping terminals.

This month, *JURUTERA* had the opportunity to interview Ir. Prof. Dr Mohd Rizal Arshad and Professor Dr Hanafiah Yusoff who elaborated more about AI and its application in the marine industry. ■

EDITOR'S NOTE

by Ir. Dr Bhuvendhraa Rudrusamy
Bulletin Editor

Like almost everyone else, I spent nearly 3 months working from home during the MCO, doing my part to contain the Covid-19 pandemic. With the recent government announcements allowing interstate travel and the opening of more business, I felt truly blessed and overjoyed to be able to visit my family.

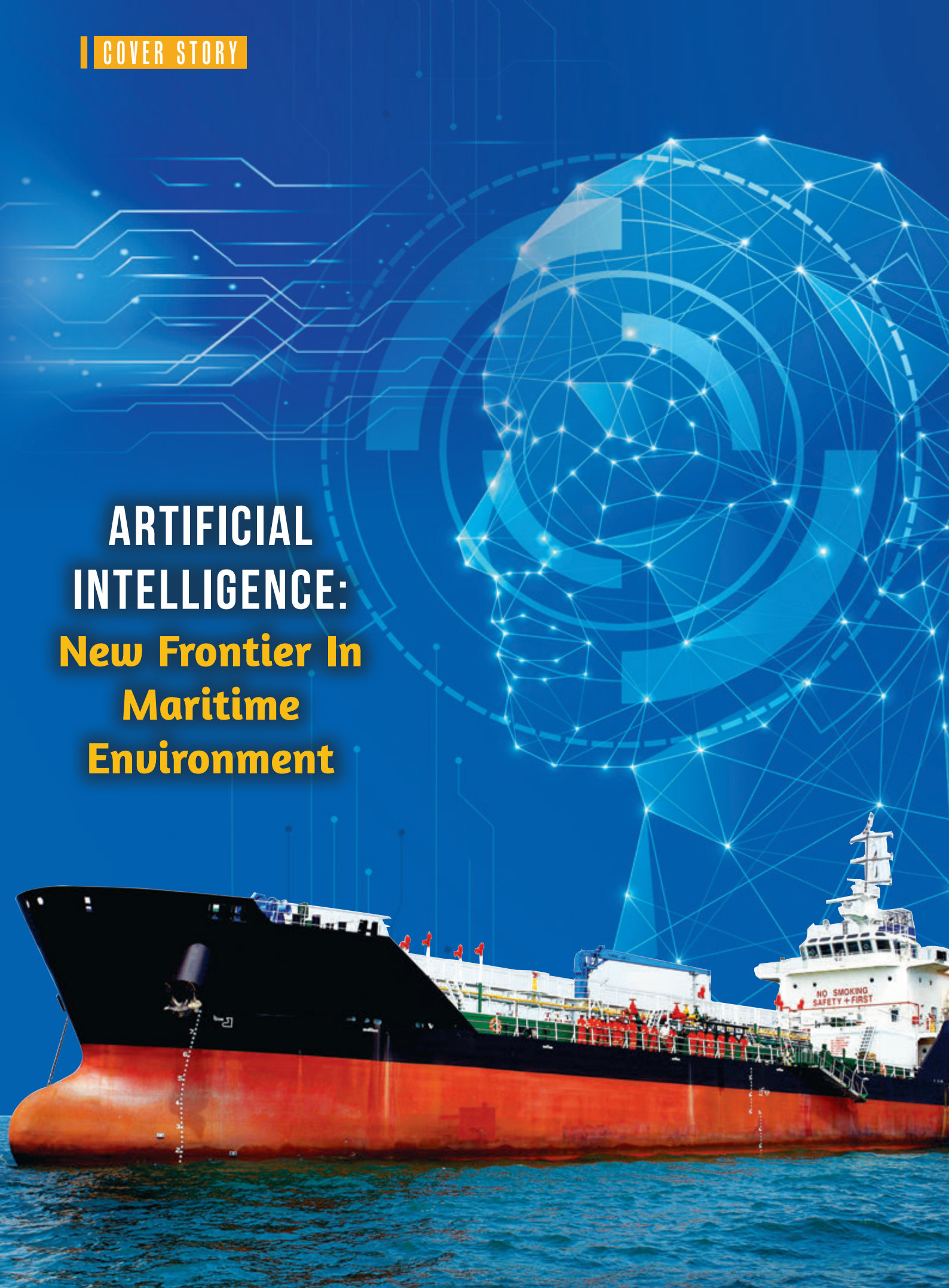
Looking back at the months spent at home keeping myself and my family motivated with activities such as home studies, evening exercises, DIY, etc., I must confess that my personal lifestyle had changed too. I shopped online more than before. I registered and queued up to enter premises for my basic needs, feeling awkward with the newfound discipline instilled by the pandemic.

Moving forward. My job continues to demand that I work from home and so I explore new approaches to the ways I've been doing things before and to better these where possible. Although working from home reduces travelling time, I find myself spending longer working hours as I juggle work and family affairs.

For me, the most disruptive technology during this challenging time is digitalisation, connectivity and data analytics. It is amazing to see so much information made available online which significantly reduces one's need to travel out of the house for one's needs. The virtual environment has made its presence clear and everything seems heavenly for now. Nonetheless, utmost importance must be given to cyber security to ensure our privacy is well protected. ■

ARTIFICIAL INTELLIGENCE:

New Frontier In Maritime Environment



While Artificial Intelligence has penetrated Malaysia's maritime industry, a lot still needs to be done to move it forward, especially by capitalising on digital technology to sharpen competitiveness, achieve greater efficiency, reduce cost and improve profitability.

We are now in the era of Industry 4.0, the industrial revolution trend that pivots on the convergence of technologies, particularly in telecommunications, information technology (IT) and the Internet. This convergence has resulted in faster, cheaper and more efficient transmission, exchange and processing of information and data, which translates into greater competency and productivity, faster decision-making process and the potential for companies to achieve increased trade and improved bottom lines.

Industry 4.0 builds on an array of digital technologies, including Internet of Things (IoT), Big Data & Analytics, Augmented Reality (AR) and Artificial Intelligence (AI). Zeroing in on AI, digital technology refers to the simulation of human intelligence in machines that are programmed to think like humans and to mimic their actions. AI involves the creation of machines with the traits of a human mind, such as learning and problem-solving. The ideal characteristic is its ability to rationalise and take actions that have the best chance of achieving specific goals or providing solutions to problems.

For example, cruise operator Royal Caribbean Cruises (RCC), the world's second-largest cruise operator, has used AI to solve several problems in recent years, such as the exhaustively lengthy time needed to check in a large number of passengers at any single departure point. Traditionally it would take 60-90 minutes to go through the process of boarding a ship. To cut the check-in time, RCC deployed AI facial recognition technology which uses computer-vision equipped cameras which can recognise travellers as they board, cutting down the need to verify identification documents and travel passes manually. Built into the ship terminals that customers interact with as they come aboard are computer vision-equipped cameras with sophisticated algorithms that can match the captured visual data with photographic identification that passengers have submitted before their departure date.

The fundamental element in AI technology is algorithms that are essential in data processing. Many computer programmes contain algorithms that detail the specific instructions a computer should perform in a specific order to carry out specified tasks such as facial recognition and scheduling the maintenance of equipment. The use of algorithms also allows solutions to be automated in many forms other than robots, such as Computer Numerical Control machines using computers executing pre-programmed sequences of machine-control commands. Algorithmic thinking, which is a way of getting to a solution through clearly defined steps, underpins the concept of AI.

Elaborating on AI, Prof. Ir. Ts. Dr Mohd Rizal Arshad, the Deputy Vice Chancellor (Academic & International) Universiti Malaysia Perlis (UniMAP) in Kangar, says AI mimics the way humans make decisions based on very complex data, as well as emulates all the six human senses: Vision, hearing, taste,

Prof. Madya Dr Hanafiah Yussof *is Associate Professor, Faculty of Mechanical Engineering, UiTM. He holds a PhD in Information Science from Nagoya University Japan specialising in humanoid robot. He established Robopreneur Sdn. Bhd. in 2015 and was Chairman (2013-2015) of IEEE Robotics and Automation Society (RAS) Malaysia Chapter. He is also Visiting Professor at University of Toyama Japan and Visiting Researcher at Nagoya University and Hosei University Japan. He has received awards such as ASME Best Mechatronics Paper Award and Nagoya University Award for contributions to International Exchange between Japan and Malaysia.*

Prof. Ir. Ts. Dr Mohd Rizal Arshad *is Deputy Vice Chancellor (Academic & International), Deputy Vice Chancellor's Office (Academic & International), Universiti Malaysia Perlis (UniMAP), Kangar, Perlis. He was President (2019-2021) of the Malaysian Society for Automatic Control Engineers (MACE), IFAC National Member Organisation (NMO), Past-Chair (2019) of IEEE Oceanic Engineering Society (OES) Malaysia Chapter and committee member of IEM Marine Engineering and Naval Architecture Technical Division (MNATD).*

> **AI mimics the way humans make decisions based on very complex data as well as emulates all the six human senses: *Vision, hearing, taste, smell, touch and perception.***

smell, touch and perception.

"With input from all six senses, humans can reach a decision. Before, we talked about parallel processing of data. Computers then were designed using sequential methods, which was why old computers were very big. It was the result of one processing level that needed to be passed on to another level through a long pipeline," says Prof. Ir. Dr Rizal, adding that humans process data in parallel, using our multiple neurons and sensors to reach a conclusion. He says the neural network, with multiple inputs and multiple layers of processing and a single layer of multiple output, had long excited sensor scientists to mimic the ability of human parallel processing of data for decision-making, in machines.

He says it also covers many sub-domains or various states of knowledge. Proper AI has elements of computer science, mathematics, linguistics, psychology and sociology, to name a few, in order to make one complete AI system with numerous capabilities.

"For example, one AI module has the ability to discern voice tone or pitch and can tell if a person is happy or angry or experiencing other emotions and some can recognise speech and facial expressions. In facial recognition, the AI machine can detect minute facial feature variations which may indicate changes in one's situational feelings. These are just a few examples of what AI is capable of. Others include predictive analysis, image recognition, machine vision, translation from speech to text and more," he says.

PROCESSING TOOLS OF AI

AI has two processing tools: Machine Learning (ML) and Deep Learning (DL). Commenting on these, Dr Hanafiah Yussof, Associate Professor at the Faculty of Mechanical Engineering, Universiti Teknologi MARA (UiTM), says many people often confuse AI with ML, DL and even data analytics.

He explains: "In my perspective, AI has become a general word; it is not alien anymore but some people still have a shallow understanding of it and tend to mix it up with ML and DL. To understand it, let us imagine AI as a big umbrella, and under it are two segments. The first is ML and the next level is DL. Both are tools under AI, which is a process to come out with certain predictive measures based on algorithms. These are programmed using different techniques, such as neural advance network."

The difference between ML and DL is the amount of data generated. "If data is still at optimum level, ML can be used to process it and come out with the objective of calculation. There are two inputs of algorithms. One is pure numerical data and the other is sensor data. An example of the former is financial data, which can be processed and filtered by using algorithms to calculate and achieve accuracy with certain value, such as predictive value which gives a high confidence level to use the data," he says.

AI is used to detect and flag unusual activities in banking and finance such as large account deposits and unusual credit or debit card usage which can help the fraud department to take necessary actions. AI is also useful in healthcare industry, such as for dosing drugs and administering different treatment in patients as well as for surgical procedures.

The other type of data is sensor data, which is collected by sensors which can observe the environment and then measure its physical quantity. The sensors can translate physical measurements such as light, temperature and water pressure into data for the digital domain. There are five types of sensor data:

1. Live or real-time data which can trigger an alert if something goes wrong, so it can be used to control, monitor and decide the best course of action to be taken.
2. Historical data for record-keeping and compliance purposes.
3. Analytical data for learning and assessing situations to get certain results.
4. Predictive data for forecasting and planning.
5. Data for change that can be used to achieve consensus and make improvements to business operations.

Assoc. Prof. Dr Hanafiah further explains: "When the amount of data is so huge that it is streaming per day, per hour or per second, then we go to next level, which is DL. Data analytics then play a very important role in analysing the data and coming up with output based on the data, using different techniques, such as supervised or unsupervised, as well as determine if the data can be generated as control data or uncontrolled data. These are all the technical aspects. Now AI is used broadly, not only in hardware but also software. The most important thing is how the data collected can be used effectively."

Similar to how humans learn from experience, the DL algorithm, which allows a task to be performed repeatedly, can be tweaked to improve the outcome each time. This is possible as the AI neural networks have various (deep) layers that enable learning. DL can also be utilised to learn and search for the

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optimal solution, even when a data set is very diverse, unstructured and inter-connected. For example, DL provides "vision" for driverless delivery trucks, drones and autonomous vehicles. DL algorithms allow an autonomous vehicle, for example, to evaluate the situational conditions of the road and how best to respond. The more data the algorithms receive, the better learning for the DL algorithm and closer DL will imitate a human's decision-making processes.

HOW DATA CAN BE USED

AI systems are critical for companies wishing to extract value from data by automating and optimising processes or getting insights to take action and solve problems. Companies can leverage on large amounts of available data collated through AI, which would otherwise be impossible for any one person to identify. Analysing the data enables companies to predict critical care requirements, identify fraudulent transactions, achieve targeted communications and many more.

Citing further examples on the use of data, Prof. Ir. Dr Rizal says a pre-programmed camera, when placed strategically to focus on a crowd in a particular place, can identify situations and provide data to avoid possible collision or people being trampled on. Using different classification methods and a sequential process, AI can be used as input to take and make a decision, such as whether to proceed or to delay certain operations.

Prof. Ir. Dr Rizal says that with its capability to deduce concepts and process the main parameters in a situation, AI has tremendous potential for application in many industries, including the marine industry. "For example, when operators at a port want to load cargo on ships, they need to sequence the cranes to move and to schedule the loading of the cargo. Since this operation can become complex especially when it involves a huge number of cargo and ships, operators need a system to intelligently make a schedule. This is where AI can come in."

AI APPLICATION IN MARITIME INDUSTRY

AI can be applied to all the three main sectors of the marine industry, namely shipping, shipbuilding & ship repair and port & terminal operations. The well-established maritime industry, dating back to the 15th century when Melaka was a major national and international seaport in this region, had also surfed with the wave of Industry 4.0 by going digital. Extensive industrialisation over the years has also facilitated the incorporation of newer and better technologies particularly in port infrastructure. Ports use IT extensively to plan container loading and offloading on-board ships and to track containers in dockyards.

AI is already being used for automated loading cranes in some ports, such as in Shanghai (China), southern California, New Jersey and Virginia (United States) and Rotterdam (the Netherlands). AI makes decisions on which container to stack or unload first, based on database and other analyses. All ground processes are automated with significantly reduced dependency on manual loading and unloading of cargo, for example.

Some shipping companies are already using real-time information to send and receive data on cargo transported by their vessels. Ships are also equipped with e-navigation features, such as electronic charts. Dr Hanafiah says these features can be used to manage the traffic of vessels in the fastest and most optimum way as well as more précised.

"There is also the possibility of accidents or cranes being wrongly operated in dockyards so the use of visual AI data or sensor data can give early alarm to control operations and avoid accidents. This is important from the safety aspect," he emphasises. He adds that AI can also be used in the total supply chain of commodities; for example, companies can optimise their operations and avoid wastage through reduced waiting time or by getting ground logistics to operate at precise times. The cost of transportation can be reduced through greater operational efficiency and better management of vessels.

> **"While AI technology is available for many applications in the maritime industry, the technology is not yet mature enough for the industry. It is not just a question of whether it will work; the greater concern is whether it will work all the time."**

Assoc. Prof. Dr Hanafiah also noted that in terms of operational cost effectiveness, some of Malaysia's busiest ports have yet to manage and leverage on AI data properly. "For example, they are not addressing the issue of fuel wastage by coming out with business intelligence with data analytics that port managers can use to manage the ports better. The maritime sector needs to implement and install a lot of sensors to derive data that can be used to optimise operations, reduce cost and increase efficiency. In my opinion, our country's maritime industry is mature but its use of AI is quite slow. Not much effort has been taken so far to venture into AI, compared to other sectors such as banking," he says.

He reasons that the business margin in maritime sectors, such as logistics and oil & gas (O&G) support services, is very slim and this is a

deterrent to investing in AI technology. "But with Industrial Revolution 4.0, pressure is mounting for players in Malaysia's maritime industry to use AI as a means to reduce cost, improve profit margin and become more efficient. This is very important as the regional maritime industry is very competitive," he adds.

The world's maritime environment is now seeing top shipyards in countries such as South Korea, Japan and China, using sophisticated computer-aided design software to design ships (and share drafts of designs with ship owners through cloud computing), marine equipment and others.

Autonomous, crewless ships are being tested, while remotely controlled, autonomous vehicles and robotics are increasingly being used for repair and maintenance work at yards to check the integrity of vessels and offshore structures.

Prof. Ir. Dr Rizal says: "When we talk about AI, we must know that it is part of the solution to problems, not the only solution. Autonomous ships are ideal because they eliminate the element of danger in certain operations at sea. Robotics can be applied to do jobs that are dirty, dull (or repetitive), dangerous and difficult – in short the 4Ds."

AI technology, he says, enables autonomous vessels to take off, navigate and make decisions in the open ocean and to optimise energy. Now marine robotics are being further developed for data collection, such as measuring water temperature over a prolonged period as it can be a huge risk to deploy people out in the ocean for five to six months. Even robots need to be remotely taken out of the waters periodically as marine organisms can grow on the robots and damage them.

Prof. Ir. Dr Rizal emphasises that it is not simply a question of applying AI technology as it is also important that people understand it. "AI is not going to replace humans 100% and in every spectrum of work but it is efficient in certain domains of work, especially when we need to have very fast access to data. In general, we must utilise AI in the right situation. While AI software is available, there is however a limitation to the readiness of the hardware for implementation. On the hardware side, we are still at the preliminary stage," he says.

Associate Prof. Dr Hanafiah concurs on the limitation of hardware to implement AI in the maritime sector. He says the cost of investing in hardware and technology is also a deterrent to faster robotic applications in maritime activities.

"We have received a lot of enquiries from shipyards, including on the use of AI for inspection of tanks, ship painting work and other maintenance work. Manual inspection of tanks consumes manpower, time and cost. Current technology in terms of pipeline inspection and cleaning and ship body painting by robots is available and this lowers the risks for humans doing the job," says Assoc. Prof. Dr Hanafiah, Founder, Director and Group Chief Executive Officer of Robopreneur Sdn. Bhd., which commercialises his research products and explores various services in robotics business.

Marine industry players can also use drones for air inspection and monitoring of ships. "We also have the visionary objective to introduce autonomous vessels for the Malaysian maritime industry by leveraging on our AI capability. It is the same way as we understand how autonomous cars can operate. Autonomous vessels can work for the maritime industry by combining robotics and navigation system within the AI system," he says.

NEED FOR RELIABLE PERFORMANCE OF AI

While AI technology is available for many applications in the maritime industry, such as scheduling cargo operations and navigation of ships, Prof. Ir. Dr Rizal feels the technology is not mature enough for the industry. "It is not just a question of whether it will work; the greater concern is whether it will work all the time. My opinion is that, in terms of AI technology for the marine industry at present, it is not reliable enough to work every time," he says.

He explains that the data needed can be complex, such as how to optimise schedules between ports to carry cargo into docks and onto ships, how to schedule the operations of multiple cranes, how to monitor multiple ships criss-crossing between docks with multiple sea passages and how to determine energy efficiency of ships once out on the ocean until they reach their destinations. All these and more are issues that need to be looked at in greater detail.

"The use of autonomous tankers, for example, to carry crude oil from one continent to another, is seen as a solution. There are no humans onboard such tankers which sail through rough seas. They are self-driven and remotely controlled, including to avoid colliding with other sea vessels. My research team has looked into the aspect of preventive collision avoidance of small ships at docks. It is a challenge to make it work for the maritime industry all the time and we still have a lot of work to do to ensure that this can be confidently adopted by the industry," says Prof. Ir. Dr Rizal.

Another area is the need for regular checks on the integrity of ship bodies to ensure there are no cracks and other problems. Body checks are mostly done manually at dockyards and to help improve this area, he and his team are developing a system to perform body checks directly on water without the necessity for ships to berth at dry docks.

"We want to ensure the activities of the maritime industry can be at its most optimum, but we also don't want to over-stretch nor under-use AI technology. For now, our aim is to acquire enough data with parameters which can help industry players decide on the best course of action for specific operations," he says.

He points out that there are new technologies which can complement AI for the maritime industry. "Two years ago, PETRONAS projected 9 big areas

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with the potential to contribute toward our maritime industry. Among these is the development of autonomous vessels to carry supplies from O&G docks to ocean platforms without having to wait for good weather conditions. This means supplies can be transported at any time. Checking of oil platforms with steel beams which are prone to rust is another area identified. Aerial robots can be used to check the integrity of the structure. Robotics can be applied to determine how much fuel to pump out. All these tools are now available but there is still a need to find ways to optimise algorithms for effective application. This is a challenge for AI researchers especially on successful applications of data analytics.

CHALLENGES DURING COVID-19 PANDEMIC

The current Covid-19 global pandemic has posed a lot of challenges for many industries, including maritime. Assoc. Prof. Dr Hanafiah cites, for example, Japan's Diamond Princess cruise liner, which is one of the world's major clusters for the viral infection.

"Cruise ships such as the Diamond Princess, which transport people for leisure from port to port, are not prepared for such situations. They do not have advance monitoring systems on board. But from now on these ships must install equipment to remotely and rapidly measure the body temperature of passengers and to do facial recognition of those onboard. It is important to recognise and record people who have tested positive for Covid-19. They may have recovered but the virus has the tendency to mutate and those affected may spread this," he says.

"There is no vaccine at present so if we have a system to detect the root or movements of people who have tested positive for Covid-19 and who travel on public transportation such as ships, buses, trains and aeroplanes, we can monitor them even two years from now. If we do not monitor and another pandemic strikes us, what do we do? We must take extra precautions now."

At present, he says, the maritime industry does not have the means to record and report on viral infection in livestock and commodities like meat which ships carry from port to port. "To prevent future transmission of the virus, we must have the mechanisms to trace the origin and history of livestock and other products; this will help us to make appropriate decisions and take the necessary actions," he stresses.

In terms of cross-continent travel, Assoc. Prof. Dr Hanafiah says the shipping industry is as badly affected as the airline industry. Airlines cannot carry passenger load at full capacity because of social distancing regulations, hence making it not economical for them to operate. Passengers are also thoroughly checked, causing much delay and this discourages people from travelling. With tighter regulations in place at ports of calls for ships and tankers, compounded by the drop in oil prices, many vessels are forced to lay idle. Operators are finding it hard to operate in the face of the current recession caused by the Covid-19 pandemic.

"It is a big challenge for the industry, unless the players can innovate and come out with new platforms to exchange or transport goods. The pandemic is not expected to end any time soon; some predict that the situation will not improve until the middle of 2021," he says.

It is a disruption to the global economy, including the whole supply line of the maritime industry, encompassing its entire eco-system, from service companies and parts suppliers to maintenance companies. All were impacted when the Malaysian government enforced the Movement Control Order. Many businesses try to remain afloat while continuing to incur operational costs, such as parking charges for vessels and staff salaries. Some have been forced to lay off workers or reduce manpower and shrink their businesses in order to survive.

Assoc. Prof. Dr Hanafiah says that despite such difficult circumstances, the economy must continue to roll out. "We need to strike a balance between keeping people at home and letting industries operate. Our government has done a good job but we must still take precautions as Covid-19 can spread again. On the global front, there is a need to find a way to increase oil prices and restart trading of oil-related commodities. Reviving the support system in the O&G industry can spur the economy as well as create jobs again within the eco-system."

Prof. Ir. Dr Rizal adds: "The Covid-19 pandemic has shown how humans are vulnerable and how it even affects the production of goods. With AI, some industries can proceed, thus reducing the interruption to production."

While some existing jobs are lost due to the pandemic, he foresees the creation of new types of jobs. He says data scientists who can analyse and manage data will be at the top of the list of new jobs in demand. So will people who know coding, and who can exploit AI technology and IT. He says post Covid-19, it is no longer the survival of the fittest but more the survival of the quickest. Two persons can have the same knowledge but the one who can respond the fastest will thrive better. Otherwise the opportunity is lost. Some understanding of AI will help one to decide quickly and move fast.

In entering the period of recovery from the Covid-19 pandemic, business owners and employees need to up-skill, learn and re-learn, and be more data-driven. Acquiring knowledge on data analytics and robotics is the way forward.

Prof. Dr Hanafiah says industries must revive by reassessing and finding the optimum way to recover. Technologies such as AI can be part of the recovery plan. "The more people are able to absorb technologies, the greater the chances for industries to recover. It is like pushing a reset

button to decide which technology to use in order to recover and to see how technology can work to the advantage of humans. We cannot expect robots to do everything; we must strike a balance between human participation and technology input in order for both society and industry to recover. The use of technology can help speed up recovery," he says.

FUTURE EMPLOYMENT SCENARIO

In future, Prof. Ir. Dr Rizal says, almost all types of employment will have technology embedded in the job scope. Therefore, people must know and embrace some language of technology and have a basic grasp of it. In terms of AI, it is not the end product. Instead it is a tool for future jobs. He notes however, there is the issue of the compatibility of technologies. There are now inadequate standards in Malaysia for AI deployment in industries and it is an area that must be addressed.

We can learn from Germany's Industry 4.0, which is being accepted as the standards covering all aspects of digitisation, including ML, data producing and interpretation. Germany, through the German Industry-Science Research Alliance, was after all, the country that first introduced the concept of Industry 4.0 in 2011. Since then there has been increasing digitisation of the entire supply chain, which makes it possible to connect actions, objects and systems based on real-time data exchange. Industry 4.0 technologies require systems integration with the application of standards covering both technology standards and the importance of process standardisation. For Malaysia to advance further in the utilisation of AI across industries, the ecosystem for AI growth covering the education, societal and industrial stakeholders must be developed.

> **We must recognise that AI will not replace all jobs but it can help jobs to be done better. For example, in the marine sector which is governed by various rules and regulations, the AI system can assist by providing the required data.**

In this aspect, Assoc. Prof. Dr Hanafiah says the country is late in transforming curriculum structures in universities and in preparing students to meet current and future demands of industries. "For instance, AI is a cross-disciplinary area, covering both hardware and software so there is always something that can be worked on. There are many open source tools and tutorials to help people embrace AI. We need some proof of concept to be done. In optimising a process, we do not merely want a system to work. Like Prof. Ir. Dr Rizal says, reliability of the technology must be there for it to work every time," he says, adding that in terms of readiness of local talents in AI, the country needs to tackle both the academic and industry aspects and to ensure AI will evolve from the academic and technical perspectives to benefit industries.

On whether AI will be a threat to engineers, technicians and ship crew, Prof. Ir. Dr Rizal says robots are already being deployed to do certain jobs, especially those involving the 4Ds. "We must recognise that AI will not replace all jobs but it can help jobs to be done better. For example, in the marine sector, which is governed by various rules and regulations, AI systems can assist by providing the required data," he says.

Prof. Dr Hanafiah says: "It is inevitable that robots will take over some jobs, especially 4D jobs. Humans must therefore develop new skills to do jobs that require higher thinking levels."

ADDRESSING LEGAL & STATUTORY ASPECTS

In employing AI in ships or in other marine-related areas, Prof. Ir. Dr Rizal says legal and statutory aspects must first be put in place. "We cannot blame a system for making the wrong judgement and decision when something untoward happens. There must be accountability for this and it should fall on humans who manage the system," he says.

There is legal implication with regards to safety and security issues, such as the decision to abort or to proceed with an operation. It is therefore important to have a clear statement of legal implications for the use of AI modules. "When something bad happens, we cannot start pointing fingers, especially when AI is used in highly sensitive situations," he stresses.

Both professors who are also experts in the AI field, agree that there is still plenty of room for the extensive use of technology in the marine industry, incorporating areas such as maritime supply chain security, cargo tracking, environmental protection, navigating safety, planning, operations, administration and monitoring, to progress further and at the same time become safer, more efficient, environmental friendly and cost-efficient. ■

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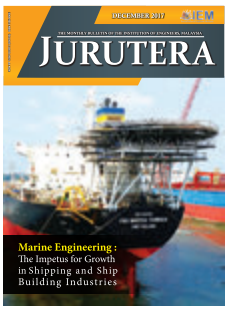

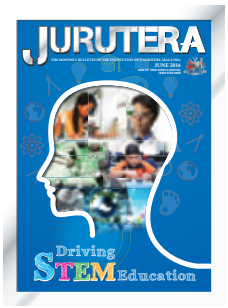

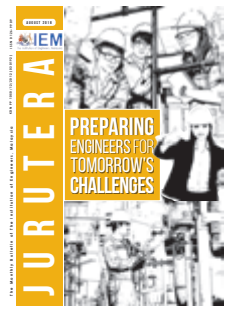

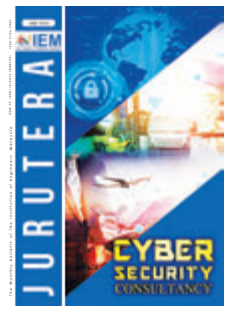

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ARE CURRENT ROBOTIC TECHNOLOGIES READY FOR OCEAN SEARCH & RESCUE MISSIONS IN DEEP OCEANS?

by Ir. Prof. Dr Mohd Rizal Arshad

On 8 March 2014, Malaysia Airlines (MAS) Flight MH370 lost communication after the main control tower of Kuala Lumpur International Airport (KLIA) had supposedly handed over the flight monitoring to the Vietnam Aviation Authority. The confusion that arose after the flight went missing for a few hours and the frantic search which followed for days and months after, did not result in a conclusive explanation.

The final reliable location, via available satellite data, in the middle of the South Indian Ocean, led investigators to believe that Flight MH370 ended up in the deeper part of the ocean which varied from a depth of 3,000m to a maximum of about 7,000m.

The uneven and unknown terrain of the ocean bed, coupled with the rough ocean surface and volatile weather made the Search & Rescue (SAR) mission very difficult. The use of underwater robotics with relevant sensors and instrumentation seemed appropriate but after more than 28 months of intensive searching, the SAR teams failed to detect any probable debris or any part of the ill-fated plane. Why? Did the available robotic technology fail us? Or were there other reasons? This article will discuss this specific issue.

UNDERWATER ROBOTIC TECHNOLOGY

The general aim of robotic technology is to execute task/tasks deemed to be Dangerous, Dirty, Difficult & Dull (4Ds). A robotic system will have the necessary capabilities and capacity to tolerate the dangerous circumstances of the environment in which the task needs to be executed. Coupled with the extended duration of application where the human operator will not be able to withstand and sustain reliable execution, a robotic system can certainly perform and sustain its execution over a much longer deployment mission. Of course, all these assumptions are based on the premise that the power system and all sub-systems for the chosen robotic system would operate as expected.

Underwater robotic technology includes fixed and mobile types. Mobile type robotic platforms include land, underwater and aerial mobile robotic systems. In terms of a basic sub-system, all mobile robotic platforms will adopt similar modules. The differences will be in platform design, mode of propulsion, sensing parameters and communication modules. The "brain" or controller module will follow similar design structures with suitable fine-tuning according to the targeted application.

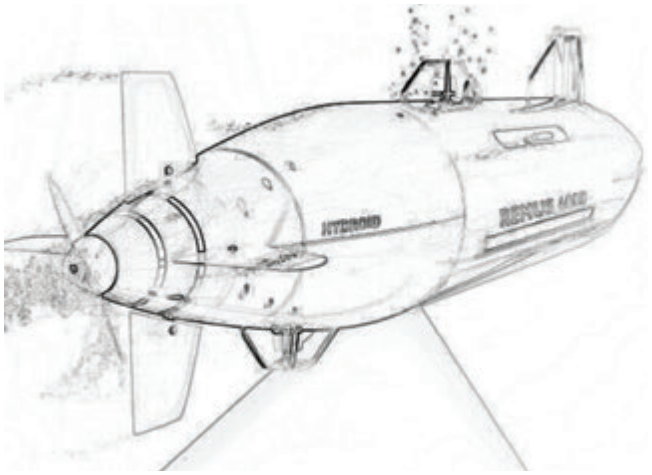
Underwater robotic platforms such as the Remotely-Operated Vehicle (ROV), Autonomous Underwater Vehicle (AUV) and Underwater Glider Platform (Gliders) will be designed to cope with underwater environment applications, especially in handling the high-pressure and corrosive marine conditions. As the world's average ocean depth can go down to thousands of metres, the design of an underwater robotic platform will always be governed by the maximum depth rating (water density) and the ability to cope with the varying temperature and salinity levels. The high dependency on acoustic mediums for sensing and communication also limits the versatility of underwater robotics platforms.

SUDDEN DISAPPEARANCE

Flight MH370 was flying on a regular route from KLIA to Beijing. Its sudden disappearance and the frantic search for its whereabouts remain one of the world's greatest aviation mysteries till this day.

Nobody could have guessed or predicted that, in this modern era of global aviation industry and the availability of advanced terrestrial and satellite communication systems, an aircraft as big as MH370 could be lost and no proof found to conclusively determine her final resting place.

In one of the Press briefings by the Malaysian authority, it was stated that there were two possible zones for SAR, i.e. northern and southern corridors. The northern corridor would bring the plane over a large area of the continent and across



many countries. The southern corridor would bring it right into the South Indian Ocean and even possibly into the vast expanse of unchartered waters of the Southern Oceans, very near to Antarctica. This meant the wreckage would have sunk into the ocean bed which went as deep as 7,000m.

The southern corridor theory was finally accepted as the logical scenario due to the corroborated Inmarsat satellite data ping data. The initial estimated area of search was very large, i.e. about 320,000 sq km. The assets needed to cover such a search area would be tremendous.

The search area was later revised to about 120,000 sq km and the underwater ocean bed mapping tasks were conducted by multiple groups. There was an abundance of raw imaging data of the ocean bed acquired. The major tasks were to reconstruct and make visual identification for potential pieces of wreckage, assuming the plane crashed into the ocean and had broken into pieces. Lighter parts would drift away while heavy pieces would sink to the bottom.

Using the drift model, researchers tried very hard to identify the best possible location of the wreckage, especially the fuselage where one would find the black box.

STAGES OF SAR

In a SAR mission, the main objective is to recover the survivors and the aircraft black box which comprises the Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR). If a plane nose-dives into the ocean, one can safely assume that there are no survivors. So the target will be to look for the black box.

The first stage was to look for floating debris but, as the days went by, no debris was found. Images of floating debris were in abundance but none were found that could have come from Flight MH370.

The search of the ocean bed continued for the following 30 days during which the black box would give the acoustic signature (i.e. a short pulse with carrier frequency of 37.5 kHz). False signals were detected and after the 30-day period ended, the ocean bed mapping stage was triggered. The use of towed underwater mapping module or tow-fish was implemented. This module was towed using an elongated cable connected to a host ship which enabled the mapping module to get close to the

ocean bed. An AUV System (Bluefin) was also utilised to enable close and high resolution mapping but, due to the wide expanse of the targeted search area, the ocean bed mapping took months to complete.

The purpose of the tow-fish and AUV was to determine the exact location of the wreckage before a deep-water ROV system could be deployed. The deployment of an ROV for mapping was not done because it was not a practical or logical step to take. An ROV is a local area inspection system, while an AUV is a global searching platform or wide-area mapping platform. Using the right tools for the right job is critical so as not to waste time and resources.

The use of an underwater robotic platform is mainly limited to ocean bed mapping operations. The bottleneck is not due to the technical side but rather to the time taken to cover the total search areas and to process the acquired raw data. Until this day, the completed and final analyses of the data gathered have not been offered for wider scrutiny. Even the fate of the search mission remains uncertain.

WHAT NEEDS TO BE IMPROVED?

If we look at the use of technology for deep-water SAR, we can see the high dependency on a limited number of deep-water technology assets. The use of one or two deep-water AUV and the limited number of fully-equipped search vessels with towed and hull mounted ocean bed mapping module (Multi-Beam Echo Sounders) make SAR missions too slow in relation to the total areas which need to be mapped. Unreliable weather conditions also hamper proper AUV deployment and recovery.

The use of multiple AUV platforms with extended power sources will be useful for longer ocean bed mapping mission. A smaller surface-based hull mounted for deep sonar imager will allow faster mapping of the designated search zones. Onboard data analyser with super-computing capabilities will allow on-site ocean bed reconstruction and determination of the reliable clues.

The ability to do underwater docking for data transfer and power recharging is also a very attractive feature in new generation AUVS. Highly sensitive hydrophones with built-in signal processing modules can reduce the amount of post-processing needed. More coordinated mapping strategies will allow more cohesive and concrete data reconstruction and visualisation.

The technologies for all these are available for different applications, but have yet to be adapted for deep-sea SAR applications. As for the black box, there should be a release mechanism to allow the module to detach itself from the fuselage and float to the surface. On top of this, the battery pack should allow for a much longer signal activation time, possibly up to one year instead of the current 30-day limit.

Deep-sea SAR missions require newer and more novel technology. The possibility of another incident like MH370 should not be ruled out. What is more important now is to ensure that available deep-water technologies are further improved and ready for such an incident.

CLOSURE

In my opinion, the extended SAR mission for probable MH370 wreckage in the deep oceans was constrained by the SAR strategies adopted and time-to-deploy limitations due to the estimated location, rather than to the unavailability of tools or technologies. The available underwater robotic technologies and platforms are relatively ready and stable.

Some issues remain, such as the use of proper equipment and the analyses of the data acquired. Admittedly, the cost of deploying an underwater robotic platform for ocean bed mapping is quite high. This is probably one of the reasons why the SAR mission for MH370 has yet to find a satisfactory closure, even up to this day. Nonetheless, we are always hopeful that one day, the mystery will unfold.

So, back to the original question: Are current robotic technologies ready for Search & Rescue missions in deep oceans? The answer is "YES".

"Good Night Malaysia, Three Seven Zero" ■

Author's Biodata

An academician with Universiti Sains Malaysia, **Ir. Prof. Dr Mohd Rizal Arshad** was seconded to Universiti Malaysia Perlis as Deputy Vice Chancellor for Academic & International until end 2022.

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1. Welcome Address by the President for Session 2019/2020.
2. Presentation of Honorary Secretary Report Session 2019/2020.
3. Presentation of Financial Statements for the year ended 31 December 2019.
4. Proposed Amendments to the IEM Constitution.
5. Presentation of Results of Election for Council Session 2020/2021.
6. Presidential Address 2020/2021

Scan this QR Code for The Annual Report 2020 and proposed amendments to the Constitution

SCAN ME

SOUTH KOREAN SHIPBUILDING PRACTICES FOR NAVAL SHIPS

First Admiral Dato' Ir. Hj. Ahmad Murad bin Hj. Omar (Rtd)

In 2019, former Economic Affairs Minister Datuk Seri Mohamed Azmin Ali said the aerospace industry will be given high priority under the 12th Malaysia Plan (2021-2025). A special technical working group would be formed to develop a 5-year strategy for the industry [1]. It was estimated that, for the military and commercial sector in 2017, the industry was worth US$838 billion globally and for the Malaysian market, it was projected to, by 2030, contribute revenues of RM20.4 billion for Maintenance, Repair & Overhaul (MRO), RM21.2 billion for aero manufacturing and RM13.6 billion for engineering and design services, a total of RM55.2 billion [2]. If the aerospace industry can generate such a sizeable revenue, what would the outlook for the marine shipbuilding sector in Malaysia?

SHIPBUILDING INDUSTRY: SOUTH KOREA VS CHINA AND JAPAN

At the beginning of the shipbuilding industry, Japan was the world leader. Slowly thereafter, South Korea caught up and overtook Japan's position. In the meantime, China slowly picked up speed and, in 2012 [3], it overtook South Korea for the top position until 2018.

The year 2018 was a meaningful juncture for South Korea's shipbuilding industry. In 2018, it reclaimed the title of world's biggest shipbuilder (in terms of orders volume) for the first time in six years, since it conceded the top spot to China in 2012.The order quantity stood at 26 million CGT (Compensated Gross Tonnage) in 2018, which was merely 28% more than that in 2007 when the demand peaked out, but reclaiming the position was significant.

The three major South Korean shipbuilders made a remarkable progress in the liquefied natural gas (LNG) carriers market, a high-value-added business that required advanced technology. Of the worldwide total of 59 contracts for LNG carriers last year, Hyundai Heavy Industries had 24 (including 12 for Hyundai SAMHO Heavy Industries), Daewoo Shipbuilding & Marine Engineering signed for 17 and Samsung Heavy Industries clinched 18 deals. In particular, Samsung signed an LNG carrier contract worth 209 billion Won on the last day of 2018 [4]. One reason why South Korea was able to grab the lead position was that it had the correct ingredients to become the world's leader.

SOUTH KOREAN INGREDIENTS FOR SUCCESS

In 1970-1990, South Korea began upgrading its shipbuilding industry. Three elements were fundamental: Government support, low labour cost and accessibility to funds [5]. With these in place, South Korea began to indulge in technological advancements and to upskill its workforce. It was through the upskilling backed by technology that its shipbuilding industry gained a sure footing to produce high value-added ships.

INVOLVEMENT IN NAVAL SHIPS CONSTRUCTION

In 2015, under a programme to enhance the transformation of shipbuilding techniques in Boustead Naval Shipyards (BNS) Lumut, and supervised by Might Meteor Advanced Manufacturing Sdn Bhd, came an opportunity to visit Daewoo Shipbuilding & Marine Engineering (DSME) shipyard in Geoje Island. It was clear during the briefing (and a guided tour of the yard later) that DSME was involved not only in commercial shipbuilding but also in naval shipbuilding, including submarines.

Today, many countries in Asia have adopted the South Korean technology and some of the best practices in its application for ship repair and building projects.

BEST PRACTICE APPLIED

It can be seen now that the South Korean Best Practice (SKBP) is not a very complex approach and that its focus is on "Effective Planning & Execution" as explained below:

- SKBP is a productive work culture that uses a production-oriented zone methodology to control

shipbuilding and ship repair works by dividing onboard areas into discrete zones.

- The divide-and-conquer approach, backed by comprehensive serial documentation, allows for rapid and effective work execution, identification of problems and adaptation to change.
- The SKBP emphasis is on coordination, accountability and initiative among personnel to put together a professional and efficient workforce capable of executing shipbuilding activities in the marine industry.

Figure 1 provides a breakdown sequence from start to delivery of a shipbuilding process.

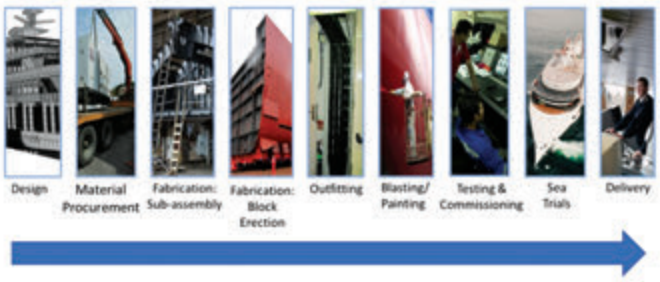

Figure 1: Generic shipbuilding process (Courtesy of OMAHAMS Corp)

EFFECTIVE PLANNING & EXECUTION

Focusing on effective planning and execution seems to be the correct approach in many endeavours and is not limited to shipbuilding. The elements involved in planning are:

- **Job Design (What to do):** This element covers the scope of work and content. Simply put, it's the series of processes that need to be carried out on the project and scoping the jobs is vital as this need to be done at the early stage (before starting). Usually, the cost estimation starts here. Detailing work content is also done at this stage when the work scope is further expanded into very detailed content to enable the project manager, planner and production department to effectively execute the tasks.

  For this element, one key consideration is the zoning concept. Once the complete vessel is dissected into zones, the scope of work and its contents can be streamlined to a very close accuracy in terms of what is needed to complete the jobs within a particular zone.
- **Job Method (How to do):** This element includes work process, Detailed Work Procedure (DWP) which covers, work sequence, time and master plan. Here, the key consideration in the design production stream include determinant of process, alignment with zone and disciplines of the organisation such as Electrical, Hull & Painting, HVAC, Piping, Machinery etc.

  When planning a certain zone completion, meticulous planning is involved to determine which team from which discipline goes in first and which goes in later. It will be difficult to have five teams from five different disciplines working in one area/zone at any one time. The sequencing, the orderly arrival of materials, the correct discipline for executing the task before and after and avoiding collision of tasks within the same vicinity are vital. The key consideration here is Design Production Stream.
- **Job Scheduling (When to do):** This element includes resource allocation and covers time, manpower and materials. It also covers production levelling. It deals with the juggling of work and adopting the Insulation, Hull, Outfitting & Painting (IHOP) schedule approach. Key considerations are high speed and best efficiency. As all projects are related to scheduling, which is directly related to time and labour required to accomplish the completion of a particular zone, the timely arrival of materials is important. The supply chain becomes essential and, in certain instances, even vital.
- **Job Instruction (Who to do):** This element involves executing the work packages in the most efficient sequencing, mobilising the optimum number of manpower and ensuring materials arrive just-in-time. This can only be achieved and will contribute to the timely completion of the work packages if, and only if, the workers carrying out the jobs are explicitly provided with the exact, correct instructions as to what is to be done.

  In South Korea, it is common practice that workers are briefed by their respective foremen at the work site before commencing their work every morning and at the close of business each day when the workers brief the foreman on the level of tasks achieved so that planning for the following day can then be put into the place. This activity has two benefits:
  1. Continuity of work execution is not broken.
  2. Any requirement, in terms of manpower or materials necessary to achieve the next day's task, is identified well in advance.

5 KEY CONSTITUENTS OF EFFECTIVE PLANNING

- Zone
- Detailed Work Procedure (DWP)
- Production Systems
- Synchronised Production and
- Work Execution Programme (WEP)

Zone. In principle, the whole ship's General Arrangement is dissected into 'Zones' such as outfitting, painting, completion, and inspection. Once the zones are established, the production process detailed out and becomes much easier to manage for the given time frame. Activities are:

- Zone outfitting
- Zone painting
- Zone completion
- Zone inspection

Detailed Work Procedure. The DWP of a work unit is to be optimised for the whole project or the entire shipyard.

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Standard Work Practice is to achieve efficient production through the effective utilisation of manpower, time and material. A shipyard will usually have, based on years of experience, developed a Production Standard. DWP is controlled by a foreman and managed by management. The 3 requisites of DWP are, working days (cycle time), work sequence and the number of workers. Standard work is the cardinal rule.

Production Systems. First, there is a need to identify and see through all DWP to get a bird's eye view of how to link each DWP as a production system. To do this, look for a clear production process and identify the production streams. Once the main production stream is identified, it will be easier to identify an entire production system. Figure 2 is a detailed explanation in terms of consideration and designing a production system. There are three categories in designing a production line: Main-line, By-pass line and Off-line. Define a clear work process in sequence to eliminate any interference and to ensure a smooth flow of work.

Design of Production System

Design Criteria

Define Clear work process in sequence

: To eliminate any interferences between disciplines
: To concerntrate on one disciplinary works to do one-time-qualitative works to avoid reworks.

Keep Continuous work flow

: To minimize 'FLOAT' time
: To manage workforce in the simplest and most effective way

Establishing FLOW is the BASIC condition.

1. Continuous flow

The production processes and DWP must be aligned with a same working time [TACT]

2. Standard work

Standard M x D should be observed by all workers at working floor.

3. Leveling production

Leveling production should be done as much as possible.

Planning is the purposeful activity to create clear and simple production system to achieve company target.

Figure 2: Fundamental elements that contribute to successful shipbuilding (Courtesy of Mr. Suh Wan Chul) [6]

Synchronised Production. Earlier paragraphs explained the activities of IHOP and Zone. Once completed, production streams will make the synchronisation simpler. Up to this point, we have combined the teams for executing the work, the discipline, the materials necessary to complete the tasks and other supporting facilities required such as compressed air, electrical power supply, scaffolding, gas freeing, etc. The total man-days too has been determined, based on standard work and experience.

Now all the production streams need to be synchronised, spread over a group of zones and the attributes mentioned earlier underpinned by the IHOP approach. At this stage, production levelling is also critical. Peaks and spikes must be avoided. Focusing on the main flow-line, and coupled with production levelling, disruption of manpower can be better managed. This, in essence, is managing production effectively and keeping costs under control.

Work Execution Programme (WEP). In essence, what was explained at the beginning has now culminated into the end-stage or Work Execution Programme. The smart approach of the SKBP is not too complex to

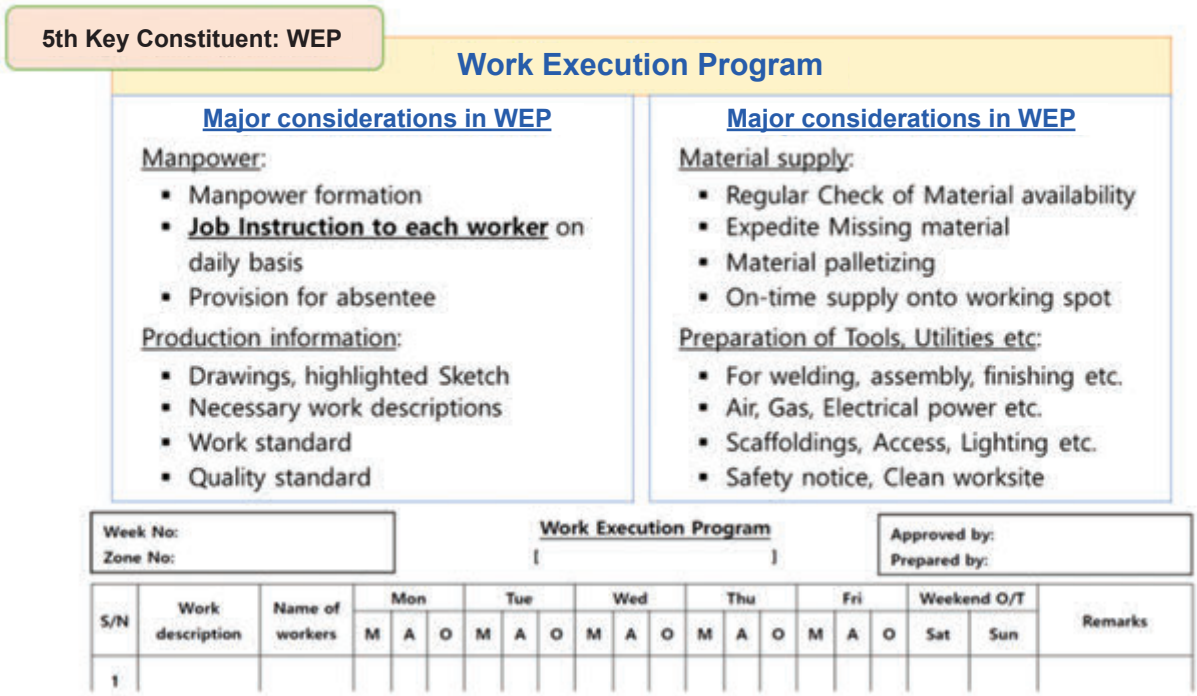

Figure 3: Major task of a ship building processes (Courtesy of Mr. Suh Wan Chul)

understand: Start with zones, then work on the sequence based on manpower needs against work standards and develop into DWP. The IHOP adaptation is also an important aspect that requires focus on information especially materials and time allocation.

We have now moved into the production design and synchronisation. All along the line, production information such as drawings, work sequence/description, work standard and quality standard has to be referred to constantly. Figure 3 shows some of these considerations.

CONCLUSION

Shipbuilding and, to some extent, ship repair are considered complex activities in the maritime industry. It can be complex and difficult if the projects are not managed in an orderly fashion from the onset. Nonetheless, SKBP has devised a methodology that simplifies control throughout a project.

Elements such as design, production of construction drawings, work sequence, standard work, alignment of build strategy with strict monitoring and coordination, material supply chain management and pallet delivery system just to name a few, make a combination that, coupled with the WEP and its five constituents, with strict compliance will prove to be a choice that will benefit many shipbuilders.

Reality-based planning is interactive planning and production generating a realistic plan that combines DWP as a result of interactive collaboration among planners and production teams. Shipbuilding is not rocket science but, if not managed carefully, will spell disaster.

To bring WEP up a notch, the zone-based planning and production streaming and maintaining flow and continuity with production levelling with a dash of reality-based planning make a better approach. ■

REFERENCES

[1] The Ingenieur Magazine, Vol 80, Lembaga Jurutera Malaysia, pp 6

[2] The Ingenieur Magazine, Vol 80, Lembaga Jurutera Malaysia, pp 8

[3] https://www.theepochtimes.com, 22 Aug 2018

[4] https://www.hellenicshippingnews.com/korean-shipbuilding-industry-reclaims-the-worlds-no-1-title/

[5] Lars Bruno & Stig Tenold, 'The Basis of South Korea ascent in shipbuilding industry 1970-1990', Dept of Economics, Norwegian School of Economics. 2003.

[6] Mr. Suh Wan Chul, Consultant with My-Kor Maritime Proper Mediation Inc, South Korea.

Author's Biodata

First Admiral Dato' Ir. Hj. Ahmad Murad bin Hj. Omar (Rtd) joined the Royal Malaysian Navy in 1975 and OMAHAMS Corporation Sdn. Bhd. in 2010. He is a Fellow of IMarEST, a member of SNAME (USA) and ASEAN Eng and Vice President of IEM.

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COVID-19: PSYCHOLOGICAL & SOCIO-ECONOMIC IMPACTS

by Dr Lim Ju Boo

Much has been written about the Covid-19 pandemic in terms of infectivity, incidence and mortality rates, its clinical features and pathology.

Great emphasis has been placed on social and preventive measures such as social distancing, lockdown, movement control, hygiene, washing of hands and wearing of face masks.

Then there were reports on the treatment aspects, including the development of vaccines and the use of anti-malaria drugs like chloroquine and hydroxychloroquine as well as anti-viral drugs like remdesivir.

However, little if anything has been written on the socio-economic impact of this viral pandemic, lockdown and movement restrictions on our social and economic lives, our livelihood and the maintenance of the economy of many countries and individuals.

What is immediately more important, however, is not just socio and economic effects or physical health, but rather the direct impact of the pandemic on psychological health which, in turn, may affect our physical health and well-being.

This area is almost either forgotten or neglected. There were reports of people in Italy and Spain who had committed suicide because of the deaths of their entire families from Covid-19; in Malaysia there were at least two cases of suicides in Penang due to the loss of jobs and businesses.

Let us take a look at the impact of the virus on not just physical health but also the psychological well-being which can be both short and long-term.

The psyche effect of past pandemics such as the Black Death or bubonic plague (1347-1351) which resulted in the deaths of between 25 million to 200 million people in Eurasia and North Africa and peaking in Europe, was untold hardship, mentally and physically, for the people. Then, in 1918, the Spanish flu pandemic (H1N1 virus) infected 500 million people or one-third of the world's population; it took one year for the pandemic to flatten.

It was not just the millions who lost their lives or were affected physically, socially and economically; what was even more disastrous was the post-traumatic stress disorder (PTSD), a mental trauma condition caused by experiencing or witnessing a terrifying event, which persisted for many, many years, long after the event was over. Symptoms included flashbacks, nightmares, insomnia, severe anxiety, uncontrollable thoughts, muscular jerks and uncontrollable movements as evidenced in the people after the previous pandemics.

Signs of PTSD can continue for anything from a few years to 60 years or longer. Most people who go through such traumatic events may have temporary difficulty adjusting and coping, but with time and good self-care, they usually get better. If the symptoms get worse, these can greatly interfere with family, working, socio and economic lives as well as physical health such as psychosomatic illnesses.

PTSD symptoms are generally intrusive memories, avoidance, negative changes in thinking and mood as well as changes in physical and emotional reactions.

Among others, severe depression and the loss of desire to live may persist even though the Covid-19, which has resulted in hundreds of thousands of deaths worldwide, may soon be over. Anxiety, insomnia and nightmares may persist for years as recorded in many people who survived World-War II. Already, a new mental problem called "panic pandemic" has been reported in Shanghai.

Even though the number of coronavirus cases in Malaysia (8,590 infected, 121 deaths and 8,186 recoveries as at 24 June 2020) is relatively low when compared to the United States, Spain, China, Italy and other countries, there will still be social and mental health issues. There are no statistics so far on the number of people who have lost their jobs, loss of business, loss of social dignity and loss of family relationships.

During these difficult times, psychiatrist Professor Kua Ee Heok of the National University of Singapore suggests that we indulge in yoga, meditation or exercises which can help us to relax, hobbies such as gardening and music, and maintaining a proper diet. ■

Author's Biodata

Dr Lim Ju Boo was previously a medical researcher at MIT (USA) and Institute for Medical Research, Malaysia

ZHANGJIAJIE GRAND CANYON GLASS FOOTBRIDGE

Ir. Lau Tai Onn

***Ir. Lau Tai Onn** a retired Civil & Structural Engineer. He is the secretary of IEM's Standing Committee on Information & Publications (since 2007).*

The Grand Canyon Glass Footbridge at Zhangjiajie National Park, Hunan Province, China, is said to be the world's tallest (260m or 85 storeys high) and longest (430m) pedestrian suspension bridge. Needless to say, it is a hotspot destination that attracts millions of visitors each year.

The bridge has a metal frame with more than 120 glass panels made of 3-layered, 50mm thick tempered glass. The deck is 15m wide at both ends of the bridge, tapering to 6m in the centre. The two main support cables curve inwards and the stringers soar outwards in a V-shaped pattern, opening the bridge up to the sky like a giant butterfly. The support pillars for the suspension cables are placed at 45m apart on either side of the canyon and are encased in rock, making them look like natural stone spires.

The glass footbridge, completed in June 2016, was designed by internationally renowned architect Professor Haim Dotan. The structural engineering firm was China Railway Major Bridge Reconnaissance & Design Institute Co. Ltd (BRDI).

I visited the glass bridge in September, 2019, and found the spectacular view of the gorge through the glass panels beneath my toes an exciting experience. ■

TACKLING EXTREMITIES AND ASSOCIATED CONDITIONS OF MARINE OFFSHORE INSTALLATIONS

by Ir. Lim Leong Bok

On 29 February 2020, the IEM Marine Engineering & Naval Architecture Technical Division (MNATD) organised a technical talk on "Tackling Extremities and the Associated Conditions of Marine Offshore Installations" by Ir. Dr Rafee Makbol Mohamed Alias at the Auditorium Tan Sri Prof. Chin Fung Kee, Wisma IEM in Petaling Jaya, Selangor. There were 40 participants who attended the talk in person while another 26 members from the Perak Branch participated via live video conference.

The Deputy Chairman of MNATD, Ir. Lim Leong Bok, started the talk with a welcome note and a brief introduction. Ir. Dr Rafee, a regular speaker at IEM talks, has over 30 years' experience in fabrication, design, installation and certification of offshore installations. He talked about his experiences, especially on the design aspect on tackling extremities conditions. He introduced performance-based design as an alternative approach rather than prescriptive methodology in tackling these issues.

Extreme conditions assumed in the assessment of structural integrity may lead to unnecessary strengthening of local structural components that may affect the global performance of a marine installation, not only during pre-service conditions but also the response behavioural and foundation capacity at in-service conditions. These extremities are typically imposed to account for uncertainties such as change in environment data, variation in topography of the sea bed, fabrication and others associated to the process plant of an installation. Issues on major extremities and the consequences in the design process were discussed. The extremities conditions may cause the collapse of a structure or part of the structure and disruption of normal conditions. Some examples are tipping or sliding, rupture, progressive collapse, plastic mechanism, instability, corrosion, fatigue, deterioration, fire and blast, boat impact, drop object, excessive or premature cracking, deformation, deflection and vibration.

Ir. Lim Leong Bok presenting a token of appreciation to Ir. Dr Rafee Makbol

Performance-based design is the best approach to tackle these issues. This is based on the concept of performance in terms of behaviour, response, risk and safety requirements. It is a more comprehensive methodology compared to prescriptive methodology.

Ir. Dr Rafee showed the participants some design case studies. It is a best practice to consider a combination of wave, wind and current. It shall be sufficient to design for maximum horizontal force applied to whole structure and maximum overturning moment applied to whole structure.

He discussed 3 improvement techniques: Profile and grinding, hammer peening and cast joint. A case study was discussed by comparing each option of improvement against workability, delivery, weight and cost. Ir. Dr Rafee also touched on the issue of sustainability with a focus on CO_2 emission. The data of carbon footprint shall be established in every design. This information is essential to identify ways to reduce carbon footprint.

Due to the uniqueness of marine offshore installations, there are many challenges ahead. Such an installation is not only to be built based on reservoir capacity and process plant requirements, but the design should also be assimilated with the surrounding topography and be in balance with the ecology. Hence, performance-based installation is the most suitable approach in dealing with this scenario. The engineer should be able to deliver a new technique that is able to quantify the integration of this method, at both component and system levels in order to satisfy stakeholder requirements.

This talk ended at 11.00 a.m. with the presentation of a token of appreciation to Ir. Dr Rafee Makbol by the Deputy Chairman of MNATD, Ir. Lim Leong Bok. ■

UPCOMING ACTIVITIES

WEBINAR - Towards a Future of WDM-POF Network With User and Environment Friendly Feature

Date : 1 July 2020 (Wednesday)
Time : 2:30 p.m. - 4:30 p.m.
Venue : Online Platform
Approved CPD : 2
Speaker : Prof. Ir. Dr Mohammad Syuhaimi

WEBINAR - Introduction Submarine Engineering & Technologies

Date : 7 July 2020 (Tuesday)
Time : 3:00 p.m. - 5:00 p.m.
Venue : Online Platform
Approved CPD : 2
Speaker : Commander Mohd Khairul Anuar bin Mohd Nor

WEBINAR - Integrated Urban Water Management Towards Sustainable Cities

Date : 10 July 2020 (Friday)
Time : 6:00 p.m. - 7:30 p.m.
Venue : Online Platform
Approved CPD : 0
Speaker : Ir. Kamalesen

TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING: IMPACT ON INDUSTRY

by Ir. Lim Leong Bok

On 22 February 2020, the IEM Marine Engineering & Naval Architecture Technical Division (MNATD) organised a technical talk titled Technical & Vocational Education and Training (TVET) – Impact on Industry. It was presented by IEM Vice President First Admiral Dato' Ir. Hj. Ahmad Murad bin Hj. Omar (Rtd), at Auditorium Malakoff, Wisma IEM, and was attended by 45 participants.

The talk started with a welcome note and a brief introduction by Ir. Roznan bin Abd Rashid, Chairman of MNATD. Then Dato' Ir. Murad, who is a member of Jawatankuasa Kabinet Permerkasaan TVET (JKKPTVET) as Technical Secretariat, presented a lively talk filled with constructive ideas and suggestions.

He elaborated in detail how implementation of the Government's TVET initiative and programme would impact the industry. The government had placed great emphasis on TVET and this was clearly exemplified by the involvement of the then-Prime Minister, YAB Tun Dr Mahathir[1] who was acting Education Minister and served as Chairman of this committee along with the following 7 ministers:

1. Minister of Entrepreneur & Co-operative Development
2. Minister of Human Resource
3. Minister of Rural Development
4. Minister of Tourism & Culture
5. Minister of Work
6. Minister of Youth & Sports
7. Minister of Agriculture & Agro Based Industry

The government recognises that TVET is a force multiplier towards a developed nation and aims for it to produce TVET graduates who are ready to take on challenges and who possess characteristics of entrepreneurship. Their qualification and skillset acquired should be aligned to industry demand. Therefore, active and constant engagement between government and industry players is essential to eliminate any possibility of mismatches from occurring. Some of the identified key elements are the qualification of teachers and training personnel, codifying quality standards, practical training, social acceptance of vocational training, balance between standardisation and flexibility and readiness to face challenges with the advent of Industrial Revolution 4.0 etc.

As for the job market, it is estimated that 60% of 1.5 million new jobs will require TVET skills. The government plans to increase the skilled workforce to 35% by the end of 2020. There was a requirement to increase TVET student intake in stages from 164,000 in 2013 to 225,000 by 2020. To-date, there are 707 public institutions and 636 private institutions that provide TVET courses.

In 2019, JKKPTVET introduced TVET Valued Industry Partners (TVET VIP), comprising industry players who offer commitment, cooperation, support and contribution to the TVET programme. This initiative recognises and encourages industry players who are actively playing their roles and making continuous effort to strengthen TVET. Awards will be presented to winners in each category, including Government Link Company (GLC), Multi National Company (MNC), Small-Medium Enterprise (SME), Listed Local Company (LLC) and Trade Association. Other initiatives and catalysts include co-ownership model centre of excellence, competency certification bodies, incentive to the industry, allocation of special fund, National Industry Committee, branding, re-study and amending of TVET Act.

Dato' Ir. Murad also touched on future TVET skills such as 3D printing, 5G, advanced manufacturing, cybersecurity, drones, information technology, neuroscience, automation, virtual and augmented reality, digital communication and mental health.

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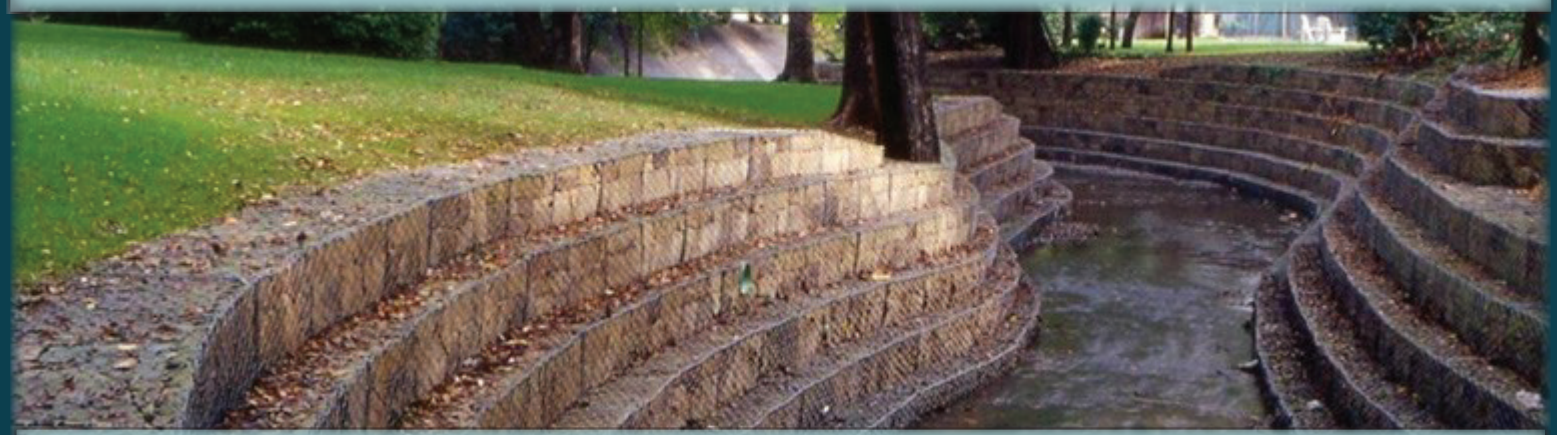

Channeling Works is the canalization of water course involving constructing a specific channel with a customized cross-section to meet the flow characteristics and capacity required.

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Traditionally, graduates were trained in conventional extraction technology such as cutting, boring and turning. However, these skills alone are no longer adequate to meet current job demands and graduates must further enhance their skills with the application of latest additive technologies such as 3D printing. Indeed, a revolution in the TVET curriculum is essential to prepare graduates and equip them with the latest TVET skills.

TVET is one of the key elements which will drive our nation's aspiration towards developed nation status. Continuous engagement and consultation between government and industry are essential to understand industry needs as well as close the gap and align with industry demands. This will help avoid any potential mismatch of TVET graduates and industry demands on the workforce in quantitative and qualitative aspects.

Continued efforts in up-skilling and re-skilling of the workforce, especially in TVET, are vital to ensure a highly competent workforce. The talk ended at 1.15 p.m. with MNATD Deputy Chairman Ir. Lim Leong Bok presenting a token of appreciation to Dato' Ir. Murad. ■

Ir. Lim Leong Bok presenting a token of appreciation to First Admiral Dato' Ir. Hj. Ahmad Murad bin Hj. Omar (Rtd)

FOOTNOTE:

1 Tun Dr Mahathir's term as Prime Minister of Malaysia ended on 29 February 2020 when the Yang di-Pertuan Agong appointed YAB Tan Sri Muhyiddin Yassin as the country's 8th Prime Minister.

STABILITY OF BUILDINGS: THE FUNDAMENTALS

by Ir. Chong Chee Meng

The Civil & Structural Engineering Technical Division (CSETD) and Young Engineers Section (YES) jointly organised a webinar talk on The Stability Of Buildings – The Fundamentals on 22 April 2020 via GoToWebinar. The talk was delivered by structural engineer Ir. Yasotha Chetty. Passionate about creative engineering solutions, she was involved in building projects in UK, Europe, Middle East and Malaysia and her works spread across various structural materials including concrete, steel, timber and masonry.

The talk was moderated by Mr. Ling Teck Ping, a committee member of YES, and attended by 99 participants from engineering consultants, contracting firms, government agencies and local authorities as well as faculty members from local institutions of higher learning.

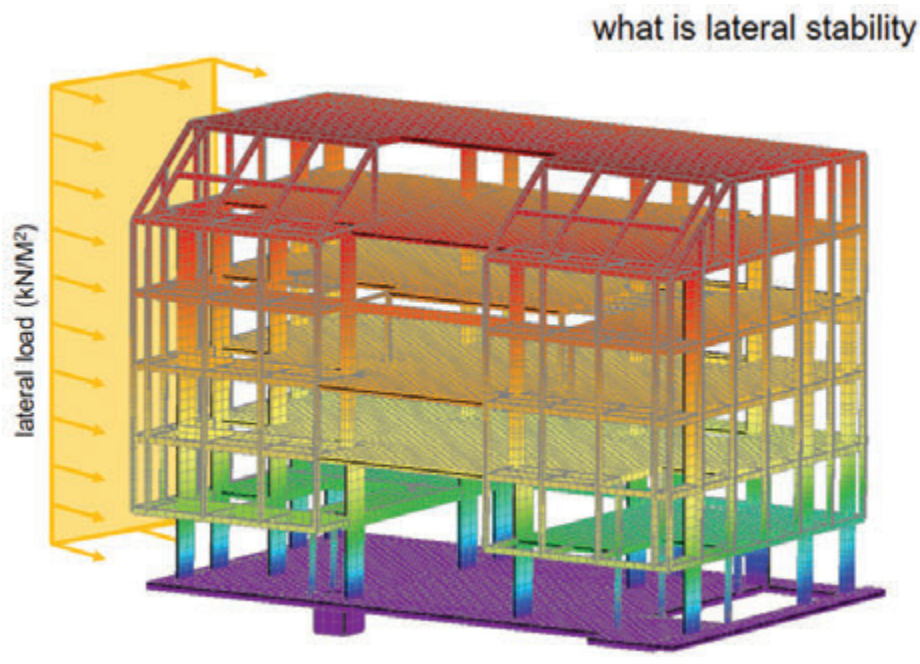
There were 7 sections, i.e. the definition of lateral stability, the importance of lateral stability in the Malaysian construction industry, components providing lateral stability, type of loads, design criteria, the fundamental physics, and design approach.

The first section explained lateral stability, which is the ability of a structure to adequately resist lateral forces. A building structure should not topple or collapse during the ultimate limit state and should not excessively deflect horizontally, twist or accelerate during serviceability limit state.

Ir. Yasotha said lateral stability is becoming increasingly important locally because traditional construction is moving away from in situ reinforced concrete structures to using lighter materials such as steel and composite. Components which provide lateral stability for a building include shearwall, bracing, core, portal frame and diaphragm. In addition to lateral stability, a building must also be able to resist wind load, earthquake load and notional load in fulfilling the design criteria of serviceability limit state and ultimate limit state.

Then Ir. Yasotha talked about the fundamental physics of how a building can resist lateral loads and how the load is transferred from the façade to perimeter structure, then to slab diaphragm and finally, to the lateral stability resisting system.

To end the talk, she discussed the design approach. A design engineer will need to study the overall structure, decide which lateral stability system to use, where the stability elements can be located, carry out a preliminary design and verify it with 3D finite element analysis. After the talk, Ir. Yasotha took questions from the floor. ■



PEEK AT IEM PENANG BRANCH

by Ir. Khoo Koon Tai

The 2018/19 session of IEM Penang Branch closed with a fantastic 103-table 52nd Anniversary Dinner & Award Night on 15 November 2019. The night was marvellous and the crowd unbelievable! IEM President Ir. David Lai and Branch Chairmen from 8 branches joined us for the unforgettable event.

One milestone that we achieved with great pride for the 2018/19 session was the publishing of our very own News Bulletin, the inaugural edition of *Ingenieur Penang* in September 2019. This print bulletin which complements the existing online newsletter, allows our members to hold, feel and read in between their strenuous work schedules without stressing their eyes online. As they say, hard work pays off! The good feedback and commendations we have received from our members have been extremely encouraging.

The inaugural edition of Ingenieur Penang

IEM Penang organised 117 activities with a total of 254.5 approved CPD hours for the 2018/19 session but only the Transportation & Traffic Management Seminar, Young Engineers National Summit (NATSUM) 2019 and Asean Electrotechnical Symposium & Exhibition 2019 (AES) would be mentioned here due to space limitation.

The full-day Transportation & Traffic Management Seminar held at Cititel Penang attracted 80 participants who listened to 4 local experts share their knowledge on the following topics: Alleviating traffic congestion, sustainable transportation engineering, traffic impact assessment, road safety audit and the Penang Transport Master Plan (PTMP).

Through the seminar, participants were able to get a deeper insight into transportation and traffic issues in Penang and the PTMP, which were among the main themes of the state development vision of Penang 2030.

There were 150 participants for NATSUM 2019, including a first-time-ever participation by secondary school students who took part in the Future Engineers Engagement Session, a platform created to promote engineering as a career among students. The summit ended with a bang and many went home with fond memories of productive interaction and meeting sessions, interesting technical visits, unforgettable high-in-the-cloud dinner on 60th floor of the KOMTAR building and an exciting Heritage Hunt in the heart of Georgetown's World Heritage Site.

The last major event of the year was the ASEAN Electrotechnical Symposium & Exhibition 2019 on 5 December 2019 at City Bayview Hotel. A total of 120 engineers, including speakers from local and ASEAN countries, attended the event which was a collaboration between IEM Penang Branch, IEM Electrical Engineering Technical Division, Standard Malaysia and Suruhanjaya Tenaga.

The symposium highlighted initiatives to synergise and standardise electrical installation works and industry practices among ASEAN countries. It is hoped that this will inspire local engineers to further explore business opportunities within ASEAN region in electrical engineering field. ■

IEM Penang 52nd Anniversary Dinner & Award Night

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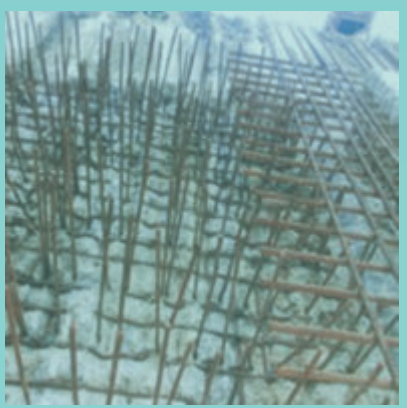

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ISLE OF MAN'S MOUNTAIN RAILWAY

Ir. Chin Mee Poon

***Ir. Chin Mee Poon** is a retired civil engineer who derives a great deal of joy and satisfaction from travelling to different parts of the globe, capturing fascinating insights of the places and people he encounters and sharing his experiences with others through his photographs and writing.*

As a train buff, I could not miss taking a ride on the scenic mountain railway in Isle of Man. My wife and I flew from Liverpool to Douglas at the end of September 2012 after a month of backpacking in Ireland and Northern Ireland.

Douglas is the capital and largest city in Isle of Man. With an area of 572 sq km and a population of 85,000, Isle of Man is a self-governing British Crown dependency situated in the Irish Sea between Ireland and Great Britain. Queen Elizabeth II, as its head of state, is known as Lord of Mann and she is represented by a lieutenant governor.

We spent 4½ days on the island and our ride on the Snaefell Mountain Railway ranked as one of the highlights of our visit. That scenic mountain railway, connecting the lower terminal station at Laxey and the upper terminal station at the summit of Snaefell, is only 8.9km long. It was completed in 1895 for electric locomotives. Laxey is a village on the east coast of the island and Snaefell summit at 621m a.s.l. is the highest point of the island. We boarded a single-coach train from Manx Electric Railway Station in Douglas to the quaint Laxey Station; it took just half an hour.

The Snaefell Mountain Railway's single-coach train was waiting on the adjacent track which is of a different gauge. The Manx Electric Railway, completed in 1893 and later extended beyond Laxey to Ramsey in the north, has a gauge of 914mm, whereas the Snaefell Mountain Railway has a gauge of 1,067mm. That the two railways were not constructed in the same gauge was probably because they belonged to different owners who did not foresee their coming under the same management one day.

The Snaefell Mountain train departed with only 17 passengers. It was a great pity that we had chosen to take the train ride on a day of inclement weather. Not only was the sky overcast but the clouds even descended right onto the mountain and rendered visibility really low. With a brief stop at the Snaefell Mountain Railway Bungalow Station, we reached the summit in less than 25 minutes. We were told that, on a bright sunny day with good visibility, we could see all 7 kingdoms from up there: Isle of Man, England, Wales, Scotland, Ireland, the Heaven and the Sea, but that day, we hardly saw anything because visibility was down to about 10m. Sigh!

Steep stretches of the railway used the Fell system for braking. Designed by British engineer John Barraclough Fell, the system consists of a raised centre rail between the two running rails to provide extra traction, braking or both. This system has largely been superseded by various types of track railway.

In 1825, the first steam locomotive, built by George Stephenson and his son Robert, was put into service to move passengers on a public rail line. George, an English civil engineer and mechanical engineer, contributed so much to improvements and innovations in railway engineering and transportation that he was bestowed the accolade, Father of Railways. The rail gauge he had chosen for that railway and the first inter-city railway 5 years later was so successful that it became the basis for the 1,435mm (4ft 8½ins) standard gauge used by most of the railways in the world today.

Rail or track gauge refers to the distance between the inner faces of the two running rails. In the early days of rail transport development, the choice of track gauge was often an arbitrary decision based on local conditions and prejudices. The possibility of a future connection to other lines was rarely considered. In mountainous regions, narrow gauges were used out of necessity to allow tighter turns in the line and to bring down cost. Industrial railways also use narrow gauges.

Other than the standard gauge, 11 narrow gauges ranging from 381 to 1,067mm and 7 broad gauges ranging from 1,520 to 1,676mm are used throughout the world. In Malaysia, the metre gauge is used in the inter-city main lines while the standard gauge is used in the ERL, LRT and MRT of Kuala Lumpur. ■

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TEMUDUGA PROFESSIONAL

Tarikh: 22 Mei & 15 Jun 2020

Kepada Semua Ahli,

SENARAI CALON-CALON YANG LAYAK MENDUDUKI TEMUDUGA PROFESIONAL TAHUN 2020

Berikut adalah senarai calon yang layak untuk menduduki Temuduga Profesional bagi tahun 2020.

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 2020.

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. Mohd Khir bin Muhammad FIEM, PEng
Setiausaha Kehormat, IEM

PERMOHONAN BARU

Nama	Kelayakan
KEJURUTERAAN PEMBUATAN	
PRAKASH RAO A/L POLAIAH	BE (THE ROBERT GORDON UNIVERSITY OF ABERDEEN) (MECHANICAL & OFFSHORE, 2004)

PERMOHONAN BARU / PERPINDAHAN MENJADI AHLI KORPORAT

Nama	Kelayakan
KEJURUTERAAN AWAM	
MOHAMMED BIN MAT DRIS	BE HONS (UTM) (CIVIL, 2003)
RAJANDRAN A/L SUPPIAH RAMAN	BE HONS (UTM) (CIVIL, 2004)

PERPINDAHAN AHLI

No. Ahli	Nama	Kelayakan
KEJURUTERAAN ALAM SEKITAR		
43664	LAW HONG KWANG	BE HONS (MALAYA) (ENVIRONMENT, 2008)
KEJURUTERAAN AWAM		
85882	CHONG WOEI SONG, RAYMOND	BE HONS (MALAYA) (CIVIL, 2008)
30525	NG KOK SHIEN	BE HONS (UTM) (CIVIL, 2004) ME (UTM) (CIVIL-GEOTECHNIC, 2005) PhD (NUS) (2013)
KEJURUTERAAN BIOMEDIKAL		
90350	HAW YU HONG	BE HONS (MALAYA) (BIOMEDICAL, 2016)
KEJURUTERAAN ELEKTRIKAL		
93709	MOHD NASHRIQ BIN MOHAMAD DAT	BE HONS (UiTM) (ELECTRICAL, 2010)
87364	VIGNES A/L KANNESAN	BE HONS (UNITEN) (ELECTRICAL POWER, 2015) ME (UPM) (ENGINEERING MANAGEMENT, 2018)
KEJURUTERAAN KIMIA		
31964	TOH PEY YI	BE HONS (USM) (CHEMICAL, 2009) PhD (USM) (2015)
KEJURUTERAAN MEKANIKAL		
60038	AMIRUL FAIZ BIN KAMARUDDIN	BE HONS (UPNM) (MECHANICAL, 2012)
65659	MOHAMAD FARID BIN SIES	BE HONS (UTM) (MECHANICAL, 2007) ME (UTHM) (MECHANICAL, 2013) PhD (UTHM) (MECHANICAL, 2019)
35024	MOHD ZAMADI BIN MAT LODDIN	BE HONS (UiTM) (MECHANICAL, 2012) ME (UTHM) (MECHANICAL, 2014)

PERMOHONAN BARU / PERPINDAHAN MENJADI AHLI KORPORAT

No. Ahli	Nama	Kelayakan
KEJURUTERAAN KIMIA		
81276	FOONG WAI LOONG, MELVIN	BE HONS (UMS) (CHEMICAL, 2008)

KEAHLIAN

CONTINUATION FROM JUNE ISSUE 2020

PERMOHONAN MENJADI AHLI SISWAZAH

No. Ahli	Nama	Kelayakan
KEJURUTERAAN ELEKTRONIK		
104608	WAN ASYRAF BIN AZMI	B.E.HONS.(UiTM) (ELECTRONICS-INSTRUMENTATION, 2013)
KEJURUTERAAN INDUSTRI		
105629	DR AZIANTI ISMAIL	B.Sc.(RENSSELAER POLYTECHNIC INST.) (INDUSTRIAL & MANAGEMENT ENGINEERING, 1998) M.Sc.(THE UNI. OF MANCHESTER)(ADVANCED MANUFACTURING TECHNOLOGY & SYSTEMS MANAGEMENT, 2005) PhD.(DAEGU UNI.)(2014)
KEJURUTERAAN KIMIA		
104328	CHAI SIONG KIT, WATTENA	B.E.HONS.(UTAR KAMPAR) (PETROCHEMICAL, 2019)
104323	CHIN NIKKI	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
104327	CHONG JI YIEN	B.E.HONS.(UTAR KAMPAR) (PETROCHEMICAL, 2019)
104322	CHOO YUNG LIM	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
105593	DR CHE HUI XIN	B.E.HONS.(USM) (CHEMICAL, 2012) PhD.(USM)(NANOSCIENCE & TECHNOLOGY, 2017)
104913	DR MUS'AB BIN ABDUL RAZAK	B.E.HONS.(UNI. OF DELAWARE)(CHEMICAL, 2007) PhD.(THE UNI. OF QUEENSLAND)(CHEMICAL, 2013)
105627	ENDDY MADAIS	B.E.HONS.(UMS)(CHEMICAL, 2005)
104326	FU YEE XUEN	B.E.HONS.(UTAR KAMPAR) (PETROCHEMICAL, 2019)
104321	KHOO TIONG HENG	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
104294	KISHODARRAN RAJADERAN	B.E.HONS.(UTP)(CHEMICAL, 2017)
104874	KOO BOON CHUN	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
104320	LEE JAU LOONG	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
104858	LIM SIEW SHEE	B.Sc.(STATE UNI. of NEW YORK at BUFFALO)(CHEMICAL, 2004) M.E.(STATE UNI. of NEW YORK at BUFFALO)(2006)
105243	MAH XIN YEE, ANGEL	M.E.HONS.(THE UNI. OF NOTTINGHAM)(CHEMICAL, 2018)
105247	MOHAMAD ARIF BIN MUSA	B.E.HONS.(UiTM)(CHEMICAL, 2012)
105251	MOHAMAD FIRDAUS BIN AZIZAN	B.E.HONS.(UTM)(CHEMICAL, 2015)
105260	MOHD HAZRIQ HAKIMI BIN YAACOB	M.E.HONS.(THE UNI. OF LEEDS) (CHEMICAL & ENERGY, 2017)
104313	MUHAMMAD FADLY BIN AHMAD USUL	B.E.HONS.(UiTM)(CHEMICAL, 2008)
104311	MUHAMMAD RAHIMI HADZRI BIN SHAHIDAN HADZRI	B.E.HONS.(UiTM)(CHEMICAL, 2011)
104873	NG SIN LONG	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
104324	ONG KA-WEY	B.E.HONS.(UTAR KAMPAR) (PETROCHEMICAL, 2019)
105267	OOI SENG WENG	B.E.HONS.(UTM)(CHEMICAL, 1997)
105236	RAFIDAH BINTI JALIL	B.E.HONS.(UKM) (CHEMICAL, 1999) M.Sc.(UKM)(CHEMICAL & PROCESS, 2004)
105234	RASYIDAH BINTI ALROZI	B.E.HONS.(USM) (CHEMICAL, 2009) M.Sc.(USM)(CHEMICAL, 2010)
104314	TOH LER KANG	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
104316	WEENITHA A/P MAHALINGGAM	B.E.HONS.(UTAR SG LONG) (CHEMICAL, 2019)
104291	WONG WIE MING	B.E.HONS.(UKM)(BIOCHEMICAL, 2012)
KEJURUTERAAN KOMPUTER		
105616	LEE KIM HAN	B.E.HONS.(UTM)(COMPUTER, 2006)
KEJURUTERAAN KOMUNIKASI		
105628	DR MOHAMAD KHAIRI ISHAK	B.E.HONS.(IIUM) (COMMUNICATION, 2007) M.Sc.(UNI. OF ESSEX) (EMBEDDED SYSTEMS, 2008) PhD.(UNI. OF BRISTOL)(2015)
KEJURUTERAAN MEKANIKAL		
105264	AHILAN GUNASEGRAN	B.E.HONS.(SWINBURNE UNI. OF TECH.)(MECHANICAL, 2016)
105589	BAKHTIAR BIN ISMAIL	B.E.HONS.(UiTM)(MECHANICAL, 1997)
105659	CHIA VOON KUI	M.E.HONS.(UNI. OF BIRMINGHAM)(MECHANICAL, 2015)
105646	DHANIS PARAMAGURU	B.E.HONS.(UTP)(MECHANICAL, 2016)
104283	DINESH CHANDRASEGAR	B.E.HONS.(CURTIN UNI OF TECH.)(MECHANICAL, 2015)
104914	DR AHMAD MUHSIN BIN ITHNIN	B.E.HONS.(UTM)(MECHANICAL-AUTOMOTIVE, 2012) PhD.(UTM)(2015)
105605	FATIN NABILA BINTI JAMALUDDIN	B.E.HONS.(UTP)(MECHANICAL, 2017)
105521	FOO CHUN HOONG	B.E.HONS.(UNITEN) (MECHANICAL, 2013)
104915	HAZWAN IZZUDDIN BIN HASHIM	B.Sc.(IOWA STATE UNI. Of SCIENCE & TECHNOLOGY) (MECHANICAL, 2014)
105602	KAMARUL ARIFFIN BIN MOHAMAD	B.E.HONS.(UTM) (MECHANICAL, 2007) M.E.(UMP)(MECHANICAL, 2017)
105257	KHAIRIL IZUDDIN BIN ABDUL RANI	B.E.HONS.(UTM)(MECHANICAL, 2013)
104849	KHOO JIA ZIN	B.E.HONS.(UNITEN) (MECHANICAL, 2006)
104853	LEE JON SHING, OSCAR	M.E.HONS.(THE UNI. OF NOTTINGHAM)(MECHANICAL, 2018)
105240	LEE VAN ZEN	B.E.HONS.(USM)(MECHANICAL, 1999)
105660	LEE WONG THENG	B.E.HONS.(UTAR)(MECHANICAL, 2011)
104864	LEONG CHIE QUEN	B.E.HONS.(TAYLOR'S UNI.) (MECHANICAL, 2018)
104274	MAARUF BIN MOHAMAD	B.E.HONS.(UTP) (MECHANICAL, 2010) M.Sc.(UTM)(PETROLEUM, 2015)
104851	MANIMARAN A/L GANESAN	B.E.HONS.(UTM)(MECHANICAL, 2018)
104840	MOHD FADZRIZAL BIN PAIMIN	B.E.HONS.(USM) (MECHANICAL, 2006) M.E.M.(UPM)(MANAGEMENT, 2009)
104867	MOHD GHAZALI BIN MOHD HAMAMI	B.E.(NAGAOKA UNI. OF TECH.) (MECHANICAL, 2007)
105228	MOHD LUTFI ARIF BIN MOHD ZIN	B.E.(TOKAI UNI.)(MECHANICAL, 2006)
105500	MOHD SHAHRIZAL BIN KAMARUL ZAMAN	B.E.HONS.(UNITEN) (MECHANICAL, 2014)
104850	MOK SWEE SING	B.E.HONS.(UTAR)(MECHANICAL, 2018)
105612	MUHAMMAD ADIB BIN AHMAD SUHOD	B.E.HONS.(UTHM) (MECHANICAL, 2015)
105536	MUHAMMAD ASLAM BIN MOHD SALLEH	B.E.HONS.(UNITEN) (MECHANICAL, 2017)
105656	MUHAMMAD HAKIM BIN JAFFAR	B.E.HONS.(UTM)(MECHANICAL PRECISION, 2015)
105524	MUHAMMAD QAMARAN BIN ABDUL AZIZ	B.E.HONS.(UTM)(MECHANICAL, 2018)
104289	MUHAMMAD SADIQ BIN MOHD ANIPAH	B.E.HONS.(UNITEN) (MECHANICAL, 2013)
105651	MUHAMMAD YUSRI BIN ABU HARIS	B.E.HONS.(UiTM)(MECHANICAL, 2018)
104862	MUHAMMAD ZULHILMI BIN ARBI	B.E.HONS.(UNIMAS) (MECHANICAL & MANUFACTURING, 2017)
105529	MUSTAL BIN MAKMUD	B.E.HONS.(UNI. OF MALAYA) (MECHANICAL, 2000)
105594	NAZRUL AIDIL BIN MAT AKHER	B.E.(VANDERBILT UNI.) (MECHANICAL, 2017)
104847	NGO XIA RUI	B.E.HONS.(TAR UNI. COLL.) (MECHANICAL, 2017)
104611	NGUEH ENG KEONG	B.E.HONS.(TAR UNI. COLL.) (MECHANICAL, 2018)
105227	NIK ROSELINA BINTI NIK ROSELEY	B.E.(KOBE UNI.) (MECHANICAL, 2004) M.Sc.(USM)(MATERIALS, 2011)
104875	NOOR HAZELIN BINTI CHE HASSAN	B.E.HONS.(UTM)(MECHANICAL-AUTOMOTIVE, 2011)
104312	NOORAZMAN BIN ZULKARNAIN	B.E.(VANDERBILT UNI.) (MECHANICAL, 2012)
105259	NUR ZALYNDA BINTI ZAKARIA	B.E.HONS.(UNITEN) (MECHANICAL, 2017)
104857	OW YEE SENG	B.E.HONS.(MMU)(MECHANICAL, 2018)
105537	RAMKEE MARAN	B.E.HONS.(UNITEN) (MECHANICAL, 2015)
105658	ROZAIMI BIN MOHD SAAD	B.E.HONS.(UTM)(MECHANICAL-MANUFACTURING, 1998) M.E.(UTM)(MECHANICAL-ADVANCED MANUFACTURING, 2004)
104286	SAFUAN EFFENDY BIN MAT GHANI	B.E.HONS.(UTeM)(MECHANICAL-STRUCTURE & MATERIAL, 2009)
104298	SHAZLAN BIN SEKARI @ SHOKRI	B.E.HONS.(UTM)(MECHANICAL, 2001)
105648	SIVANES A/L SINGARAVELU	B.E.HONS.(UTHM) (MECHANICAL, 2013)
105617	SOO KAR FAI	B.E.(THE UNI. OF QUEENSLAND)(MECHANICAL, 2018)
105253	TAN CHUN KHAI	B.E.HONS.(UTM)(MECHANICAL, 2012)
105655	TAN OON XIN, NICKLAUS	M.E.HONS.(THE UNI. OF LEEDS) (MECHANICAL, 2017)
104279	TENG TZE SIAN	B.E.HONS.(QUT)(MECHANICAL, 2017)
104909	TNG CHOON SIONG	B.E.HONS.(UTM)(MECHANICAL, 2017)
104876	VENGADESAN VYTHILINGAM	B.E.HONS.(MONASH UNI.) (MECHANICAL, 2013)
105604	WANG HUI LER	B.E.HONS.(THE UNI. OF QUEENSLAND)(MECHANICAL, 2016)
104910	WONG SHY KIT	B.E.HONS.(UPM)(MECHANICAL, 2018)
104305	YEE MING ZHI, JULIAN	M.E.HONS.(THE UNI. Of MANCHESTER)(MECHANICAL ENGINEERING with INDUSTRIAL EXPERIENCE, 2016)
105531	ZAMIR BIN MUSTAFA	B.E.HONS.(UTeM)(MECHANICAL-THERMAL FLUID, 2012)
KEJURUTERAAN MEKATRONIK		
104865	MOHAMAD AMIRUL BIN RADZALI	B.E.HONS.(UniMAP) (MECHATRONICS, 2014)
105623	TANG JING RUI	B.E.HONS.(USM) (MECHATRONIC, 2012)
KEJURUTERAAN MIKROELEKTRONIK		
105232	LAU TENG HUI	B.E.HONS.(UniMAP) (MICROELECTRONIC, 2018)
KEJURUTERAAN PEMBUATAN		
105527	DR CHIEW TSUNG HENG	B.E.HONS.(UTeM) (MANUFACTURING-ROBOTICS & AUTOMATION, 2011) M.Sc.(UTeM) (MANUFACTURING, 2014) PhD.(UTeM)(2018)
104848	HOW YONG CHIAN	B.E.HONS.(UKM) (MANUFACTURING, 2012)
104317	SOO YEW HANG	B.E.HONS.(UTAR SG LONG)(MATERIALS & MANUFACTURING, 2019)
KEJURUTERAAN PERTANIAN		
104845	ADAM DANIAL LIM BIN JEFRI LIM	B.E.HONS.(UPM) (AGRICULTURAL & BIOSYSTEMS, 2018)
105533	DR ABD HALIM BIN MD ALI	B.E.HONS.(UM)(BIOLOGICAL & AGRICULTURAL, 2008) M.Sc.(UPM) (ENVIRONMENTAL, 2013) PhD.(UNI. OF NEWCASTLE upon Tyne)(2018)
104282	SHAZELIA ASHIKIN BINTI SULAIMAN	B.E.HONS.(UPM) (AGRICULTURAL & BIOSYSTEM, 2012) M.Sc.(UPM)(SOIL & WATER ENGINEERING, 2015)
KEJURUTERAAN PETROLEUM		
104852	MOHAMED SHAFEER MOHAMED ALTHAF	B.E.HONS.(UCSI UNI.) (PETROLEUM, 2018)
105515	NG SAY HENG	B.E.HONS.(UTM)(PETROLEUM, 1987)

PEMINDAHAN KEPADA AHLI 'INCORPORATED'

No. Ahli	Nama	Kelayakan
KEJURUTERAAN MEKANIKAL		
43440	SIVA BALAN A/L BANAYA	B.E.HONS.(TWINTECH INT. UNI. COLL. OF TECHNOLOGY) (MECHANICAL & MANUFACTURING, 2013)

PERMOHONAN MENJADI AHLI 'INCORPORATED'

No. Ahli	Nama	Kelayakan
KEJURUTERAAN ELEKTRIKAL		
105641	ONG ZHEN CHENG, DANIEL	B.E.HONS.(UNIVERSITY OF SUNDERLAND)(ELECTRONIC & ELECTRICAL, 2016)
KEJURUTERAAN MEKANIKAL		
104239	KHAIRUL BIN ARIFFIN	B.E.HONS.(THE UNI. OF DERBY) (MECHANICAL, 2014)
105514	LIM CHEE YONG	B.E.HONS.(UCL)(ENGINEERING with BUSINESS FINANCE, 2014)
104616	MUHAMAD NURALIFF BIN RAMANI	B.E.Tech.Hons.(UNIKL) (NAVAL ARCHITECTURE & SHIPBUILDING, 2012)
KEJURUTERAAN MEKATRONIK		
105643	AHMAD NAUFAL BIN MUHAMMAD MUSTAFA	B.E.Tech.Hons.(UniKL) (MECHATRONICS-AUTOMOTIVE, 2012) M.E.(UPM)(MANUFACTURING SYSTEMS, 2016)
104617	HAH SHIEN YEE	B.E.HONS.(SHEFFIELD HALLAM UNI.)(MECHATRONIC, 2017)

PERMOHONAN BARU / PEMINDAHAN AHLI

Persidangan Majlis IEM yang ke-**419** pada **21 Oktober 2019** telah meluluskan sebanyak **941** ahli untuk permohonan baru dan permindahan ahli. Berikut adalah senarai ahli mengikut disiplin kejuruteraan:

DISIPLIN	GRED KEAHLIAN									
	FELO	SENIOR	AHLI	COMPANION	SISWAZAH	"INCORPORATED"	"AFFILIATE"	"ASSOCIATE"	SISWA	JUMLAH
Aeroangkasa					1					1
Pertanian					1					1
Automotif			1						1	2
Biokimia					2					2
Bioperubatan					3					3
Kimia			4		43		1		52	100
Awam	3	1	48	2	99				118	271
Komunikasi					1				1	2
Komputer									5	5
Pembinaan			1							1
Kawalan			1							1
Elektrikal & Elektronik									57	57
Elektrikal		1	21	4	52	2			44	124
Elektronik			9	6	27				48	90
Alam Sekitar					5				4	9
Geoteknik			1							1
Lebuhraya			1							1
Industri					1					1
Pembuatan			2		2				6	10
Bahan			2		1					3
Metallurgi					1					1
Mekanikal			11	7	68	2		1	81	170
Mekatronik					5				59	64
Sumber Mineral					1					1
Perlombongan					1					1
Petroleum			1		1				9	11
Polimer			1			1				2
Struktur									1	1
Telekomunikasi					1				1	2
Sumber Air			2							2
Pengangkutan	1									1
Hidraulik					1					1
Pengurusan Infrastruktur									1	1
JUMLAH	4	2	106	17	317	5	1	1	488	941

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

Ir. Mohd Khir bin Muhammad FIEM, PEng

Setiausaha Kehormat, Institusi Jurutera Malaysia, Sesi 2019/2020

PERMOHONAN MENJADI AHLI 'ASSOCIATE'

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
104615	ABDULLAH BIN BASRI	DIPL. (SULTAN HAJI AHMAD SHAH POLYTECHNIC, 2003)
KEJURUTERAAN BANGUNAN		
105642	KHOO SIK KHUI	DIPL.(TAR COLLEGE) (BUILDING, 2007) B.Sc.(SHEFIELD HALLAM UNI.) (BUILDING CONSTRUCTION MANAGEMENT, 2009)

PERMINDAHAN AHLI KEPADA AHLI FELLOW

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
19880	LEE PEIR TIEN	BE HONS (UTM) (CIVIL, 2001)
23082	LO CHAU THAI @ KENNY LO	BE HONS (LEEDS) (CIVIL, 2002)
12809	MOHD SABRI BIN ABDULLAH	BSc HONS (STRATHCLYDE) (CIVIL, 1985) MSc (LIVERPOOL) (STRUCTURAL, 1988) PhD (DUNDEE) (STRUCTURAL, 1993)
KEJURUTERAAN PENGANGKUTAN		
21054	KHOO HOOI LING	BE HONS (MALAYA) (CIVIL, 2002) MESc (MALAYA) (2005) PhD (NATIONAL UNIVERSITY OF SINGAPORE) (2008)

PEMINDAHAN AHLI KEPADA AHLI SENIOR

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
20104	ZAMHURI BIN HJ. DRAHMAN	BE HONS (UTM) (CIVIL, 1996) ME (UNIMAS) (CIVIL, 2016)
KEJURUTERAAN ELEKTRIKAL		
29738	LEE CHOO YONG	BSc HONS (USM) (MATHEMATICS, 2001) PART II (EC)(ELECTRICAL, 2001) ME (UTM) (ELECTRICAL-ELECTRONICS & TELECOMMUNICATIONS, 2008) PhD (MALAYA) (2014)

PEMINDAHAN AHLI KEPADA AHLI KORPORAT

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AUTOMOTIF		
50129	MAHATHIR BIN RAHMAN	BE HONS (UiTM) (MECHANICAL, 2011)
KEJURUTERAAN KIMIA		
38611	LIEW WENG HUI	BE HONS (USM) (CHEMICAL, 2007) MSc (UKM) (CHEMICAL & PROCESS, 2013) PhD (UiTM) (CHEMICAL, 2016)

***Note:** Continuation would be published in August 2020. 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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