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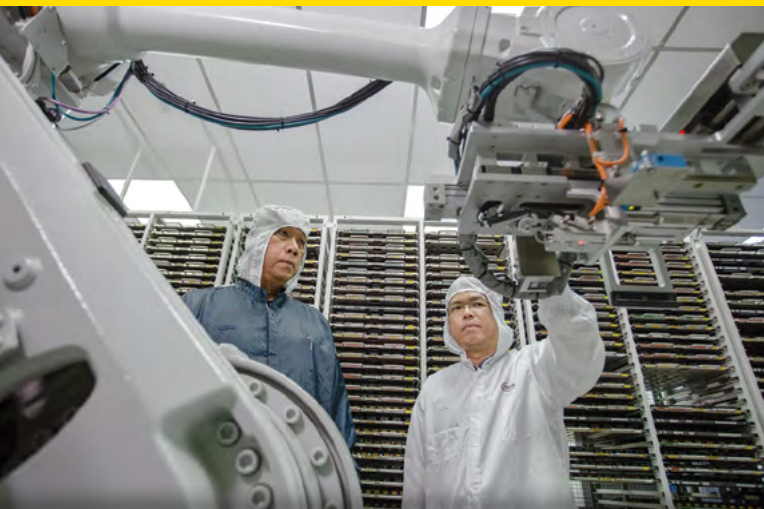


THE SINGAPORE ENGINEER

December 2020 | MCI (P) 004/03/2020

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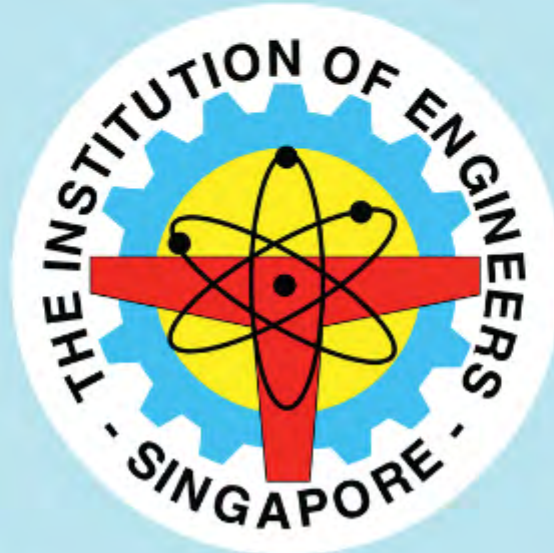
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CONTENTS

FEATURES

IES UPDATE

- 10 New directions for engineers in a disruptive world**
Dr Richard Kwok, President of The Institution of Engineers, Singapore, sets out his vision for IES.
- 13 IES celebrates engineering brilliance and launch of new partnerships at NED 2020**
Highlighting current achievements and the efforts to boost capabilities for the future.

COVER STORY

- 16 Infineon to make Singapore its global AI innovation hub by 2023**
The company will upskill employees and engage with local industries as well as educational and research institutions.

ELEVATORS & ESCALATORS

- 26 Innovative technologies for people movement in high-rise buildings**
They will make buildings smarter, safer and more adaptable to a changing urban environment.



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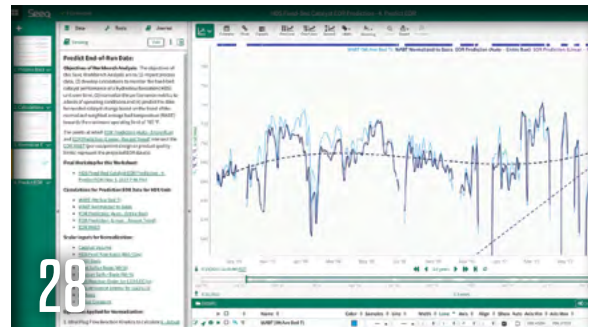
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Cover designed by **Irin Kuah**
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Published by
The Institution of Engineers, Singapore
70 Bukit Tinggi Road, Singapore 289758
Tel: 6469 5000 | Fax: 6467 1108
Printed in **Singapore**

DIGITALISATION

- 28 Future Advances in Process Automation**
A review of the pressing challenges.
- 30 Enabling smarter revenue generation in the petroleum refining industry**
Digitalised operations and processes can help to accelerate decision-making and boost revenues.
- 32 Leveraging technologies for smart food production**
The industry is adopting innovative methods.
- 34 Resilience in a time of uncertainty**
A manufacturing company responds to the disruption caused by the pandemic.



ENERGY ENGINEERING

- 35 Transitioning a power generation system to use zero-carbon hydrogen**
The purpose-built plant in the US is expected to start operations in late 2021.
- 36 Delivering a carbon-free future with green hydrogen**
Decarbonising the economy to fight climate change is one of the most urgent goals that countries and companies have set for the coming decades.



REGULAR SECTIONS

- 04 INDUSTRY NEWS**
- 37 PRODUCTS & SOLUTIONS**

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ENHANCED FUNDING SUPPORT

TO DRIVE WATER EFFICIENCY IN COMPANIES

Companies looking to purchase water-efficient equipment or embark on water recycling initiatives to save more water in their operations will now be able to tap on additional funding and receive their grants faster, from PUB, Singapore's National Water Agency. These are some of the new pro-industry measures under PUB's enhanced Water Efficiency Fund (WEF) which will benefit eligible companies using at least 1,000 m³ or more water monthly. The enhanced funding scheme has come into effect from 1 November 2020.

Introduced in 2007, the WEF encourages companies to manage their water demand by co-funding water efficiency projects that yield at least 10% reduction in water consumption or achieve annual water savings of at least 6,000 m³. These include feasibility studies, water audits, recycling efforts and the use of alternate sources of water. To date, PUB has facilitated more than 350 projects, with over SGD 24 million funding awarded.

PUB has been actively supporting companies and industries to implement water saving initiatives and reduce their water consumption. The non-domestic sector currently accounts for more than half of Singapore's total water demand of 430 million gallons per day. Total water demand is expected to almost double by 2060, with the non-domestic sector accounting for most of the increase in demand.

Enhancements to the Water Efficiency Fund

The latest enhancements to WEF include expanded funding areas, higher funding amounts and shorter disbursement periods, to facilitate adoption of water-efficient equipment and better cashflow for project implementation. This is expected to benefit about 3,200 eligible non-domestic customers.

The expanded funding areas include a new category for water-efficient equipment. Companies can now receive funding of up to SGD 300,000, or up to 50% of the cost of installing water-efficient equipment such as commercial dishwashers and washer extractors for their business. For existing categories such as the Water Efficiency Assessment, PUB will co-fund up to half of the total qualifying costs, instead of just the water audit cost, up to a maximum of SGD 30,000.

Water recycling initiatives and projects using alternative water sources could also receive higher funding amounts from higher incentives per cubic metre (m³) of potable water, NEWater and industrial water saved, that will be accrued over a longer period of time (up to 15 years instead of seven years), and capped at SGD 1 million per project.

The funding amounts received will be based on the lower of i) 50% of the project cost and ii) water savings over the economic life of the project or 15 years, whichever is lower.

The incentive rates to be applied per cubic metre (m³) of water saved will be increased from SGD 0.60 to SGD 0.71 for potable water, SGD 0.30 to SGD 0.45 for NEWater and SGD 0.10 to SGD 0.37 for industrial water.

PUB has also shortened the grant disbursement period for water recycling initiatives and the use of alternative water sources, from seven years to three years. Companies undertaking these projects will receive 50% of the grant amount upon commissioning of the plant, and the remaining 50% upon satisfactory performance in the third year. Pilot projects will also receive full funding of up to 50% of the project cost, capped at SGD 50,000, upon the submission and acceptance of the feasibility report for full-scale implementation, instead of after the full-scale recycling plant has been commissioned.

"Singapore's non-domestic sector is expected to continue to consume a substantial amount of water and PUB aims to help the sector realise greater water savings. We have enhanced the Water Efficiency Fund to help water-intensive companies defray onboarding costs and facilitate cashflow management, ultimately reducing their water consumption and achieving cost savings and greater business sustainability", said Mr Ridzuan Ismail, Director, PUB Water Supply (Network) Department.

Iwash Laundry, a commercial laundry operator and a large water user, sees the value of managing its water use more efficiently and is looking forward to reap greater benefits under the enhanced funding scheme. Its parent company, 800 Super Holdings Limited, was recently awarded a grant under WEF to build its first water recycling system, to recycle used water from its tunnel washer and washer extractors for reuse in its laundry operations. The recycling system is expected to be ready by third quarter 2021.

"As a commercial laundry operator, Iwash Laundry uses a lot of water in our business operations. Water is a scarce resource in Singapore, and we want to do our part as a good corporate citizen to make every drop count. With PUB's approved funding to build our first water recycling system, we expect to achieve a water recycling rate of up to 49% when the plant is completed. This will reduce our overall water consumption and achieve around 15% cost savings in our monthly water bills. We will continue to explore the use of water-efficient equipment and other water saving projects", said Mr Au Chee Cheong, Director of Iwash Laundry, a fully owned subsidiary of 800 Super Holdings Limited.

Water efficiency benchmarks for business sectors

PUB encourages companies to be more water-efficient through the Reduce, Replace and Reuse approach. In 2015, PUB introduced the Mandatory Water Efficiency Management Practices (MWEMP), where large water users are required to install private meters to monitor their water usage, and submit details of their water consumption, business activity indicators and water efficiency plans to PUB annually.

With the data collected, PUB develops sector-specific water efficiency benchmarks and Best Practice Guides to help customers better understand water usage patterns in their premises and identify areas where water efficiency can be improved.

Since 2017, PUB has published Best Practice Guides for various sectors.

They include the Built Environment sector, Wafer Fabrication and Semiconductor Manufacturing, Refineries, Petrochemicals and Chemicals, Commercial Laundries, and Biomedical Manufacturing.

WATER FOR SMART CITIES

Placing water at the core of the city's urban planning and investments creates a strong foundation for sustainable growth. This is one of the key takeaways from the white paper 'Water for Smart Liveable Cities', a new publication from State of Green and IWA Denmark, published ahead of the IWA World Water Congress & Exhibition in Copenhagen, Denmark, from 9 to 14 May 2021. The white paper takes a closer look at how rethinking urban water management can transform the cities of the future. It is meant to serve as a tool for inspiring the creation of innovative water solutions that will contribute to smarter and more liveable cities.

THE SINGAPORE ENGINEER MAGAZINE GOES FULLY DIGITAL

As part of IES' effort to go green and do its part for environment sustainability, The Singapore Engineer (TSE) magazine will be going fully digital starting Feb 2021, with TSE Jan 2021 being the last print issue. You will still be able to access it through our monthly emails (both PDF and the interactive reader version on ISSUU), through the ISSUU mobile app, or online at ies.org.sg.

With the digital magazine, you will be able to:

- Keep up with engineering news curated from local and international sources
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HEALTHCARE FACILITIES IN SINGAPORE

WIN INTERNATIONAL AWARDS

The National Centre for Infectious Diseases (NCID) and Ng Teng Fong Centre for Healthcare Innovation (CHI) won in a total of three award categories at two prestigious international healthcare design awards - the European Healthcare Design Awards 2020 and the Design & Health International Academy Awards 2020.

Both projects were commissioned by the Ministry of Health Singapore (MOH) and MOH Holdings (MOHH), and designed by CPG Consultants Pte Ltd.

NCID and CHI won the following awards at the European Healthcare Design Awards 2020:

- Healthcare Design (over 25,000 sqm) - Winner
- Design for Adaptation and Transformation - High Commendation

As part of the European Healthcare Design Congress 2020 held in London, UK, the European Healthcare Design Awards were delivered exclusively online this year on 19 September 2020. The awards were given in 10 categories across primary, community, secondary and tertiary levels of international healthcare provision and delivery witnessed over the past 18 months. Entries went through a four-month worldwide submission process and were stringently judged by an evaluation committee consisting of international multidisciplinary experts, to identify various international projects that demonstrate professional excellence in the design of healthcare environments.

NCID and CHI won the 'Healthcare Design (over 25,000 sqm)' award for displaying high levels of sustainability and urban integration. Both facilities are built amidst the city landscape, functioning effectively as independent entities whilst also being integrated smoothly with their environment, with close connectivity to the surrounding buildings of Tan Tock Seng Hospital (TTSH) and the Lee Kong Chian School of Medicine via link bridges and underpasses.



The National Centre for Infectious Diseases (NCID) and Ng Teng Fong Centre for Healthcare Innovation (CHI) recently won prestigious international healthcare design awards. Image: The Write Edition.

Both projects were highly commended in the 'Design for Adaptation and Transformation' category, for their ability to meet the complex service design challenges in dealing with a major health crisis.

NCID and CHI won the following award at the Design & Health International Academy Awards:

- International Health Project (over 40,000 sqm) - High Commendation

The Design & Health International Academy Awards is an award programme that recognises professional excellence in the design and research of health environments. The award seeks to encourage teams or individuals globally who, through outstanding efforts, have contributed to progress, and demonstrated vision in exemplary initiatives in the health sector.

For demonstrating a sustainable and salutogenic approach in the innovative design of a health facility, NCID and CHI received the high commendation under the award category 'International Health Project (over 40,000 sqm)'.

Designed to protect and transform healthcare

NCID is a purpose-built facility designed to strengthen Singapore's capacity and capability in infectious disease management and prevention, in concert with other hospitals. NCID is a self-contained 330-bed hospital with a full suite of facilities - isolation rooms, negative pressure rooms, ICUs, diagnostic imaging facilities, operating theatres, mortuary, laboratories, an outpatient clinic and a screening centre.

These standalone facilities allow for a lockdown of the building during a large outbreak of infectious disease, while minimising the risk of transmission of pathogens from highly contagious cases to patients, healthcare workers and the public. NCID was also built with an expansion capacity and the flexible design of patient rooms allows it to accommodate more than 500 beds during an outbreak of infectious disease. NCID is equipped with advanced safety features that protect people within the building and the surroundings.

The airflow design is a single-pass air-conditioning system without recirculation and with separate air handling units supplying fresh air to different zones. Exhaust air passes through HEPA filters before it is dispersed into the atmosphere. There is clear segregation of people and materials flow and a safe and thorough waste management system.

CHI is an innovation and training development that grooms the healthcare workforce to be future-ready. It is Singapore's largest purpose-built healthcare innovation centre, with simulation and innovation labs and engagement spaces. CHI is also home to TTSH's Command, Control and Communications (C3) system which crucially enabled the hospital to have real-time visualisation of its ground operations to better plan and coordinate its outbreak response to the COVID-19 situation.

CPG, in collaboration with hospital staff, designed both buildings to be well-connected to the main TTSH, allowing for integrated planning of operations. This proved pivotal especially during the current pandemic, as both TTSH and NCID leveraged on the same pool of resources and manpower.

"The timely opening of NCID has enabled us to mount a coordinated and swift response to contribute to Singapore's fight against the COVID-19 pandemic", said Prof Leo Yee Sin, Executive Director, NCID.

"We have two new landmark buildings in HealthCity Novena that will help shape the future of healthcare in Singapore. Both buildings were planned and co-designed by CPG with TTSH and NCID healthcare staff. NCID was built to be ready to adapt and respond to outbreaks of new and emerging infections. Yet, it is safe for our staff and patients, and integrated with TTSH for support and scale. For the Ng Teng Fong Centre for Healthcare Innovation, we built it for the future, to cater to changes in healthcare needs. The reasons are obvious as our demographics shift and new social drivers of health emerge. The CHI immerses our healthcare professionals and innovation partners from academia and industry,



Negative pressure room with double door at NCID. Image: NCID.



The CHI LIVING LAB (CHILL). Image: The Write Edition.

local and overseas, to co-learn, collaborate and co-create new models of care, enabled by digitalisation and workforce transformation", said Dr Eugene Fidelis Soh, CEO, TTSH & Central Health.

"The COVID-19 pandemic has put healthcare facilities to rigorous tests globally. NCID's and CHI's design wins are strong testaments to the effectiveness of these facilities. CPG's design focuses on practical medical planning and the execution of effective clinical configuration, both of which are leading factors in an outbreak management framework. The awards are also an encouragement to Singapore's current efforts in building pandemic resilience and the continued strengthening of the country's medical preparedness", said Mr Yeang Hoong Goon, CEO, CPG Consultants Pte Ltd.

"Medical planning and design are important cornerstones of building NCID and CHI. We want to design facilities that not only remain clinically effective all the time but can also adapt easily to unpredictable outbreaks in the future. An example would be how we purpose-built the 330-bed NCID with expansion capacity to accommodate more beds if necessary. This proved useful in dealing with a pandemic like COVID-19", said Mr Jerry Ong, Senior Vice President, CPG Consultants Pte Ltd.

SINGAPORE-MADE ROBOTS

WIN INTERNATIONAL AWARD

Singapore-based company, LionsBot International (LionsBot) was declared the overall winner of the biennial Amsterdam Innovation Award at the InterClean Amsterdam Online 2020 event held on 5 November 2020, edging out 86 other entries from all over the world.

This makes LionsBot the first Asian company to have won this award.

The products in focus were the LeoBots by LionsBot, a family of four commercial cleaning robots offering autonomous scrubbing, vacuuming, mopping and waste bin collection.

“We are grateful for the award. It was really a huge validation of our first product and all the sweat and tears the team has put in to make it a reality”, said Mr Dylan Ng, CEO and Co-Founder of LionsBot.

The InterClean juries had voted for the Leobots because this family of floor cleaning robots is capable of performing a range of tasks.

“This socialised robot is able to build a relationship with human cleaners through continuous interaction with the environment. This way, the Leobot elevates the cleaners’ status and motivation, helping them take pride in their job. The robot brings cleaning out into the public domain in a fun and positive way”, the jury stated on the InterClean website.

Mr Ng Chun Pin, Deputy Chief Executive Officer (Planning, Corporate and Technology) at the National Environment Agency (NEA), said, “We are heartened to see a local SME such as LionsBot, being recognised on the international stage. The launch of LeoBots in the local and domestic markets is a testament of how technology and innovation can be developed and used to improve productivity and efficiency across the environmental services industry. NEA looks forward to more of such solutions and seeing them on display at the next CleanEnviro Summit Singapore in 2021. We urge more SMEs to continue transforming their businesses, to pioneer innovative solutions and to export their capabilities overseas”.

Many of LionsBot’s engineers are trained at the Singapore University of Technology and Design (SUTD), through projects funded by the National Robotics Programme. The company also advanced its technological development and the training of its engineers by working with government agencies such as NEA, and with the support from Enterprise Singapore (ESG). LionsBot’s solutions are also supported under NEA’s Productivity Solutions Grant (PSG) which alleviates the cost in the adoption of technological solutions and equipment by cleaning companies, while enhancing their



Mr Dylan Ng, CEO and Co-Founder of LionsBot (holding the winner's trophy) with members of the LionsBot team.



LeoVac, a vacuum cleaning LeoBot can be used to clean both carpets and hard floors.

operational efficiency and productivity, to pave the way for a future-ready workforce.

Supporting cleaners and saving the earth

Cleaners can operate the LeoBots through the LionsClean mobile application. The app has been designed to be user-friendly with bigger fonts, so that it is suitable for older cleaners.

“Our cleaning robots are built to support cleaners. They are never meant to replace jobs. LionsBot aims to help upskill cleaners and ease the laborious tasks of cleaning”, said Mr Dylan Ng.

Each LeoBot effectively provides the service it is set out to do, which allows the human operator to execute cleaning tasks of higher value, thereby increasing cleaning efficiency and productivity.

By automating laborious and menial cleaning tasks, the LeoBots help to alleviate labour shortage issues faced by most developed nations in the environmental services industry.

The LeoBots are not only efficient cleaners, they also advocate environmental sustainability through their low power and water consumption technology. For example, the mopping robot, LeoMop, uses 80 times less water than a conventional floor scrubber - using only 0.6 litres of water per hour, compared to floor scrubbers which use 48 litres of water per hour on average, thus saving 47 litres of water per hour.

Local and international certification

In October 2020, LeoScrub, a member of the LeoBots, became the first professional cleaning robot in the world to receive the SS ISO13482 type test certificate from TÜV SÜD PSB, Singapore.

Mr Dylan Ng explained, "Receiving the award is a testament to our focus on safe engineering and safety in operations. This is significant because professional

cleaning robots are operated in crowded places, and this ISO certification is a good way to appraise its safety standards by service buyers".

The LeoBots also received the Conformité Européenne (CE) Attestation of Conformity in September 2020, making these commercial cleaning robots compliant with both European Union (EU) regulations and Singapore safety standards.

LionsBot said it would be exporting more than 100 cleaning robots to the EU region by the end of 2020.

LionsBot International

LionsBot International develops cleaning robots for commercial, industrial and public spaces. Developed and made in Singapore, the robots have friendly personalities and clean effectively.

A team of robots can be easily operated with the LionsClean mobile application. The robots are experts in their respective fields of cleaning and support the human cleaning workforce with efficient technologies.

HELSINKI SEEKING BUSINESS PARTNERS IN DEVELOPING IAQ SOLUTIONS

Helsinki Business Hub (HBH), the international trade and investment promotion agency for the Finnish capital region, is taking steps to spark new business opportunities and boost bilateral cooperation between Finland and Singapore, focusing especially on indoor air quality (IAQ) solutions and services.

HBH's partner, IPI Singapore, is a subsidiary of Enterprise Singapore that catalyses and enables enterprises to grow their business through innovation.

The cooperation between HBH and IPI dates back to 2017 and covers a wide array of topics in the smart city sector. Actions are now being taken to focus specifically on IAQ. As the COVID-19 pandemic has created the need to improve air quality in our living and working spaces, the IAQ solutions market has grown steadily with opportunities for all players along the value chain.

To kick off the collaboration on IAQ, HBH and IPI launched a series of virtual events in September 2020 and October 2020 to provide a platform for relationship building, knowledge sharing, showcasing Finland's and Singapore's expertise, and providing business opportunities in the built environment sector including IAQ and sustainable urban solutions.

"Finland offers a wealth of opportunities to global businesses - both SMEs and MNCs. This is especially significant in the digital space. Smart city opportunities have flourished in the wake of the ongoing COVID-19

pandemic as governments and communities are looking for ways to achieve sustainable urban development while improving public health and safety", said Ms Marja-Liisa Niinikoski, CEO, HBH.

"Finland's early adoption of digital developments, commitment and cooperation between citizens and companies, as well as government initiatives, offer the perfect setting for developing and piloting scalable solutions for smart cities. HBH is focused on helping foreign companies find possibilities within the smart city sphere in Helsinki. Singapore companies can likewise benefit from top R&D possibilities, product development opportunities, unique piloting platforms, global expansion, university & research collaboration, funding, talent and partners", Ms Niinikoski added.

"IPI's industry partners have expressed keen interest in the technologies pitched by the Finnish companies under HBH, over the years. This year we have taken our collaboration up a notch and brought together leading experts from Singapore and Finland to share about innovative IAQ solutions as well as insights from IPI's white paper on the emerging technology trends and opportunities for impactful innovation along the IAQ value chain. We have seen great synergy in our collaboration with HBH and look forward to generating opportunities between Singapore and Finnish enterprises to co-innovate and tackle the complex challenges in the IAQ space", said Mr Wong Lup Wai, CEO, IPI.

NEW DIRECTIONS FOR ENGINEERS IN A DISRUPTIVE WORLD

Dr Richard Kwok was inaugurated as President of The Institution of Engineers, Singapore (IES), on 25 July 2020. In an email interview with 'The Singapore Engineer', he sets out his vision for IES and mentions some of the initiatives that will be rolled out during his two-year term, whilst also highlighting the need for engineers to constantly improve their knowledge and skills, in order to address major challenges.



Dr Richard Kwok

'The Singapore Engineer': During the ongoing COVID-19 pandemic, important contributions are being made by engineers. How can engineers help to increase preparedness and resilience against future events of this nature?

Dr Richard Kwok: The current pandemic has indeed underscored the central role of engineering in protecting our safety, our lives and our jobs. From developing protective equipment to accelerating telecommuting solutions, to scaling up of vaccines, engineers have made pivotal contributions to the fight against the pandemic.

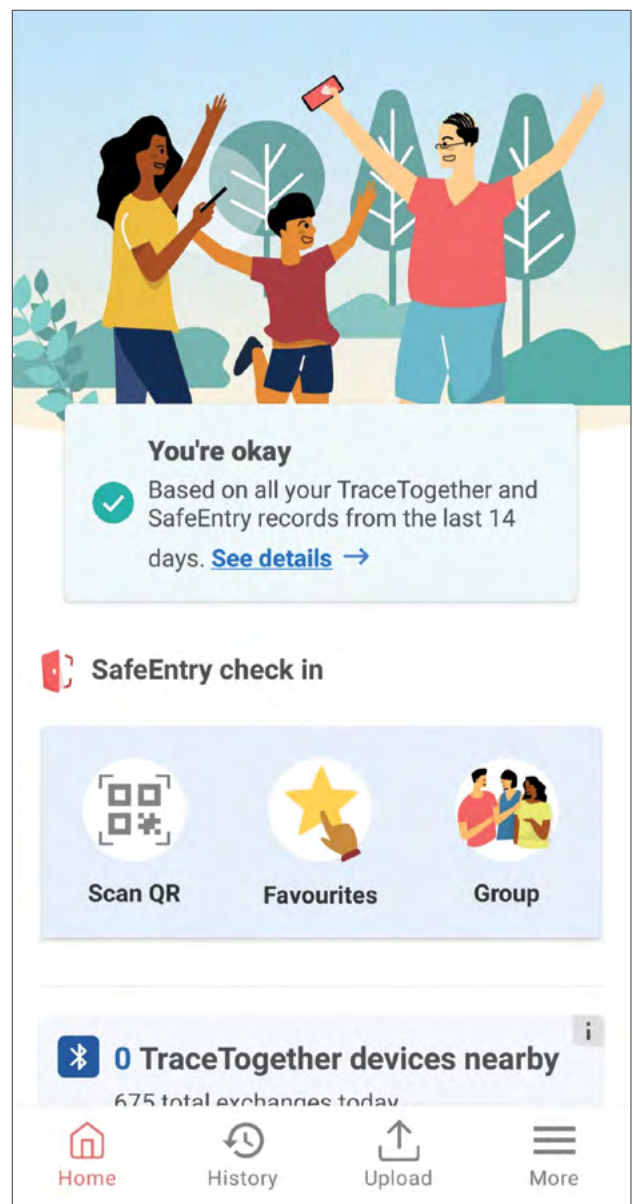
It is important to harness the observations made and lessons learnt from the pandemic to be better prepared for future threats.

One major observation from the pandemic is that Singapore's technology preparedness is a big factor in our ability to respond swiftly to critical needs. For example, our Smart Nation plans have built a strong core of engineering talents who are capable of creating innovations such as the TraceTogether app within a short period of time and establishing ultra high speed connectivity to support remote working and learning.

The engineering community must therefore continue to help Singapore to stay ahead of the technological curve in preparation of future threats and disruptions. We must also not lose momentum in implementing Singapore's various Industry Transformation Maps, including accelerating the adoption of Artificial Intelligence (AI) and automation, and pushing towards the implementation of Industry 4.0.

In this regard, IES recently signed Memorandums of Understanding, separately, with AI Singapore (AISG) and AI Professionals Association (AIP). The MoUs aim to, respectively, drive cluster-wide adoption of AI solutions by our member companies in the engineering sector, and develop and promote joint learning and development programmes for engineering communities in Singapore.

Our engineers must certainly not stop learning and acquiring new skills to succeed in an increasingly disruptive world. In addition, the pandemic has also emphasised the importance of collaboration among engineers - across



A strong core of engineering personnel created the TraceTogether app within a short period of time.



On the occasion of the signing of the MoU between IES and AISG are, from left, Ms Grace Fu, Minister for Sustainability and the Environment; Dr Richard Kwok, President, IES; and Mr Laurence Liew, Director of AI Innovation, AISG.

disciplines, sectors and borders. As the national society of engineers in Singapore, IES strives to enhance greater collaborations among engineers locally and internationally.

TSE: A key response to the global challenge has been the increased digitalisation of activities. How can engineers keep abreast of the rapid developments and make greater contributions in this important area?

RK: The pandemic has accelerated digitalisation to an overdrive mode, opening up, along the way, as many challenges for engineers as opportunities. The main challenges include cybersecurity gaps and data privacy concerns while the opportunities include enhancing digital experiences with new technologies.

This wide-scale digital adoption is likely to outlast the pandemic and continue after the lifting of restrictions on physical activities.

To stay competitive and be in the best position to contribute, engineers must embrace new knowledge, competence and ways of doing things. They can take advantage of the training provided by the IES Academy, designed to keep engineers ahead in many technological fields. I am pleased to share that IES recently introduced the IES Virtual Classroom where local engineers can attend online talks and workshops in various fields.

In addition, engineers can also join the IES Technical Committees to not just keep their pulse on digitalisation

developments but also contribute their expertise to formulate plans and projects for the digital economy.

TSE: How will an inclusive engineering community support Singapore's engineering ecosystem - what does that mean for engineering professionals?

RK: An inclusive engineering community is one that enables technicians, technologists and engineers to work side by side; offers a practical route for career progression; and recognises their contributions to Singapore's engineering sector.

At the national level, as problems in the area of engineering have become increasingly complex, we need to tap on the complementary skillsets of engineers, technologists and technicians across different engineering fields, to be able to develop better and faster solutions and innovations.

An inclusive engineering community will be better placed to tackle the challenges faced by Singapore and the world. By embracing the broad spectrum of skills, we will have more broad-based support in addressing problems and challenges in areas such as climate change, energy, water and food security, healthcare, environment and living habitats.

To provide more individuals with better opportunities for learning and career advancement, IES embarked on the journey to promote inclusivity, a few years back. In 2019, together with partners, IES formed a steering committee to build the National Engineering Career Progression Pathway.

The pathway consists of three levels of certifications - to certify chartered technicians, chartered technologists and chartered engineers. It gives graduates from the Institute of Technical Education (ITE) and polytechnics the opportunity to progress towards the chartered engineer certification, by attending modular training programmes and gaining relevant work experience.

This is an important step in creating a clear route for career progression for technicians, technologists and engineers. The traditional emphasis on academic qualifications has limited their career advancement opportunities. Now, through workplace learning, they can upskill, value add, get recognition and gain better career advancement prospects.



In 2006, Dr Richard Kwok received the Lifelong Learner Award from then President S R Nathan.

“I am a strong advocate for continuous learning as it opens up career advancement pathways. My personal journey could perhaps illustrate the importance of lifelong self-development and workplace learning. Since joining the workforce after completing my GCE ‘O’ Level examinations, I have adopted a work-and-learn approach that took me from obtaining specialist certifications through part-time courses to diplomas in mechanical engineering and business management to a Master of Science degree and a PhD. In recognition of my journey, I received the Lifelong Learner Award in 2006.” - Dr Richard Kwok

IES will continue to work on building an inclusive engineering ecosystem by enhancing training, accreditation, networking and promoting enterprises.

TSE: In your inauguration speech, you spoke of four strategic initiatives that you will be adopting, as IES President, to drive greater excellence. Could you elaborate further?

RK: As we enter the post-pandemic phase, it is essential for IES to provide our engineering community with maximum support to overcome immediate challenges while continuing to move towards our long-term goals. With this in mind, we have laid down four strategic initiatives for the next two years:

- To enhance opportunities for continuous professional development and upskilling for engineering professionals - through the IES Academy.
- To increase recognition of engineering professionals by establishing mutual recognition with international engineering institutions to promote cross-border mobility of engineers.
- To attract more engineers to join the IES family by engaging and adding value to our stakeholders - making IES the partner of choice.
- To drive excellence in various engineering sectors in Singapore through our Technical Committees (TCs).

To realise these goals, we have also identified three key action steps or what I call 'DiSH':

- 'Di' stands for digitalisation - our aim is to integrate all technical resources and business processes to make information more accessible for our members and key stakeholders. This will elevate our administrative standards and operational productivity.
- 'S' stands for standardisation - where work processes will be standardised to enhance organisational output, efficiency and transparency.
- 'H' for harmonisation - which involves synchronising all existing committees and initiatives to achieve maximum synergy across all functions at IES.

TSE: What are some of the criteria necessary to nurture the next generation of engineers?

RK: Awareness, upskilling and recognition are critical components in nurturing the next generation of engineers. These areas are covered in our four strategic initiatives.

Awareness is important as rapid technological advancement is creating lots of new job roles in engineering that our younger generation may not know about. We hope to raise, amongst our youth, awareness of the fact that getting into engineering is the perfect launchpad to an exciting career. We will also continue to work with our partners to show students the vast range of career possibilities that engineering

offers and help them start thinking, at a young age, about engineering as a career choice.

Upskilling is another key area. Technological changes mean that skillsets required for engineers are rapidly and constantly changing. Our initiative to enhance upskilling for engineering professionals, including new entrants to the field, will ensure that they can succeed in the fast-paced, disruptive and competitive environment.

Recognising engineers and their contributions is another important aspect, as young people are looking for a career with clear, strong opportunities for progression. We will continue to introduce or strengthen existing professional accreditation programmes to support young engineers in moving from one role to another, according to their career aspirations.

TSE: Any other information that you wish to provide?

RK: Setting clear goals is only half the battle won. Identifying a clear path and formulating actionable steps are just as critical. With the support of the IES Council, I have developed a holistic action plan beginning with reorganising the IES Council to oversee five different core functions and move towards our goals as one synergistic team.

IES will also be setting up a legal advisory panel and a finance committee to establish a robust corporate governance system that strengthens checks and balances for all our processes and compliance regulations.

Above all, I am thankful to our members for giving me the opportunity to serve as IES President for the next two years. I have enjoyed being an engineer for the past 47 years as it has allowed me to add value to the society. With their support, I am committed to leading IES forward so that more engineers can be in the best positions to create a positive impact on our lives and our future.



The five core functions of IES are Professional Development and Education (Group 1), Professional Accreditation & Recognition (Group 2), Engineering Excellence (Group 3), Professional Engagement (Group 4) and Membership Relations (Group 5).

IES CELEBRATES ENGINEERING BRILLIANCE AND LAUNCH OF NEW PARTNERSHIPS AT NED 2020

Highlighting current achievements and the efforts to boost capabilities for the future.



A screenshot of the virtual exhibition, with the Science Centre Singapore booth highlighted.

The first-ever hybrid National Engineers Day (NED) 2020 event concluded on 21 November 2020 at IES' Bukit Tinggi premises with the Engineering Innovation Challenge (EIC) 2020 Prize Announcement Ceremony.

Held from 12 to 21 November, the digital-physical hybrid event offered students and adult participants insights into the latest advancements and career opportunities in engineering through a series of online talks, workshops, site visits, along with a virtual booth exhibition and interactive contests.

Ms Grace Fu, Minister for Sustainability and the Environment graced the event as the guest-of-honour and addressed close to 1,000 students and other guests on livestream.

She also witnessed the signing of three memorandums of understanding (MoU) to deepen artificial intelligence (AI) capabilities in Singapore's engineering cluster; unveiled the winners of EIC 2020 and the IES Prestigious Engineering Achievement Awards; and launched the third edition of Who's Who in Engineering, Singapore.

This year's NED presented its first-ever virtual exhibition, an interactive platform showcasing technological innovations from leading engineering organisations in Singapore. Freed from the space limitations of a physical event, the online format allowed for participation from 18 exhibitors, a significant increase from previous years.

MoUs to boost national AI capabilities

At the ceremony, three MoUs were signed, marking a notable milestone in engineering advancements in the field of AI in Singapore. The first was between AI Singapore (AISG) and IES to drive cluster-wide adoption of AI solutions by engineering companies here.

The collaboration will also seek to grow certified local AI engineering talent through AISG's talent programmes such as the AI Apprenticeship and AI Certified Engineer programmes. Programme participants will be provided with advanced learning tools and technology as part of AISG's partnership with Google Cloud. Members interested to find out more can email Mr Rickie Teo at rickie.teo@iesnet.org.sg.



From left: Ms Fu, Dr Kwok, and Mr Koo Ping Shung (President, AIP) after signing the MoU.

The MoU will facilitate project proposals to AISG for development of deployable AI solutions under AISG's 100 Experiments (100E) programme. The ceremony saw ST Engineering Electronics become the first recipient of a Letter of Award for their 100E project on AI-based object recognition for unmanned surface vehicles.

SMRT also signed its own MoU with AISG, becoming the first organisation in Singapore to collaborate with the national AI programme on multiple projects under the AI Engineering Hub programme.

The final MoU was signed between IES and the AI Professionals Association (AIP) to develop and promote joint learning and development programmes for engineering communities in Singapore.

"AI is a frontier technology of the digital age, holding immense potential for improving lives, increasing productivity and opening up new growth opportunities. Through these MoUs, IES hopes to put in place a 'green lane' for local companies to tap on AISG's AI Innovation programs and engineering expertise; and fast track the co-creation of innovative AI solutions in Singapore," said Dr Richard Kwok, President of IES.

"AISG is honoured to partner with IES and AIP to identify up to 20 AI projects, which will be supported under AISG's 100E programme, as well as train up to 50 Singaporeans as Certified AI Engineers through AISG's AI Apprenticeship Programme over the next two years," said Mr Laurence Liew, Director of AI Innovation, AISG.

Engineering Innovation Challenge (EIC) 2020 Winners

A total of 101 student teams battled it out at the annual EIC 2020, jointly organised by IES and Science Centre Singapore, and supported by Singapore Nuclear Research and Safety Initiative and the Ministry of Education.

EIC 2020 challenged students to design projects and prototypes in response to the topic "Radiation 360". Winning projects were aimed at improving the food security of Singapore and the region – From enhancing crop quality, yields and growth, and extending the shelf life of food, to improving food packaging materials for radiation processing, and even creating portable beverage disinfectors.

Teams from River Valley High School, National Junior College, Temasek Polytechnic and NUS topped their respective categories, the results of which were revealed via livestream to all eagerly-awaiting participants (Refer to Table 1 for full list of winners and project titles).

"Holding a student-centric event in the midst of a pandemic presented IES with many challenges. However, it has also highlighted the urgency in nurturing the next generation of engineers to develop solutions that can keep us safe, provide quality of life and stimulate economic competitiveness."

"This is encapsulated aptly in the NED 2020 theme: 'Transforming the Future through Engineering'. We are encouraged to see our students responding



The gathered guests view the results of EIC 2020 and IES PEAA 2020 as they are announced.

enthusiastically to the EIC 2020 challenge ... Such resilience amongst our younger generation will pave the way for a brighter future for all of us," said Ms Jasmine Foo, NED 2020 Chairperson.

IES Prestigious Engineering Achievement Awards (PEAA) 2020

The 15 winning projects of the IES PEAA 2020 were also announced that day, recognising the outstanding contributions of local engineers to advancing engineering and enhancing quality of life of Singaporeans. This year, IES received a record number of 50 submissions, an indication of the expanse of engineering innovations being developed in Singapore.

This year's winning projects have demonstrated excellence in impacting lives, society and economy, from the setting up of a healthcare facility to handle infectious outbreaks and shepherding wildlife for animal well-being, to enhancing productivity and sustainability in construction and food waste co-digestion approaches (See Table 2 for the list of winners and project titles; more details will be provided in the January 2021 issue of The Singapore Engineer)

Launch of Third Edition of Who's Who in Engineering, Singapore

Finally, IES launched "Who's Who in Engineering, Singapore" a publication that recognises outstanding engineers for their contributions to Singapore's economic progress, nation development and enhancement of quality of life. The third edition featured engineering profiles selected from more than 60,000 engineers from more than 1,000 organisations. The book is available for purchase online at <https://bit.ly/WWIES2020> at a retail price of \$128.40 (inclusive of GST).



Immediate Past President Prof Yeoh Lean Weng (right) presents a copy of Who's Who in Engineering, Singapore to Ms Fu during the launch of the publication.

Table 1: Engineering Innovation Challenge 2020 Results

Category 1 (Secondary Schools)		
Position	School	Project Title
Champion	River Valley High School	GROWnite
1st Runner-up	School of Science and Technology	Investigation on How the Amount of Ionising Radiation Affects the Growth Rate of Vigna Radiata
2nd Runner-up	Orchid Park Secondary School	UV Tunnel for Sushi Conveyor Belt
Category 2 (Junior Colleges)		
Position	School	Project Title
Champion	National Junior College	Improving Materials for Packaging Food for Radiation Processing
1st Runner-up	Victoria Junior College	Increasing Crop Yield by Reducing Arsenic Poisoning in Crops
2nd Runner-up	Anglo-Chinese Junior College	Gamma
Category 3 (Polytechnics & Institutes of Technical Education)		
Champion	Temasek Polytechnic	Food Rejuvenator
1st Runner-up	ITE College West	Improve Food Security with Enhanced Food Packing Methods
2nd Runner-up	ITE College East	Photographic Film Ionizing Radiation Indicator
Category 4 (Local & Overseas Universities)		
Champion	NUS	BevSafe: A Hand Crank Powered Portable UV-C Based Beverage Disinfectant
1st Runner-up	NTU	BreadBuddy
2nd Runner-up	Chindwin Technological University Myanmar	Innovative Food Irradiation Chamber

Table 2: IES Prestigious Engineering Achievement Awards 2020

Category: Applied Research and Development	
Project Title	Team
Solid State Transformer for Energy Grid 2.0	Energy Research Institute @ Nanyang Technological University (ERI@N)
Neuro-inspired Electronic Skin Nervous System for Intelligent Autonomous Robotics	NUS
Small-Scale Wireless Bioelectronics for Remote-controlled Phototherapy	NUS
Microbial Electrochemical Sensor (MES) for Detecting Heavy Metals and Cyanide Discharge in Used Water	PUB
Development of End-to-end Pilot Scale Recycling Process for Recovery of All Materials from Full-size Discarded Photovoltaic Modules	Singapore Polytechnic
Category: Engineering Project	
Project Title	Team
National Centre for Infectious Diseases, Singapore	CPG Consultants Pte Ltd
Hunter Armoured Fighting Vehicle	Defence Science and Technology Agency, Singapore Army and ST Engineering
T226 of Thomson East Coast Line, Marina Bay Station	Kiso-Jiban Singapore Pte Ltd
Singapore Management University Connexion	Meinhardt (Singapore) Pte Ltd
Largest Wildlife Shepherding in Singapore Using Innovative Engineering Solutions	Samwoh Corporation Pte Ltd
Category: Technology Innovation	
Project Title	Team
Recycling Various Wastes into High-Valued Engineering Aerogel Materials Winner	NUS
Co-digestion Technology of Food Waste and Used Water Sludge to Enhance Biogas Production	PUB
Category: Young Creators	
Project Title	Team
A Wearable, Patient-Adaptive Freezing of Gait Detection System with Biofeedback Cueing for Parkinson's Disease Patients	NUS
Air Leakage Vacuum-Assisted Detection System without Aircraft Cabin Pressurisation	Republic Polytechnic
Interweave	Singapore Polytechnic, NUS

INFINEON TO MAKE SINGAPORE

ITS GLOBAL AI INNOVATION HUB BY 2023

The company will upskill employees and engage with local industries as well as educational and research institutions.

On 1 December 2020, Infineon marked its 50th year in Singapore by announcing plans to be a global artificial intelligence (AI) innovation hub here, as part of its corporate-wide digital transformation.

To prepare for a digital future, it will empower its Singapore workforce to be capable of deploying and developing AI solutions in all business functions. More than 1,000 employees will be upskilled and around 25 unique AI projects covering the entire value chain of activities in Singapore will be deployed by 2023.

Internally, Infineon will focus on inculcating a digital growth mindset among its staff by encouraging behavioural changes through habit-changing nudges and enabling leaders to drive augmented performance.

Additionally, the company will proactively engage with the semiconductor, electronics, and innovation ecosystems in Singapore through collaborations with SGInnovate, local start-ups, institutes of higher learning (IHLs) and research institutions on new AI solutions. These organisations can work on actual problem statements by leveraging Infineon's rich datasets to build their solutions.

Infineon is also looking to empower the next generation of employees and innovators by collaborating with NUS Institute of Systems Science (NUS-ISS) and AI Singapore (AISG) to offer AI courses and certifications.

Mr Heng Swee Keat, Singapore's Deputy Prime Minister, Coordinating Minister for Economic Policies and Minister for Finance, attended the 50th anniversary event as the Guest-of-Honour.

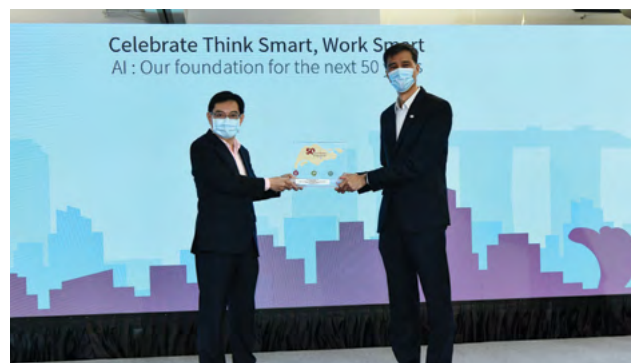
The event was held at Infineon Technologies Asia Pacific Headquarters in Singapore. The celebration was themed 'Celebrate Think Smart, Work Smart. AI - Our Foundation for the Next 50 Years'.

Speaking on the occasion, Mr Heng said, "Today, Infineon's manufacturing operations here are amongst the 'smartest' across your global sites. Infineon's plant in Singapore has been recognised by the World Economic Forum as a Lighthouse project - a distinction given to only 50 other model factories around the world. My visit to your plant in 2017 left a deep impression on the advancements we have made in manufacturing. I am even more impressed by the transformation that Infineon has embarked on since".

"I am heartened that Infineon will be investing more than SGD 27 million over three years, on an AI initiative in Singapore. Under this initiative, Infineon Singapore will be partnering academia, industry, and local-startup



Deputy Prime Minister Mr Heng Swee Keat (on stage) with Infineon CEO Dr Reinhard Ploss (who participated via video from Munich, Germany) jointly signed a digital plaque to mark the launch of ARISE, Infineon's AI initiative that makes Singapore the company's global AI innovation hub.



Infineon Asia Pacific President and Managing Director Chua Chee Seong presented a token of appreciation to Deputy Prime Minister Mr Heng Swee Keat. The plaque was specially designed by an Infineon engineer who used Infineon chips to form the map of Singapore.

SixSense AI to develop new AI solutions and courses. Infineon Singapore will also be signing an MoU with SGInnovate to partner other AI startups. These efforts will help grow our AI capabilities and provide a reference customer for promising startups", he added.

Dr Reinhard Ploss, Chief Executive Officer, Infineon, attended the event virtually.

"Singapore is a global node of technology, innovation and enterprise that is able to re-invent itself while conserving its strengths. The country offers a vibrant innovation ecosystem and an attractive environment for top talents to live and work in. On its journey to become a Smart Nation, a key step is Singapore's national strategy to develop impactful AI solutions. This fits well together with Infineon Singapore's vision to make it an AI innovation hub and a key player for our AI strategy", said Dr Ploss.



Aerial view of Infineon's building in Singapore

"Singapore is the first in Infineon worldwide to embark on a comprehensive AI journey for all our business and manufacturing operations, embedding AI into every job function. To help our employees on this digital transformation, we will be helping our staff to develop a digital mindset and driving training programmes while creating exciting opportunities and AI solutions with our ecosystem that benefit individuals and industries in Singapore and around the world", said Mr Chua Chee Seong, President and Managing Director, Infineon Technologies Asia Pacific.

"Infineon's decision to locate its global AI innovation hub here is another important milestone in our longstanding partnership, which has spanned 50 years. The latest investment will allow Infineon to build new smart solutions for its operations in Singapore and beyond, and in the process upskill its Singapore workforce", said Dr Beh Swan Gin, Chairman, Singapore Economic Development Board.

The company has budgeted more than SGD 27 million to prepare for a future-driven by AI. The investment will cover infrastructure, AI projects, employee reskilling, and collaborations with ecosystem partners.

Infineon has been part of Singapore's semiconductor landscape for the past 50 years, starting out first as Siemens, assembling low-cost discrete transistors and diodes, and passive components.

With about SGD 700 million invested here in the last decade, the company has become the lead site for smart factory solutions development and the global test hub for automotive microcontroller units. It is also a key node for Infineon global distribution and one of the major microelectronics R&D centres in Asia.

Infineon

Infineon Technologies AG is a world leader in semiconductor solutions that make life easier, safer and greener. The company employs a workforce of some 46,700 people worldwide.



Inside Infineon's smart factory



The control centre for the smart factory

INFINEON SIGNS FOUR AGREEMENTS TO BOOST THE AI ECOSYSTEM IN SINGAPORE

Following the announcement that it plans to make Singapore the company's global artificial intelligence (AI) innovation hub by 2023, Infineon Technologies signed agreements with four organisations to boost the AI ecosystem in Singapore.

The organisations are AI Singapore (AISG), NUS Institute of Systems Science (NUS-ISS), SGInnovate and Tata Consultancy Services Asia Pacific Pte Ltd.

Singapore's Deputy Prime Minister, Mr Heng Swee Keat witnessed the event which was held also on 1 December, at the Infineon Technologies Asia Pacific Headquarters in Singapore.

Agreement with AI Singapore

AI Singapore (AISG) is a national program office that develops AI engineering capability for companies as one of its main workstreams. In this collaboration, AISG will help Infineon develop company-wide AI literacy, enable its staff to upskill themselves and learn data science and AI in Python and recognise its internal AI talents via the Chartered AI Engineer professional qualification.

"AISG is excited to play a part in contributing to Infineon's digital transformation and training journey. As the national AI program, our key thrusts are to anchor deep national capabilities in AI and to groom local AI talents. As AI becomes more pervasive and with Singapore moving into becoming a smart nation, it is important that our people are not only AI-aware, they will also be AI-enabled and ready to be producers and users of AI products and services", said Mr Laurence Liew, Director of AI Innovation, AI Singapore.

Agreement with NUS Institute of Systems Science

NUS Institute of Systems Science (NUS-ISS) will support Infineon in developing AI competencies including customised training programmes focused on building AI skills to solve problems within the organisation. Infineon will collaborate with NUS-ISS in talent devel-

opment for AI-related job positions. NUS-ISS will also provide AI and machine learning consultancy services.

"Artificial Intelligence is rapidly shaping the future of work, and NUS-ISS is proud to have supported AI adoption in industry for more than 30 years. We are honoured to partner closely with Infineon on training programmes, projects, talent acquisition and community engagement to deepen and harness AI and machine learning skills to drive digital transformation efforts. Through a holistic and collaborative approach, we are looking forward to developing digital leaders and change agents to support Infineon's plans moving forward", said Khoong Chan Meng, CEO, NUS-ISS.



From left to right, Mr Laurence Liew, Director of AI Innovation, AISG; Mr Heng Swee Keat, Deputy Prime Minister; Mr Chua Chee Seong, President and Managing Director, Infineon Asia Pacific and Ms Pamela Leong, Vice President of Human Resources, Infineon Asia Pacific.



From left to right, Mr Khoong Chan Meng, CEO, NUS-ISS, Mr Heng Swee Keat, Mr Chua Chee Seong and Ms Pamela Leong.

Agreement with SGInnovate

SGInnovate and Infineon will collaborate to support the development and growth of AI start-ups in technology sectors in Singapore. As a leading Deep Tech investor, SGInnovate will identify potential start-ups to work with Infineon on their problem statements. Infineon will partner with SGInnovate in reaching out to and growing the AI ecosystem in Singapore, tapping on SGInnovate's over 55,000-strong Deep Tech community for joint events and community engagement activities. SGInnovate will also support Infineon in the search for AI experts and talent via its network and marketplace.

"Collaborations between the public sector, corporations and startups are critical in fostering a vibrant Deep Tech ecosystem, especially in providing support for the commercialisation of scientific research, scaling high-potential startups and nurturing talent. By consolidating our expertise and network, I am confident that our partnership with Infineon will unlock greater opportunities for startups to tap on the power of AI and bring to market practical innovations that can solve industry and global challenges. We are pleased to work with Infineon to deepen AI capabilities in Singapore and hope that more corporate players can join us as we continue our push to grow a thriving Deep Tech economy", said Dr Lim Jui, CEO, SGInnovate.

Agreement with Tata Consultancy Services Asia Pacific Pte Ltd

Tata Consultancy Services (TCS) is a global leader in IT services, digital and business solutions, that partners customers across the globe including leading semiconductor companies to simplify, strengthen and transform their businesses through its comprehensive industry expertise and a global network of innovation and delivery centres. TCS will collaborate with Infineon in exploring AI, machine learning and related technologies, for data management, data science support, data engineering support and AI platform architecture.

In addition, TCS will provide Infineon with training, knowledge ramp-up and knowledge transfer through best practice sharing, seminars, expert talks and benchmarking exercises.

"TCS has been leveraging its deep domain expertise in the semiconductor industry, and its investments in research and innovation in the areas of artificial intelligence and machine learning to enable our customers to scale from proof-of-concepts to the industrialisation of AI solutions, to further their growth and transformation aspirations. We are excited to partner with Infineon in this strategic initiative, and use our contextual knowledge to help them harness the power of machine learning and AI to transform different aspects of their business", said V Rajanna, Global Head, Technology Business Unit, TCS.

All images by Infineon



From left to right, Mr Lim Jui, CEO, SGInnovate, Mr Heng Swee Keat, Mr Chua Chee Seong and Mr Rohit Girdhar, Vice President, Strategy and M&A, Infineon Asia Pacific.



From left to right, Mr Ameet Nivsarkar, VP and Country Head, Tata Consultancy Services, Mr Heng Swee Keat, Mr Chua Chee Seong and Ms Natalie Yap, Vice President, Information Technology, Infineon Asia Pacific.



Improving energy efficiency is pivotal in realising Singapore's transition to a low-carbon and sustainable economy. It is also a critical component of the nation's pledge to reduce greenhouse emissions, under the Paris Agreement in 2015, by 36 per cent from 2005 levels by 2030.

However, it is not a priority for many local businesses, in particular small and medium enterprises (SMEs), due to the lack of financial resources and capability.

To generate an impetus towards greater energy efficiency amongst local industries, the Singapore Institute of Technology (SIT) set up the Energy Efficiency Technology Centre (EETC) in collaboration with the National Environment Agency (NEA) in October 2019.

Seeking to be a leading technology innovation centre in energy efficiency, EETC focuses on driving greater identification and implementation of energy efficiency improvement measures amongst local businesses; and boosting industrial energy efficiency capabilities in Singapore.

Addressing core challenges faced by SMEs

While SMEs recognise the benefits of being more energy efficient, many are apprehensive

about the cash outlay required to implement improvement measures. EETC is set up to help them take the first important step, by offering energy consultancy services and high-quality, low-cost energy assessments.

In this way, SMEs can receive a diagnosis of their energy performance and obtain specific recommendations on areas of improvement — without rocking their budgets. Most importantly, by implementing the suggested measures, they can work their way towards reducing energy costs and strengthening business competitiveness.

EETC also supports SMEs in capability development to address both short- and long-term needs.

SMEs can work with EETC to upskill their existing engineers or energy efficiency practitioners through the EE Upskilling Programme (EEUP), a series of practical training courses designed to complement classroom-based theoretical knowledge. Through the programme, engineering professionals can acquire skills in energy management and in performing energy assessments of industrial facilities.

EETC also offers a comprehensive range of energy efficiency courses, masterclasses,



Professor Lock Kai Sang, Head of EETC (centre) with EETC staff members and SIT students.

workshops, seminars and conferences for industrial EE professionals looking at upgrading their skill sets.

SMEs on board the programme can also take in SIT engineering undergraduates through the EETC attachment programmes, to support them in performing energy assessments for their facilities. They can select students from SIT's range of degree programmes, including Sustainable Infrastructure Engineering (Building Services); Mechanical Design and Manufacturing Engineering; Chemical Engineering, and Electrical Power Engineering.

Such attachments are in line with SIT's strong emphasis on applied learning, where students receive hands-on training through their Integrated Work Study Programme (IWSP) to enhance their industry readiness.

Another key thrust of EETC is fostering academia-industry collaborations to co-create innovations that address current industry challenges. Oftentimes, many companies are too overloaded with daily operations to resolve energy-related issues.

EETC could step in to help, including performing energy assessments to identify areas of improvement and recommending measures to address gaps through capstone projects that actively link industry partners with the SIT faculty's various members. Faculty members would review and analyse complex industrial problems, in a methodical and scientific manner, for participating companies.

Harnessing early accomplishments to drive greater impact

Since its establishment, the EETC has already signed service agreements for energy assessments with three local companies – Far East Packaging Industrial Pte Ltd, Aalst Chocolate Pte Ltd, and Doxon Engineering Pte Ltd.

"We are still operating ageing equipment and M&E facilities but energy conservation has always been in our agenda. We had been planning to

implement energy management for sustainability and long-term benefits but did not get down to doing it," said Andrew Lim, Business Manager, Far East Packaging.

"When we learnt about SIT's offer to conduct energy audits at a nominal cost through Prof Lock's presentation at an SME workshop, we immediately registered our interest. We are glad about our decision as the SIT team has demonstrated their dedication towards assessing and identifying our energy utilisation issues," added Andrew.

A total of 19 IWSP students from various degree programmes have also joined EETC attachment programme.

Amos Ong, a Year 3 student from the SIT-Newcastle University Electrical Power Engineering programme found his IWSP experience at EETC to be a positive one.

"I had the opportunity to conduct audits on electrical systems during my IWSP. Understanding the Single Line Diagram and knowing where to install the metres to measure power quality are valuable skills that I've picked up during the process," said Amos.

The hands-on programme has also boosted his confidence in performing tasks in real-life scenarios. "I was able to apply the concepts learned in class when conducting power quality measurement and data analysis," he added.

Building on these early milestones, EETC will continue to promote energy efficiency across all industrial sectors while nurturing more talents in energy efficiency to create a reliable and sustainable energy future for Singapore. ■



This sponsored feature on engineering education was brought to you by SIT.

SINGAPORE IS GOING DIGITAL

Going digital is another term for digital advancement. At Bentley, instead of speaking about transformation, which sounds like there is an end to it, we speak in terms of going digital, because this is something that is ongoing. Your people, processes, and the technology you employ will continue to evolve to improve how you plan, design, and build infrastructure, and how infrastructure asset owners operate these assets.

Evolving business processes mean you need new ways to do your work. Digital workflows change the way you interact with your project team and stakeholders. They eliminate paper-based workflows through software applications that can intelligently and semantically share data. They position you to leverage digital technologies to reduce risk and avoid errors. Here are a few ways you can add more value to your work:

- Collaborate, communicate, and manage project processes and data more effectively.
- Standardize and federate for more productive workflows.
- Access data created for one purpose and use it elsewhere – streamlining work and improving data quality over the infrastructure lifecycle.

SINGAPORE: DIGITALLY ADVANCING AND COMPETITIVELY RANKED

The **IMD World Digital Competitiveness Ranking** measures the capacity and readiness of economies for adopting and exploring digital technologies. In the IMD World Digital Competitiveness Ranking 2019 report, Singapore was ranked second, with the highest ranking in technology, third in knowledge, and 11th in readiness for the future. Considering Singapore is digitally advanced as a country, it follows that the ecosystem of engineering and consultants, as well as infrastructure owners, are digitally advancing. **For more information, visit, <http://www.bentley.com/2019Ranking>.**

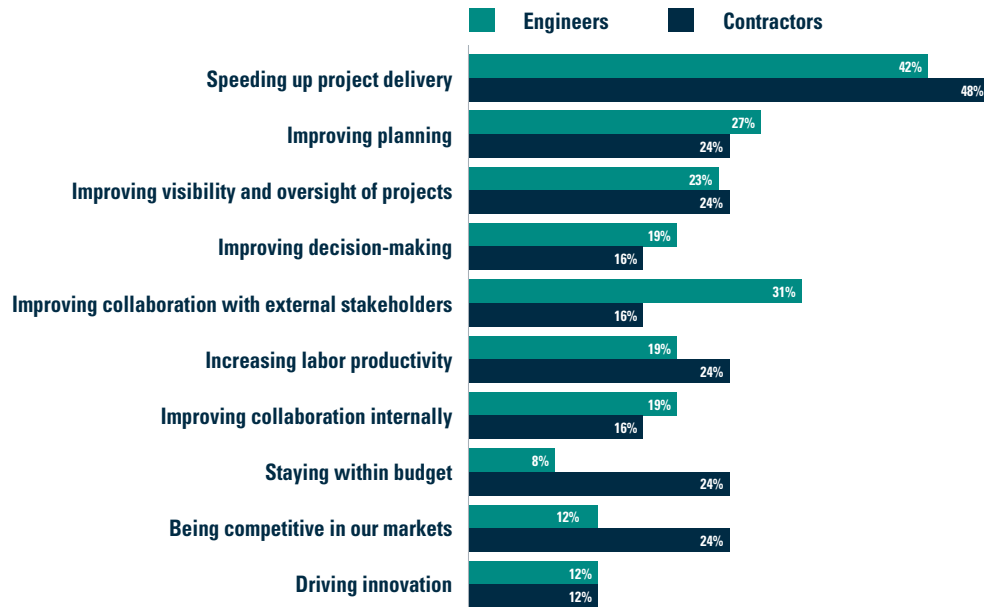
Recently, we reached out to engineers and contractors in Singapore to gauge their digital maturity with the help of Dodge Data & Analytics, a leading provider of commercial construction project data, market forecasting and analytics services and workflow integration solutions for the construction industry. With this survey built by Dodge, contractors and engineers responded to provide insights into their capabilities and self-assessed maturity level focus on project delivery in Singapore. The following includes a summary of the results. Of the 95 respondents, here is the breakdown of the primary types of work.

Type of Work	Contractors	Engineers
Primarily designs buildings	12%	23%
Primarily designs heavy civil assets	24%	14%
Primarily designs industrial facilities	24%	14%
Design work is evenly split between buildings, heavy civil, and industry projects	41%	50%

In each of the sections below, respondents were asked questions related to the current project delivery software and workflows.

DRIVERS FOR ADOPTING PROJECT DELIVERY SOFTWARE

The results show where the response indicated their high or very high level of satisfaction.



LEVEL OF SATISFACTION

The results show where users are reporting high or very high levels of satisfaction.



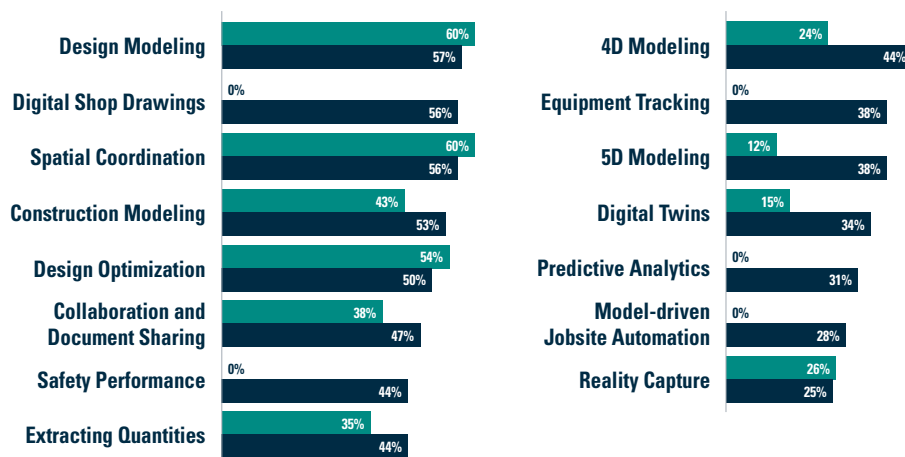
BENEFITS OF USING SOFTWARE FOR PROJECT DELIVERY

Results show how many users receive each benefit of technology at a high or very high level.



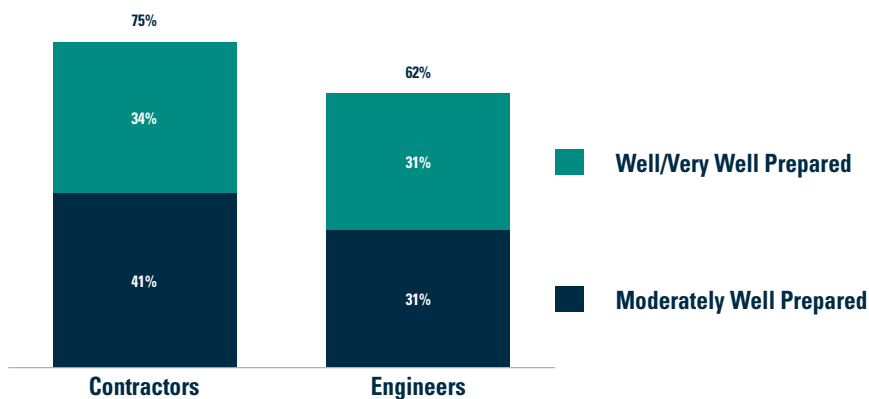
USAGE OF DIGITAL TECHNOLOGIES AND INNOVATIONS

Results show the percentage of users applying technology for each specific purpose on at least 25% of their projects.



CURRENT LEVELS OF DIGITAL CAPABILITY

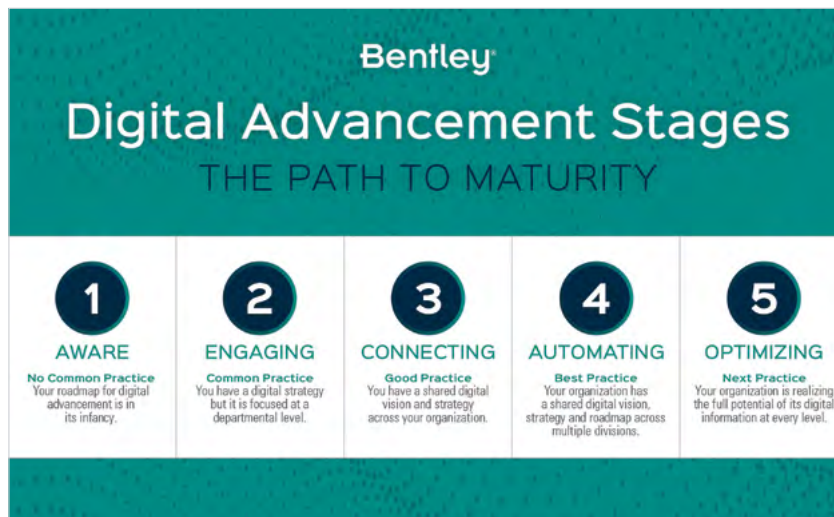
With governments across the world legislating for mandatory BIM requirements on public sector construction projects, the respondents answered how prepared their businesses were to participate in BIM construction projects. The results show those that report being at least moderately well prepared.



ARE YOU GOING DIGITAL?

This going digital framework covers five levels of advancement: aware, engaging, connecting, automating, and optimizing. By understanding common business practices and how the technology is used in each stage, this framework can help you begin to evaluate your current state, identify areas of improvement, and prioritize your next steps.

To download the full infographic explaining the going digital framework, visit, <http://www.bentley.com/DigitalAdvancement>.



GET STARTED NOW

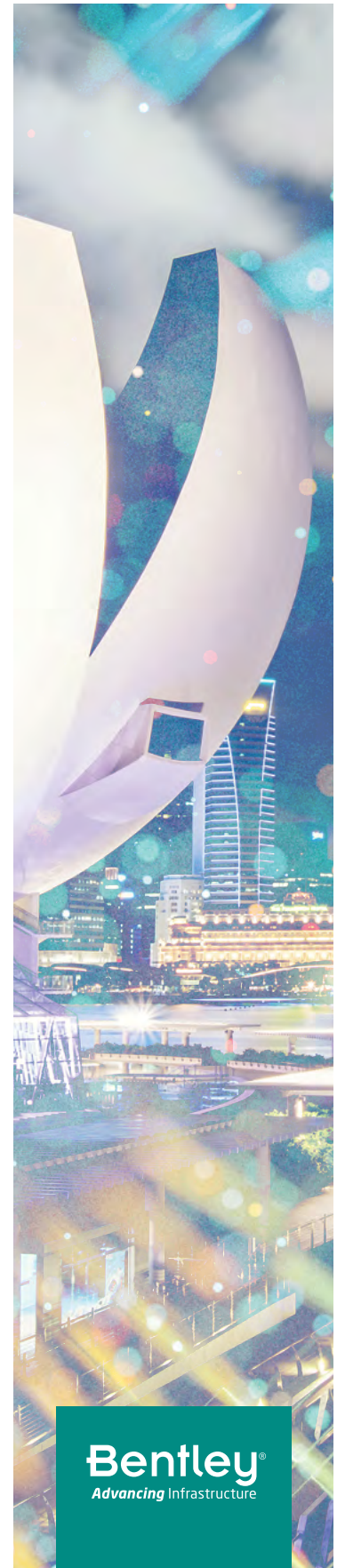
Bentley Systems partners with project delivery firms, consultants, contractors, and owner-operators to help them get the most value out of their data in a connected data environment and to help make better decisions, gain insights, improve asset performance, and achieve better business outcomes. Here are a few ways to get started.

- Support the work of your multidiscipline team and integrate all project processes across your supply chain including instant-on BIM collaboration.
See how it works at <http://www.bentley.com/pw365>.
- Give your teams model-centric and multidiscipline design review, fully integrated with ProjectWise®. Track changes, manage change, and get complete visibility of your design decisions across the entire project timeline.
See how it works at www.bentley.com/itwin.
- Plan, manage, construct, and track in 4D and model-based workflows so that everyone reviews, communicates, and collaborates in a digital interactive and visual environment.
See how 4D construction modeling works at www.bentley.com/SYNCHRO.

ABOUT BENTLEY

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Bentley®
Advancing Infrastructure

INNOVATIVE TECHNOLOGIES FOR PEOPLE MOVEMENT IN HIGH-RISE BUILDINGS

They will make buildings smarter, safer and more adaptable to a changing urban environment.

KONE, a global leader in the elevator and escalator industry, recently introduced KONE Office Flow, a new solution for offices, high-rise buildings and commercial developments.

According to the company, it will transform the way in which people can move in a lobby or from floor to floor, by combining new connected services for elevators, personalised access management, and adaptability over the lifetime of buildings.

KONE Office Flow is also expected to meet the evolving needs of sustainability in high-rise buildings.

The solution has been co-created together with customers and users. As the changing nature of work and digitalisation transforms the workplace, KONE Office Flow is expected to contribute to the realisation of a smarter, safer and connected environment.

With touchless access, and predictive elevator calling, KONE Office Flow integrates with mobile devices, removing the need for key cards and tags. It features a newly designed destination control system as well as visitor management and guidance, to reduce waiting and journey times.

KONE Office Flow can be adapted to meet the aesthetic design of a building.

The solution's inherent connectivity means that new applications and different types of equipment and services can be added now and in the future. As organisations look to improve office well-being, reduce their environmental footprint and create new smarter workplaces, open Application Programming Interfaces (APIs) can securely connect elevators with a growing range of solutions and services. Service robots, navigation apps, smart office and visitor management solutions, or custom-branded applications can be integrated.

KONE is working with leading companies in the field of smart buildings and smart access, and has announced its collaboration with new ecosystem partners including dormakaba, Schneider Electric, Siemens and Smarten Spaces.

"KONE Office Flow is a new solution for the times we are in today as well as the future we want to create. We want to help our customers adapt, particularly as they navigate the effects of the pandemic. The workplace of the future will be a dynamic mix of both the physical and the digital, where offices need to be flexibly modified to meet evolving demands. Personalised experiences boost innovation, attract talent and ensure the overall well-being of employees. KONE Office Flow is a flexible,



With touchless access, and predictive elevator calling, KONE Office Flow integrates with mobile devices, removing the need for key cards and tags. Images: KONE.



Dynamic digital experience in the elevator car. Image: KONE.

connected solution that grows with your needs and adapts to the digital future of the workplace”, said Hanna Inget, Head of New Services and Solutions, KONE.

KONE is also introducing a complete range of flexible solutions for its customers, to help improve the planning, construction and operation of taller buildings. These solutions are recommended for new projects and for the upgrade of existing buildings. The offering includes tools which use cutting-edge robotics to assist with the precise installation of elevators in high-rise elevator shafts.

In addition, KONE DX Class elevators will be available in selected markets for high-rise buildings, bringing the ability to adapt and improve the elevator experience.

KONE’s DX Class elevators offer connectivity and a customisable user experience, with the use of dynamic displays, sound and lighting, and materials with anti-stain, anti-scratch and anti-bacterial surfaces. The elevator range also uses sustainable materials to meet green building criteria like BREEAM and LEED.

“We want to rethink high-rise because of the exciting opportunities we see in the future together with our customers. With a combination of physical design, digital technologies including AI, as well as new services, we can change the game in terms of what is the best people flow experience and how that can evolve in a high-rise environment. We are taking a quantum leap towards smart and sustainable urban environments”, said Tomio Pihkala, EVP, New Equipment Business, KONE.

KONE WINS ORDER FOR PUNGGOL DIGITAL DISTRICT

KONE Corporation has won an order to deliver 62 elevators and 28 escalators to the integrated business park development in Singapore’s Punggol Digital District.

Punggol Digital District is a 50-hectare smart and sustainable development that will testbed new concepts of living, working, and delivering services.

It is being masterplanned and developed by JTC, and designed by WOHA Architects. The tallest towers in the district’s integrated business park development will be around 55 m and 12-storeys high, and will host a wide variety of innovative digital businesses.

KONE will help to create smart and smooth people flow around the business park area by delivering 40 KONE

MonoSpace elevators, 22 KONE MiniSpace elevators, and 28 KONE TravelMaster TM110 escalators.

Additionally, the buildings will be equipped with the KONE Destination Control System for reduced waiting and travelling times, and the KONE E-Link facility management tool which is designed to secure the best possible tenant service quality.

“Punggol will showcase the future of living in Singapore, combining digital technologies to improve liveability and sustainability. We are excited to be included in this project to help deliver a great people flow experience”, said Axel Berkling, Executive Vice President for KONE Asia Pacific.



Punggol Digital District is a 50-hectare smart and sustainable development that will testbed new concepts of living, working, and delivering services. Image: JTC.

FUTURE ADVANCES

IN PROCESS AUTOMATION

Andrew Ogden-Swift reviews the pressing challenges

Over the last 40 years, there has been continual growth in the use of digital technologies in process manufacturing. This has ranged from increasingly reliable and low-cost sensors, digital field networks, control and shutdown systems, process historians, model-based optimising controllers, and manufacturing information systems, to enterprise resource planning systems. These technologies have enabled higher process performance, reduced operating risk and improved staff productivity.

Improvements in these technologies continue:

- Continued improvements in self-diagnostics, error prevention, precision in field instruments and valves along with continued cost reduction and instrument asset management.
- Better control systems capabilities such as configurable I/O and tools that ensure control systems are no longer on the critical path of new build projects. Better tools and new modules to reduce the cost of system maintenance, migration and sustaining IP in existing systems. Better approaches and technologies to build operator interfaces.
- Better control loop maintenance and advanced control including distributed MPC and site-wide real time dynamic optimisation.
- More integrated manufacturing execution systems.
- Better technologies and approaches to manage cyber security risk.

In the broader world, there are trends that will impact the process industries and enable further performance improvements and help mitigate loss of expertise. They will also contribute to improved sustainability of these industries.

Technology Area: Big Data and Analytics

The trends in digital computing and mobile technologies now mean there are huge amounts of information about people and their behaviours, appliances and equipment, and the environment. Increasingly, companies are analysing these data to help make better decisions, faster. We are all familiar with internet-based systems recommending other purchases based on the items we have selected, or adverts presented to us based on entries made.

Similar opportunities exist in manufacturing with some challenges that are specific:

- To be successful, subject matter experts need to use modern analytical tools. Subject matter experts such

as engineers, managers and operators seldom have a strong background in statistics, machine learning and AI. Similarly, data scientists seldom have good understanding of process manufacturing. Tools are needed that enable subject matter experts to perform analyses and yet collaborate with data scientists on the more complex problems.

- Data is stored in disparate systems. There are usually data quality issues including missing data, different sampling rates and temporal misalignment, signal and process noise, measurement uncertainty and the relationship with business risk. Tools need to make it easy to access, align and cleanse data.
- Process analysis needs to make it easy to answer common questions but in ways that make sense by, for example, allowing for grades, operating modes, and feedstocks.
- Analysis needs to allow fast results to be achieved, effective collaboration, issues to be communicated quickly and improvements to be driven rapidly.

Increasingly, tools are becoming available that meet these needs and enable engineers and managers to analyse performance without the grind of trying to use spreadsheets or become data science experts.

Technology Area: Mobility

It might seem strange to see mobility identified as a technology that will have significant impact in manufacturing. After all, we have all had mobile phones for a couple of decades. Mobile tools have been increasingly used over the last 5-10 years to enable field workers to be effective, for example, to carry out and collect data from operator rounds.

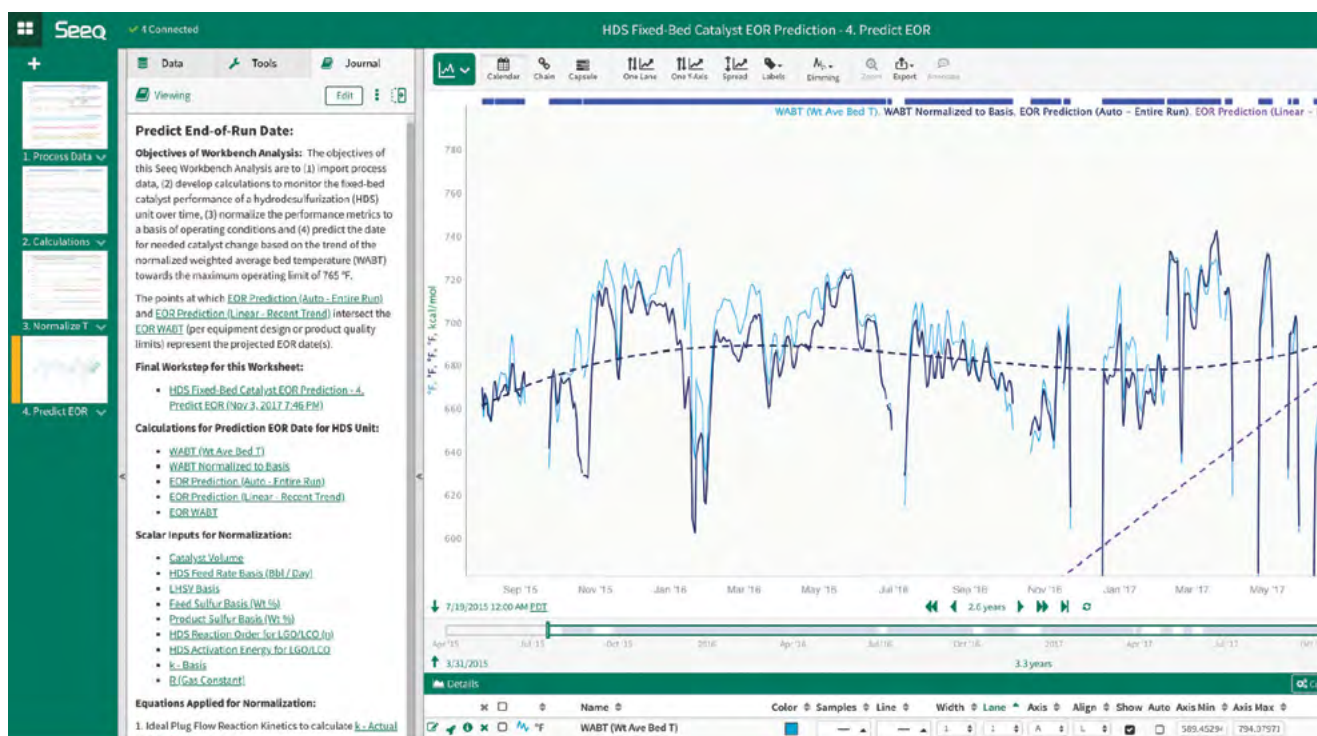
The key challenges for mobility in process operations are use in hazardous environments, use in hands-free and high noise environments. Increasingly these problems are being overcome with integration with ear protection (along with noise cancellation) and near-to-eye displays providing augmented reality.

Provision of effective applications interfaces and analytics will empower mobile workers to create significantly higher value.

Technology Area: Edge and Fog Computing

With continued growing capability of microprocessors and communications technologies, increasing computational capability will be available in controllers and other digital devices (edge computing) which are located at the plant. Moreover, these devices will allow more complex and sophisticated algorithms to be implemented close

Mr Andrew Ogden-Swift CEng, MChemE is Director at Ogden-Swift Consulting, UK



Example of prediction of reactor end-of-catalyst life. Image: Seeq Corporation.

to equipment and communicate effectively with higher level analytical platforms.

Technology Area: Open Systems

In some sectors of the process industries, highly integrated distributed control systems have been used. The integrated nature of these systems makes it more difficult to incorporate new components into the system allowing the site to take advantage of lower cost options or new innovations.

Over the last few years new architectural concepts have been prototyped which would allow operating companies to leverage new components effectively at the lower levels of the control system.

Technology Area: Computer/Human Interaction

In addition to the mobility theme addressed above, there is a wide range of other new approaches being developed that enable us to interact with digital systems. Voice recognition and synthesis is becoming increasingly widespread but other approaches such as augmented reality, gesture-based interaction and eye tracking may start to be used.

Significant improvements have been demonstrated by improvements in design of operator displays through work by the Abnormal Situation Management Consortium and Center for Operator Performance. These approaches can be expected to be more widely applied and enhanced by further human factors research.

Technology Area: Cloud

Increasingly, information and decision support systems

are being moved to being hosted on the cloud. The primary driver for this is reduction in the cost of systems and applications management. Companies no longer have to buy and maintain servers nor upgrade applications when new releases or patches are issued - these are managed by the cloud service vendor. New usage and payment models are enabled, such as pay-per-use.

Cloud platform providers are developing new AI and machine learning technologies which will further improve analytics results. Some are also actively investing in time series data stores which will see new entrants into this market and price compression of process historians.

Summary

The digital transformation journey that many process manufacturing companies have been on for decades is accelerating with more capable electronic and software platforms and new algorithms. This will drive continued improvements in process safety, emissions to the environment, production results and working capital. This is in spite of continued loss of expertise in the industry and ever-rising regulatory demands.

New emerging architectures and technologies will see current systems and architectures become obsolete, threatening incumbent suppliers and new, innovative capabilities will create higher opportunities for higher business results and productivity.

[Adapted from an article written by Mr Andrew Ogden-Swift and included in the October 2019 Issue of 'The Chemical Engineer', published by the Institution of Chemical Engineers (IChemE)]

ENABLING SMARTER REVENUE GENERATION

IN THE PETROLEUM REFINING INDUSTRY

Leading petroleum refineries are continuously pressured to achieve, sustain and reach the next level of performance. Ravi Gopinath, Chief Product and Cloud, AVEVA, looks at how digitalised operations and processes can help to accelerate decision-making and boost revenues.

Downstream business processes commonly refer to the petroleum industry and are associated with post-production activities. Leading petroleum refineries are continuously pressured to achieve, sustain and then reach the next level of performance.



Mr Ravi Gopinath

In the ongoing quest for value creation, businesses are also seeing a new wave of technology-enabled productivity growth. This is acknowledged in McKinsey & Company's research on 'Digitising the Value Chain', which states that 80% of operations agree that digitalisation is a critical driver of competitiveness.

In monetary terms, digital transformation in the oil and gas industry could unlock approximately USD 1.6 trillion of value for the industry, its customers and the wider society. This total estimated value from digitalisation can further increase to USD 2.5 trillion if existing organisational/operational constraints are relaxed, and the impact of futuristic technologies, such as cognitive computing, is considered. Digitalisation has the potential to create around USD 1 trillion of value for oil and gas firms.

Digitalisation is gaining momentum. It enables management to receive real-time operational information in an integrated manner and can help businesses break through to the next level of performance in three key ways:

- **Unlock hidden or captive value:** Performance gains made by early adopters of Refining Operations Management show significant contribution to profitability goals and invested capital.
- **Close the digital operations gap:** Addressing the steps in an end-to-end refinery value chain as an integrated whole is driving the next productivity frontier in petroleum refining. Although it goes by different names (Digital, IoT, Industry 4.0), they all reflect a common theme of digitalisation of business processes, with huge potential especially for areas like operations management.
- **Enable a step change in process:** Unlocking hidden value requires dealing with events closer to real time - in particular, the many minor performance deviations or 'value leaks' that occur daily.

UNLOCKING HIDDEN POTENTIAL

To understand the performance improvement potential in quantitative terms, consider the benefits to a 400,000/bpd refinery from integrated refinery information management processes.

- Revenue increase achieved through improved availability and yield is more than USD 67 million per year per percent improvement.
- Energy efficiency increase of at least 4%, which is worth more than USD 20 million per year, is achieved through proactive operations and closer coordination through the 'internal value chain'.
- Further cost reductions achieved through logistics improvements within the 'internal value chain' is more than USD 60 million per year per percent improvement.

In qualitative terms, the deployment of Refining Operations Management achieves further improvements in the following ways:

- **Enabling planning with accuracy:** Refining Operations Management enables planning and scheduling processes to tightly couple with supply chain and operations management and allows accurate planning based on accurate demand forecasts and real plant constraints.
- **Allowing the plant to operate optimally, reliably and safely, while meeting targets:** Applications like Operator Logbook, Operating Window, Offsites Management and others enable digitalised business processes and allow enhanced operator productivity and improved decision-making, while working within the operating envelope, to improve plant efficiency and asset lifecycle, as well as provide a safer and a more reliable operation.
- **Measuring performance with accuracy:** This is achieved through tightly integrated quality management processes benchmarked against stringent quality standards, as well as a well-implemented real-time database, Laboratory Information Management Systems (LIMS), mass and energy balance, production accounting and accurate plant models. A single version of truth is achieved through the seamless flow of validated data across all applications via an integrated environment.
- **Analyses performance with a collaborative analysis tool:** The accurate and robust progress measurement

tool ensures a high level of integrity in reporting, roll-up of individual KPIs to the corporate KPIs, powerful visualisation and event management, as well as seamless flow of validated data and designed version of truth.

- Continuous improvement by agile decision-making based on reliable data: Well-designed business processes and workflow management leverage state-of-the-art technology and industry standards.

REAL-TIME REPORTING TO REAL-TIME DECISION-MAKING

As an early adopter of both enterprise and real-time control systems, the petroleum refining industry is well into the digitalisation journey. Most operational applications were designed for reporting as opposed to real-time decision-making. As a result, the strategy-to-execution linkage is weak, preventing real-time visibility and agility.

The current reality for operational users in the oil refining industry is that users do not have time to coordinate closely or take advantage of available data, especially data that could provide appropriate insight into upcoming refinery behaviours.

The highly competitive nature of the refining industry has required higher levels of operational excellence. But with no relief in sight for margin pressures, there is a general recognition that in order to sustain the refining business under this 'new normal' we have to change the operational mindset. In other words, businesses need a step change in performance to be able to survive in the long term and ensure smart revenue generation.

The key requirement for managing performance in real-time is that relevant information should reach the appropriate approval level quickly so that decisions can be made while the opportunity still exists or before the

issue becomes a problem. All too often, the decision cycle takes too long and/or the action fails to impact the KPIs that matter to the business.

What is needed is to compress the time within the decision loop while, at the same time, enabling informed decisions along the management hierarchy. This approach enables operations to deal with events closer to real time - in particular, the many minor performance deviations that occur daily. These minor deviations or 'value leaks', if undetected and left unchecked, slowly but surely erode profitability over time.

Companies evaluating an integrated, real-time operational system like Refining Operations Management are encouraged to consider business decisions that would enable the right level of operational integration, in order to gain agility, so that the companies can adapt to changing business conditions and exploit new opportunities.

Digital initiatives, if well executed, can unleash enormous opportunities in value creation



An external view of a downstream processing plant



AVEVA's digital platform for energy management

LEVERAGING TECHNOLOGIES

FOR SMART FOOD PRODUCTION

by Ummi Syafiqah, Freelance Writer

The industry is adopting innovative methods.

Driven by rapid urbanisation and a burgeoning demand from a rising middle-class, Asia's food manufacturing industry continues to prosper, despite the lingering COVID-19 pandemic. No doubt, the pandemic is adding pressure to the sector, as manufacturers and producers struggle to cope with the rapidly changing demands for consumer-packaged goods and a growing shift towards e-commerce and online purchasing.

Functioning in an already labour-intensive and highly competitive industry with rising raw material costs and utility charges, retailers are now looking to technology and automation to push manufacturing beyond its limits, to improve food quality, output, and flexibility.

A report by Meticulous Research predicts Southeast Asia's industrial automation and process control market to grow to USD 4.97 billion by 2025, at a CAGR of 7.8%.

To keep pace with the fast-moving digital commerce and adoption of a smarter approach, governments are investing heavily in the development and implementation of industrial automation and process controls.

In July, Malaysia Digital Economy Corporation (MDEC) introduced the #SMART Automation Grant (SAG) as part of the government's initiative to support small and medium enterprises (SMEs) in taking the leap towards automating their business processes.

Similarly, Enterprise Singapore which champions enterprise development is promoting a customised approach towards encouraging businesses to adopt smart technologies. The government has also announced the Heartlands Go Digital programme to support the digital transformation of some 20,000 retailers and food and beverage (F&B) enterprises in the heartlands.

Quality food production and technology advancements go hand-in-hand. Digital transformation not only offers food and beverage manufacturers a competitive edge but, more importantly, it helps to ensure product quality, from farm to table.

With the capital push from governments, businesses are already leveraging connective technologies and solutions such as collaborative robots (cobots), intelligent networked devices and multi-product packaging systems to meet the increasing consumer demand for product diversity and transparency across the entire supply chain.

Robot-powered fulfilment solutions

As we experience an accelerating global shift towards e-retail, many businesses are finding it difficult to cope with repetitive labour-intensive tasks, while juggling logistics, order fulfilment and keeping up with the modern-day sophisticated consumer. With a growing demand from enterprises, industrial robots are automating specialised tasks that are transforming the food industry. According to research firm, Grand View Research, the global collaborative robots market size is set to expand at a CAGR of 44.5% by 2025.

To accommodate the fast-expanding e-commerce industry, Universal Robots is achieving new levels of productivity with their collaborative industrial robots. The Quick Deployment Kit (QDK), developed by MDCI Automation, is a scalable solution for parcel induction, case packing, and goods-to-person tasks. While traditional industrial robots are usually programmed in protective cages to perform only one handling task, these cobots are encoded for flexible implementation. QDK can pick targets with a payload of up to 9.07 kg through a remote alerting technology. Utilising the UR10e cobot arm, alongside a powerful vision engine powered by PlusOne's PickOne Software, the artificial intelligence (AI) enabled technology identifies items in a pick zone and sends them to the UR cobot that picks and places each item onto a place zone or a conveyor. Configurable from a menu of market-leading robot and gripper options with adjustable camera and lighting equipment, the adaptable technology is automated to be effortlessly integrated into a wide range of layouts including existing production lines. Additionally, the kit can keep up with fast-moving conveyor speed with a maximum robot speed of 1 m/s (39.4in/ sec). In the production and manufacturing sector, where speed, consistency and high levels of repetition are required, the intelligent and user-friendly robotics allow for straightforward time and space optimisation with greater accuracy.

Smart and accessible

When contaminated air comes into contact with food, the products are exposed to particles, microorganisms, water, and oil. These physical, chemical, and biological hazards compromise hygiene standards and can affect the taste, appearance, colour and shelf-life of the food products. A ubiquitous tool in food production and packaging operations, compressed air is critical to

consistently maintaining high quality standards during processes like product handling, canning, freezing, dehydration, labelling and bottle filling, and packaging. Manufacturers equipped with compressed air systems, with the ability to gather, compile, and analyse system data, are able to not only track and monitor food safety risks but also optimise energy and production efficiency.

Leading air compressor specialist, BOGE is setting new standards for the networked control of air compressor stations. The newly launched airtelligence provis 3 is designed such that an unlimited number of compressors can be controlled, managed and monitored proactively, based on consumption. Facilitating communication, via Ethernet, between products from different manufacturers and enabling different devices to work safely and reliably, the BOGE control uses the OPC UA open data format. With the ability to integrate its 15.6 inch intuitive touch display remotely on the PC, tablet or smartphone, the sleek and user-friendly controller continuously monitors all compressed air treatments, such as compressed air filters and dryers, through the simple integration of pressure dew point sensors or fault messages. The visualisation includes that of network pressure, volume flow, capacity utilisation, trends, efficiency of each compressed-air station and electric power consumption and performance history. The web-based interface allows for real-time data to be called up and operated from anywhere and from any device. For efficient energy management, the high performance control algorithms select optimal combinations of compressors and components proactively, and determines the energy-intensive over-compression, thereby optimising operations for load run or idle times. With such defining features, BOGE's airtelligence provis 3 guarantees high quality standards, reliability, durability and process integration at all times.

High precision product packaging

Conveyors improve efficiency and productivity in addition to elevating safety and the performance of distribution facilities, while reducing labour costs. However, as customer requirements and demands evolve, the need for innovative packaging solutions and strategies to save time and money are becoming even more critical.

At the core of MagneMotion Solutions, Independent Cart Technology is a new generation of linear motors that provides significantly higher machine performance and flexibility, without undermining productivity, compared to conventional gear, chain and belt conveyors.

Rockwell Automation's iTRAK 5730 system enables smart, flexible and diversified multi-product packaging for food manufacturers. Designed with magnetic propulsion technology, the individually controlled carts can start and stop with high precision, reducing machine wear and increasing energy efficiency. Easily applicable, the system which allows for easy changeovers using pre-configured move profiles implemented with the push of a button, is also scalable and can be integrated into existing architectures as a stand-alone machine or

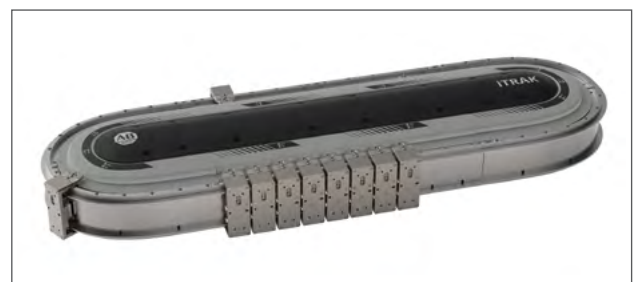
as part of a much larger complex line. Thanks to its 50 mm minimum pitch, the technology is ideal for primary packaging applications, such as flow wrapping, end load cartoning, and form-fill-and-seal pouching. Its simulation capabilities allow manufacturers to create and virtually design a digital twin system which can be commissioned, demonstrated and used to virtually train workers. With features such as safe torque off, Safe Stop 1, a SIL 3, PLe safety rating and the ability to create safety zones, the iTRAK 5730 offers integrated safety by allowing motion to continue outside of the safety zone, even after a trip inside the zone. This mechanical solution, is the next step motion control, redefining speed and flexibility in automation.

Smart Manufacturing Ecosystems

As we progress to the Industry 5.0 standard, technology will stay grounded as the foundation of digitalisation - promising faster, safer and efficient output. For the manufacturing industry, real-time data, analytics and high precision machinery will become the defining and necessary features in the market. The early adoption of these dynamic technologies will go a long way to help food retailers achieve operational performance by meeting order fulfilment and logistics requirements.



The BOGE airtelligence provis 3 provides maximum energy efficiency, easy maintenance and customer flexibility.



With its magnetic propulsion technology, the iTRAK 5730 system enables smart, diversified multi-product packaging for food manufacturers.

RESILIENCE IN A TIME

OF UNCERTAINTY

Companies need to have plans for business continuity, disaster recovery and crisis management, to cope with situations such as a global pandemic.

Mr Albert Joseph Carreon, Head of Global Architecture, Directory Services & Collaboration, Coats, a UK-based industrial thread company, provides an overview of how the company has responded to the disruptions caused by the outbreak of COVID-19.



Mr Albert Joseph Carreon

‘The Singapore Engineer’: Can you tell us more about Coats?

Albert Joseph Carreon: Coats is the world's leading industrial thread company. Headquartered in the UK, we have a work force of 18,000 in some 50 countries across six continents around the world.

TSE: How did Coats handle the overall IT concerns during the pandemic? What was the biggest challenge faced?

AJC: The biggest challenge was how to manage remote working as most of the countries declared a total lockdown around March. It was a good thing that our leadership had anticipated this possibility and started preparing our locations globally a few weeks before. We were in a better position to carry out our day-to-day operations while most of the employees were working from home.

TSE: What are some measures that Coats implemented which other companies can benefit from?

AJC: Coats is almost fully in the Cloud. All our solutions and infrastructure are hosted there. We even leveraged the use of Virtual desktops so that we can still work as though we are in the office even though we are working from home. Foresight may have differentiated us with other similar manufacturing companies who may have more difficulties during the pandemic.

TSE: How did the pandemic force Coats to rethink their long term business contingency plans?

AJC: The pandemic just highlighted that technology plays a vital role for a company's success. We can work from anywhere and still be flexible and productive in delivering outcomes. It has proven that remote working actually works. Probably, we would invest more in making this area by providing further digitisation and integrating everything else remaining on-premise into the cloud. There may be less or very limited face-to-face meetings and some office leases may not be needed anymore.

TSE: What were some measured approaches that Coats picked up that were not part of the processes before the pandemic hit?

AJC: We had to leverage all features of the IT / Business solutions. We had to ensure that these deliver added value to the business. We also had to ensure that we spend

only on essentials that will keep the business running successfully.

TSE: How did Coats benefit from adopting these solutions?

AJC: Even before the pandemic started, Coats had derived benefits from the implementation of solutions provided by ManageEngine, the enterprise IT management division of Zoho Corporation. During the pandemic, the same features and services have proven to be helpful for end-users and IT technicians alike. With ADSelfService Plus, end-users still continue to maintain their accounts and reset their passwords. With ADManager Plus, we have still been able to perform business-as-usual, day to day Active Directory tasks. With ADAudit Plus, we have quickly narrowed down events such as account lockouts and address the root cause, thereby not delaying the work of our colleagues.



Coats employs advanced technologies at its manufacturing facilities.

TRANSITIONING A POWER GENERATION SYSTEM TO USE ZERO-CARBON HYDROGEN

The purpose-built plant in the US is expected to start operations in late 2021.

Long Ridge Energy Terminal (Long Ridge), located in Hannibal, Ohio, USA, recently announced plans to transition its 485 MW combined-cycle power plant to run on carbon-free hydrogen. In collaboration with New Fortress Energy (NFE) and GE, Long Ridge intends to begin providing carbon-free power to customers as early as 2021, by blending hydrogen in the gas stream, and transition the plant to be capable of burning 100% green hydrogen over the next decade.

With commercial operations planned for November 2021, Long Ridge will be the first purpose-built hydrogen-burning power plant in the US and the first worldwide to blend hydrogen in a GE H-class gas turbine. The plant utilises a GE 7HA.02 combustion turbine which can burn between 15% to 20% hydrogen by volume in the gas stream initially, with the capability to transition to 100% hydrogen over time. Long Ridge has engaged Black & Veatch to assist with developing plans for the plant integration for hydrogen blending and to ensure safe and reliable industrial practices.

“We are thrilled to work with the Long Ridge and New Fortress Energy teams on this first-of-its kind GE HA-powered project that will drive a cleaner energy future by utilising hydrogen to ultimately produce carbon-free power”, said Scott Strazik, CEO of GE Gas Power.

“As one of the leaders in decarbonisation in the gas turbine industry and the OEM with the most fleet experience in using alternative low heating value fuels including hydrogen, we look forward to applying more than 80 years of experience to help Long Ridge achieve its goal of providing reliable, affordable, and lower-carbon power to its customers”, he added.

To support a green hydrogen transition, Long Ridge is teaming with NFE’s new division, Zero, which is focused on investing in and deploying emerging hydrogen production technologies to meet zero emissions targets. NFE’s Zero division will support Long Ridge’s carbon-free power transition as it scales up novel technologies that can produce low-cost hydrogen.

“Long Ridge has many advantages in the pursuit of green hydrogen and zero-carbon power and this partnership allows us to get firsthand knowledge and experience blending hydrogen and natural gas in GE turbines”, said Wes Edens, CEO and Chairman of NFE.

“Our singular focus has been to identify and support clean technologies that can eventually produce hydrogen at commercially attractive prices. As we continue to make progress in our efforts and advance proof-of-concept projects, this experience will bring tremendous value”, he added.

“As the cost of carbon-free fuels continues to drop, the Long Ridge Energy Terminal is ideally positioned to become a leader in deploying utility-scale green hydrogen solutions and clean energy storage”, said Joe Adams, CEO of Fortress Transportation and Infrastructure Investors LLC (FTAI). Long Ridge is a subsidiary of FTAI.

For initial testing of hydrogen blending, Long Ridge has access to nearby industrial byproduct hydrogen. For the production of green hydrogen with electrolysis, Long Ridge has access to water from the Ohio River. Over time, below ground salt formations can be used for large-scale hydrogen storage.

“With one of the most efficient power plants in the United States, Long Ridge continues to innovate by being among the first to provide reliable, resilient, on-demand power fuelled by hydrogen”, said Matthew Rinklin, Managing Director at GCM Grosvenor which owns a 49.9% equity interest in Long Ridge.

Combined with Long Ridge’s proximity to large scale storage, the plant will be capable of supporting a balanced and diverse power generation portfolio in the future, from energy storage capable of accommodating seasonal fluctuations in renewable energy production, to cost-effective, dispatchable intermediate and baseload power.



Hydrogen-burning power plant under construction at the Long Ridge Energy Terminal located in Hannibal, Ohio, USA. Image: Kiewit.

DELIVERING A CARBON-FREE FUTURE

WITH GREEN HYDROGEN

Decarbonising the economy to fight climate change is one of the most urgent goals that countries and companies have set for the coming decades.

Wind energy is having a huge impact on reducing the world's reliance on fossil fuels for electricity generation, but the challenge of decarbonising the economy requires the massive deployment of carbon-neutral fuels in other polluting sectors, such as transport and heavy industry.

Green hydrogen from renewable sources is a 100% sustainable, storable, transportable and versatile fuel. It represents a massive opportunity for green transition by driving the transformation of the energy system. Green hydrogen can be produced anywhere and used in sectors that are very difficult to decarbonise, such as aviation and shipping, as well as heavy industry, such as iron and steel, chemicals and glass. Hydrogen can go a long way to reducing emissions at a national and company level.

Hydrogen is already used to power industry today, and currently accounts for 1.7% of global annual energy consumption. Just 1% of that hydrogen is generated from green energy sources. The bulk is obtained from natural gas and coal, emitting 830 million tons of CO₂ per year.

Replacing this current polluting energy consumption would require 820 GW of wind generating capacity, 26% more than the current global installed wind capacity. Long-term forecasts from various industry sources point to hydrogen growing exponentially over the coming decades as transport and heavy industry decarbonise, requiring between 1,000 GW and 4,000 GW of renewable capacity by 2050 to meet demand.

Brande Hydrogen pilot project

Siemens Gamesa is developing, what is said to be, the first pilot project in the world to connect a wind turbine to an electrolyser, with the ability to operate in 'island mode', i.e. to drive an electrolysis rig with no link to an electricity grid. With the Brande Hydrogen project, Siemens Gamesa is pioneering a major potential future application for both onshore and offshore wind.

The pilot project is now under development, close to Siemens Gamesa's Danish headquarters in Brande, western Denmark. It includes a 3 MW Siemens Gamesa wind turbine, owned by local partner Uhre Windpower, that will produce clean electricity to power a 400 kW electrolyser. This machine splits water into oxygen and

hydrogen so that the hydrogen can be stored and later delivered to customers in the mobility sector. The project is close to obtaining final permits. The first test runs were planned for December 2020 and hydrogen production is expected to start by January 2021.

Siemens Gamesa recently signed an agreement with Danish company Everfuel, which will distribute the 100% green hydrogen produced by the facility to refuelling stations across Denmark. For example, in Copenhagen, it will be used to fuel taxis. When fully operational, the project's single turbine will produce enough hydrogen to fuel around 50 to 70 taxis each day.

Carbon-free hydrogen, derived from low-cost, competitive wind power, can be stored and transported for use on demand.

This facility will provide insights that will be crucial to scaling up the technology to much larger turbines and wind farms both on land and at sea.

"Green hydrogen has the potential to be a game changer in the quest to decarbonise the power supply and solve the climate crisis. Our wind turbines are already making a huge contribution to this effort by providing clean electricity to the grid but, with the storage potential of hydrogen, we can start addressing other key industries. This is an exciting project and I am proud that the ingenuity and commitment of our people is enabling Siemens Gamesa to take the lead. This is the future", said Andreas Nauen, CEO, Siemens Gamesa.



With the Brande Hydrogen project, Siemens Gamesa is pioneering a major potential future application for both onshore and offshore wind.

SOFTWARE RELEASED

FOR OPTIMAL FORENSIC SCENE DOCUMENTATION

FARO Technologies Inc, a global leader for 3D Metrology, AEC (Architecture, Engineering & Construction), and Public Safety Analytics, recently announced the release of its new FARO Zone 3D 2021 software for crime, crash, fire and security applications. The latest edition of FARO Zone represents a significant software advancement that empowers public safety professionals with even more tools to draw, document, share and analyse forensic scenes, and create 3D scene reconstructions with a high level of realism.

For forensic investigators, FARO Zone 3D 2021 provides the ability to reconstruct any scene with complete and accurate documentation, including factual diagrams, detailed reconstruction analysis and photo-realistic visuals that include grass that grows, multiple light sources and enhanced textures for stone, brick, wood, metal and water. Additional new features include analysis of blood cast off stains, bullet trajectories through multiple surfaces, automatic import of popular crash Event Data Recorder (EDR) data, a 3D roof builder, more than 50 new human models, and a new database for vehicle models and specifications.

For FARO Laser Scanner users, the new FARO Zone 3D 2021 'Advanced' option has all the new tools to register scan data into a 3D point cloud and merge point clouds from multiple sources including drones. Once a scene



The FARO Zone 3D 2021 software enables public safety professionals to quickly and easily capture and share accurate data.

is preserved as a point cloud, it can be used to digitally obtain accurate measurements, analyse the evidence, verify a witness perspective, animate crashes, and more. The Advanced option also creates custom virtual reality scenarios so users can 'enter' any scanned scene to take photos and measurements, pick up evidence, and swab for DNA samples, while completely immersed in VR.

FARO Zone 3D 2021 also features Zone 2go, whereby professionals can create comprehensive presentations with multiple views of the scene, diagrams, reports, photographs, animations, and fly-throughs. The self-running viewer can be exported to a USB flash drive and, since no internet connection is required, it is ideal for jury observation and deliberation.

HYPERTHERM INTRODUCES EXTREME BEVEL CONSUMABLES FOR PLASMA CUTTING

Hypertherm, a US-based manufacturer of industrial cutting systems and software, recently announced the release of extreme bevel consumables for its MAXPRO200 LongLife air and oxygen plasma cutting system.

The consumables, designed for mechanised, robotic, and hand-held cutting, have an aggressive pointed geometry, so that the plasma torch can tilt to an angle of up to 66.5°. This makes the consumables ideal for a wide range of jobs including steep mechanised bevelling, tube and pipe cutting, structural steel work, pressure vessel construction, and hand-held cutting. In addition, they make it easier for operators to see what they are cutting and give them better access to beam flanges and areas with limited clearance for better cuts and fewer secondary operations.

The extreme bevel consumables are available for both air and oxygen cutting at 130 amps and 200 amps. MAXPRO200 owners and operators can choose to purchase the consumables separately or as part of a starter kit (part 528058) that includes consumables for all the extreme bevel cutting processes available for this system.



The extreme bevel consumables are ideal for a wide range of jobs.

UV-C LIGHTING PRODUCTS

FOR DISINFECTION APPLICATIONS

Signify, a world leader in lighting, is accelerating the adoption of UV-C disinfection lighting with new luminaires and equipment for the professional market in Singapore.

UV-C lighting is effective in disinfecting air, surfaces, and objects, adding an extra layer of safety for people in homes for the elderly, schools, food and other retail outlets, industry, offices, and public transportation.

The effectiveness of Signify's UV-C light sources in the inactivation of SARS-COV-2, the virus that causes COVID-19, has been validated by tests conducted in the National Emerging Infectious Diseases Laboratories at Boston University, USA.

Professional customers in Singapore can now order Philips UV-C disinfection upper air luminaires to disinfect air, Philips UV-C disinfection battens and Philips UV-C disinfection trolleys to disinfect surfaces, and Philips UV-C disinfection chambers to disinfect objects.

The UV-C disinfection batten can be used with a control system that contains the appropriate safeguards like the Philips Dynalite PDUVCC control system for UV-C disinfection battens.

Signify is contributing an extra layer of safety in a world where organisations are seeking ways to continue operations and provide services to customers.

"Now more than ever, disinfecting air, surfaces and objects is critical", said Mr Jitender Khurana, Country Manager for Singapore and Export Markets at Signify.

"To support offices, schools, public transportation, retail outlets and many businesses as they strive to disinfect their spaces, we have leveraged our knowledge and experience in UV-C lighting, making multiple product ranges available for professionals", he added.

Several products are now available in Singapore. These can be used for the disinfection of shopping trolleys; corridors and rooms in schools, hotels and offices; kitchens in restaurants; packages and other items delivered to offices; as well as for the disinfection of trains, planes and buses. Tailor-made solutions can also be developed for customers.

Air disinfection solutions

Signify offers ceiling-mounted Philips UV-C luminaires to disinfect the air. These are installed at a height of at least 2.3 m which, in combination with shielding and optics, ensure that people can continue to work in the lower sections of a room. The UV-C disinfection upper air luminaires can continuously disinfect the air. These luminaires are ideal for use in high-contact areas.

Solutions for disinfecting surfaces

Philips UV-C disinfection battens are installed on the ceiling to disinfect surfaces, outside of operating hours. They should be used in connection with appropriate safeguards, such as the incorporation of the Philips Dynalite PDUVCC control system. Multiple safeguard controls are available using authorised activation with sensor monitoring, door monitoring and emergency override with visible and audible triggers during operation.

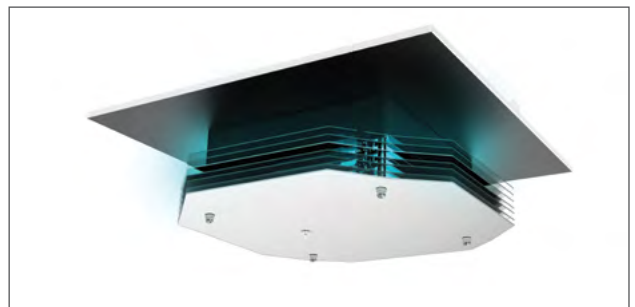
At controlled times, the UV-C battens disinfect rooms or enclosed spaces.

The Philips UV-C disinfection trolley, without sensor and in a 1-arm or 2-arm version, is designed to disinfect up to 36 m² of circular coverage area / 20 m² of square coverage area. Integrated safeguard controls include a timer to plan disinfection for a predefined period, remote control, and voice alarm.

Additional containment safeguards (such as user manual and mounting instruction) should be deployed together with the UV-C trolley, in order to ensure that no people or animals are exposed to the UV-C rays.

Solutions for disinfecting objects

The Philips UV-C disinfection chamber is used for disinfection of objects for professional use. It is available in two variants - small (77 litres), and medium (110 litres). It can be used for disinfecting objects and shared devices.



Signify offers ceiling-mounted Philips UV-C luminaires to disinfect the air.

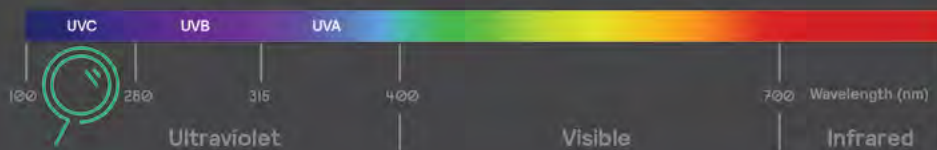


Philips UV-C disinfection battens are installed on the ceiling to disinfect surfaces, outside of operating hours.

Power of light to disinfect air, surfaces and water



UV-C in sunlight is filtered out by our atmosphere



**3
days**

How long some viruses can live on surfaces



Signify UV-C light sources inactivate the virus causing COVID-19 in seconds¹

**254
nm**

Peak wavelength of our germicidal UV-C lamps, which inactivates the DNA and RNA of bacteria, viruses and spores



Avoid exposure to humans and animals to protect their skin and eyes²

Powerful disinfectant for surfaces and air in



Offices



Stores



Schools



Public transport



Fast

UV-C can disinfect surfaces and objects in minutes or even seconds



Trusted

Proven technology. Signify has 35 years of experience in UV-C lighting and applications expertise

¹ Tests performed in a lab setting by Boston University using a Signify UV-C light source revealed that a dose of 5mJ/cm² reduced 99% of SARS-CoV-2, the virus causing COVID-19, in just 6 seconds. Based on the data, it was determined that a dose of 22mJ/cm² will result in a reduction of 99.9999% in 25 seconds. Research variables available upon request.

² Germicidal UV-C lighting is proven to be safe, provided it's designed, installed and used according to safety instructions.



VELCRO-LIKE FOOD SENSOR DETECTS

SPOILAGE AND CONTAMINATION

MIT engineers have designed a Velcro-like food sensor, made from an array of silk micro-needles, that pierces through plastic packaging to sample food for signs of spoilage and bacterial contamination.

The sensor's micro-needles, each measuring about 1.6 mm long and 600 microns wide, are moulded from a solution of edible proteins found in silk cocoons. They are designed to draw fluid into the back of the sensor, which is printed with two types of specialised ink. One of these 'bioinks' changes colour when in contact with fluid of a certain pH range, indicating that the food has spoiled, while the other changes colour when it senses contaminating bacteria such as E coli.

The researchers attached the sensor to a fillet of raw fish that they had injected with a solution contaminated with E coli. After about 16 hours, they found that the part of the sensor that was printed with bacteria-sensing bioink turned from blue to red, indicating contamination. After several more hours, the pH-sensitive bioink also changed colour, signalling that the fish had also spoiled.

The results, published in the journal *Advanced Functional Materials*, are a first step towards developing a new colorimetric sensor that can detect signs of food spoilage and contamination. Such smart food sensors might help head off outbreaks and also prevent consumers from throwing out food that may be past a printed expiration date, but is in fact still consumable.

The new food sensor is the product of a collaboration between Assistant Professor Benedetto Marelli, from MIT's Department of Civil and Environmental Engineering, whose lab harnesses the properties of silk to develop new technologies, and Prof John Hart, Director of the university's Laboratory for Manufacturing and Productivity.

Prof Hart recently developed a high-resolution floxography technique, realising microscopic patterns that can enable low-cost printed electronics and sensors, while the silk micro-needle stamp was developed as a result of Prof Marelli's research.

In conversation, both professors then realised that their expertise could be combined to produce a printed food sensor that monitored food safety.

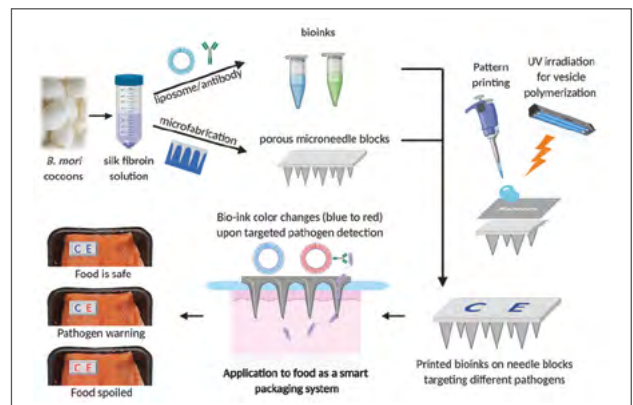
The team then looked to create a sensor that could pierce through the surface of many types of food. The design they came up with consisted of an array of microneedles made from silk.

"Silk is completely edible, nontoxic, and can be used as a food ingredient, and it is mechanically robust enough to penetrate through a large spectrum of tissue types, like meat, peaches, and lettuce", said Prof Marelli.

Through their tests, the research team also found their new sensor indicated contamination and spoilage faster than existing sensors that only detect pathogens on the surface of foods, and noted that their solution enabled food quality inspection without opening its packaging.

The team is currently looking for ways to speed up the micro-needles' absorption of fluid, as well as the bioinks' sensing of contaminants.

Once the design is optimised, they envision the sensor could be used at various stages along the supply chain, from operators in processing plants to consumers of food products.



The method of functioning of the silk micro-needle array food monitoring system. Image: MIT.

ADVERTISERS' INDEX

Bentley Systems ————— Page 22 to 25
 IES Chartered Engineer ————— Page 01
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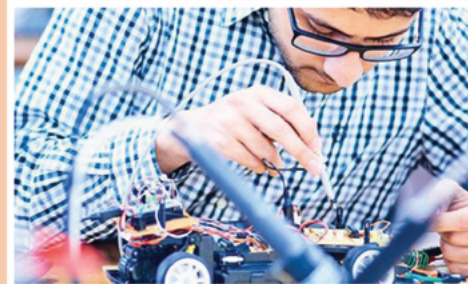


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