

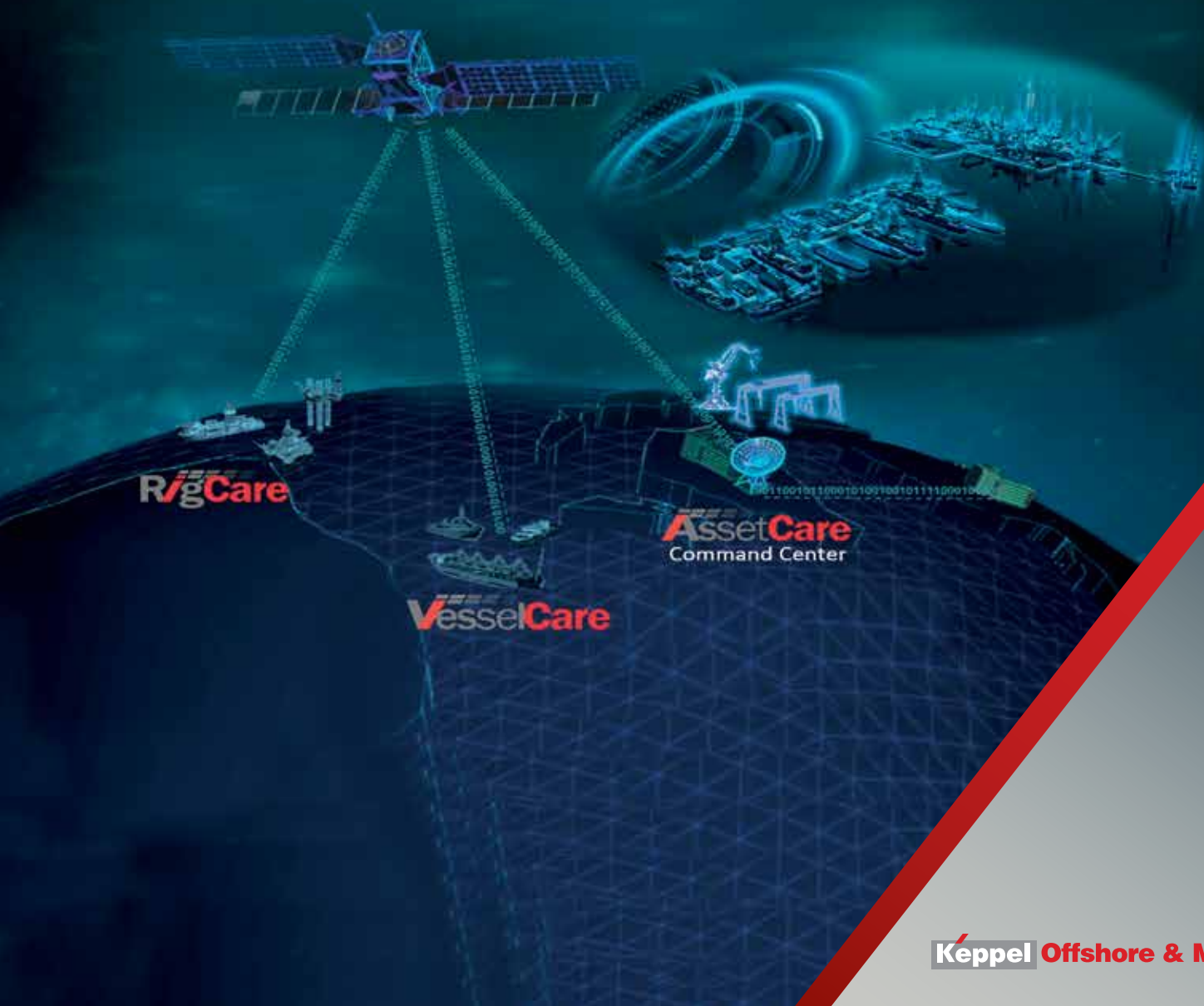
OFFSHOREMARINE

A newsletter of Keppel Offshore & Marine

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TRANSFORMING BUSINESS WITH DIGITALISATION

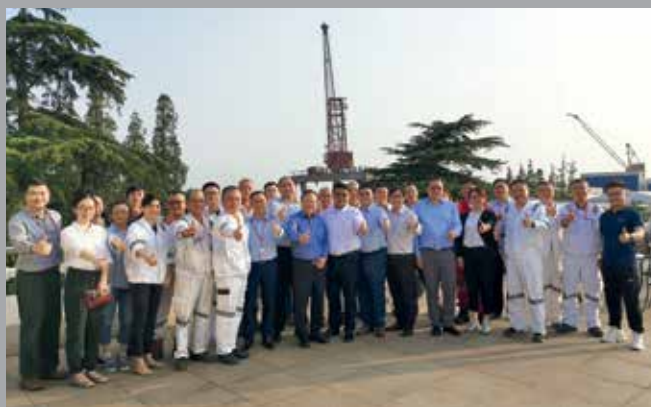


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Keppel Offshore & Marine's yards and offices worldwide have all achieved certification under a common management system for the ISO 37001 Anti-Bribery Management System (ABMS).

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Capturing opportunities

Mr Loh Chin Hua, CEO of Keppel Corporation and Chairman of Keppel Offshore & Marine (Keppel O&M) outlined the Group's performance and strategic developments at the Company's 3Q & 9M 2019 results webcast. Below are extracts from his speech.

Reflecting Keppel O&M's progress in securing new orders and the increased workload in our yards, our O&M Division made a profit of \$18 million in 9M 2019, compared to a net loss of \$38 million for 9M 2018.

In Brazil, Keppel O&M has reached a Settlement Agreement (SA) with Sete Brasil, bringing closure to the outstanding contracts for the construction of the six rigs. The

SA will become effective upon the fulfilment of certain conditions precedent, including the successful sale of two rigs, which are about 92% and 70% completed, by Sete Brasil to Magni Partners. As part of the agreement, the contracts for the other four uncompleted rigs are considered amicably terminated with no penalties, refunds or additional amounts due to any party. We will have full ownership over these uncompleted

rigs, and can explore various options to extract the best value from them.

Keppel O&M continued its focus on executing projects well. It delivered a Floating Storage and Re-gasification Unit (FSRU) in 3Q 2019 and a jackup in October 2019, and is on track to deliver Singapore's first dual-fuel bunker tanker in 2019.

Continues on page 4...



In August 2019, Keppel O&M delivered the FSRU BW Paris to BW Offshore

Continued from page 3.

Our yards completed 47 scrubber and ballast water treatment system retrofit contracts in 9M 2019 worth over \$80 million, as shipowners strive to meet the IMO 2020 and IMO Ballast Water Management Convention regulations. We have received 100 scrubber orders since 2018 and continue to see more enquiries.

Our efforts to build new capabilities and capture new opportunities are bearing fruit. Over the past four years, gas solutions and offshore renewables have contributed \$2.4 billion in new orders for Keppel O&M.

Keppel O&M's net orderbook currently stands at \$5.1 billion as at end-September 2019, excluding our projects for Sete Brasil, compared to \$4.3 billion as at end-2018. New contracts secured by Keppel O&M year-to-date amount to about \$1.9 billion, with close to 60% of these new orders for liquefied natural gas and renewables-related projects.

M1 is working closely with different business units across the Keppel Group to enhance the connectivity of our different solutions, whether they are new, smarter rigs, advanced yards of

the future, data centres or urban solutions.

Keppel is committed to sustainability, which is at the core of not just how we run our business, but our strategy as a provider of solutions for sustainable urbanisation. Today, Keppel is contributing to a cleaner and greener world with our suite of solutions, including green buildings and townships, environmental infrastructure, water treatment, and offshore wind infrastructure, among others.



Keppel O&M has received 100 scrubber orders since 2018 and continue to see more enquiries

IN CONVERSATION

OffshoreMarine reproduces highlights of management's responses to questions from the media and investment community at the Company's 3Q & 9M 2019 results webcast.

Q: In line with your commitment to sustainability, are there any businesses that you will exit such as oil?

LCH: We are committed as a business to sustainability, and we will not go into any business that is pollutive, for example coal-fired power plants. As for the oil business, although it has a carbon footprint, the world still requires fossil fuels. And you can see from our business at Keppel O&M that we have also started to move, partly driven by market. We are still doing oil-related business but have pivoted away a little, and are focused now on renewables and on gas. This has actually paid off for us. For 9M 2019, renewables made up about \$720 million of the \$1.9 billion worth of new orders that Keppel O&M had secured.

So in short, we are taking a portfolio approach. We are looking to emphasise renewables, gas, etc. but there are no plans currently to exit any business.

Q: What are your expectations on the direction of oil prices?

LCH: We don't give forecasts on oil prices, but I think it's useful to note that for Keppel O&M, as I mentioned earlier, in the last few years, we have diversified our business in Keppel O&M. In the past, we were very dependent on building oil rigs and oil solutions. In today's world, if you look at the orderbook we have, while we still have a lot of production assets that are oil-related, Keppel O&M has increasingly a lot of renewable projects as well as gas solutions. So

whilst oil price is important to us, it is not as critical as it was in the past. If you look at renewables, offshore renewables, wind, the demand there is quite incredible if you believe the projections. Certainly, if you look at the enquiries we have been getting, this is a market which we believe will grow.

Q: O&M's new order momentum appears to have slowed down in recent months, driving a quarter-on-quarter decline in your orderbook. Are there signs of decline in customer enquiries and contracts because of the uncertain macro environment?

CO: The FID (Final Investment Decision) of projects itself is not driven by quarters. On top of that, although there are still challenges in certain segments of the oil and gas market, for example the drilling units, we continue to see opportunities in offshore renewables and the LNG market. There are still fresh enquiries going on in those markets, and we continue to chase them and improve the quality of our orderbook. We will make announcements when there are material developments in new orders.

Q: Did O&M continue to increase hiring in 3Q 2019? Were the new hires in Singapore?

CO: Year-to-date Keppel O&M has increased its headcount by about 2,120 personnel, more than the 1,800 headcount increase initially envisaged. The bulk of the increase was overseas, while about 250

were in Singapore. In 3Q 2019, we hired about 1,350 personnel, and this includes new hires to fill new positions and to replace those who have left due to natural attrition. Comparing quarter on quarter, the net increase in Keppel O&M's global direct headcount was about 1,190.

Q: Can you indicate if the \$476 million provisions by Keppel in relation to the six rigs for Sete Brasil are adequate and there will not likely be more? What are your expectations of possible writebacks?

CHC: We have made \$476 million in provisions for the six rigs. When making those provisions, we have considered a number of different scenarios and different outcomes. Based on those scenarios and outcomes, we believe \$476 million in provisions is sufficient. And looking at the information we have today based on the settlement agreement, these provisions are still sufficient.

As to your next question on whether there are any possible writebacks, I think at this point it is still too premature. As you know, the settlement agreement is still under discussion. It is not yet settled. But at this point, we believe the provisions are adequate and also reasonable.

**LCH – Mr Loh Chin Hua,
CEO of Keppel Corporation**

**CO – Mr Chris Ong,
CEO of Keppel Offshore & Marine**

**CHC – Mr Chan Hon Chew,
CFO of Keppel Corporation**

Keppel reaches settlement with Sete Brasil



When the Settlement Agreement is completed, Keppel O&M will have full ownership over the four uncompleted rigs to explore various options to extract the best value from the assets. Keppel O&M is also in discussions with Magni Partners on the terms to complete the construction of the drilling rigs Urca (pictured above) and Frade, which are about 92% and 70% completed respectively.

Keppel Offshore & Marine (Keppel O&M) announced on 7 October 2019 that its wholly owned subsidiaries, Fernvale and FELS Offshore, have entered into a Settlement Agreement with subsidiaries of Sete Brasil in relation to the Engineering, Procurement and Construction contracts (EPC Contracts) for the six semisubmersible drilling rigs.

As part of the Settlement Agreement, Fernvale will take over ownership of the uncompleted rigs Bracuhy, Portugalo, Mangaratiba and Botinas. The EPC Contracts and related agreements on these four rigs will be deemed to be amicably terminated, with no penalties, refunds and/or any additional amounts being due to any party, and the parties will waive all rights to any claims.

Work on Bracuhy and Portugalo are about 40% and 21% completed respectively, while those for Mangaratiba and Botinas are below 10%. When the Settlement Agreement comes into effect, Fernvale will have full ownership over the four uncompleted rigs, and will be able to explore various options to extract the best value from these assets.

At a meeting of Sete Brasil's creditors that was held on 3 October 2019 in Brazil by Sete Brasil and its Austrian subsidiaries, the Settlement Agreement as well as the winning bid proposal for Magni Partners (Bermuda) Ltd to purchase four Sete Brasil subsidiaries, including Urca and Frade was approved by the creditors. The Settlement Agreement will only become effective upon the fulfilment of other conditions precedent, including the successful sale of Urca and Frade by Sete Brasil to Magni Partners.

Separately, Fernvale is in discussions with Magni Partners on the terms to complete the construction of the drilling rigs contracted with Urca and Frade, which are about 92% and 70% completed respectively.

When the Settlement Agreement becomes effective, Keppel O&M would be able to resolve a long outstanding issue related to the six rigs, and look forward to exploring other opportunities to contribute to the oil and gas industry in Brazil.

Keppel delivers fourth jackup rig to Borr Drilling

On 15 October 2019, Keppel Offshore & Marine (Keppel O&M), through its wholly-owned subsidiary Keppel FELS (Keppel FELS), delivered the state-of-the-art jackup rig, Hermod, to Borr Drilling Limited (Borr Drilling) safely, on time and within budget.

Built to Keppel's proprietary KFELS B Class design, Hermod is the fourth of eleven jackup rigs that Keppel is building for Borr Drilling.

Mr Tan Leong Peng, Executive Director (New Builds) of Keppel O&M, said, "We are pleased to deliver a fourth high-specification jackup rig to Borr Drilling. Operators and oil companies have shown a preference for the high spec KFELS B Class rig as it is robust, reliable, versatile and efficient.

"Completed on time, within budget, and with a good safety record, the delivery of Hermod reflects Keppel O&M's steadfast commitment to provide value-added solutions to our customers. We have seven more jackup rigs on order for Borr Drilling, and we look forward to furthering our partnership with them."


Developed by Keppel O&M's technology arm, Offshore Technology Development, the KFELS B Class rigs have a market share of about a quarter of all jackup rigs delivered since 2000. The cost-effective rig, which

incorporates environmentally friendly features that reduce emissions and discharges, is designed to operate in 400 feet water depth and drill to 30,000 feet. It is equipped with a full 15,000 psi BOP system, with accommodation for up to 150 personnel.

Mr Svend Anton Maier, CEO of Borr Drilling, added, "We are pleased to add another quality jackup rig to our fleet from Keppel. Our customers can be assured that these rigs have a proven track record and always deliver excellent performances wherever they are deployed.

The global jackup drilling rig fleet utilisation has been on an upward trend, driven by increasing utilisation of modern rigs such as Keppel's B Class rigs. Demand also continues to grow, with various jackup rig tenders across the world. We look forward to the delivery of subsequent jackup rigs, which will allow us to further capitalise on these opportunities in the market."

Keppel O&M has previously delivered the Saga, Skald, and Thor jackup rigs to Borr Drilling.



The jackup rig Hermod is built to Keppel's award winning KFELS B Class design which has a market share of a quarter of the jackup rigs delivered since 2000

Trusted solutions

With strong engineering expertise, operational efficiency and well-equipped facilities, Keppel Offshore & Marine (Keppel O&M) is able to build a wide variety of products and deliver them on time, on budget and safely. In the past quarter, it marked significant milestones for several new build and conversion projects.

WINDFARM SUBSTATIONS

On 10 October, Keppel O&M marked the striking of first steel for the offshore windfarm substations currently being built for Ørsted.

When completed, the 600MW substations will be deployed in Ørsted's Greater Changhua offshore wind sites in Taiwan, which have a total potential capacity of 2.4 GW.

TRAILING SUCTION HOPPER DREDGERS

Further strengthening its presence in the non-oil and gas segment, Keppel O&M in September laid the keel for the first of three high-specification Trailing Suction Hopper Dredgers (TSHD) for Van Oord.

When completed, the TSHD will have a hopper capacity of 10,500 m³ and come equipped with dual-fuel systems capable of running on LNG.

MID-WATER SEMISUBMERSIBLES

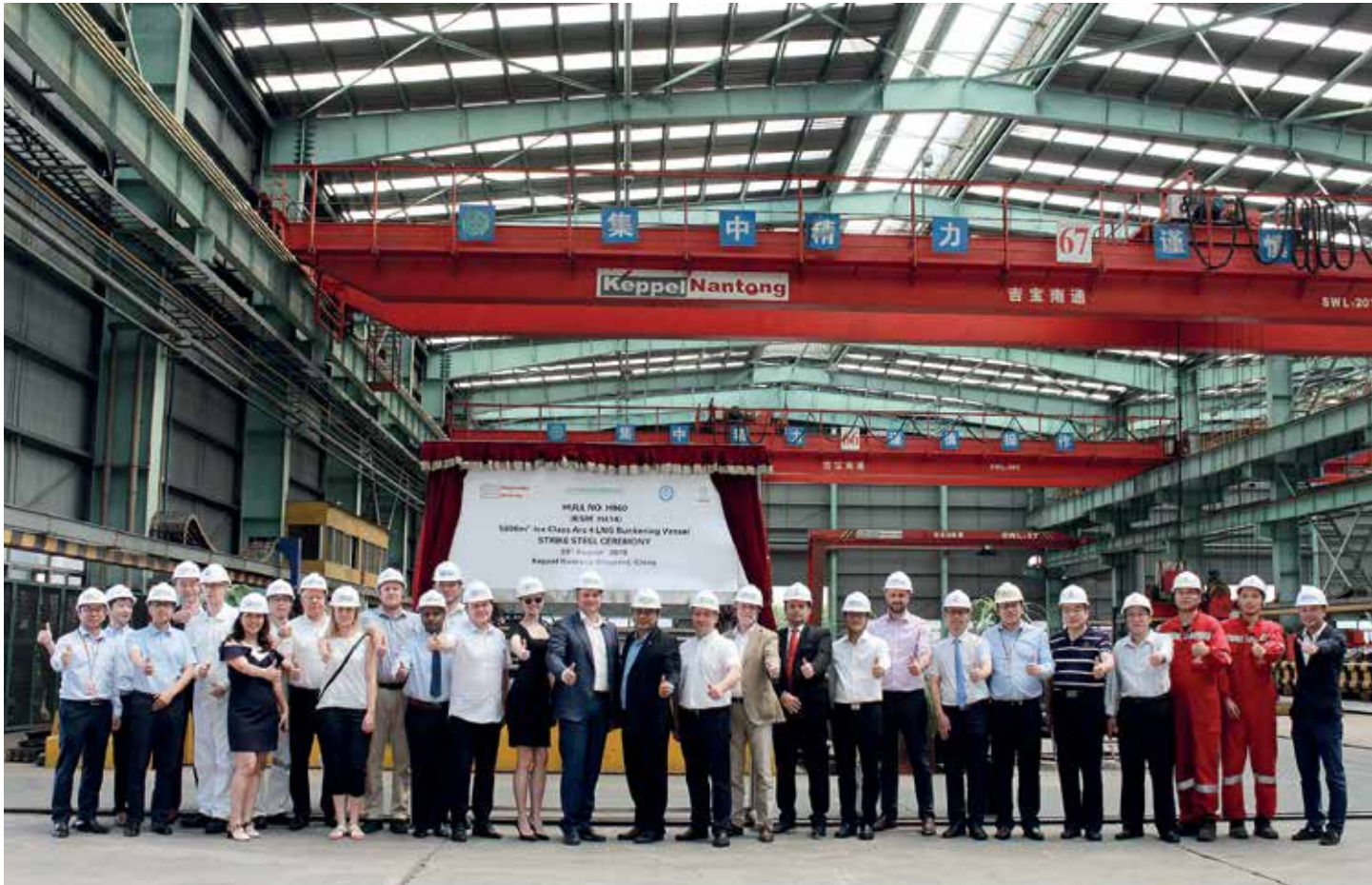
Leveraging its network of yards, Keppel O&M is able to maximise resources and increase project



The Ørsted and Keppel O&M teams at the initiation of the strike steel process



The Keppel Nantong team marked the laying of the keel for the pontoon of the first mid-water semisubmersible drilling rig being built for Awilco Drilling



Scheduled for delivery in 4Q 2020, the ice-class LNG bunkering vessel is currently being built to Keppel O&M's proprietary MTD 5800V LNG design

efficiency. On 19 August, Keppel Nantong in China marked the laying of the keel for the pontoon, column and bracings of the semisubmersible drilling rig currently being built for Awilco Drilling. Upon completion, the lower hull will be shipped to Singapore and assembled with the rest of the semisubmersible.

Construction of the project is on schedule and has crossed the 1.5 million safe man-hours milestone, attesting to Keppel O&M's project management and new build expertise.

Scheduled for completion in 1Q 2021, the rig is specially designed, configured and outfitted for harsh environment mid-water operations of up to depths of 1,500m.

LNG BUNKERING VESSEL

On 20 August, Keppel O&M struck steel for the ice-class LNG bunkering vessel which when completed, will be chartered to Gazpromneft Marine Bunker for operations in the Baltic Sea.

To be built to the MTD 5800V LNG design, a proprietary design

of Keppel O&M's ship design and development arm, the vessel will have an Ice Class Arc 4 notation and a cargo capacity of 5,800 m³.

Keppel O&M has delivered 11 ice-class vessels to-date and is currently building LNG-filled vessels including Singapore's first LNG bunkering vessel.

Continues on page 10...



The strike steel ceremony for the Liza Unity FPSO project was attended by representatives from SBM Offshore as well as Keppel O&M New Builds and Conversion & Repairs Divisions

Synergy in FPSO Unity

On 16 July, Keppel O&M held the strike steel ceremony for the modification and topsides integration work on the Liza Unity Floating Production Storage and Offloading Vessel (FPSO), which will be the second FPSO for the Liza project in Guyana.

Scheduled to arrive in the third week of January 2020, the Liza Unity will be accommodated in Keppel O&M's Admiral Dock. This leverages the Group's combined facilities and demonstrates its ability to utilise resources across its divisions.

The shipyard's work scope includes the fabrication of several topside modules, the riser balcony, the spread-mooring and the umbilical support structures as well as installation and integration of associated equipment and all topside modules onto the FPSO.

QHSE ownership

Quality, Health, Safety and Environment (QHSE) aspects are deeply engrained in the operations of Keppel Offshore & Marine (Keppel O&M) and initiatives are frequently organised to rally employees and reinforce its importance.

On 18 September 2019, Keppel O&M concluded a successful QHSE excellence promotion campaign aimed at reducing the incidence of at-risk work behaviours by instilling a sense of ownership in all workers.

The two-month long campaign featured 18 activities across all the yards, ranging from health quizzes to interactive safety games and roadshows on quality awareness, gathering an active participation from employees and subcontractors.



As part of the QHSE excellence promotion campaign, engagement sessions were held with workers to reiterate the importance of taking ownership

During his closing speech, Mr Chris Ong, CEO of Keppel O&M, called on Keppelites to learn not only from within the company, but also from other industries to improve QHSE aspects. He also rallied Keppelites to continue working together to further strengthen safety culture.

With the slogan "Our Behaviour and Actions Matter", one of the key objectives of the QHSE campaign was to reinforce the importance of daily actions and inactions as these determine attitude and mindset.

ISO37001 anti-bribery certification achieved globally

Keppel Offshore & Marine (Keppel O&M) is one of the first companies in Singapore to achieve global certification for the ISO 37001 Anti-Bribery Management System (ABMS). Following the certification of Keppel O&M's Singapore-based subsidiaries at the end of 2018, all its overseas business units, which include those in the United States, Brazil, China, the Philippines, the United Arab Emirates, India and Bulgaria have also achieved certification.

The ISO 37001 Standard is the first and only international ISO Standard relating to compliance programmes and anti-bribery management systems. As part of the certification, the Keppel O&M business units implemented a series of globally recognised anti-bribery measures, which include anti-bribery policy; procedures and training; financial, procurement and contractual controls; third-party risk assessments and due diligence; as well as reporting, monitoring and investigation procedures, which are conducted on a regular basis.

Mr Chris Ong, CEO of Keppel O&M, said, "Keppel O&M is proud to have achieved the ISO 37001 global certification. This has been a very thorough exercise and we have put in place a robust compliance system across all our operations worldwide. We are committed to the highest level of integrity in the conduct of our business, and



All of Keppel O&M's yards have undergone a strict compliance exercise and achieved ISO37001 certification by November 2019

will continue to engage all our stakeholders to strengthen our compliance programme."

Mr Dave Cheng, Managing Director of Socotec Certification Singapore, added, "The ISO 37001 certification is a rigorous exercise that ensures the effectiveness of Keppel O&M's Anti-Bribery Management System.

I would like to commend the management and staff of Keppel O&M for fostering a culture of transparency and compliance that is essential in preventing bribery and corruption at all levels."

Transforming business with digitalisation

Keppel Offshore & Marine (Keppel O&M) is continuously advancing technology to develop offshore products and shipyards of the future. It is leveraging digitalisation, robotics, data analytics, enhanced IIOT (industrial internet of things), drones, additive manufacturing, and artificial intelligence (AI) to offer state of the art solutions to

customers, whether in product features, optimising performance and maintenance or construction efficiencies.

It is collaborating with partners such as M1, Classification Societies, industrial associates, and academia such as the National University of Singapore and Nanyang Technological University.

Earlier this year, Keppel O&M introduced its proprietary AssetCare solution which encompasses a suite of digital



Autonomous vessels – Autonomous technology is being developed for vessel operations, starting with the retrofit a 65-meter harbour tugboat to enable autonomous vessel navigation in the Port of Singapore at the end 2020. These technologies include a Digital Twin to simulate vessel behavior in multiple scenarios, data analytics tools to improve the control and response of the tug, as well as implementing a sensor fusion network that will enhance situational awareness for safer shipping operations

SMART YARD – Through the use of digital technology and big data, the yard will be able to analyse and develop the most effective plans of construction to reduce cost, improve productivity and increase safety. It is able to operationalize real time data and insights to improve overall efficiency while reducing the impact to the environment



Digitalisation across



AssetCare – The AssetCare service tracks the performance of from a range of sensor technology to monitor machinery and approach, offering significantly increased uptime and reduced

services to support the asset's lifecycle needs. The company is also developing autonomous vessels and utilising digital twin

technology to improve a variety of product designs for optimal operations.

The shipyard has already established an automated panel line workshop, robotic welding machines, smart sensors and a digitised supply chain, and is in the process of developing prototype robots and equipment as well as advanced sensor technologies and algorithms.

Through harnessing insights from real time data, machine learning by assets, as well as equipping personnel with technology enabled tools, Keppel O&M aims to enhance capability, efficiency, safety, predictability and productivity.

Cross Keppel O&M



of rigs and vessels, with smart functionality to collect data and structural health. It supports a condition-based classed maintenance costs

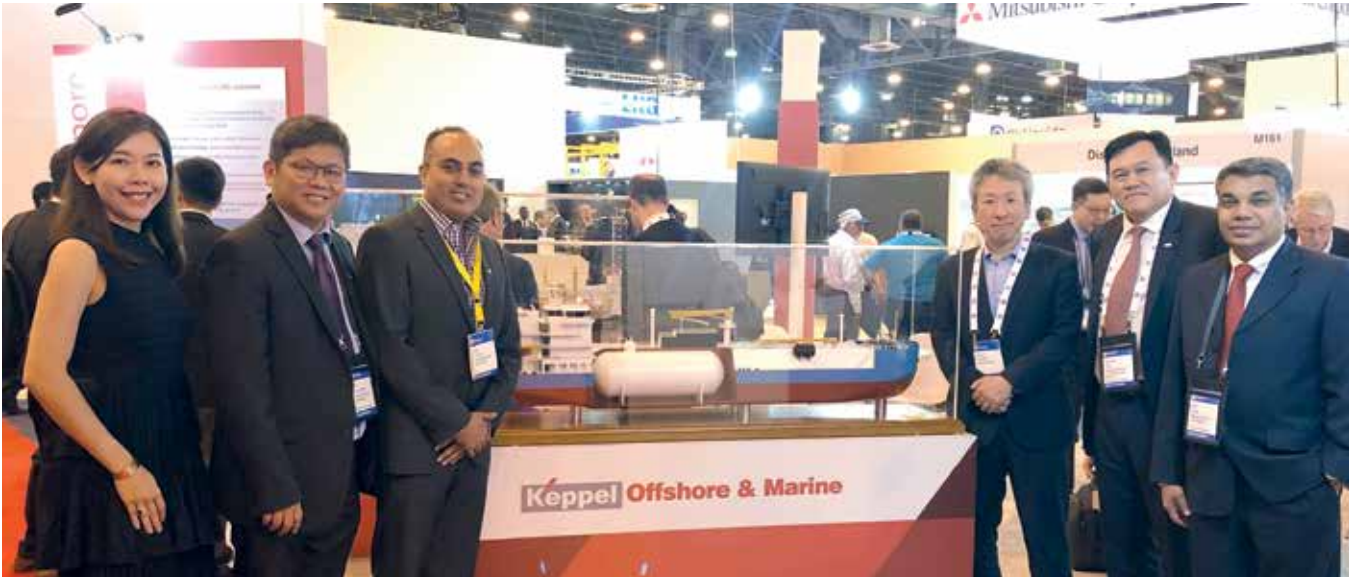


Digital Twin – Co-development of Digital Twin technology where a digital replica of a product is used to simulate vessel behavior in multiple scenarios without needing to test it in the real world. The digital twin is used for deep learning with a view to increase efficiency, reduce carbon footprint and enhance vessel response in complex sea conditions. The data is also used with predictive analytics to increase performance, efficiency and reliability of vessels and rigs



AI & data analytics – Keppel O&M is leveraging sophisticated AI systems to improve production efficiencies, optimise the performances of offshore vessels automatically, and even cut down on emissions by improving the efficiencies of various onboard systems. AI is also being used in combination with digital analytics to analyse market trends, spot patterns and help anticipate the needs of the industry

Innovative gas solutions



Management from Keppel O&M including Mr Tan Leong Peng (2nd from left), ED (New Builds) and Mr Chor How Jat (2nd from right), MD (Conversions & Repairs) and Mr Jayakumar (right), ED (Commercial, Conversions & Repairs), took the opportunity at Gastech 2019 to network and strengthen ties with customers, vendors and partners

As demand for gas as a source of cleaner energy increases, Keppel Offshore & Marine (Keppel O&M) is well positioned to increase its footprint in the gas value chain through its compelling suite of solutions. The company participated at the Gastech conference held in Houston, USA, from 16 to 19 September 2019 as part of efforts to showcase its capabilities and expand its customer base.

Keppel O&M has close to 40 years of experience in LNG carrier repairs. It undertook the world's first Floating Storage and Regasification Units (FSRU) conversion Golar Spirit in 2007, and now holds the record for the largest number of FSRU conversions in the world. Its expertise in vessel conversion includes that of Floating Liquefaction vessels (FLNG).

In conjunction with Gastech,

Mr Jayakumar, ED (Commercial) of Keppel O&M's Conversions & Repairs Division, shared with the media on Keppel O&M's experience in FLNG conversion projects, including the world's first Hilli Episeyo.

"An FLNG was an unknown quantity at the time, but Keppel O&M had previously partnered with Golar LNG to convert three LNG carriers to FSRUs. That relationship established a trust and confidence between the two companies, which led to Golar selecting Keppel O&M on the Hilli Episeyo project", Mr Jayakumar shared.

He said the FLNG project provided the opportunity for Keppel to build its core competencies in the engineering procurement and construction business and position itself as a leading solution provider in the gas market.

Following the success of Hilli Episeyo, Golar contracted Keppel Shipyard for a similar conversion of the 125,000-m³ Moss-type LNG carrier Gimi into an FLNG.

Keppel O&M is currently converting the second FLNG for Golar, with delivery expected in the first half of 2022.

"We believe the lessons learned during the conversion of the Hilli will pay off in the Gimi project in terms of efficiency and productivity. Hilli Episeyo took us 20 million man-hours to build. We expect to build Gimi in significantly less man hours", he added.

Gathering an attendance of over 35,000, Gastech 2019 saw industry experts discussing pertinent topics such as FLNG, LNG bunkering and small-scale LNG.

Reliquefaction technology

Illustrating its research and development expertise, product specialists from Keppel O&M took the opportunity at Gastech 2019 to present on their reliquefaction technology. It tackles the issue of boil-off gas (BOG), a result of LNG vaporizing in the cargo containment system of an LNG bunker vessel.

The innovative technology utilises cold energy recovered from vaporizing LNG to liquefy all BOG generated from the cargo containment system. Through a design comparison study based on a 7,500m³ bunker vessel, this technology was found to consume more than 50% less power than other existing methods. It also has

a smaller total package footprint compared to other reliquefaction technologies.

The research team was led by Dr Foo Kok Seng, ED of Gas Technology Development, one of Keppel O&M's research arms.

Showcasing expertise



Next generation arctic ice breaker designed by Keppel O&M

With its deep experience and expertise, Keppel Offshore & Marine is frequently asked to present at forums and conferences. It participated in two events in October 2019.

Mr Aziz Merchant, Executive Director, Keppel Marine & Deepwater Technology, who is also Adjunct Professor at NUS was part

of a panel at the Arctic Frontiers Abroad (AFA) Conference 'Knowledge for Ocean Sustainability.

The event is supported by the Royal Norwegian Embassy in Singapore and the National University of Singapore (NUS). Mr Merchant spoke on how Keppel O&M's track record in building ice-class vessels enables

it to assist in the development of maritime shipping & infrastructure in the Arctic region. Keppel is also partnering with NUS on various Arctic related research to better understand ice physics & ice mechanics through numerical simulation and lab tests.

Separately, Mr Gilberto Israel, Commercial Director at Keppel FELS Brasil presented at OTC Brasil, an international oil and gas conference held biennially in Rio de Janeiro. He was on the FPSO (Floating Production Storage and Offloading vessel) panel for constructors and designers which was conducted on 30 October. Highlighting the achievements of Keppel's Brazilian yard, BrasFELS, he illustrated the capabilities of the shipyard to meet the demand for FPSO constructions locally and efficiently.



Keppel O&M's Conversions & Repairs division won the Chairman's Safety Challenge Trophy for their safety performance, initiatives and innovations

Safety Champions

At the 13th Keppel Group Safety Convention on 5 November 2019, close to 400 Keppelites, contractors, subcontractors and business associates came together to reaffirm their commitment to safety. It is part of Keppel's continuous efforts to strengthen safety culture, systems and processes across its eco-system.

Themed "Safety 4.0", the convention was graced by Guest-of-honour Mr Silas Sng, Commissioner of Workplace Safety and Health at the Ministry of Manpower, as well as guest speaker Mr Tony Lombardo, CEO Asia at Landlease.

In his opening address, Mr Loh Chin Hua, CEO of Keppel Corporation and Chairman of Keppel Offshore & Marine (Keppel O&M), elaborated on how the Group has embraced technology in many safety processes.

Citing one example, Mr Loh said, "Keppel O&M is currently piloting a smart watch capable of monitoring heart rate, detecting falls and distress calls, and providing tracking positions for emergency response teams should an incident

occur. This complements the current buddy system at the yards for activities like working at height and in confined spaces, and makes operations even safer and more reliable."

In his keynote address, Guest-of-Honour Mr Silas Sng, shared about the three strategies identified in WSH 2028 – the national workplace safety and health strategies for the next ten years. He also recognised

SIT platinum awards

PROJECT ANGLER

This adjustable work table allows steel outfits to be fabricated horizontally, replacing the conventional vertical fabrication method. Besides eliminating hazards such as objects toppling and having workers in the line of fire, this innovative work table doubled productivity and freed up resources such as cranes.

PROJECT CRANOV

By installing CCTV cameras at strategic parts of the cranes, this innovative project eliminated blind spots during lifting operations. Besides improving safety, it has increased productivity by reducing the required lifting crew from 4 to 2 personnel and lifting time by more than half from 25 minutes to just 10 minutes on average.



SIT platinum award winners, Project Angler and Project Cranov, exhibited and explained their innovative solutions

the efforts by Keppel, “We aim to develop a WSH technology ecosystem to deepen industry capability and strengthen WSH training through technology. I am glad that the Keppel Group too, is placing more emphasis on the role of technology in safety. Across the Group you are also utilising drones and unmanned inspection robots

to enhance safety by reducing workers’ exposure to hazards.”

One of the highlights of the event was the Chairman’s Safety Challenge, which assesses business units across the Keppel Group based on three categories, namely safety initiatives assessment, safety innovation projects, and

safety performance statistics. This year, Keppel O&M’s Conversions & Repairs Division emerged as winners of the challenge for their impressive safety performance, which earned themselves numerous awards including two Safety Innovation Team (SIT) Platinum awards.

Committed to safety globally

Various Keppel Offshore & Marine worksites around the world rallied together for the third annual Global Safety Time-out (GSTO) on 26 August 2019, demonstrating their common commitment to safety. During these timeouts, safety heads and line managers took the time to reiterate safety messages and share best practices with Keppelites.



The Global Safety Time Out was observed globally, to remind Keppelites that safety is a top priority



Congratulatory ceremonies were held to celebrate the achievements of the graduates of the KTED and sponsorship programmes

Empowering growth

Learning plays an important role at Keppel Offshore & Marine (Keppel O&M) and the company is committed to engaging the engineering community and providing employees with opportunities to grow beyond their potential.

KTED PROGRAMME

On 27 September 2019, 36 Keppelites from Keppel O&M graduated from this year's Keppel O&M Technology and Engineering Development (KTED) programme.

As part of the programme, participants visited Google Singapore, Omron Asia Pacific, and Wartsila Acceleration Centre to learn more about the applications

of technologies such as data analytics, and artificial intelligence in advanced manufacturing.

In its fourth edition, the annual KTED programme exposes participants to innovative concepts and ideas to inspire them to develop new solutions. The programme has trained a total of 118 Keppelites from both local and overseas yards.

SPONSORSHIP PROGRAMME

21 Keppelites were recognised on 16 October 2019 for successfully completing their courses of study under Keppel O&M's sponsorship programme. The graduates completed their courses in various education institutions, ranging from polytechnics, Institutes of

Technical Education (ITE), and universities.

STUDENT ENGAGEMENT

On 26 August 2019, Mr Chris Ong, CEO of Keppel O&M, spoke to aspiring engineers from Singapore Institute of Technology and shared his views on the industry. Mr Ong encouraged the new batch of Marine Naval Architecture and Offshore students and touched on the training efforts that Keppel O&M has in place for employees to continuously upskill and overcome engineering challenges.

In attendance to help at the event were also Keppel O&M scholarship recipients in their second and third year of studies at SIT.

Partnership with Norway

The Deputy Minister of the Norwegian Ministry of Petroleum and Energy, Ms. Liv Lønnum, led a Norwegian business delegation to visit Keppel Offshore & Marine (Keppel O&M) on 9 October 2019. Keppel and Norway have a long-standing partnership with Norwegian companies. Over the years, Keppel O&M has delivered more than 50 projects supporting Norway's oil and and gas activities. Norwegian suppliers also form an important part of Keppel's eco-system, especially in supporting Norwegian projects.

The delegation was here to discuss



Keppel O&M hosted a Norwegian business delegation to discuss business opportunities. (L-R) Mr Loh Chin Hua, CEO of Keppel Corporation and Chairman of Keppel O&M; Ms. Liv Lønnum, Deputy Minister of the Norwegian Ministry of Petroleum and Energy; Norwegian Ambassador, Her Excellency Anna Nergaard; and Mr Chris Ong, CEO of Keppel O&M

opportunities for collaboration in a variety of markets. Besides oil and gas markets, these included

renewable energy and offshore infrastructure projects.

Maritime security



Mr Phillip Mah (second from left), GM (Security), Keppel O&M, was part of a panel that shared more about security challenges and initiatives at the MARSEC workshop

Committed to ensuring a secure work environment, Keppel Offshore & Marine (Keppel O&M) works closely with community partners to ensure its premises are well protected with a vigilant workforce equipped with the proper training and tools.

On 27 August 2019, Mr Phillip Mah, GM (Security), Keppel O&M spoke at the Maritime Security (MARSEC) workshop organised by the Maritime and Port Authority of Singapore (MPA) and shared more about the various programmes and exercises Keppel

O&M has in place to prepare for security threats.

“Security is a collective effort. It is crucial and we have a strong emphasis on engaging our workforce and stakeholders so that they understand their roles and how it supports our security objectives. For example, we hold regular security awareness briefings and circulate security knowledge questionnaires which incorporate SGSecure principles. Through broadcasts and posters, we also ensure employees are kept up-to-date on the latest security advisories and initiatives,” Mr Mah shared.

Interview with Chor How Jat

Mr Chor How Jat, MD (Conversions & Repairs), Keppel Offshore & Marine has been with the company for more than 20 years. He started as a management trainee in 1987 with Keppel Shipyard, and took on various leadership roles before assuming his current role in 2012.

How did you first come to join Keppel and what was the journey like?

After completing my studies in naval architecture at Newcastle upon Tyne, I had the chance to join Keppel Shipyard. There was no better place to gain offshore and marine experience than at Keppel. However, it was a steep learning curve, and a lot had to be learnt on the job in those days. The training was not as structured as what we have today.

I was fortunate to have good mentors to guide me. It was hard work but there was a strong sense of camaraderie and we all pulled together to ensure the projects were successful. As a shiprepair manager at Keppel Shipyard, my projects changed every other week and we had to be very vigilant because you never know what surprises an old ship might bring in. Our projects included all kinds of vessels, from tankers to fishing vessels, live-stock carriers and cruise ships.

When I joined Keppel FELS in 2001 in the rig building business, it was quite different because newbuild projects generally were long term and it was very important to get the planning and engineering aspects right at the start to make sure there were no reworks.

What are some of the memorable milestones in your career over the years?

A recent milestone project was the world's first converted FLNG, Hilli Episeyo, which we delivered in 2017. The project was first conceived in a simple discussion with our long-term partner, Golar, as a sketch on a notepad, even though there was no end-client then. To then develop it from concept to the success it is today is very fulfilling. For us, it was not just a new type of vessel to undertake, but it was Keppel Shipyard's first major EPC (Engineering, Procurement, Construction) project. It was challenging, but I think our experience and Can-Do attitude helped push us to complete it as well as we did.

Another memorable achievement was back in 2009 when I was GM of Operations at Keppel FELS. We had a large order backlog and the team worked hard with grit, tenacity, and strong teamwork to deliver 13 rigs that year. It was really about planning, project management, process improvements, and strong partnerships with our customers and vendors.

Having worked at different yards in Keppel O&M, can you share on

the synergy between them?

Although the working styles of a repair yard versus a newbuild yard are different, the core values we have are the same, and we collaborate when we can.

Over the years, the yards have learned much from each other and adopted each other's best practices. More recently, as part of the restructuring of Keppel O&M into New Builds and Conversions & Repairs divisions, we further streamlined processes and shared resources to be OneKOM. A good example is the conversion of the FPSO Liza Unity. The docks at the Conversions & Repairs division are not big enough for the job so we discussed with the New Build division and managed to configure a way to use the Admiral dock for this job.

How is this period of the downturn different from previous cycles and how is the Conversions & Repairs division navigating through it?

I would say that this is the worst downturn I have experienced so far because of how prolonged it is and the underlying factors such as competition from shale oil. At the same time, the market for greener sources of energy is growing to address climate change concerns. We have seized the opportunity to

further build our capabilities in the gas market, such as developing the FLNG concept, delivering the first vessel and undertaking the second. Keppel O&M has also secured new orders for offshore wind projects.

Our repairs also helped tide us through. We have built strong relationships with our clients and many of them come back to us because we have mutual trust and work together to plan ahead. We have also leveraged our expertise to capture the scrubber and BWTS (ballast water treatment system) retrofit market as shipowners target to meet the IMO 2020 regulations.

The FPSO market is also becoming more active but these are long term projects that take time to secure financing and get FID (final investment decision). Some research firms anticipate up to 30 FPSO awards in the next 4 years and we are positioning ourselves to secure a significant share of projects.

How is technology changing shipyards and the future of the O&M business?

We are embarking on industry 4.0 and leveraging digitalisation to improve processes, starting with data collection, cameras and sensors, linking data to training, and communication. This helps improve inventory management, project planning and resource allocation.

We have also implemented semi-automatic equipment such as pipe rotators and welding machines. We have an R&D team exploring



Mr Chor How Jat, MD (Conversions & Repairs), Keppel O&M has been implementing new technologies in the yard and sees a strong future for the group as it expands its capabilities and takes on more diversified work

3D printing but this will take some time because being in a heavy industry, we are subject to many regulations.

We have also installed over 21,000 units of solar panels on our roofs which effectively reduces our carbon footprint by 4,100 tCO₂ per year.

How do you attract the next generation to join this industry?

We have in place a structured recruitment programme, starting with creating awareness in schools, promoting the industry and developing maritime curriculum at tertiary institutes as well as offering scholarships and industrial attachments.

There are many opportunities for career progression and developing skillsets in the yard. It is a dynamic workplace that is not deskbound.

What do you do in your free time? What are your hobbies?

I like to spend time with the family

and go for family dinners during the weekends when I can. I am an avid golfer, and I play with my son often. I enjoy golf as the setting is usually very scenic and it is good for networking or catching up with friends and family.

I also enjoy fish, not eating them, but rearing them, in particular Koi. I appreciate their gracefulness and the sense of peace they bring.

What / Where is your favourite food?

I love hawker centre food and I would usually rotate and try different stalls. Being based at the yard, we sometimes go to the Taman Jurong hawker centre where there are a number of good stalls such as 'Bak Chor Mee' (minced meat noodles) and curry fish head. And of course, I love durians as well!



1. Volunteers from Singapore cleaned up the beach at East Coast Park, collecting 600 kilograms of trash in total;
 2. As part of Language Month, volunteers in the Philippines engaged with pre-school children over activities such as reading and singing;
 3. Volunteers in the Philippines combed the shorelines of nearby communities in support of International Coastal Cleanup, collecting 1,000 kilograms of trash in total

Making a difference

Committed to being a good corporate citizen, Keppel Offshore & Marine (Keppel O&M) continues to support initiatives that uplift communities.

CARE FOR THE ENVIRONMENT

In support of International Coastal Cleanup, 100 volunteers from Keppel O&M and Keppel FELS Employees Union on the morning of 29 August cleaned up the beach at East Coast Park, collecting 600 kilograms of trash in total. Over in the Philippines, 70 volunteers from Keppel Batangas Shipyard and Keppel Subic Shipyard gave the shores of Batangas Bay and Subic Bay a clean sweep. They collected 1,000 kilograms of trash in total.

PROMOTING LITERACY

On 23 August, volunteers from Keppel Batangas Shipyard participated in the Language Month or Buwan Ng Wika, an annual month-long celebration to appreciate the country's culture and language.

Volunteers engaged pre-school children at the SIBOL Learning Centre at the Keppel GK Eco Village in Bauan, Batangas, with activities such as reading and singing. Storybooks and textbooks were also donated to the centre to encourage children to continue learning.

COMMUNITY ENGAGEMENT

In Brazil, Keppel FELS Brasil and

BrasFELS celebrated the country's Independence Day with employees, clients, as well as members of the Angra dos Reis community. Long service awards were also given to employees who have worked for more than 10 years to recognise their efforts and contributions to BrasFELS.

Over in Brownsville, Texas, USA, volunteers from AmFELS participated in United Way of Southern Cameron County's annual Day of Caring campaign and refurbished one of the community playgrounds.

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The naming ceremony of Marine Vicky was attended by Guest-of-Honour Ms Quay Ley Hoon (sixth from left), Chief Executive of MPA, and Lady Sponsor of the vessel, Mr Wu Yong Hong (fifth from left), Vice Mayor of Nantong Municipal, Mr Ju Kai Meng (seventh from left), MD, Sinanju Tankers Holdings, and Mr Chris Ong (sixth from right), CEO of Keppel O&M

Singapore's first LNG powered bunker tanker

Keppel Offshore & Marine (Keppel O&M) is on track to deliver Singapore's first dual-fuel bunker tanker. To be owned and operated by Sinanju Tankers Holdings, the bunker tanker will deliver marine fuels to ocean-going vessels within Singapore port limits.

The vessel was named Marine Vicky by Ms Quay Leh Hoon, Chief Executive of the Maritime and Port Authority of Singapore (MPA), and Lady Sponsor of the vessel, at a ceremony in Keppel Nantong, China.

Ms Quay Ley Hoon said, "This is Singapore's first bunker tanker to run on LNG and signifies the emphasis that Singapore is placing on developing Singapore into a LNG bunkering hub as the industry

gains momentum to adopt LNG as a marine fuel. MPA is pleased to be able to partner Keppel O&M and Sinanju through the MPA LNG bunkering pilot programme. The maritime sector is evolving and through these steps, we aim to further strengthen Singapore's offering as a global maritime hub and a LNG hub."

Mr Tan Leong Peng, Executive Director (New Builds), Keppel O&M, added, "We are at the forefront in providing environmental solutions in the marine industry, enabling us to support Sinanju with our dual-fuel vessel solutions. This bunker tanker will be the third dual-fuel vessel to be delivered by Keppel O&M. The dual-fuel technology enables more sustainable and economical

operations, with more efficient fuel consumption, and underlines our ability to consistently provide value-added solutions."

Marine Vicky is expected to be delivered on time and with a perfect safety record.

Built to the requirements of classification society, Bureau Veritas, the 7,990 DWT vessel will be Sinanju's first dual-fuel bunker tanker. Measuring 103-metre long and 19-metre wide, it is equipped with a 55 cubic metre LNG tank with a fuel gas supply system on deck to supply gas to the engine. The vessel is also fitted with pipelines and tanks that enable it to carry multiple grades of marine fuel cargo.