OFFSHOREMARINE

Builder of distinction

September – October 2010

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SEAMLESS INTEGRATION

First KFELS N Class rig delivered

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All smiles: President Lula (second from left) and officials from the Brazilian government joined Keppel, SBM and Petrobras in celebrating the successful completion of FPSO P-57.

Keppel secures rig refurbishment contracts



Backed by its track record, Keppel FELS has been entrusted by long-time customer Ensco with the refurbishment of the ENSCO 7500 semisubmersible rig

Keppel FELS will leverage its engineering expertise and project execution capabilities in the commissioning of Scarabeo 9 for Saipem

Keppel FELS has secured contracts worth about US\$101 million (\$\$134 million) to complete and refurbish two semisubmersible drilling rigs.

The first contract was awarded by Saipem S.p.A for the commissioning of the technologically advanced Frigstad D90 semisubmersible rig, Scarabeo 9. A significant part of the work scope involves the commissioning of all marine and drilling sub-systems onboard. Equipped with a Dynamic Positioning 3 system, Scarabeo 9 will be able to operate at a water depth of 3,600 metres.

KS Wong, ED of Keppel FELS, said, "Rig completions and refurbishments are highly complex projects by nature, because every vessel that comes into our yard is different. Very often, these rigs are in transit from various locations across the world and require further assessments and engineering solutions with quick turnaround times.

"Leveraging our internal competencies, we are able to size-up the project requirements and recommend the best course of action to get the jobs done safely, on time and within budget. Keppel FELS' in-house engineering expertise, on top of its proven project management and execution capabilities, further enables the company to add value in the completion, repair and refurbishment of all types of rigs. This unique proposition is something that our customers appreciate."

The second contract was awarded by a subsidiary of Ensco plc for the upgrade, repair and refurbishment of its proprietary ENSCO 7500 semisubmersible rig. The major work scopes include significant life extension work, renewing steel and pipes, operational enhancements, overhauling machinery and expanding the living quarters.

KS Wong said, "We would like to thank Saipem and Ensco for affirming us with the award of these two new contracts. We remain committed to work shoulder-to-shoulder with our valued customers in the coming months to deliver the projects to their highest satisfaction."

Triple feat for Rowan

Keppel delivers third jackup rig of the year to Rowan with perfect safety record.



Rowan Viking was named at Keppel FELS by Lady Sponsor, Karen Russell, spouse of David Russell, Rowan's Executive VP, Drilling Operations on 23 October 2010

"We are heartened to deepen our successful partnership with Rowan and will strive to deliver the remaining four Rowan rigs being built at our global yards with Keppel's hallmark quality, on time, within budget and with no incidents."

CH Tong CEO of Keppel O&M As long term prospects for premium jackups rise,
Keppel's valued customer,
Rowan Companies, Inc. (Rowan) is strongly positioned with three newly built high-specification jackup rigs – Rowan EXL I and II and Rowan Viking – already lined up for work this year.

VIKING READY FOR ACTION

Built to Keppel FELS' proprietary KFELS N Class design, Rowan Viking is designed to thrive and operate in ultra harsh work environments.

The biggest jackup to be designed

and constructed in Singapore to-date, Rowan Viking is the first of three KFELS N Class rigs for Rowan. The rig is already on term contract to operate in the North Sea.

Matt Ralls, President & CEO of Rowan, said, "The high-specification KFELS N Class rigs are among the most capable jackups in the world. These rigs will add to our market-leading position in large jackups with hook-load capacities of two million pounds or more, and will strengthen our ability to help

our customers drill their most challenging wells.

"Importantly, these rigs will be certified to work in the demanding Norwegian sector of the North Sea, where we see solid demand for high-specification jackups. At the same time, we see multiple drilling opportunities in other global markets for this elite class of rig."

CH Tong shared, "The Rowan Viking is the result of the winning combination of Keppel OTD's rich design expertise, and Keppel FELS' strong engineering, construction and project management experience.

The Rowan EXL rigs, built to distinction with Keppel AmFELS's experienced project management and production capabilities, solidly augment Rowan's premium fleet

"Recovery of oil and natural gas in the North Sea's inhospitable climate and great depths requires advanced and cost-effective offshore technology. Combining state-of-the-art design and dual capabilities, the KFELS N Class rigs are capable of performing efficient and safe drilling and production activities, even under the severe conditions of the Norwegian North Sea.

"They can drill in challenging environments anywhere in the world, making them exceptionally versatile and qualified for worldwide deployment. We are very pleased that Rowan has placed their confidence in the KFELS N Class fleet."

PERFECT TRACK RECORD WITH SECOND ROWAN EXL RIG

Earlier this year, the second of four EXL rigs being constructed at Keppel AmFELS in the US joined Rowan's fleet.

Rowan EXL II, christened and delivered in August, is deployed to Trinidad for three years under contract with BP Trinidad and Tobago.

David Russell, Executive VP of Rowan, said, "Once again, we are pleased with Keppel AmFELS's repeat delivery of a rig with the highest standards in quality and safety. We have every confidence that the Rowan EXL-II will do very well when it is in full operation." Built as an enhancement of the LeTourneau Super 116E design with leg lengths of 511ft and a capable hook load of 2,000,000 lbs, the ABS-classed rigs employ the latest state-of-the-art technology to drill high-pressure, high-temperature and extended-reach wells in jack-up markets throughout the world. They are capable of operating in 350 ft of water or more and drilling to a depth of up to 35,000 ft.

Located in Brownsville, Texas,
Keppel AmFELS reinforces
Keppel O&M's presence in the
Gulf of Mexico. G.S. Tan,
President of Keppel AmFELS, said,
"Keppel O&M's Near Market, Near
Customer strategy gives us the
leverage to better understand and
support our customers in the local
markets where they operate.

"The Rowan EXL-II is another well-executed project, proving our track record in this region and strengthening the partnerships with our repeat customers such as Rowan."

Construction of the remaining two KFELS N Class rigs, Rowan Stavanger and Rowan Norway, are on schedule with expected deliveries in 1Q and 2Q of 2011. respectively. The remaining two of four Rowan EXL-Class jack-up rigs (Enhanced Super 116E), are expected to deliver in 1Q 2011 and 3Q 2012.

Continues on page 6...

Continues on page 5...

Class of its own



Rowan Viking, the world's first KFELS N Class jack up rig is already on term contract to operate in the North Sea

The KFELS N Class jackup design is the brainchild of Keppel's R&D arm, Offshore Technology Development (OTD), following Keppel's extensive experience in constructing rigs for the North Sea region since 1985.

Towering at 568 feet (extendable to 598 feet), the KFELS N-Class rig can operate in harsh weather conditions in water depths ranging from 400-500 feet, which are 40% deeper than traditional units in benign waters, and drilling depths of 35,000 feet, 15% deeper compared to existing harsh environment jack-ups.

Unique technical features:

 Designed with a focus on personnel safety and improved work environment conditions to reduce exposure to occupational hazards like pipe handling operations, air-borne and liquid chemical exposure, material handling processes on deck, maintenance access, emergency preparedness, response and evacuation and other issues that arise from the harsh and difficult nature of this business.

- Accommodation for 120 persons in one and two-man cabins, meeting stringent Norwegian requirements with adequate space for offices, conference rooms, recreational facilities and other task-specific areas.
- Capable of simultaneous drilling and production operations with a cantilever drilling package designed to skid transversely,

allowing drilling to take place at two positions 26 ft apart. The two cantilever drilling positions also provide an exceptionally wide drilling envelope.

- The drill floor is equipped with a 4,600 HP AC drawworks providing 2 million pounds of hook load capacity in a totally enclosed, noise-reducing cabinet designed to limit exposure of personnel working on the drill floor to noise hazards.
- A two-man driller's cabin elevated above the rig floor and equipped with cyberbased controls is used to remotely operate all of the drilling equipment including the drawworks, mud pumps and 2,300 HP dual-AC motor topdrive.
- The 180 ft high, 40x40 ft base derrick supports 35,000 ft of drill pipe, racked by remote control from the driller's cabin.
- A dust-free, automated mud mixing system reduces personnel exposure to airborne chemicals, the liquid mud processing system is controlled remotely from an air-conditioned operators station and the sack storage area is fitted with an elevator designed to transfer chemical pallets from the main deck to the sack room floor, reducing material handling risks.

Jacked up demand

David Russell, Executive VP of Rowan Companies, Inc shares insights on the premium jackup market in an interview with OffshoreMarine.



David Russel, Executive VP of Rowan Companies, Inc, expects utilisation rate for harsh environment rigs to be in excess of 90%

Q. HOW IS THE JACKUP MARKET DOING?

The market is showing signs of improvement. We have seen very strong demand for units like Rowan Viking and the rest of our high-specification units.

Days of the easy gas and easy oil are over. Wells have become much more difficult. There is strong enquiry for jackups in the high-specification segment. The operators are starting to term up the better rigs, putting them on longer term contracts.

We have been contracting our rigs before they leave the shipyard, and that's always a very positive sign. I think that things are improving, and it is evidenced by our ability to continue to contract our highspecification rigs, but I would say that there is some weakness in the lower capacity rigs.

Q. WHAT KIND OF DAYRATES CAN BE EXPECTED FOR PREMIUM JACKUPS?

As you increase the specification, the utilisation rates increase. Rowan Viking is a very special unit. For this particular kind of harsh environment rig, we would expect utilisation rate in excess of 90%. That is the kind of direction that Rowan is heading, to be able to provide very harsh environment rigs for demanding drilling services.

In the high-specification market, the day rates are strong. Our day rates range from US\$150,000-US\$160,000, all the way up to the US\$300,000s, depending on where the units are working. The highest day rates come from Norway. That's where these rigs are targeted. Ultimately, they will wind up in Norway.

Q. NORTH SEA IS TRADITIONALLY DOMINATED BY NORWEGIAN CONTRACTORS. HOW WILL ROWAN ENTER THIS MARKET?

That is one of the advantages for acquiring Skeie; they have a very good group, very strong and competent Norwegians within the company. We didn't just buy three rigs; we bought a company that has very strong engineering and operational people. We will keep the Norwegian content of the company.

Rowan Viking will be the second rig and second time Rowan enters the Norwegian sector of the North Sea. This market is quite closed but there are opportunities as long as you can meet the safety requirements. That was the one thing that interested us about these (KFELS N class) rigs; they were designed specifically for the North Sea.

The PSA (Petroleum Safety Authority, Norway) was involved throughout the building of this rig. We also involved the Norwegian labour unions who looked at all the work environment issues and the rig complies... This is exactly what the Norwegian government is looking for.

Q. DO YOU SEE RETIREMENT OF THE OLDER RIGS?

We do see some retirement of the older jackup rigs built in the 1970s. I think eventually you'll see that the older rigs will need to be retired. They are too old and from a safety standpoint I don't think the operators will take the risk of using technology from that type of rig.

Specialist shipbuilder



The construction of the 162 m-long GLOBAL 1200 achieved a perfect safety record of more than three million incident-free man-hours

"With a proven track record and expertise in the design and construction of specialised ships, we are well-poised to support Global, Greatship and Seaways in growing their fleet of modern, sophisticated vessels."

Hoe Eng Hock ED of Keppel Singmarine Keppel Singmarine's latest slew of stellar projects demonstrates its expertise in the design and construction of specialised ships.

ACHIEVING GLOBAL STANDARDS

GLOBAL 1200, the first of two new generation derrick pipelay vessels that Keppel Singmarine is building for Global Industries, is one of the largest specialised ships Keppel Singmarine has built in recent times.

Lady Sponsor, Kay Doré, spouse of Global Industries' founder William Dore, named the vessel on 18 September 2010.

John Reed, CEO of Global Industries, said, "The construction of subsea pipelines is expected to intensify globally in tandem with the increasing number of exploration and production activities in deeper and more remote frontiers.

"At Global Industries, we are in position to meet the market's needs for reliable and advanced solutions with a new fleet of two pipelayers, GLOBAL 1200 and 1201.

"We are very pleased to take delivery of our first vessel, which has been completed with a perfect safety record. We are confident that our win-win partnership with an established shipbuilder such as Keppel Singmarine will strengthen our position as a core provider of innovative solutions in the deepwater sector."

GLOBAL 1200 has a state-of-theart pipelay system and is capable of operating in waters as deep as 3,000m. Dynamically-positioned, the vessel can be swiftly and economically deployed in offshore destinations worldwide. It also meets the stringent standards in safety and stability required by International Maritime Organisation Special Purpose Ships codes.

The construction of the second vessel GLOBAL 1201 is scheduled for completion in the 2Q 2011.

BUILDING GREAT SHIPS

Keppel Singmarine also recently delivered its fourth Multi-Purpose Supply and Support Vessel (MPSSV) to Greatship Global Offshore Services Pte. Ltd. (Greatship). For completing the vessel, Greatship Manisha, with a perfect safety record, Keppel Singmarine was awarded a safety bonus of US\$10,000.

The first three MPSSVs for Greatship were delivered earlier this year and have started operations smoothly.

The four 94-metre long MPSSVs are each equipped with two units of electrically-driven 2600 KW Azimuth thrusters and three units of 1,050 KW tunnel thrusters to achieve Dynamic Positioning II capability.

They are capable of supporting offshore exploration, production and subsea construction activities.

MAKING WAVES WITH SEAWAY 16

Seaways International Pte Ltd (Seaways) too was a satisfied customer of Keppel Singmarine.

It took delivery of Anchor Handling Tug (AHT) Seaways 16, which at sea trial had performed excellently, exceeding its contractual bollard pull and speed.

The 100-tonne bollard pull vessel is equipped with dynamic positioning system, thrusters and control pitch propulsion system to enhance its position keeping and manoeuvrability. She performs terminal handling, anchor handling, escort and fire fighting duties.



For achieving a perfect safety record on Greatship Manisha, Keppel Singmarine was awarded a safety bonus of US\$10,000

200 and going strong



Celebrating Keppel and NSB strong relations are Helmut Ponath (second from left), President and CEO of NSB, Nelson Yeo (third from left), MD (Marine) of Keppel O&M and MD of Keppel Shipyard, Bozidar Petrovic (fourth from left), VP of NSB along with fellow colleagues



The 200th NSB vessel to call at Keppel Shipyard, Kalani is a symbol of enduring partnership between the two companies

"Our long standing partnership stems from mutual understanding and trust. We have always been able to dock our vessels at Keppel Shipyard and expect a quality vessel returned on time, or even ahead of time. It is a win-win partnership and I look forward to the 250th vessel or 300th vessel milestone."

Bozidar Petrovic VP of NSB Mutual understanding and trust

- these were the key ingredients
Niederelbe Schiffahrtsgesellschaft
mbH & Co. KG's (NSB) VP Bozidar
Petrovic cited for his long-standing
relationship with Keppel Shipyard.

The two companies recently celebrated the stopover of the 200th NSB vessel at Keppel Shipyard, where it underwent drydocking

and repair works. This milestone vessel – Kalani – first came to Keppel Shipyard for repairs in 1999 as Ville De Vela, and returned in 2002 as Northern Reliance.

Speaking at the ceremony, Nelson Yeo, MD (Marine) of Keppel O&M and MD of Keppel Shipyard, said, "Through a close partnership strengthened over the years and as the preferred yard for NSB in the Far East, we are delighted to be a part of the company's exceptional growth in the shipping industry."

Adding on, Helmut Ponath,
President and CEO of NSB, said,
"It has been my pleasure to
share a productive and enduring
partnership with Keppel Shipyard.
Both our companies have grown
together and supported each other
to be leaders in our respective
industries.

"NSB is today one of Germany's largest container shipping companies with a fleet of over 100 vessels, most of which have had at some point or other received quality service from Keppel Shipyard."

Bozidar Petrovic, VP of NSB, who has worked with almost every member of Keppel Shipyard project team, said, "Our long standing partnership stems from mutual understanding and trust. We have always been able to dock our vessels at Keppel Shipyard and expect a quality vessel returned on time, or even ahead of time. It is a win-win partnership and I look forward to the 250th vessel or 300th vessel milestone."

DDIII to the rescue

The Macondo well in the Gulf of Mexico (GoM) has been successfully intercepted by a relief well drilled by Transocean's DSS™ 51 semisubmersible (semi), Development Driller III (DDIII).

Representing the culmination of five months of intensive rescue work, this breakthrough was reported by BP on 19 September 2010.

"This is a significant milestone in the response to the Deepwater Horizon tragedy and is the final step in a complex and unprecedented subsea operation – finally confirming that this well (Macondo) no longer presents a threat to the GoM," said Mr Tony Hayward, BP Group Chief Executive.

The Macondo well has been shut-in since 15 July 2010 and cementing operations in August, following the static kill, provided an effective cement plug in the well's casing. With this successful interception, BP is now able to proceed with the complete abandonment of the Macondo well and other relief wells. It will also begin the process of dismantling and recovering containment equipment and decontaminating vessels that were deployed at the well site.

DDIII, built to Keppel's proprietary DSS™ 51 semi design, was delivered in 2009 by Keppel FELS on time and within budget to Transocean. The DSS™ series rigs are among the most technically advanced deepwater drilling rigs to be designed and completed by Singapore to date.

In his recent National Day Rally speech, Singapore's Prime Minister Lee Hsien Loong singled out both the DDIII and the Keppel AmFELS-built Q4000 unit for their contributions to the GoM response. He cited these rigs as examples of how Singaporean companies such as Keppel have been able to develop deep specialist knowledge and skills to create value and grow competitive and profitable businesses.



 $\label{thm:condowell} The \ Keppel-built\ rig,\ Development\ Driller\ III,\ has\ successfully\ intercepted\ the\ Macondo\ well$

Making milestones

Keppel O&M's network of 20 yards worldwide teems with activity.

As some projects enter early construction phase, others sail away to begin operations.

STRIKING START

Seafox 5, a Multi-Purpose Self-Elevating Platform (MPSEP), achieved its strike steel milestones on 1 Oct 2010 at Keppel FELS. The unit is being constructed for Workfox B.V, a member of the Seafox Group.

Designed by Keppel's Research & Development arm, Offshore Technology Development, this wind turbine installation unit can withstand harsh offshore environmental conditions all year round in the North Sea.

Rainier W. Verhulst, Workfox's Operations Director, said, "After nine months of hard work by our teams, we are very proud to cut first steel. We look forward to this exciting joint journey from a great design towards a state-of-the-art self-propelled installation and decommissioning jackup. Seafox 5 will set new standards in the wind as well as oil and gas industry, which makes it unique of its kind."

REVVING UP

A strike steel ceremony on 29 September 2010 marked the start of physical construction of Global Tech 1, a Mobile Offshore Application Barge (MOAB).

Keppel Verolme is building the transformer substation for Global Tech 1 Offshore Wind GmbH

(formerly Wetfeet Offshore) and it will be deployed at the Global Tech 1 Wind Farm in the German Exclusive Economic Zone in the North Sea.

This self-erecting floating platform will host the transformers and high voltage switchgears to collect and convert electricity generated by the wind turbines for delivery to Germany's national power grid. It can also provide permanent accommodation for up to 32 personnel operating the wind farm.

By serving both energy transmission and wind farm maintenance functions, the MOAB helps to enhance the operational reliability and efficiency of the Global Tech 1 Wind Farm,



Keppel FELS' CEO CH Tong (right) and Project Manager Adeline Chia (centre) with Workfox's Operations Director Rainier Verhulst (seated), George Brill, Project Manager (left) and Diederik C de Boer, Director of Seafox 5 Limited



Celebrating the strike steel milestone of Global Tech 1 are the managements of Global Tech 1 Offshore Wind GmbH and Keppel Verolme



Win-win partnership – KS Wong, ED of Keppel FELS, and Bob Issac, Senior Legal Counsel of Ensco International plc, at the delivery of ENSCO 8503

contributing overall to a greener environment.

HEADING OUT

Semisubmersible drilling rig, Hakuryu-5 owned by Japan Drilling, departed from Keppel FELS in September 2010 after the completion of maintenance and modifications work.

Work on the rig undertaken at Keppel FELS includes the fabrication and installation of the platform, scaffold erection, replacement of pipes and brackets, as well as blasting and painting works.

The rig has headed off for work in the Bontang production sharing contract area, off Indonesia for Salamander Energy.

Hakuryu-5 is due to drill the Angklung-1 prospect, which is believed to hold prospective resources of 125 million barrels of oil equivalent. Salamander, which has a 90% stake in the Bontang PSC, said the well will take about 39 days to drill.

EARLY HANDOVER

Keppel FELS has handed over the keys for ENSCO 8503 to Ensco on 28 September 2010, two days ahead of schedule, within budget and with no lost time incident.

The rig is the fourth of even ENSCO 8500 Series® semisubmersible drilling rigs being built exclusively by Keppel FELS for Ensco.

Continues on page 14...

Continues on page 13...



Maersk Peregrino was converted to meet Maersk FPSOs' stringent requirements which will prepare her to handle the heavy crude oil of the Peregrino field in offshore Brazil

When the ENSCO 8500 Series® is completed, Keppel-built rigs will make up a third of the leading driller's premium fleet. Construction of the next three rigs remains on schedule with expected deliveries extending to 2012.

ENSCO 8503 was also conferred the Safety and Health Award Recognition for Projects (SHARP), under the WSH Awards 2010.

MISSION PEREGRINO ACCOMPLISHED

Keppel Shipyard has successfully delivered the technologically-advanced Floating Production Storage and Offloading (FPSO) vessel, Maersk Peregrino, to Maersk FPSOs on 14 October 2010.

Peter Williams, Senior
Project Manager of Maersk
Peregrino, shared, "Many
congratulations on the successful
departure of the Peregrino today. I
would like to extend a warm thank
you and appreciation to the Keppel
team for accomplishing a very
fine job. The on-schedule and safe
delivery of this high quality FPSO
is due to the excellent partnership
that we have established with
Keppel over the years."

Work on Maersk Peregrino involved the conversion of a newbuild Very Large Crude Carrier. This included assembling and integrating the internal turret, fabricating and installing the flare tower, process piperack and

helideck, installing and integrating topside modules, as well as upgrading the accommodation quarters.

The FPSO will operate in a water depth of around 100 metres at the Peregrino field in Brazil's Campos Basin and is capable of producing 100,000 barrels of oil per day with a storage capacity of 1.6 million barrels.

Stig Hoffmeyer, CEO of Maersk FPSOs and Maersk LNG, was hosted by senior management from Keppel Shipyard when he toured Maersk Peregrino on 2 October.

A solid makeover

Retired car carrier, Merlion Ace, was given a new lease of life when her owners decided to convert her into a livestock carrier.

Her successful makeover was undertaken at Keppel Shipyard for Merlion Ace Compania Naviera S.A, an affiliate of Jordanian company Hijazi & Ghosheh Group, a world leading livestock carrier owner and operator.

Keppel Shipyard Project Manager Jason Tan shared on the transformation, "Converting this car carrier into a livestock carrier was no mean feat. One of our challenges was bringing in all the cattle pen rails in loose pieces. In addition, this being a retrofitted project, we did not have much leeway in the modification of the deck structures."

Renamed Ghena, the livestock carrier will ply the route between Australia and the Middle East.

Jason added, "As the vessel will go to Australia, we had to make sure that it met the stringent rules and regulations of the Australian Maritime Safety Authority (AMSA), which proved to be quite a challenge but one we passed with flying colours."

Works on Ghena included design engineering, procurement of major equipment, fabrication of cattle pen rails and gates, and crew living quarters, installation of the upper deck and roof deck, construction of the shore and internal ramp, as well as the fitting up of new generators.

Ghena is the second livestock carrier Keppel Shipyard has converted for Hijazi & Ghosheh. The first, the livestock carrier Maysora, was delivered in 2001.

Issam Hijazi, President of Hijazi & Ghosheh Group, said, "Ghena will be another quality vessel for us and a valuable addition to our fleet of livestock carriers. Keppel Shipyard has done a tremendous job in the turning over this vessel on time and in a safe manner. We have been pleased with the service and quality and look forward to future projects ahead."

The 1984-built, 17,090 dwt livestock carrier Merlion Ace was sold as a car carrier last December by Singapore Shipping to the Jordanian company.



Ghena (ex-Merlion Ace) is the second livestock carrier conversion by Keppel Shipyard for Hijazi & Ghosheh

Pushing safety frontiers



Keppel teams were lauded at the 13th WSH Innovations for their creative and practical safety solutions

Through knowledge exchange and innovation, Keppel continues to scale greater heights in safety.

LEADING IN SAFETY

To achieve a safe work environment, leaders must be able to stay abreast of changes to technology, as well as manpower and industrial policies.

CB Choo, CEO of Keppel Corporation and Chairman of Keppel O&M, shared these insights at the inaugural Singapore Workplace Safety and Health (WSH)
Conference 2010 attended by some 600 regulators, business leaders and safety professionals from across the region.

Themed "Embracing Challenges, Pushing WSH Frontiers", the conference held on 15 September 2010 at Suntec City, addressed the challenges of implementing safety measures in the workplace, and how to overcome them. As a conglomerate with businesses across different industries worldwide, Keppel is in a unique position to share its experience on safety given its multinational and multicultural work environments.

Emphasising the need for safety leadership at all levels, CB Choo said, "For workplace safety to be effective and far reaching, it has to be integrated into an organisation's systems and processes. Stakeholders at all levels must take ownership of safety and be empowered to stop any unsafe acts.

"Keppel actively engages its partners – from clients, government agencies and industry associations to unions, employees, contractors and vendors – to be safety leaders. We are committed the creations of an incident-free workplace by strengthening safety

leadership, increasing partnership and creating an effective safety management system. "

A vital platform for the exchange of safety knowledge, the conference was organised by the WSH Council and the Ministry of Manpower.

INNOVATION REWARDS

Four safety innovations from Keppel were lauded at the 13th WSH Innovations in the Marine Industry Convention. Held on 2 September 2010, the event was organised by the Association of Singapore Marine Industries (ASMI).

Keppel Singmarine's projects Smart Arm and Universal Mobile Stool were awarded Gold and Bronze, while Keppel Shipyard's projects Baby Turret and Unsafe Usage took Silver and Bronze. The Smart Arm is a safe, simple and secure method for installing electrical panels on a vessel.

Project team leader, Muhd Yassin bin Anuar, Assistant Engineer at Keppel Singmarine, shared, "With the smart arm solution, workers use a lever block, instead of undertaking manual lifting, and do not have to hold the panel down with their hands; hence, the threat of injuries to backs and hands is reduced."

As for the Baby Turret solution, it minimises the need for workers to manually guide wire ropes over the sides of a vessel, and so reduces possible hand injuries.

Downstream savings are achieved with the Baby Turret solution as well. It helps to prevent wire ropes from being worn out; as such, they have to be replaced less frequently.

Alpha performance on safety

Sterling efforts to upkeep safety at Keppel have not gone unnoticed.

CONGRATULATIONS TO B309 ALPHA STAR PROJECT TE.
FOR ACHIEVING 6,000,000 MAN-HOURS WITHOUT

LOST TIME INCOMENT

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A firm handshake expressing QGOG's satisfaction towards Keppel FELS as Marcelo Abreu (right), QGOG's Project Manager, presents the safety bonus to B.G. Chan, Keppel FELS's Project Manager

For achieving six million safe man-hours on construction of the DSS™ 38 semisubmersible Alpha Star for Queiroz Galvão Óleo e Gás (QGOG), Keppel FELS was awarded a bonus of \$20,000 on 16 September 2010.

Additionally, the project was conferred the Workplace Safety & Health Award by the Ministry of Manpower and Workplace Safety and Health Council recently.

Progressing on time and within budget, Alpha Star, the second DSS™ 38 unit to be built by Keppel FELS for QGOG, is scheduled for delivery in mid-2011.

The first unit, Gold Star, is also the first DSS™ 38 rig to have entered the market and is supporting Petrobras' exploration and production activities in Brazil.

Spurring productivity

To spur like-minded companies to achieve world-class manufacturing standards, Keppel FELS shared its winning strategy and approach at Manufacturing Excellence Award (MAXA) 2010.

In 2008, Keppel FELS was the first Singaporean company to bag the coveted MAXA Award, which recognises companies for manufacturing innovation and excellence.

At this year's MAXA event, held on 26 August, Keppel FELS participated in the lunch forum, sat on the judging panel and hosted a tour of its facilities for the manufacturing community.

During the lunch forum, CH Tong, CEO of Keppel O&M, shared that in 2009 the company had invested \$21.6 million on training programmes, which not only enhanced the skills and knowledge of the workforce but also inspired ideas for productivity gains.

The synergy between Keppel O&M's 20 yards and offices worldwide is crucial to its high productivity as well. As a result of this synergy, Keppel FELS had been able to coordinate with its overseas units, enabling the simultaneous construction and engineering of multiple components of a project.

Additionally, CH Tong advised looking beyond a firm's own operations and into the efficiency of the entire supply chain.
He stated that Keppel O&M works closely with its smaller

subcontractors, even looking into their work processes and cash flow, to ensure that can perform optimally.

Battling over the decision with fellow judges over the winner for this year's MAXA Award was Wong Fook Seng, GM of Planning & Control, Quality Systems & Process Excellence at Keppel FELS.

Highlighting the continuing significance of manufacturing to Singapore and the growing relevance of the MAXA platform, Mr Wong shared, "Singapore has emphasised a renewed focus on



CH Tong (left), CEO of Keppel O&M, shared that Keppel O&M looks into the efficacy of its entire supply chain to ensure optimal performance



Giving participants feedback was Wong Fook Seng (right), GM of Planning & Control, Quality Systems & Process Excellence at Keppel FELS, who sat on the judging panel of MAXA 2010

productivity to strengthen our economic resilience. To remain competitive, our manufacturing sector must raise productivity levels through innovation, use of technology and training.

"At Keppel, we have benefited greatly from our MAXA journey. The takeaways from this watertight appraisal have helped to further improve Keppel FELS's operations, and through our crosssharing, those of other business units within the Keppel O&M group."

Strategic exchange

Eager to learn the factors behind Keppel FELS' high performance, senior management and personnel from Panasonic's Asia Pacific offices called on the company on 13 October 2010.

In a lively discussion led by Keppel FELS' general managers, the visitors were enlightened on the company's production processes, supply chain systems as well as strategies to motivate its workforce. In turn, the Panasonic delegation shared on their manufacturing principles and challenges.

Though they operate in vastly different industries, Panasonic and Keppel FELS found common ground and gleaned insights from each other. It is this active pursuit of continuous learning which will enable both companies to raise the bar on manufacturing excellence.

Pledge to quality



Leading by example – prompting every Keppelite to be a Quality Champion is Nelson Yeo, MD of Keppel Shipyard

Since Keppel Shipyard's Quality Plus programme was launched in 2008, it has consistently stepped up efforts to ensure utmost quality standards are delivered to its customers. Renewing its commitment to quality, Keppel Shipyard launched its Quality Plus 2010 programme on 17 September. Targeted at reinforcing ownership, the programme stresses a personal and collective responsibility towards ensuring high quality standards.

This new multi-pronged Quality
Plus action plan involves increasing
management and workforce
involvement as well as continued
training and development in the
march "Towards Zero Defects
& Work Excellence", which is
the mission statement of the
programme.

In its journey to higher quality standards, Keppel Shipyard has the strong support of its partners – BW Offshore, SBM, Shell, Prosafe Production, Maersk FPSOs, Woodside and Bumi Armada.

Seamless integration



Celebrating the successful completion of FPSO P-57 were (from left) Mr Sérgio Cabral, Governor of Rio de Janeiro, CH Tong, CEO of Keppel O&M, Brazil's President Lula and CB Choo, Chairman of Keppel O&M and Non-Resident Ambassador to Brazil

Keppel FELS Brasil's BrasFELS

With a burgeoning oil and gas sector fuelled by large offshore oil discoveries, Brazil is undergoing significant socio-economic changes.

Harnessing the strengths of Keppel O&M's global network, Keppel FELS Brasil's BrasFELS yard stands ever-ready to support the nation's growth.

LANDMARK CHRISTENING

Keppel FELS Brasil's BrasFELS yard in Angra dos Reis and Keppel Shipyard in Singapore have successfully completed P-57, the largest Floating Production Storage and Offloading (FPSO) vessel converted for Brazil.

On 7 October 2010, P-57 was christened by Madam Renée Carvalho, widow of the late Mr Apolônio de Carvalho, in the presence of Brazil's President H.E. Luiz Inácio Lula da Silva, Governor of Rio de Janeiro Mr Sergio Cabral, as well as Petrobras' President Jose Sergio Gabrielli at BrasFELS yard. They were joined by the senior management of Keppel and SBM and some 8,000 BrasFELS employees, in celebration of this landmark national project.

Tony Mace, MD and CEO of SBM, said, "After 24 months of intensive planning, engineering and execution together with Keppel, we are very pleased that the P-57

will be delivered to Petrobras early and within budget, and with the highest safety standards.

"Converted to Petrobras' newgeneration FPSO design, under SBM/Petrobras' stringent requirements for safety and quality, the P-57 represents a major step in SBM's business growth as a leading provider of offshore floating production solutions. It is also a strong showcase of the reliability and capability of Keppel's global yards in carrying out massive projects across continents.

The upgrading and pre-conversion of the 255,272 dwt tanker,



yard is the most comprehensive offshore and marine facility in Latin American

Extracts of President Lula's speech

At the christening ceremony, President Lula shared an emotional recount on how Angra clawed back its shipbuilding heritage.

Addressing the crowd, he said, "Angra do not be afraid...This is where we first took the view that it was possible to build here, it was here we took the first seed that we would recover the Brazilian shipbuilding industry, and now here we are seeing it...

"Metalworkers in Brazil, we recovered 600,000 jobs. Six hundred thousand jobs that no longer existed in this country, we have recovered.

"Petrobras has US\$224 billion to invest by 2014. You will have many more vessels, platforms, and will need more yards.

These companies will make more Singapore shipyards here, because we have to build platforms for other countries in

need, to South America or to other countries that do not have the same technology as our own."

"On P-57, over 60% was Brazilian content. The next could be 70%, 80%...we can think of a platform to be 100% Brazilian content. If you launch the challenge, we can do it."

Continues on page 22...

SPECIAL FEATURE

Continues on page 21...

MT Accord, into the P-57 was completed at Keppel Shipyard earlier this year, earning the yard \$1 million bonus from SBM for the safe and timely completion.

Upon reaching the shores of Brazil, further work performed at BrasFELS yard included the fabrication and integration of topside modules, piping and electrical equipment, as well as commissioning. The project has fulfilled Brazil's local content requirement of 68%, and was achieved with an outstanding safety record of about nine million incident-free man-hours to date.

CB Choo, Chairman of Keppel O&M and Non-Resident Ambassador of

Singapore to Brazil, said, "We are very privileged to be entrusted by SBM and Petrobras with the conversion of the P-57, and look forward to deepen this winwin partnership between our companies."

P-57 is the 12th major FPSO conversion/upgrading project that Keppel has completed for Brazil. Including P-57, Keppel's projects for Petrobras will contribute substantially to Brazil's domestic oil production capacity.

When deployed on location in 2010, P-57 will have a production capacity of 180,000 barrels of heavy oil per day. Its capabilities include compressing two million

cubic metres of gas per day, processing 300,000 barrels of liquids per day and storing 1,600,000 barrels of oil.

FLYING THE BRAZILIAN FLAG

The success of BrasFELS and the timely delivery of P-57 have much to do with the commitment and perseverance of its workforce.

Despite it being a holiday, on Brazil's Independence Day, workers enthusiastically returned to yard to participate in the Independence Day Observance Ceremony.

Addressing the workers, KC Kwok, CEO of Keppel FELS Brasil, said, "Each and every one of you at BrasFELS plays an important part



On Brazil's Independence Day, workers enthusiastically returned to yard to participate in the Independence Day Observance Ceremony

in contributing to the revitalisation of the naval construction industry in Brazil.

"Together, we share in the same vision of helping Brazil attain its goal of being in the league of net oil exporting countries. Let us continue to work together as family at BrasFELS, contributing to the economic development and success of Brazil."

The workers' continued efforts have contributed to the successful conversion of the Floating Production Storage and Offloading vessel P-57, as well as the marine mating milestone for Floating Production Unit P-56.

EMPOWERING LIVES

Through a sustained transfer of expertise, technology and systems from Keppel's Singapore yards and training and upgrading programmes, BrasFELS yard has been empowering its workers to take on more sophisticated jobs.

Last year, BrasFELS launched the inaugural Trainee Engineers Scheme. Currently, about 50 engineers are participating in the two-year programme. To provide them with a well-rounded understanding of the yard's functions and capabilities, these engineers are exposed to the various trades and sections within BrasFELS through job rotation.

The aim of the Trainee Engineers Scheme is to enhance engineering expertise, spur innovation, build key competencies and empower BrasFELS' next generation of young Brazilian talents to take on leadership positions.

Decade of service



Through BrasFELS, Paulo de Souza has participated in landmark projects which have contributed tremendously to the nation's total oil production capacity

Life for many in Angra changed, said Paulo de Souza, when Keppel entered Brazil and set up the BrasFELS yard.

Paulo believes he would never have been able to send his daughter to university if not for the stable employment and training opportunities offered by the company.

Born and bred locally, he adds that in Angra, it is hard to find a stable job with a good salary supplemented by health insurance.

Today, the 43 year old, has been upgraded three times in his job, and is placed in charge of a team of 15 people in the maintenance department.

He boasts an employee card numbered '0002', which reflects his decade of service and emotional attachment to BrasFELS since the first day of the yard's establishment.

"This has become my second home. Back in the early days, there were only some 50-60 faces in the yard. Today, we have 8,000! Everybody knows me and I have many good friends here," he shared, with a smile.

Paulo also added that he is proud to work at BrasFELS, which has enabled him to participate in projects – such as the P-48, P-52, P-51, P-57 and P-56 – that have contributed tremendously to Brazil's total oil production capacity.

Leg doctors



Keppel FELS' Flying Squad was commended by Seawolf for answering an urgent call for help swiftly and effectively

For their swift and effective response to repair the legs of the jackup rig, Seawolf Oritsetimeyin, thousands of miles away in Calabar, Nigeria, members of the offshore repair team were aptly dubbed the 'leg doctors'.

A 17-men team led by Sim
Kong Peng had set off just a day
after receiving the call for help.
After the scope of work was
determined, an additional team of
11 men was immediately deployed
as reinforcement.

Dale Graham, Seawolf's rig manager, said, "I would like to express my appreciation and thanks to the Keppel FELS crew under the lead of Sim Kong Peng for their excellent performance in the repairs to the damaged leg braces.

"Their knowledge and expertise were instrumental in an excellent completion of the project which I strongly believe only Keppel FELS has the skills and expertise to take on. This really proves that Seawolf has made a right choice engaging Keppel FELS for this project."

In an appreciation lunch for the Flying Squad held at Keppel FELS, CH Tong commended the team for a job well done.

He added, "We must always have safety at the top of our mind in every job that we do, be it in our yards or outside."

Lauding Kong Peng's strong leadership and the team for reinforcing Keppel FELS' reputation as the expert in jackup legs, CH Tong recalled his own experience back in 1973 when he led a team of 30 men to offshore Gabon, Africa for an 11-day thruster installation job onboard Sedco 445.

Overcoming many hurdles along the way, while ensuring everyone's safety is first priority were just some of the similar challenges faced by both CH Tong and Kong Peng.

Apart from rushing urgent preparations for immediate mobilisation such as necessary travel and medical documents, Kong Peng shared the odds that the team was up against.

"We were concerned about the general security situation in the region where violence is not uncommon. We exercised caution and fortunately, we were safe throughout our trip.

"Another significant challenge was communicating with the Nigerian scaffolders to ensure they built the scaffolds to our standards of safety and needs," he added.

The Flying Squad's superb command, execution and control out in the field continues to make a deep and positive impression with customers.

Qatar to launch flagship yard

Due to be inaugurated on 23 November 2010, Qatar's flagship shipyard, Nakilat-Keppel Offshore & Marine (N-KOM) is ramping up its capabilities.

In August 2010, N-KOM completed the construction of dock gates weighing a total of 2,700 tonnes for its two graving docks. Completed safely, on time and within budget, the two dock gates, at lengths of 68m and 82.25m respectively, have been installed and tested on its two graving docks.

The yard is designed is to undertake a wide and diverse range of activities. It comprises two very large crude carrier (VLCC) size graving docks which are complemented by two large finger piers providing six wet repair berths with a total length of 2,300m and a minimum water depth of 11m. A number of well equipped workshops with extensive laydown and fabrication areas are alongside both graving docks.

When completed, the yard will boast some of the most

technologically advanced equipment, which will add to efficiency, quality and safety.

Helmed by a capable management team, N-KOM has recently obtained accreditation for its Integrated Management System covering ISO 9001:2008 for Quality, OHSAS 18001:2007 for Occupational Health & Safety and ISO 14001:2004 for Environmental Management.

In addition, the yard is supported by a pool of skilled workforce from Qatar and Keppel O&M's network of yards globally. In particular, N-KOM will draw on the expertise of the LNG tanker repair teams at Keppel Shipyard in Singapore.

N-KOM is a landmark partnership between Nakilat, the owner of the largest fleet of LNG carriers globally, and Keppel O&M, the world's leading offshore and marine group, headquartered in Singapore.

The yard will undertake the drydocking, repair and maintenance of Nakilat's fleet of 54 very large liquefied natural gas (LNG) carriers, which are all currently in service.

In addition, it is targeting to carry out general maintenance repairs and drydockings works for commercial vessels of all types and sizes for the international market. It is also positioned to undertake conversions of Floating Production Storage and Offloading (FPSO) vessels, Floating Storage and Offloading (FSO) vessels and Floating Storage and Regasification Units (FSRUs) as well as fabrication work for offshore projects.

In March this year, N-KOM signed a Memorandum of Understanding with the Qatari Navy for ship repair services. The agreement provides for drydocking and repair works for the Qatari Navy's vessels as well as other military auxiliary vessels. It also provides for afloat repairs of the Qatari Navy's vessels, periodic maintenance and servicing of machineries outside of the drydocking programme, and major upgrades and conversions of vessels.



Strengthening links with Latin America

Through active participation in forums and conferences, Keppel O&M keeps its hand on the pulse of Latin America region.

BRIDGING PARTNERSHIPS

A platform for inter-regional dialogue and collaboration, Latin Asia Business Forum 2010 was well-attended by key business leaders and government officials from Latin America and Asia.

During his opening address,
Mr Lim Hng Kiang, Singapore
Minister for Trade and Industry,
shared on the strengthening trade
relations between Latin America
and Asia as well as the growth
potential of the two regions.

Helmed by a set of distinguished panelists, the forum addressed issues such as investment and partnership opportunities, and business best practices and strategies.

Keppel Group, the Strategic Sponsor of the event, hosted a networking lunch session for the 300 participants. Organised by International Enterprise Singapore, the annual forum has grown in strength and stature since 2004.

SHOWCASING RIO'S BEST

Keppel FELS Brasil participated in the Rio Oil & Gas Expo and Conference, which was held over 13 to 16 September this year. The most important tradeshow of its kind in Latin America, the event drew the attention of the global energy industry.

Attracting some 53,000 visitors from 51 countries, this biennial event's record-breaking visitorship was 33% higher than in 2008.

Partaking for the fourth time, Keppel FELS Brasil took the opportunity to showcase its milestone achievements in Brazil in the past decade. These range from the conversion of some of Brazil's largest floating production storage and offloading units to the construction of three floating production units, of which the third – P-56 – will comprise 100% local content.

Some 1,200 exhibitors, ranging from global energy companies to the manufacturers of cranes, pumps and lifeboats, showcased their products and services at the expo.

Organised by the Brazilian Institute of Oil, Gas and Biofuels, the event was held in Rio de Janeiro, the reputed oil capital of Brazil. Over the years, the event has established itself as a prominent platform for networking and the discussion of major technological issues and innovative ideas.



Hoe Eng Hock (extreme right), ED of Keppel Singmarine, in discussion with participants at Latin Asia Business Forum 2010

Preferred partner for solutions



Bonding with partners at the Pareto Conference were CH Tong, CEO of Keppel O&M (extreme right), KS Wong, ED of Keppel FELS (third from left) and Wang Look Fung, GM (Group Corporate Communications) of Keppel Corporation (extreme left)

Keppel O&M shared its research and development philosophy as well as rig and ship designs at the 17th Pareto Securities' Oil & Offshore Conference held over 1- 2 September in Oslo, Norway.

Presenting at the conference, CH Tong, CEO of Keppel O&M, explained that the company works closely with its customers and leverages its rich shipyard experince to develop marketrelevant and commercially viable products.

Keppel FELS multi-purpose selfelevating platform (KFELS MPSEP) is an example of such products. The design has been chosen by Seafox Group as the basis for a new-generation wind turbine installation vessel. Keppel FELS and Seafox have formed a 75/25 joint venture company to build and own this vessel. The KFELS MPSEP, designed by one of Keppel's Offshore
Technology Development (OTD), has the distinct ability over other existing vessels to install and maintain heavy wind turbine foundations, such as the jacket and tripod types, especially in deeper waters. The unit is also able to support a wide range of offshore oil and gas-related activities such as accommodation, well intervention, maintenance, construction and decommissioning.

CH Tong also took the opportunity to share the DS12000 and slim drillship designs. Jointly developed by Keppel with SBMGustoMSC, DS12000 presents a cost-effective rival to its larger peers, and is energy-efficient and relatively easy to maintain. Meanwhile, the slim drillship design, which Keppel is developing with Stena Drilling, is engineered for economical and effective subsea well maintenance, intervention and light drilling operations.

Committed to improving existing solutions and addressing future needs, Keppel O&M is well-positioned to meet the increasingly sophisticated demands of the energy industry.

A strategic platform to network and discuss salient issues in the offshore oil and gas industry, the conference was attended by more than 1,400 participants from over 100 energy and offshore-related organisations.

Supporting Vietnam's growth



With each successive collaboration, Keppel's partnership with Vietnam reaches new heights

A special exhibition took place in Hanoi, Vietnam, to celebrate the 35th anniversary of the nation's oil and gas industry.

Running from 28 August to 1 September 2010, the trade show was spearheaded by the state-run Vietnam Oil and Gas Group, which undertakes all activities relating to the discovery, exploitation and value-generation of the country's oil and gas resources.

Keppel FELS showcased for the projects it had completed for Vietnam, including PV Drilling's modern fleet of three KFELS B

Class jackup rigs, all of which were delivered ahead of schedule and with outstanding safety records.

The company's milestone projects for Vietnam also include Hoang Sa, a 1,200-tonne floating crane completed in 1984, Vietnam's first jackup rig, the Tam Dao I for Vietsovpetro (VSP) in 1988, and a central processing platform, CPP-3 for VSP in 2001.

Meanwhile, construction of Vietnam's first semisubmersible drilling tender is progressing well at Keppel FELS.

Knowledge network

Keppel's commitment to advance knowledge and reap new ideas saw a fruitful and lively sharing session with Petronas, the national oil company of Malaysia, on 1 September 2010.

The discussion, which took place at Keppel Offshore & Marine Technology Centre (KOMtech), involved management of both Keppel O&M and Petronas where they discussed and exchanged ideas on energy loss and management, as well as the process of engineering innovation.

Dr Foo Kok Seng, Centre Director of KOMtech, said, "We are glad to learn from Petronas on how



From left to right: Dr Foo Kok Seng, Centre Director of KOMtech, Mohaiyuddin Abdul Hamid, Head of Energy and Loss Management of Petronas, Hashim Zainal Abidin, Manager of Civil, Structural & Pipeline Engineering of Petronas and Charles Foo, Director and Advisor of KOMtech, exchanged ideas on energy loss and management, as well as the process of engineering innovation

they have increased the awareness of energy efficiency among their employees and the significant savings the company achieved from implementing energy-efficient processes.

"It is useful for industry players to convene regularly and share insights on trends and developments on energy efficiency and engineering innovation."

Treat among friends

Trick or treat, it was an evening filled with much fun and laughter at the Keppel FELS Sundowner held at the Singapore Night Safari on 8 October 2010.

More than 100 people, comprising customers, partners and employees, gamely turned up under the guise of ghosts, skeletons, witches, and devils for the Halloween-theme party.

From Brazilians to Vietnamese and Americans to Danish, the strong turnout was a melting pot of warm ties and great merriment.

Not only did the event reflect the international scale of Keppel FELS'

customer base, it also showed up the strength and familiarity of the relationships that Keppel FELS has established with its partners.

Organised regularly, the Sundowner is a great platform for Keppel FELS to enhance customer relations in lighter moments.







Keppel FELS and its business partners turned up in costumes under the guise of ghosts, skeletons, witches, and devils for the Halloween-themed party

Supporting offshore wind turbines

Keppel Offshore & Marine Technology Centre (KOMtech) is working with Keppel Verolme to develop jacket foundations for offshore wind turbines in deeper waters.

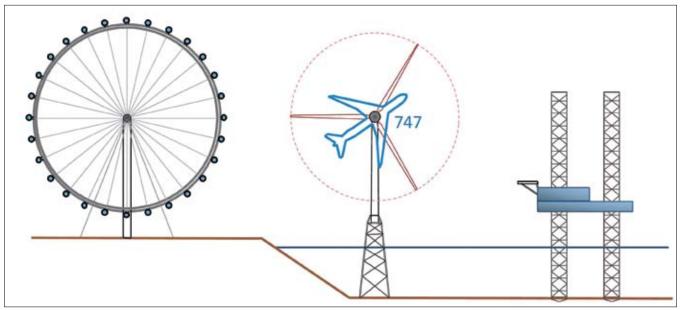


Figure 1
The size of a 5MW turbine(centre) compared to a Boeing 747, the Singapore Flyer observation wheel and a KFELS B-Class jackup rig

A typical 5 megawatt (MW) offshore wind turbine can weigh as much as 400 tonnes and have a rotor diameter of 120m or more. This is approximately the weight of a fully loaded Boeing 747 and length of twice its wingspan.

The few main types of foundations that are used to support these massive offshore wind turbines are gravity base structures (GBS), monopiles, tripods and jackets.

GBS and monopiles have been by far the most widely used, however these foundation types are less attractive options for larger turbines in deeper water depths. In general, GBS have been used in water depth of around 10m or

less, the deepest being the GBS foundations being constructed for the Thornton Bank wind farm which lie in water depths of around 20m, 30km off the coast of Belgium. As for monopiles, the largest to date are the huge monopiles with approximately 6m diameter being installed in water depth of more than 30m at Greater Gabbard wind farm.

Over the years, in line with its move towards cleaner energy sources, the UK government has become one of the strongest advocates of offshore wind energy and is currently introducing wind farm sites in phases.

Currently, Round 3 sites are being

planned with a majority of the turbines to be in water depths in the 30-45m range. At such depths, tripod or jacket structures are generally accepted as the more feasible foundation solutions.

Foundation structures for deeper waters must be capable of supporting the turbine towers while resisting large overturning loads due to wind, waves and current. Consideration must also be made to the dynamic nature of the loading and the possibility of structural resonances and fatigue.

A tripod (3 legs) or quadpod (4 legs) is an intuitive way to distribute the large overturning moment to a spread footing. The structures convert the overturning moment to a vertical couple at the foundation, which is resisted by forces in the piles. The large base spread results in significantly smaller piles compared to those of monopiles, resulting in easier pile driving using standard equipment. However, the members of the tripods are bulky and require shipyard-type fabrication processes to effectively construct and profile the members and joints.

Jackets work on the same principle as tripods or quadpods; but unlike tripods that use a few large members to transfer loads, the jacket relies on a number of relatively small members arranged in a trusswork to spread the footing. An advantage of this is that it is generally possible to produce a more transparent structure that will sustain smaller wave loads; an important consideration as water depths and wave heights increase. Also, as smaller members are used, the fabrication of the jacket can be carried out using standard truss construction practices.

Jackets appear to be feasible in water depths above 20m and are most likely to be the preferred solution for water depths above 30m. Jacket foundation structures have been installed in the Beatrice Demonstrator Project (water depth = 45m) and Alpha Ventus wind

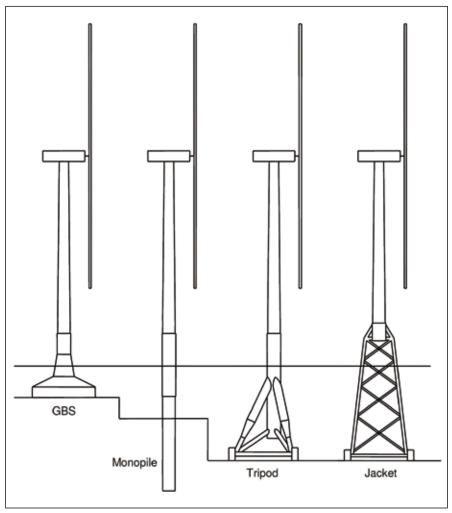


Figure 2
The four main types of foundations used to support offshore wind turbines

farm (water depth = 30m). In both cases they were used to support 5MW turbines.

Responding to the rising demand and challenges of having wind turbines in deeper waters, KOMtech is working with Keppel Verolme on developing jacket foundations suitable for mass production and installation.

Jacket structures suitable for 40m water depth are likely to weigh in the order of 800 tonnes, including the transition piece, and will be designed with a base dimension of around 25m or more. The team is also looking into cost-effective methods to construct and install the jacket foundations, keeping in mind that such processes are repetitive.

Strategic appointments









New Board directors augment Keppel O&M (from left): Lim Chin Leong, Loh Chin Hua, Abu Bakar Mohd Nor and Toh Ko Lin

Keppel O&M continues to strengthen its Boards with the appointment of Directors who provide strategic counsel and keen insights to steer the group towards further growth.

KEPPEL O&M

Joining Keppel O&M's Board is Lim Chin Leong, with effect from 13 September 2010, and Loh Chin Hua, with effect from 14 October 2010.

Lim Chin Leong, 55, retired in January this year as Chairman of Asia, Schlumberger, and is currently based in Beijing, China. Over a career of 30 years with Schlumberger, he held senior management positions in a wide range of areas and locations spanning Asia Pacific, Middle East and the US.

Loh Chin Hua, 49, is the MD of Alpha Investment Partners Limited (Alpha), the real estate fund management arm of Keppel Land. He joined Alpha in September 2002, and has 24 years of experience in real estate investing and fund management.

Prior to joining Alpha, Loh Chin Hua was the MD of Prudential Investment Management Inc. He also held management positions in the Government of Singapore Investment Corporation (GIC).

KEPPEL SINGMARINE

Over at Keppel Singmarine, the company welcomes to its Board Abu Bakar Mohd Nor as Director with effect from 6 September 2010.

Abu Bakar, who is the Director for Keppel Shipyard, began his career in Keppel in 1990. He concurrently holds the position of Senior GM (Operations) of Keppel Shipyard, as well as GM of Health, Safety and Environment for the Keppel O&M group.

Abu Bakar is also the Chairman of the Association of Singapore Marine Industries (ASMI) Safety Committee since 2005 and a member of the Workplace Safety and Health (Marine Industries) Committee under the Singapore Workplace Safety and Health Council.

KEPPEL NANTONG

Meanwhile, Toh Ko Lin, 58, has been appointed Director of Keppel Nantong Shipyard with effect from 6 September 2010.

Toh Ko Lin is also a Board member of Keppel Singmarine.

He continues to hold his concurrent positions as Senior GM (Commercial) of Keppel Singmarine and President of Keppel Philippines Marine, Inc.

Toh Ko Lin joined Keppel in 1975 and has held various management positions in the Keppel Group.

Honouring an industry stalwart

For his valuable contributions to the Nantong economy,
Lee Tai Kwee, President of
Keppel Nantong Shipyard, was conferred the Outstanding
Contribution to Nantong Open
Economy Model Award by the government of Nantong, China.

This is the first time the award is presented to industry leaders; Lee Tai Kwee is one of eight recipients from the Nantong Gangzha district.

Receiving the honours from Mayor Mr Ding Da Wei at the Nantong Port Economy Dialogue on 17 September 2010, Lee Tai Kwee shared, "I am very honoured that the Nantong government has chosen me to receive this award. This is testament to the efforts and resources we have put in to establish and build up the capabilities of Keppel Nantong Shipyard.

"Over the years, we have developed a good relationship with the Nantong government and I would like to thank them for their strong support. Looking ahead, Keppel Nantong Shipyard will continue to focus on delivering quality products, which in turn will benefit and contribute back to the local economy."



Lee Tai Kwee, President of Keppel Nantong Shipyard (third from left), and Mr Ding Da Wei, Mayor of Nantong Municipal People's Government (extreme right) in discussion at Keppel Nantong Shipyard

Successful delivery

Keppel Nantong Shipyard scores again with the successful delivery of Smit Siyanda to Smit Shipping Singapore safely and within budget on 7 September 2010.

The 90-tonne bollard pull tugboat is equipped with Azimuth thrusters to enhance strength and stability in its towing capability to better serve offshore structures.



The Smit Siyanda tugboat was another on-time on-budget delivery by Keppel Nantong Shipyard

Engineering growth

Keppel Group recently joined hands with the Institution of Engineers Singapore (IES) to promote the engineering profession to the young.

The company sponsored \$30,000 to the National Engineers Day (NED) initiative.

To enable the next generation to envision the life of an enginner, it also facilitated student tours to Keppel O&M's yards and Keppel Integrated Engineering's Senoko Waste-to-Energy Plant.

BUILDING WORLD-LEADING ENGINEERING ENTERPRISES

In conjunction with NED, CB Choo, Chairman of Keppel O&M and CEO of Keppel Corporation, delivered the Fourth IES Charles Rudd Distinguished Lecture.

OffshoreMarine brings you highlights of his speech:

"Uniting over 30,000 employees in more than 30 countries as a global team is perhaps something that Keppel has managed with some success. Nonetheless, we are still working at it. People have been and will continue to be the pillars of our company and key drivers of success. In this regard, we devote a lot of our attention and resources towards the holistic training and development of our people in both good and bad times.

We invest in the upgrading of our employees and provide opportunities for overseas exposure and job rotation across the spectrum of Keppel Group's operations.

Through Keppel College, we offer various leadership and people

World of opportunities



Keppel Singmarine Project Manager Loh Kee Huat runs a tight ship to ensure his team is on track to deliver GLOBAL 1200 safely, on time and budget

At Keppel, a world of opportunities is open to talented individuals who are keen to reach farther in their engineering careers.

DREAMS COME TRUE

Ten years ago, armed with good A Level grades, Loh Kee Huat chose engineering and a Keppel Group scholarship.

Wanting to work in a dynamic and fluid environment, Kee Huat's decision was sealed following an eye-opening tour of the busy shipyard.

The 29-year-old Project Manager's responsibilities have grown over his four years with the company. He went from being a mechanical and piping engineer to overseeing

the construction of the first two derrick pipe-laying vessels for Global Industries.

There is never a dull moment in Kee Huat's work day. He manages some 40 officers who in turn oversee hundreds of people working on these projects.

Kee Hua shared, "I derive satisfaction from seeing a vessel go from design to delivery."

GIGANTIC LEAPS

A spirit of boldness and tenacity belies the petite frame of Keppel FELS' first female Project Manager, 28-year-old Adeline Seah.

After five years in Keppel FELS' engineering department, Adeline,

development programmes to Educate, Empower and Energise our staff. It is important that we continuously provide our people with many opportunities to stretch and test themselves as they grow with the company.

Our training programmes are designed to equip employees with lifelong skills, a global mindset, as well as a set of strong core values. To Keppel, the key ingredient for success is having the right people with the right skills to ensure the company's continuity.

A world-leading enterprise, by its very definition, must be one that is constantly on the move, embracing change and developing itself to stay relevant. Most of all, it must strive to equip itself with the right people to bring it to the next level.

Keppelites, as Keppel employees are fondly known, share in the Group's vision, core values and drive for excellence with passion, integrity, determination and the *Can Do!* spirit.

Together, we are constantly working towards sustaining

growth, empowering lives and nurturing communities wherever Keppel is present. As a cohesive global team, we have steered the Group through difficult landscapes, rising to challenges, and evolving ourselves continuously to emerge stronger each time."

who holds an Honours Degree in Chemical Engineering from the National University of Singapore, took a big stride into the maledominated sphere of project management.

Adeline currently oversees the construction of the Keppel FELS Multi-Purpose Self-Elevating Platform vessel which has been chosen by the Seafox Group as the basis for a new-generation wind turbine installation vessel.

Involved in the project at the early phase in design engineering and development, her responsibilities have grown to encapsulate construction stretching to commissioning and delivery of the mammoth vessel.



Adeline Seah (second from right), Project Manager at Keppel FELS, is overseeing the construction of the newly commercialised new-generation wind turbine installation vessel

Relishing the opportunities and challenges of her job, Adeline said, "I am well-placed to observe how an innovative rig design is intertwined with constructability

and meeting customer needs, and how that translates into an outstanding vessel with good project management and execution capabilities."

Four times the challenge



65 Keppelites from across Keppel Group took part in the 3rd SAFRA Keppel Quadthlon

Keppelites were part of the third SAFRA Keppel Quadthlon, which saw 415 participants gathering at the crack of dawn at East Coast Park, Singapore.

The Quadthlon required participants to complete a total distance of 38.5 km across a variety of disciplines, including swimming, skating, cycling and running. Keppelites taking part in the relay and individual categories displayed tenacity, speed and endurance during the race.

Taking part in the individual challenge, Chris Knott, a Project Engineer from Woodside Energy working on the FPSO Okha at Keppel Shipyard, came in 12th in a field of 65 participants with a timing of 2 hours, 7 minutes and eight seconds.

He said, "I am delighted to be invited to take part and really enjoyed the challenge of my first SAFRA KEPPELQuadthlon. I think it's a great event. I brought my family who had a good time and it was also a pleasure to meet my friends from Keppel outside the work place. I'll be back next year for more fun and to take up the challenge again."

Hoe Eng Hock, ED of Keppel
Singmarine and President of
Keppelite Recreation Club, shared,
"SAFRA Keppel Quadthlon is a
great platform to train mental
resilience, promote healthy lifestyle
and foster ties among employees,
and these are important elements
needed for greater work efficiency.
As an advocator of good work life
balance and healthy living, Keppel
is proud to sponsor the Quadthlon
for the third year running."



An advocate of active living, Keppel was the title sponsor of SAFRA Keppel Quadthlon for the third year running

A sharing community



President S. R. Nathan of Singapore handed Keppel O&M several awards for their contributions to the community

Employees from across Keppel O&M pledge part of their monthly income to the less fortunate on a regular basis.

For these contributions to society, The Community Chest (ComChest), the fund-raising arm of the National Council of Social Services, honoured the Keppel O&M with several awards.

Receiving top accolades – the Pinnacle Award – was Keppel Singmarine. The company has been a long-time supporter of the Social Help and Assistance Raised by Employees (SHARE) programme, a workplace-contribution scheme in which employees donate to ComChest through their monthly payroll.

"Keppel is a regular supporter of community work. We are honoured to be recognised for our efforts. An ardent associate of the SHARE programme since 1984, we are very pleased to be a partner of ComChest as we believe in being responsible corporate citizens who make a difference to society," shared Hoe Eng Hock, ED of Keppel Singmarine.

Meanwhile, Keppel Shipyard received the SHARE Gold Awards while Keppel FELS was presented with the SHARE Platinum Award.

Scooting for a good cause

Keppel Verolme in Rotterdam, The Netherlands, is encouraging its employees to ride scooters to work. This initiative builds on a 2009 green campaign which encourages employees to commute to work on electric bicycles.

The two initiatives support the collective efforts of the Ministry of Transport, Public Works and Water Management, the Port of Rotterdam and the local community, to reduce car traffic on the main highway leading to the Port of Rotterdam by at least 20%.

Riding scooters to work has proven to be hugely popular;

over 100 of its employees are now proud scooter commuters.

Speaking at the official launch of the scooter riding programme on 8 September 2010, Harold Linssen, MD of Keppel Verolme, shared, "At Keppel, we believe in nurturing the communities in which we work and are constantly seeking ways to positively enhance our environment. We are heartened by the encouraging response we have received and hope to continue doing our part for the environment."



Keppel Verolme's very own scooter squad doing their part for the environment by reducing their fuel consumption

KEPPEL GROUP NEWSBYTES



The combined Runcorn I and II plant will be one of the largest waste and renewable energy projects in the UK upon completion, with total capacity to treat 750,000 tonnes of waste per year

KEPPEL CORPORATION POSTS STRONG PROFITS

Keppel Corporation's net profit surpassed the billion dollar level for the first nine months of 2010, to reach \$1,016 million. This represented a 10% growth over the corresponding period in the previous year. EPS grew at the same rate to 63.3 cents.

Annualised ROE was 21.7%. EVA of \$747 million was \$32 million above that of the same period last year.

For the third quarter,
Keppel Corporation's revenue
of \$2,450 million was 19% below
that of the same quarter in
2009. Despite the lower revenue,
a net profit of \$346 million
was achieved for the quarter,
representing an 8% increase over
the corresponding quarter in the
prior year.

KEPPEL SEGHERS SECURES \$341 MILLION CONTRACT IN THE UK

Keppel Integrated Engineering (KIE), through Keppel Seghers, has won an Engineering, Procurement and Construction (EPC) contract worth around €187.3 million (approximately \$341 million), for the second phase of an Energy-From-Waste (EFW) project in the UK.

This contract, Runcorn II, was awarded by Viridor EFW (Runcorn) Limited, a special purpose vehicle (SPV) owned by Viridor Waste Management Limited (Viridor). Runcorn II will be part of an earlier project currently executed by Keppel Seghers, named Runcorn I or the Greater Manchester EFW Project.

Runcorn II is expected to be completed by 2014 or 2015. Runcorn I, which is owned by Viridor, John Laing plc and INEOS Chlor, broke ground in Greater Manchester on 26 August 2010.

KEPPEL LAND CHINA SECURES PRIME RESIDENTIAL SITES IN CHENGDU

Leveraging its strong track record and relationships in fast-growing Chengdu, Keppel Land China, through a wholly-owned subsidiary of the Keppel Land Group, Hillwest Pte Ltd, has secured two prime sites at Jinjiang District and Xinjin County for RMB 1.21 billion (\$249 million) and RMB 617 million (\$127 million) respectively in the Sichuan capital for residential development.

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Double bill at Lloyd's List Awards



Keppel FELS and Keppel Shipyard took home the Achievement in Safety Award and Shipyard of the Year Award respectively

"Keppel FELS displayed initiative to introduce and enforce safety elements in all aspects of its activities. For instance, onboard every project, contractors' supervisors are appointed as Safety Leaders to assist the Safety Team in educating the workers on safety procedures and enforcing relevant rules. These Safety Leaders have been specifically trained for this task." The judging panel of the 12th Lloyd's

List Asia Awards

Keppel O&M was done proud by two of its business units at the 12th Lloyd's List Asia Awards, held on 7 October 2010.

For ensuring the safest work environment possible, Keppel FELS was lauded with the Achievement in Safety Award. Meanwhile, Keppel Shipyard received the Shipyard of the Year Award for providing cost-effective and quality services as well as consistently meeting the needs of its customers. This is Keppel Shipyard's sixth consecutive win of the aforementioned award.

CH Tong, CEO of Keppel O&M said, "Keppel O&M's global reputation is built on a vital combination of strong execution capabilities, versatility, innovation and safety.

"These prestigious awards from Lloyd's List affirm the Can Do! spirit of our people and winning partnerships we have actively cultivated with customers and vendors. At Keppel, we thrive on being able to deliver our projects safely, on time and within budget."

In support of greater excellence in the industry, Keppel O&M had sponsored the Tanker Owner/ Operator Award, which was presented by Hoe Eng Hock, ED of Keppel Singmarine, to BW Maritime.

Judged by an international panel of maritime leaders, the annual Lloyd's List Asia Awards recognises the efforts and achievements of the shipping industry.