

# OFFSHOREMARINE

Builder of distinction

July – August 2009

MICA (P) 153/04/2008

## KEPPEL O&M BAGS 17 SAFETY AWARDS

Double delivery  
to Maersk



## BUSINESS

Global yards clinch new projects	6
Successful deliveries to GulfMark and LUKOIL	10
An icebreaking success	13
Band of brothers	17
KFELS Baltech turns 15	18

## SPECIAL FEATURE

Sterling performance at WSH awards	20
------------------------------------	----

## TECHNOLOGY

Flagship solution for associated gas	28
--------------------------------------	----

## PEOPLE

ITE-Keppel technology centre opens	30
Tiding tough times together	31

## COMMUNITY

Home away from home	33
Safety moments	36



## Special Feature 20

Keppel O&M has garnered 17 safety accolades, the largest number for a single entity at the Annual Workplace Safety and Health (WSH) Awards. These awards are presented annually by the Workplace Safety and Health Council in collaboration with the Ministry of Manpower.

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# Double delivery to Maersk

In 3Q 2009, Keppel O&M delivered two newbuild rigs to long-time customer, Maersk Drilling.



Delivered on time and within budget, Maersk Reacher completes the fleet of four CJ-50 jackup rigs for Maersk

## REACHING HIGH

Delivered on time, within budget and incident-free, Maersk Reacher, completes an outstanding collection of four high efficiency jackup rigs built by Keppel FELS for Maersk Drilling (Maersk).

The rig was named by Lady Sponsor, Mrs Anne Norderud-Poulsen, wife of Mr Morten Poulsen, Maersk Project Director, Semisubmersibles, on 21 July 2009.

This series of rigs, awarded to Keppel FELS in 2005, is of the CJ-50 design by Marine Structure Consultants (MSC) of the Netherlands.

The rigs can operate in a water depth of 350 feet and are suitable for drilling high temperature/high pressure wells of 30,000 feet. They are also highly automated for safe operations.

Mr Claus V. Hemmingsen, CEO of Maersk Drilling, said, "We would like to commend Keppel FELS for delivering another rig to our highest satisfaction. Like its sister rigs, Maersk Reacher bears Keppel's hallmark of distinction."

The first rig, Maersk Resilient, was delivered in February 2008 and has commenced operations for

Dubai Petroleum Establishment. The second rig, Maersk Resolute, delivered in August 2008, has been contracted to Dong Energy for operations in the Danish part of the North Sea over three years. Meanwhile, the third rig Maersk Resolve, delivered in January 2009, is currently operating in Norway.

CH Tong, CEO of Keppel O&M, said, "Maersk is our valued partner and we are very honoured to be entrusted with building some of the most advanced premium offshore rigs in their fleet.

"We prize this longstanding relationship with Maersk and are committed to continue to deliver excellent projects, on time and within budget to Maersk."

In addition to the jackup units, Keppel FELS has also been building a fleet of three DSS™ 21 semisubmersibles (semis) for Maersk.

Mr Hemmingsen added, "The Keppel and Maersk project teams have always enjoyed close collaboration and built a strong foundation of trust over the years. We are pleased to have Keppel FELS's support."

*Continue on page 4...*



Named by Lady Sponsor, Mrs Julie Fitzpatrick, Maersk Discoverer is another outstanding example of the winning collaboration between Maersk Drilling and Keppel FELS



### DELIVERING DISCOVERER

On 22 August 2009, Keppel FELS delivered the second of three DSS™ 21 deepwater rigs to Maersk Drilling.

Maersk Discoverer has been contracted by Woodside Energy for drilling operations in Australia for three years. She was named by Lady Sponsor, Mrs Julie Fitzpatrick, spouse of Mr Ken Fitzpatrick, Senior Vice President, Woodside Energy.

Mr Claus V. Hemmingsen, CEO of Maersk Drilling, said, "Maersk Discoverer, our second DSS™ 21 rig,

is another outstanding example of the winning collaboration between Maersk Drilling and Keppel FELS.

"Optimised for field development work, the new generation DSS™ 21 series is derived from the experiences gained from our highly successful DSS™ 20 Maersk Explorer semisubmersible built in 2003. These deepwater units are among the most technically advanced in the world, and we are confident that they will position Maersk Drilling as the foremost provider of robust offshore solutions in the industry."

CH Tong, CEO of Keppel O&M, said, "We have developed the highly advanced DSS™ 21 rig model with strong input from Maersk Drilling. In choosing to build three such rigs with Keppel FELS, Maersk Drilling has demonstrated its thought-leadership and confidence in our ability to deliver.

"The successful completion of Maersk Discoverer attests to the excellent teamwork between Maersk Drilling and Keppel. We are confident that this semisubmersible will deliver the highest performance that is



synonymous with our trend setting partnership.”

Keppel O&M is the only shipyard group in the world to have its own suite of proprietary deepwater rig designs. Jointly developed and owned by the Keppel's Deepwater Technology Group and MSC, the DSS™ Series of deepwater rigs are designed for maximum uptime with reduced emissions and discharges.

DSS™ Series rigs are highly cost effective exploration units capable of drilling down 10,000 m

(30,000 ft) wells and operating at a water depth of 3,000 m (10,000 ft). The Series also features a dynamic positioning system, with the ability to attach to a pre-laid mooring system.

DSS™ Series rigs are particularly well suited to drill deep and complicated wells in areas such as offshore West Africa, Brazil, the Gulf of Mexico and Southeast Asia, and may be further customised to meet the unique challenges of each location.

The first DSS™ 21 rig, Maersk

Developer, was delivered in June 2008, and is enroute to the U.S. Gulf of Mexico where she will commence a four-year contract with Statoil. The third rig of the series is slated for delivery in 2Q 2010.

Maersk Drilling is part of the A.P. Moller – Maersk Group and is a significant drilling contractor and supplier of floating production solutions. It has a fleet of 26 drilling rigs including the third DSS™ 21 deepwater development semi currently under construction at Keppel FELS.

# Global yards clinch new projects



COSLRIVAL, an accommodation semisubmersible being repaired and upgraded in Keppel Verolme's dry dock

Keppel O&M has recently secured new contracts through its local and overseas subsidiaries.

CH Tong, CEO of Keppel O&M, said, "At Keppel O&M, we seek to be the industry's choice partner for solutions. Our focus on excellent execution, coupled with a closely integrated network of overseas yards, enable us to take on a variety of projects and complete them to our customers' satisfaction anywhere in the world.

"The garnering of new jobs across Singapore, China and the US, reflects the robust partnerships and global brand name that we have built over the years. These strong foundations will continue to stand us firm in the current downturn and position us for future growth."

## SINGAPORE

Keppel Shipyard clinched two contracts from repeat customers for a Floating Storage and Re-gasification Unit (FSRU)

conversion, and the refurbishment and life extension of a Floating Production Storage Offloading (FPSO) vessel.

Following the successful delivery of the world's first two FSRUs, Golar Spirit and Golar Winter, Keppel Shipyard was awarded a third contract by GOLAR LNG to convert Golar Freeze from a Liquefied Natural Gas (LNG) Carrier into an FSRU.

The scope of work includes installing a re-gasification plant and power generators, and upgrading the control, electrical and marine systems.

Chartered by Dubai Supply Authority, the FSRU will be permanently moored alongside a purpose-built jetty within the existing Jebel Ali port in Dubai.

When completed in 2Q 2010, Golar Freeze will be capable of storing 125,000 cubic meters of LNG. The vessel will also have a maximum gas send-out capacity of 480 million standard cubic feet of re-gasified LNG per day for further delivery into the Dubai gas network.

On the second contract, Keppel Shipyard will undertake the refurbishment and life extension of Four Vanguard, an FPSO which it converted in 2003 for Four Vanguard Serviços E Navegação Lda, a company of Premuda group.

To be completed in 4Q 2009, the FPSO will be moored in the Woollybutt field on the North West shelf of Western Australia.

Meanwhile, Keppel FELS also secured a contract from Seadrill Ltd for the special survey, repair and upgrading of a jackup rig, West Janus. The scope of work includes steel renewal, leg repairs, modification of the shaleshaker house and the replacement of the top drive system.

#### CHINA

Keppel Nantong Shipyard has received an order to build two 45-ton bollard pull twin-screw Azimuth Stern Drive (ASD) tugboats from Keppel Smit Towage Pte Ltd (KST). These vessels will be built to Keppel O&M's proprietary design, developed by its technology unit, Marine Technology Development.

Delivery of the two tugboats is expected in 2Q 2010. Including these vessels, Keppel Nantong is currently building a total of 11 tugboats for KST.

#### THE NETHERLANDS

Keppel Verolme clinched a contract for the repair and upgrade of a semi accommodation rig, COSLRIVAL (ex-Port Reval), from China Oilfield Services Limited. The rig arrived in May 2009 and has

been docked in the 500,000 dwt mammoth dry-dock for general class renewal surveys, inspections, overhauls and repairs.

The work scope includes the upgrading of electrical switchboards, piping systems and then overhauling of marine equipment as well as deck crane reinforcement.

COSLRIVAL is the third accommodation support rig for Norwegian waters to arrive in Keppel Verolme for a major overhaul and upgrade.

#### BRAZIL

Keppel FELS Brasil clinched contracts for the repair and upgrading of two semis – Noble Drilling's Noble Paul Wolff and Diamond Offshore's Ocean Yatzy.

The upgrading of Noble Paul Wolff includes the renewal of piping systems, anodes in tanks and steel work. Leased by Petrobras from Noble Drilling, the rig will return to work in offshore Brazil after her repairs in the BrasFELS yard. She is the second Noble vessel in the BrasFELS yard after the arrival of Noble Dave Beard in May 2009 for

mechanical completion which is ongoing.

Meanwhile, the Dynamic Positioning drilling semi Ocean Yatzy will have structural repairs carried out on a lifeboat platform, stability column and helideck as well as several piping and steel deck renewal works.

#### UNITED STATES

Over at Brownsville, Texas, Keppel AmFELS was awarded jobs by longtime customer, Diamond Offshore, for the repair, refurbishment and upgrading of two rigs.

Ocean Ambassador, a Bethlehem 2000 Class semisubmersible drilling rig, arrived at Keppel AmFELS for stability upgrade and repairs. The second unit, Ocean Summit, a Levingston Class 111-C jackup, underwent repairs and refurbishment at the yard.

Both rigs were redelivered to Diamond Offshore on time. Ocean Ambassador is enroute to her deployment offshore Brazil with OGX, while Ocean Summit has begun operations for PEMEX in Mexico.



Keppel Shipyard augments its growing track record for FSRU conversions with the winning of the Golar Freeze project. Golar Winter (in picture), is the latest FSRU to be delivered June 2009

# Malaysian vessels set sail from Keppel Shipyard



Project teams celebrating their close partnership at the naming of FSO Ratu Songkhla

Keppel Shipyard is on track to complete two conversion jobs. They are conversion of Floating, Storage and Offloading (FSO) vessel, Ratu Songkhla, for M3energy JDA Sdn Bhd (M3energy) as well conversion of FPSO Armada Perdana for Bumi Armada Berhad (Bumi Armada).

Speaking at naming ceremony of Ratu Songkhla, CH Tong, CEO of Keppel O&M said, "The excellent team work between M3energy and Keppel Shipyard has enabled us to deliver FSO Ratu Songkhla within six months, and without any lost-time incidents.

"This is another significant milestone in Keppel Shipyard's strong track record of more than 80 FPSO and FSO conversions. As the industry's choice partner, we seek to further strengthen our competencies in conversion work, so as to provide even more value-added services to our customers."



FSO Ratu Songkhla achieved zero lost-time incidents in its six months of conversion at Keppel Shipyard





Armada Perdana is the second FPSO to be converted by Keppel Shipyard for Bumi Armada

Formerly a 1989-built Panamax tanker, the vessel arrived at Keppel Shipyard in February this year for her conversion. She was named by Datuk Shahrazi bin Sha'ari, Group MD and CEO of M3energy, on 1 August 2009 and is scheduled to depart the yard shortly.

Work on Ratu Songkhla included the installation of the metering skid as well as the fabrication and installation of an external turret mooring system, cargo offloading station and helideck. The hull and marine systems were also upgraded.

When delivered, Ratu Songkhla will have a storage capacity of 546,000 barrels of oil. It will be chartered to CPOC, a joint venture between Petronas Carigali and PTTEPI for operating in the Malaysia-Thailand Joint Development Area (JDA) Block B-17 off the east coast of Peninsular Malaysia.

As for FPSO Armada Perdana, a ceremony prior to its deployment in the Oyo field, 70km off the coast of Nigeria, was held at the shipyard on 18 July 2009. The vessel is expected to deliver first oil in fourth quarter of 2009.

Gracing the occasion were Mr Dimeji Bankole, Nigeria's Speaker of the House of Representatives, and Mr Ahmed Mahmud Yayale, Secretary to the Government of the Federal Republic of Nigeria.

Mr Hassan Basma, CEO & ED of Bumi Armada, said, "Understanding and trust built over years of close collaboration between Keppel Shipyard and Bumi Armada have resulted in the timely and safe execution of the conversion works for FPSO Armada Perdana.

"We are delighted that our combined teams have shown capable leadership and competency. With their good work, we have been able to fast-track the project which took just

18 months, from the time the contract was awarded to the completion of the conversion."

Nelson Yeo, ED of Keppel Shipyard, said, "Keppel Shipyard is pleased to carry out the conversion of Bumi Armada's second FPSO. The delivery of Armada Perdana successfully and safely, with a record of 1.8 million man-hours without lost-time injury, is achieved through the efforts of everyone working on the project. This conversion further strengthens the partnership between our two companies."

The vessel, which arrived in May last year, underwent fabrication, installation and integration of a 12-point spread mooring system, riser balcony and topside facilities, as well as upgrading of its accommodation and auxiliary support systems.

It now has a storage capacity of one million barrels of oil with water and gas injection capabilities included in its topside. It is also capable of processing 45,000 barrels of oil per day (bopd).

Keppel Shipyard's affiliation with Bumi Armada goes back into the last decade when it first converted the FPSO Armada Perkasa in 1997 for operation in the PM3 Field, Malaysia. It was further upgraded by Keppel Shipyard in 2007 for deployment in the Okoro Setu Field, Nigeria.

# Successful deliveries to GulfMark and LUKOIL

Keppel Singmarine has successfully delivered an Anchor Handling Tug/Supply (AHTS) to GulfMark Offshore, Inc. (GulfMark) and two Multi-purpose Duty Rescue vessels to LUKOIL-Kaliningradmorneft (LUKOIL) respectively in July 2009.

Hoe Eng Hock, ED of Keppel Singmarine said, "At Keppel Singmarine, we tailor-make quality solutions for our customers, giving them added advantage and flexibility to meet the operational requirement anywhere in the world. We are very grateful that our valued customers such as GulfMark and LUKOIL have entrusted us time and again with the construction of their premium offshore support vessels."

He added, "The growing market acceptance of our in-house ship designs attests to Keppel's proven capabilities as a Builder of Distinction for highly-specialised offshore vessels. Looking ahead, we will continue to fortify our core competencies to offer innovative solutions that will fulfil the needs of the global offshore and marine industry."

Designed by Marine Technology Development (MTD), the ship design and development arm of Keppel O&M, Sea Comanche, the last of a series of six AHTS vessels was delivered to GulfMark. Built by Keppel Singmarine's sister yard, Keppel Nantong in China, it was presented a US\$10,000 bonus for

achieving a clean safety record of zero lost-time incident.

The vessel was named on 25 July 2009 by Lady Sponsor, Mrs Evelyn J Ford, spouse of Mr Brian R. Ford, a director on the board of GulfMark. She will be deployed in Southeast Asia, and is capable of performing

anchor handling and fire fighting among other support functions.

Mr Gene Leech, Executive Vice-President of GulfMark Offshore said, "During the past four years, we have developed a close working relationship with Keppel Singmarine. The company has



CH Tong, CEO of Keppel O&M (extreme right) presents a token of appreciation to Lady Sponsor, Mrs Olga Kessler, Environmental Engineer (Labour Safety) of LUKOIL, who was accompanied by Mr Victor Velikov, Deputy General-Director of LUKOIL



Keppel Nantong was awarded a US\$10,000 bonus for Sea Comanche's safety achievement



Keppel Singmarine has delivered two of such Multi-Purpose Duty Rescue vessels, Kogalym and Langepas on schedule, to customer LUKOIL in July

proven itself over the years as a reliable and strong partner to GulfMark.”

Meanwhile, Keppel Singmarine has delivered two Multi-Purpose Duty Rescue Vessels named Kogalym and Langepas on schedule to customer LUKOIL on the same month.

These vessels are jointly designed by MTD and its consultants, Robert Allan. Kogalym and Langepas are the fifth and sixth ice-class vessels that Keppel Singmarine has delivered to LUKOIL respectively since 2003.

The two 60-tonne bollard pull vessels will be deployed in the Caspian Sea region to perform supply duty and rescue operations in temperatures as low as -20°C and ice thickness of up to 70 cm.

Kogalym is named after a key production region for LUKOIL in western Siberia. She was christened

by Mrs Olga Kessler, Environmental Engineer (Labour Safety) of LUKOIL at Keppel Singmarine on the day of delivery.

Langepas was named by Lady Sponsor, Mrs Lidiya Zarichanskaya, wife of Captain Petr Zarichanskiy, at Keppel Singmarine on 29 July 2009. Keppel Singmarine was awarded a US\$5,000 safety bonus for achieving zero lost-time incidents.

Mr Victor Velikov, Deputy General-Director of LUKOIL attested to Keppel Singmarine’s strong capabilities when he said, “Heavy-duty support vessels such as Kogalym and Langepas are highly valuable in ensuring smooth offshore operations all year round in the unique weather conditions of the Caspian Sea.

“Keppel Singmarine has demonstrated its strong capabilities and commitment once

again, with the timely delivery of another fine vessel. The company has proven itself over the years as a reliable partner to LUKOIL, and we are pleased that the rest of our vessels being constructed by them are progressing well.”

Hoe Eng Hock shared, “Through the successful delivery of Kogalym, Langepas and several other important projects, we have developed a good understanding of LUKOIL’s operating requirements, be it in the Caspian Sea or Arctic regions. In the process, we have also honed our expertise in designing, engineering and constructing advanced ice-capable vessels.

“We look forward to deepening our win-win partnership with LUKOIL and continuing to support them to become a leading global energy company.”

Over the last four years, LUKOIL has entrusted Keppel Singmarine with specialised shipbuilding projects such as Asia’s first icebreakers, two ice-class Anchor Handling Tug/Supply vessels and a Floating Storage and Offloading vessel for the Caspian Sea.

# Positioned for growth

*In an interview with Money Mind's Deputy Editor Mr Frederick Lim, CH Tong, CEO of Keppel O&M shared his take on the offshore horizon. OffshoreMarine brings you extracts of the interview.*

**Q. WHAT IS YOUR ORDER BOOK LIKE CURRENTLY?**

Our orderbook as at 1H2009 is \$7.7 billion with deliveries leading into 2012. Our key focus is to work closely with customers to deliver our backlog of projects on time, within budget and without incidents.

**Q. WHAT IS YOUR OUTLOOK ON THE DEMAND FOR OIL RIGS?**

Long-term industry fundamentals remain intact.

There is sustained growth in demand for fossil fuels led by emerging markets with demand growth driven by emerging countries such as Asia, the Middle East and Latin America, among others.

With declining reserves, new sources of oil need to be developed. Substantial investments are required to meet long term energy demand and national and international oil companies are still investing in field development.

**Q. WHAT IS KEPPEL'S OUTLOOK FOR OIL PRICES?**

Oil prices have risen in 1H2009 to about US\$65-70 per barrel/day, on more positive signs of recovery in the major economies. Generally, US\$50-60 a barrel would be a viable and sustainable range.



**Q. IS THERE DOWNWARD PRESSURE ON MARGINS AT THIS TIME?**

We do not expect a downward pressure. We experienced good operating profit margins for 2Q09 – due to accumulated experience building repeated projects and savings in man hours required. Supply chain pressure is also less severe now that the economy has slowed down somewhat.

**Q. WHAT WILL BE THE GROWTH DRIVERS FOR KEPPEL OFFSHORE & MARINE IN THE NEAR TO MEDIUM TERM?**

We are in a strong position to weather the difficult period

until the market improves. Our substantial orderbook billion will keep us fairly busy in 2009 and 2010.

We are focused on strengthening our core competencies and achieving operational excellence. Our efforts will improve performance on existing projects, and put us in a prime position to support customers when the market recovers.

# No trial's too great



Slicing through ice sheets of up to 1.4m thick, Toboy surmounted the rigorous tests in the Kara Sea

Nothing seems to be able to stop Toboy in her tracks, not even 1.4m thick ice sheets as Toboy made her way at up to 5.3 knots.

Toboy is a Multi Purpose Ice-Breaking Supply Vessel, one of Asia's first two icebreakers, built by Keppel Singmarine for LUKOIL. She was delivered in August 2008 and was deployed to support the operations at LUKOIL's Varandey Terminal.

From 16-21 June 2009, Toboy underwent rigorous testings at the Kara Sea according to an ice trial programme developed by Finnish Consultant, ILS and endorsed by the Russian Maritime Register of Shipping (RMRS). The trials were conducted on ice sheets ranging from 0.7m to 1.4m thick.

The results showed that Toboy had good turning capabilities in ice and her performance fulfilled predicted design requirements. It

also demonstrated that the vessel's critical capabilities for ice breaking operations such as constant power mode and overtorque functions were functioning well.

Engineers from Keppel Norway, Steerprop and Wartsila were led by Mr Koh Kin Siah, Senior Project Manager of Keppel Singmarine and Mr P Muralee, Assistant Section Manager of Keppel Singmarine to provide critical engineering service supports onboard Toboy to ensure the success of the ice trial.

The adventure began with a helicopter ride from the assembly point at Narayan Mar Airport to Varandey Terminal. From the terminal, all personnel were transferred by lifting cage to Toboy. Mr Koh shared, "There was a sense of relief and pride on the successful outcome of the ice trial for all participants. It was a memorable experience for all of us Other than close encounters with



Engineers had to rely on daily satellite photographs to locate suitable ice sheets during the ice trial of Toboy

polar bears and some walrus, we also had to get used to the 24 hours of sunlight."

He added, "One of the main challenges was searching for suitable ice sheets. As the ice trial was conducted in late June, the ice had begun to melt and we had to rely on daily satellite photographs to locate suitable ice sheets. We also had to travel up to 300km away from Varandey Terminal to conduct the tests."

# United we stand



Mr Raymond Lim, Minister for Transport and Second Minister (third from left) for Foreign Affairs, and senior management of Keppel O&M led 3,000 Keppelites in the national pledge

More than 3,000 Keppelites gathered at Keppel FELS on 11 August 2009 to commemorate Singapore's 44th National Day.

Gracing the event was Mr Raymond Lim, Minister for Transport and Second Minister for Foreign Affairs. The minister spoke of Keppel's crucial role in anchoring Singapore's position as the world's leading designer and builder of offshore and marine products, which has contributed significantly to the nation's standing as an international maritime centre.

He also complimented Keppel on its continuous investment in people development. Commenting on Keppel's extensive training programmes, Minister Lim said, "Such efforts are indeed commendable and I would like

to urge the management to keep up this commitment and for each Keppel to seize the training and upgrading opportunities available to you. It is in this manner that you will be prepared to capture the gains when the upturn arrives."

CH Tong, CEO of Keppel O&M, also encouraged Keppelites to meet new challenges and be willing to move out of their comfort zones to grow beyond.

Elaborating on this point, he said, "I encourage you to cast your sights further to explore the possibilities of being deployed in other business units. There are many synergies between our various businesses and their industries. Our infrastructure business is expanding, and many of your engineering and project

management skills will be very relevant to Keppel Integrated Engineering."

Along with the dedication of Keppelites, CH Tong also credited the support of the unions for Keppel's success. Working closely with management to build and sustain a cohesive workforce with employee welfare, the unions continue to strengthen this win-win relationship.

Attyah Hassan, General Secretary of Keppel FELS Employees Union (KFEU), said, "We understand the need for the company to remain competitive during these uncertain times. KFEU is prepared to work hand-in-hand with the management. They have our full support."

# Commendations from customers



West Setia underwent repair works at Keppel FELS'S Pioneer Yard 2, which were completed ahead of schedule end-June 2009

For jobs well done, Keppel FELS was lauded by its customers in July.

## SIGN OF FRIENDSHIP

A letter brimming with words of commendation and personally hand-written signatures to Keppel FELS from Ensco International Incorporated (Ensco), is an unwavering sign of the trust and friendship shared between the two companies. Keppel FELS had delivered ENSCO 8501, the second of seven ENSCO 8500 Series® ultra-deepwater semisubmersibles to long-time customer, Ensco in June this year.

Ensco's Capital Projects and Operations groups expressed their high regard and appreciation to everyone who was part of the

rig construction "family" and especially commended Keppel FELS for the "value, service and spirit of the efforts" taken to complete ENSCO 8501 – a job well done!

## STAMP OF SATISFACTION

Keppel FELS scored high notes with Seadrill Asia Limited (Seadrill) for excellent execution in repair works which are ahead of schedule for semisubmersible tender rig, West Setia.

The rig went through a class survey while at the yard, with repair works such as hull renewals, steel modifications and installation of third party equipment performed to the satisfaction of Seadrill and their client, Chevron.

Beyond the contracted work scope, the team also completed additional works that surfaced as the project progressed.

In a commendation letter to Wong Kok Seng, ED (Operations), Keppel FELS, Seadrill's MD Mr Staale Roed said, "All the works were completed to our satisfaction in a highly professional manner and with full attention to health, safety and the environment.

"The high level of planning was apparent, allowing work to progress smoothly and safely. Co-operation between your team and our rig crew was excellent."

# Oil aboard!



Operating in the Campos Basin of offshore Brazil, Espirito Santo is the first turret moored FPSO in the world using steel catenary risers for fluid transfer.

FPSO Espirito Santo, which was delivered by Keppel Shipyard to SBM Offshore in November last year, achieved first oil production on 13 July 2009 in less than two weeks after the successful hook-up of the last steel catenary riser.

The vessel had earlier undergone refurbishment and conversion at Keppel Shipyard. Changes made to the existing systems included the turret mooring system as well as the integration of all the oil processing modules.

# Sixth ENSCO rig strikes steel



Building on experience and insights gained on the prior ENSCO 8500 Series rigs enables Keppel FELS to execute ENSCO 8505 with greater engineering and construction efficiency.

Work on the sixth of seven ultra-deepwater semisubmersible (semi) drilling rigs built by Keppel FELS for EnSCO International Incorporated (EnSCO) has started briskly, with first steel struck on 23 July 2009.

Like her sister rigs, ENSCO 8505 is based on ENSCO's proprietary design, the ENSCO 8500 Series™, which is an enhanced version of the ENSCO 7500 design.

The 8500 Series™ rigs will be capable of drilling in up to 8,500 feet of water, and can readily be upgraded to 10,000 feet water-depth capability if required.

Enhancements include a two million pound quad derrick, offline pipe handling capability, increased drilling capacity, greater variable deck load, and improved automatic station keeping ability. With these features, the 8500 Series™ rigs will be especially well-suited for deepwater development drilling.

In the last decade, Keppel has worked closely with EnSCO to build up and renew its rig fleet, which includes the delivery of nine new jackup rigs and the first two semis of the ENSCO 8500 Series™.



# Band of brothers



Keppel Verolme presents the framed aerial shots of the three vessels to the Heerema family as a token of appreciation

By a stroke of coincidence, three vessels owned by the Heerema family from The Netherlands called on Keppel Verolme at the same time for maintenance work recently.

But it was no mere stroke of fate alone that led them there – Keppel Verolme has long established a strong track record of delivering to its customers' satisfaction and requirements.

This was the reason that led the vessels – comprised Solitaire, a pipelaying vessel of Allseas Engineering (AE); Hermod, a crane vessel of Heerema Marine Contractors (HMC) and Aoka Mizu, a Floating Production Storage and Offloading (FPSO) vessel of Bluewater Energy Services (BES) – to Keppel Verolme.

Keppel Verolme took the opportunity to capture aerial shots of the three vessels. The framed pictures were later presented to the three Heerema brothers as a token of appreciation.

Mr Harold Linssen, MD of Keppel Verolme said, "It is a rare occasion to see the "gathering" of three vessels owned by the Heerema brothers at the Keppel Verolme yard. Over the past decade, we have established a close relationship with the Heerema family and hence, Keppel Verolme wanted to take the chance to present them the aerial pictures as a form of appreciation."

Over the years, vessels from the Heerema family have kept the Keppel Verolme yard busy. In 2001, Keppel Verolme took on the conversion of Balder, HMC's semisubmersible crane vessel into a multipurpose deepwater construction vessel. This was one of the largest conversion projects for the yard in those days.

Thereafter, a few FPSO vessels operated by BES also visited the yard for drydocking, maintenance and modification jobs. One of the projects included the successful repair of FPSO Uisge Gorm's cargo

tanks within a tight schedule of 34 days.

A close working relationship developed between AE and Keppel Verolme during the fast track conversion of the Solitaire in early 2005. After the successful conversion of Solitaire, Keppel Verolme received new orders from AE in the same year to provide several more upgrades to the vessel.

Trust between Keppel Verolme and AE further strengthened when they came together to execute the Audacia project, a dynamically positioned pipelay vessel which was successfully delivered in late 2007.

Mr Linssen added, "Looking ahead, we will continue to strive to provide our customers with a broad range of capabilities, expertise and worldwide assistance to cater to their needs."

# Keppel FELS Baltech turns 15



From strength to strength – Keppel FELS Baltech's workforce has more than doubled in the last 15 years.

*"KFB has come a long way, considering that it started out with just a handful of local engineers in Varna. Today, KFB has become a state-of-the-art engineering company, backed by a capable workforce of more than 100 people."*

*CH Tong  
CEO of Keppel O&M*

Fifteen rewarding years in the business certainly calls for a special celebration. Keppel FELS Baltech (KFB) celebrated its anniversary in traditional Bulgarian-style with music and dance on 8 July 2009.

In the midst of revelry, CH Tong, CEO of Keppel O&M, reflected on the passage of time that KFB had gone through.

He said, "KFB has come a long way, considering that it started out with just a handful of local engineers in Varna. Today, KFB has become a state-of-the-art engineering company, backed by a capable workforce of more than 100 people.

"It has also grown to become an important part of the Keppel O&M Group, helping to boost the competitive edge of our global yards across Singapore,

the Netherlands, the US and the Caspian region, with high quality engineering solutions for offshore rigs and specialised marine vessels."

Admiral Christo Kontrov, Regional Governor of Varna, reflected on the long-running relationship between Keppel and Varna when he said, "I would like to express my appreciation to Mr Tong and representatives of Keppel O&M management for creating employment opportunities in Varna, especially during the period 1995 – 2000 when it was the most difficult period for the Bulgarian shipbuilding industry.

"I would also like to assure you that the partnership between the regional government of Varna and Keppel will continue to grow in future."

The number of employees in KFB has grown from 41 in 1994 to 108 now. During the 15<sup>th</sup> anniversary celebration, 45 employees received the long service award. 13 recipients have worked in KFB for 15 years, another 7 have served between 11 to 15 years and remaining 25 has been with the company from 5 to 10 years.

KFB, founded in 1994, was Keppel O&M's first European subsidiary. KFB made substantial progress by 1996, and became the first marine company in Bulgaria to be awarded the internationally acclaimed ISO 9001 Certificate.

Through its involvement in several landmark projects with the Group, it has built a strong track record in offshore and marine engineering, and has been instrumental in customising Keppel's proprietary rig designs for various customers.

It specialises in the basic design and detailed engineering of offshore drilling units, production storage units, merchant ships, heavy lift floating cranes, tugs and specialised vessels, technical consultancy, and finite element analysis.



Senior management learnt Bulgarian folk dance 'Horo' during Keppel FELS Baltech's 15th anniversary



CH Tong presents a token of appreciation to Regional Governor of Varna, Admiral Christo Kontrov (right)

# Sterling performance at WSH awards



Safety is a mindset shared across the Keppel O&M as they celebrate their award wins.

Keppel Group has garnered 18 safety accolades, the largest number for a single entity, at this year's Annual Workplace Safety and Health (WSH) Awards held by the WSH Council and the Ministry of Manpower.

In particular, Keppel O&M was bestowed 17 awards – one for each project that was completed incident free, and with keen adherence to workplace safety and health standards. Meanwhile, two of Keppel's supervisors were singled out for their exemplary

safety leadership at the Annual Workplace Safety and Health (WSH) Awards.

Keppel Singmarine also received the Silver Award for Workplace Safety & Health Performance for the third year in a row.

The WSH Awards are presented annually by the Workplace Safety and Health Council (WSHC), in collaboration with the Ministry of Manpower (MOM), to give recognition to companies or organisations that have achieved

excellent WSH performances through sound and effective management of WSH issues at their workplaces.

Proud of the recognition Keppel has achieved at the WSH Awards, CB Choo, Chairman of Keppel O&M, said, "At Keppel, we continue to focus on promoting individual and collective responsibility to ensure workplace safety. We believe that everyone must embrace safety as a way of life."

“We are very encouraged by the Ministry of Manpower’s recognition of our sustained efforts. I would like to see more Keppel business units deepen their

safety efforts by partnering their stakeholders, including customers and subcontractors, to ensure that everyone in our workforce goes home safely each and everyday.”



Demonstrating Keppel’s core value of Safety, Keppel Singmarine won Silver Award for Workplace Safety & Health Performance for the third year in a row.

**WORKPLACE SAFETY AND HEALTH AWARDS**

**Safety and Health Award Recognition for Projects (SHARP)**

**KEPPEL FELS**

**Newbuild rigs**

- Maersk Reacher
- Enso 8501
- Transocean DD3
- Awilco Coslstrike
- Maersk Deliverer
- Transocean Sedco 706

**KEPPEL SHIPYARD**

**FPSO/FSRU Conversion projects**

- FPSO Ningaloo Vision
- FPSO Saxe Batuque
- FPSO Espirito Santo
- FSRU Golar Spirit
- Frontier Phoenix

**KEPPEL SINGMARINE**

**Newbuild specialised vessels**

- Yuri Korchagin
- TOBOY
- G1200

**Workplace Safety & Health Performance Awards (WSHPA)**

**KEPPEL SINGMARINE**

– Silver Award

**Workplace Safety & Health Awards for Supervisors**

**KEPPEL SHIPYARD**

Mr Mayalagu Paul Raj

**KEPPEL SINGMARINE**

Mr Md Aminul Islam

*continue on page 22...*



### SETTING A GOOD EXAMPLE

For actively facilitating improvements to workplace safety and health performances of the workers under their charge, two of Keppel's supervisors were lauded with the Workplace Safety and Health (WSH) Awards for Supervisors 2009.

At the same time, Mei Cong Ming, a worker at Keppel Singmarine was named the model worker by his superiors.

OffshoreMarine takes a closer look at the workplace safety and health performances of these three individuals.

### SAFETY LEADERSHIP

Mohammed Aminul Islam, technician at Keppel Singmarine, believes that one of his foremost responsibilities as a supervisor is to look-out for the safety of his team. He shared, "As the supervisor, I am accountable for the safety of my team. To ensure that the workers under my charge do not get hurt, I make it a point to ensure my team follows proper safety procedures when carrying out our duties."

To foster a "safety first" mindset and impart know-hows of safety procedures, Aminul vigilantly conducts daily safety briefings with his team as well as regularly engages in risk assessment exercises and worksite inspections. Aminul also encourages his workers to speak up on safety issues as well as praises them

when they display consideration for the well-being of other team members.

Aminul said, "The key to getting respect from the workers is a genuine concern for them. By sharing our experiences and giving them opportunity to speak up and showing our appreciation to them, we will be better able to motivate and garner support for safety from our workers."

Honoured to have received the WSH Award for Supervisors 2009, Aminul expressed that the recognition motivates him to keep up his efforts to lead his team towards safety excellence.

Mayalagu Paul Raj, hull supervisor at Keppel Shipyard, is another recipient of the WSH Award for Supervisors 2009.

Like Aminul, Paul Raj, undertakes daily safety briefings with his team to ensure that safety procedures and messages are communicated and internalised. He sets the same goals for his team - complete the tasks on time, within budget and, most importantly, without incidents, regardless of the nature of the tasks being undertaken.

His greatest satisfaction he derives from overseeing and guiding his charges is when his team - whose members have different mother tongues - pick-up the same safety lingo and learn to watch out for each other.



Mohammed Aminul Islam (top) and Mayalagu Paul Raj won the 2009 Workplace Safety & Health Awards for Supervisors.

Perhaps the greatest motivation for Paul Raj is his family because he wants them to be proud of him. He said, "I love my family and hope they do not have to worry for me at work. This applies to my team too. As such, we need to take care of ourselves and look out for each other, so that we can all go home safely at the end of each work day."

### MODEL WORKER

Thirty-four year-old Mei Cong Ming, who comes from the Jiangsu Province of China, has been working in Keppel SingMarine's piping department for three years. He was named Model Worker by his superiors for being a hardworking and responsible worker who is always mindful of safety and helpful towards his peers.

The piping department's supervisor, Mr Shukumar Dey Nishi Kanta, shared that that Cong Ming is one of the most experienced workers in the team. "Cong Ming is good at his job and very willing to share his knowledge and experience with others. I can always rely on him to take charge whenever I am not around."

Even with his experience, Cong Ming does not take things lightly especially when it comes to working in confined spaces. "It is important to follow the safety rules. I always check for a valid entry permit to make sure that the space is safe to enter in the first

place. I carry with me a torchlight in case the lighting fails and of course, a gas detector. Proper ventilation and lighting are also important," he added.

Finally, good housekeeping must be practised. "If you see any hazardous materials, chemicals or objects lying around, you have to make sure they are cleaned up immediately. Such things can be very dangerous so one must be extra careful," said Cong Ming.

To this, Shukumar adds, "A walkie-talkie is a must so that buddies can communicate with each other." He refers to a buddy system that

Keppel has put in place. This is to make sure that there is always at least one person on standby outside the space while another works inside, in case of any emergencies.

He elaborates, "Workers must know the safety procedures very well. If a worker is in trouble, his buddy must know exactly what to do and he must act fast."

Cong Ming added, "I have an eight-year-old daughter back at home waiting for my return. I want to maintain my good safety record so that I can go back home safely to my family."



Cong Ming (right) was named Model Worker by his superiors in Keppel Singmarine for being a responsible worker who is always mindful of safety.

# Friends from far and wide



Toast to strong collaborations between Nantong and Keppel

visited Keppel O&M on 25 June 2009 to learn about its successful people development strategies.

The delegation, which comprised nine Ministers, as well as Permanent Secretaries and other senior leaders from Ghana, Kenya, Mozambique, Nigeria, Tanzania and Rwanda, had a lively exchange with Keppel O&M's senior management led by CH Tong, CEO of Keppel O&M.

Apart from issues of talent management, Keppel O&M management also shared with the delegates on how they ensured that their multinational employees work and live together harmoniously.

## **BINDING TIES WITH NANTONG**

Led by Vice Mayor Shen Zhen Xin, a delegation from the Nantong Municipal People's Government visited Keppel from 25-26 June 2009.

The Chinese delegation was in Singapore to explore business collaboration with Singapore companies through a seminar that was organised by Nantong Municipal People's Government, International Enterprise (IE) Singapore and Singapore Chinese Chamber of Commerce & Industry (SCCCI).

The objective of the seminar was to promote Nantong as an attractive destination for investment. At the seminar, audiences were introduced to the developments of



CH Tong, CEO of Keppel O&M (extreme right) shared with the African and World Bank delegates his experiences of managing talents and the yards

Keppel O&M hosted several visits to foreign delegates and dignitaries recently, a testimony to its global presence and international standing in the world.

## **ENGAGING AFRICA**

As part of a study visit to Singapore, some 35 senior officials from Africa and the World Bank



Nantong's shipbuilding and marine supporting industries, as well as the benefits of investing in the municipality.

Lee Tai Kwee, President of Keppel Nantong Shipyard, was one of the key speakers for the seminar. He shared with the participants the reasons why Keppel had chosen to set up its yard in Nantong in 2005, while thanking the support that the Nantong government had given.

He shared, "We have developed a good relationship with the Nantong government and we are very happy with the support that we have received for our projects in Nantong. We look forward to their continuous support for our future endeavours in the region."

During their stay in Singapore, CB Choo, Chairman of Keppel O&M, together with other senior management from various business

units hosted a sumptuous lunch to the Chinese delegation.

**GROWING ROOTS IN BROWNSVILLE**

U.S. congressman Mr Solomon Ortiz, D-Corpus Christi and Mr Ong Siew Gay, Deputy Chief of Mission and Counsellor for the Singapore Embassy in Washington, D.C. toured Keppel AmFELS Inc. on 18 July 2009.

"I appreciate and love the relationship we have had with the company from Singapore," said Mr Ortiz during the tour of the Keppel facility in Brownsville, which has a local employment of about 2,000 people.

Mr Ong said during the luncheon at the facility. "I think we in Singapore are privileged to have Keppel AmFELS... Singapore is less than 700 sqkm. It has no natural resources, just good hardworking people who are smart. We are

privileged to be able to set up companies like Keppel AmFELS and contribute to local communities."

Ortiz and the Singaporean representatives also toured the University of Texas at Brownsville and Texas Southmost College (UTBTSC).

Keppel AmFELS is a major contributor to the university's new fine arts building and appreciates the longstanding relationship it has built with the local community.

**THE YARD OF LEARNING**

As part of the effort to contribute to the growth of knowledge in the offshore and marine sector, Keppel O&M conducted a yard tour for a 30-member academic delegation on 14 July 2009.

The delegations are academia from Ngee Ann Polytechnic and Wuhan Institute of Shipbuilding Technology (WIST), an institution in Hubei Province, China. The visit was part of an agreement between the two institutions to promote and develop overseas student exchange programmes.

The introduction has helped teaching staff from WIST to gain better understanding of how the polytechnic's curriculum is designed to meet industry needs. It also demonstrated the high level of support provided by local industry players.



Keppel AmFELS played host officials from Singapore and Brownsville.

*Continue on page 26...*



Keppel O&M hosted academic delegation from Ngee Ann Polytechnic and Wuhan Institute of Shipbuilding Technology

In addition, Keppel O&M Group HR also hosted some 60 students and professors from three renowned tertiary institutions, namely Bandung Institute of Technology, University of California Berkeley and INSEAD in July 2009. This has allowed the academia to understand Keppel O&M's global business operations.

### **BRAZILIAN SOUTHBOUND**

A delegation led by Brazilian Senator cum CEO of Petrobras Transporte SA (Transpetro), Mr Sergio Machado paid a friendly visit to Keppel Shipyard in Singapore as well as its overseas yard in Subic, Philippines on 27 July and 31 July respectively.

The delegation made a presentation on Transpetro and Keppel Shipyard also shared its job operations on shiprepair with the visitors.

In the Philippines, the Transpetro delegation caught up with Mok Kim Whang, President and General Manager of Subic Shipyard & Engineering. Inc and were taken on a tour of the repair works of the vessels.

Transpetro, a wholly owned subsidiary of Petrobras, handles the transportation and storage activities of oil and it's by products like ethanol, bio-fuels and natural gas.

### **KEEPING PACE WITH INDUSTRY GIANTS**

Sharing thought leadership with leading players of the global offshore oil industry, Keppel O&M also hosted representatives hailing from one of the largest oil and gas companies in the world on 3 August 2009.

Dr Lee Boon Yang, Chairman of Keppel Corporation and CB Choo, Chairman of Keppel O&M hosted the delegation led by Mr Li Xinhua, Vice President of CNPC. Members of the visit also include high profile representatives from PetroChina International.

Keppel Corporation, in May this year, divested its entire stake in Singapore Petroleum Company to PetroChina International, as part of a move to enable Keppel to seize opportunities that would enhance value creation for its shareholders.

It had been announced then that both companies plan to explore opportunities in the offshore oil industry and in other areas of mutual benefit as such opportunities become available.

# Go green with eco-friendly vessels

As there is a growing pursuit towards eco-friendly shipping, the industry has seen an increase in demand for such vessels in recent years.

At the opening of the third International Conference on Technology and Operation of Offshore Support Vessels (OSV Singapore) on 6 August 2009, Mr Lam Yi Yong, Chief Executive of Maritime & Port Authority of Singapore (MPA), pointed out that an important issue related to OSV market is the environment, in particular green house gas emissions.

He said, "The design of future OSVs will have to incorporate clean energy and environment solutions such as 'green ship'

design and technologies to meet current and future environmental requirements. I urge OSV designers and shipyards to collaborate with the tertiary and research institutes to develop green OSV designs and technology and to use Singapore as a test-bed for these new technologies."

Keppel Singmarine was one of the main sponsors for the two-day conference cum exhibition. It was attended by over 150 participants and speakers. This is the third time which Keppel Singmarine has supported the conference.

The event comprised of technical papers' presentations and an experts' panel discussion and this provided a platform for ship designers, shipbuilders, ship



Topics such as the 'green ship' design and technologies to meet future environment requirements were discussed at OSV Singapore.

operators, drilling contractors, installation contractors to discuss future needs and challenges, as the search for hydrocarbons moves into deeper waters.

# Creative juices flow for safety

At Keppel O&M, management and employees alike are always looking for ways to improve safety. This was demonstrated at Keppel O&M Safety Innovation Convention where teams from across the yards showcased their novel solutions to improve safety and health at the workplace.

Held on 6 August 2009, the convention is part of the Keppel Group's Safety Innovation Project (SIP). A SIP makes up 20% of the total scorecard for the Chairman Safety Challenge Trophy which Keppel Group's business units

compete for at the Annual Safety Convention to be held in November this year.

Among the many innovative and useful submissions, three were picked by a panel of judges

comprising representatives from other Keppel business units.

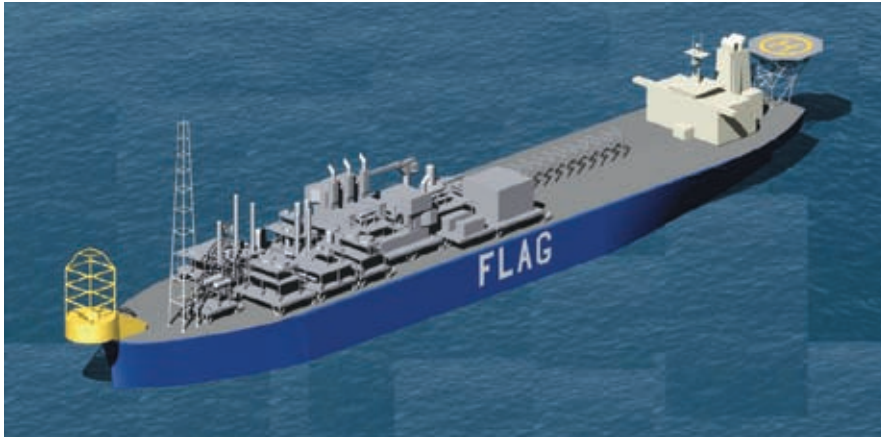
This was also the first time that this convention was held to recognise projects from the three business units of Keppel O&M collectively.

## WINNING TEAMS

Award	Project	Team	Business Unit
Gold	Safe Ship Frame Lock	Safe Structure Fabricator	Keppel Singmarine
Silver	Safe Pipe Lifter	Safe Lifter	Keppel Singmarine
Bronze	Adjustable Pin Jigs	Safe Jig	Keppel Shipyard

# FLAGship solution for associated gas

KOMtech's inaugural Technology Review 2009 showcases the work carried out by the Centre over the past year. OffshoreMarine brings you abstracts of research into offshore floating liquefied associated gas (FLAG) vessels.



The topside layout of the FLAG

Offshore natural gas liquefaction process technology is different from onshore processes. In recent years, there has been much research in developing new technologies or selection and modification of existing technologies for the offshore floating LNG plants. But most research has focused on sizable capacity offshore stranded gas field, ranging from 1-4 million tons per annum (MTPA).

### ASSOCIATED GAS PROBLEMS

The associated gas, which is generated in association with oil production, is problematic because there is often no economical way to transport it to the market in the absence of a pipeline. This gas has historically been flared.

Flaring and venting of natural gas from oil wells is a significant source of greenhouse gas emissions. Flaring, the burning of natural

gas that is produced along with crude oil during drilling, adds an estimated 400 million tons of carbon dioxide to the atmosphere annually, according to the World Bank.

More recent aspirations to decrease the environmental consequences of producing oil have increasingly led to the associated gas being re-injected into underground reservoirs. However, this is costly and is not always practical. In 2003, 12.5 tcf of gas was re-injected globally. It is estimated that nearly half of this gas is re-injected only because there is no viable or economic alternative.

### FLOATING LIQUEFIED ASSOCIATED GAS CONCEPT

One possible solution for the offshore associated gas is the production of liquefied natural gas (LNG). Offshore floating

liquefied associated gas (FLAG) has generated interests because it offers the potential to avoid flaring and re-injection. Moreover, it can convert the offshore associated gas from waste to resource.

The normal FPSO production rate is around 30,000-100,000 bbl/day associating with the production of 10-100 million standard cubic feet per day (MMSCFD) of associated gas. The associated gas is normally a wet gas, which contains much more heavy components such as ethane, propane, butane etc, than the stranded gas from the gas field. The FLAG is a possible way to deal with this 10-100mmscfd associated gas, and recover and produce 0.1-1 MTPA of LNG and certain amount of LPG.

### LNG LIQUEFACTION PROCESS

Considering the small scale capacity of associated gas and the characteristics of the LNG processes, the onshore natural gas liquefaction process modules (e.g. mixed refrigerant (MR) cycle and optimized cascade cycle) are not suitable for the offshore natural gas liquefaction which requires process with small footprint, flexibility and safety. Due to the difference of the process criteria, it makes the offshore liquefaction process different from the onshore plants. Apart from the safety advantages, nitrogen expander cycles also have the advantage

of having less motion effect due to the gas phase refrigerant. Nitrogen expander cycles are also suitable for the small scale applications which do not have high requirements on the process efficiency. Considering these issues, the nitrogen expander cycles are selected for this offshore associated gas liquefaction study.

#### LIQUEFACTION PROCESS SELECTED FOR FLAG

Five basic criteria are considered in our LNG process screen exercise: economic factors, operability and process complexity, inherent safety, marketability, and marine factors. From the process screening exercise, the single nitrogen expander cycle with a non-flammable refrigerant pre-cooling loop is selected and proposed for the liquefaction of associated gas. This nitrogen process is suitable for the small scale application, especially for the liquefaction of the associated gas because the efficient pre-cooling loop can provide a lot of warm temperature cold energy for the extraction of LPG. In this process, either rich LNG or lean LNG & LPG can be produced according to the requirement of LNG receiving terminal.

The advantage of this process is its simplicity and safety. Moreover, the pre-cooled single nitrogen process also has the advantage in the thermal efficiency, which is 91%, very competitive to the other

small scale LNG processes in the market.

#### HULL CONVERSION WITH IGC TYPE C LNG STORAGE TANK

For the FLAG conversion, storage capacity including LNG, LPG and condensate storage and the cargo tanks arrangement have been evaluated. In our FLAG concept, some center tanks are converted into LNG storage tank with Type C tank according to the target capacity and retain the wing tanks for crude oil and double side tanks for the ballast water. The horizontal or vertical arrangements of Type C tanks provided by TGE Marine Gas Engineering can be used for our FLAG.

#### TANK INTEGRATION WITH HORIZONTAL OR VERTICAL TANK

According to the IGC Code, two supporting structures along each tank are required. The supporting structure for one independent horizontal tank mainly comprised of steel frame and insulation block. And it is common that one supporting structure should be fixed to the hull structure while another one should be sliding absorb the ship motion and deformation.

To-date, some companies such as TGE provide the vertical tanks for offshore applications, which gives a way to FLAG hull conversion with the small vertical tanks. For the conversion construction method, it is easier for the small

vertical tank to integrate into the existing vessels compared to large horizontal tank.

#### CONCLUSION

For the development of FLAG, the single nitrogen expander cycle with a non-flammable refrigerant pre-cooling loop is selected for the liquefaction of associated gas. The processes have the advantage of robustness, simplicity, highly available design with equivalent thermodynamic performance and inherent safety. FLAG can be converted from double hull VLCC with IGC Type C tanks, which is more suitable in the small capacities because of lesser modifications to the existing hull structure and easier LNG containment operations and tank integration.

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# ITE-Keppel Technology Centre opens

New facility to provide advanced training for *Higher Nitec* students.



Keppel O&M Training Centre has put together a Marine Structural Tank model for ITE students's quality control and confined space training programme.

To nurture young talents to support the offshore & marine industry, Keppel O&M and Institute of Technical Education (ITE) have jointly set up the ITE-Keppel Offshore & Marine Technology Centre.

The official opening of the centre on 11 August 2009 falls under a Memorandum of Understanding (MOU) signed in October 2008 between Keppel O&M and ITE. Keppel O&M will also provide the equipment and technical support for the centre and offer 10 scholarship awards annually over the next five years for students pursuing the Higher Nitec in Marine Offshore Engineering course at ITE.

In conjunction with the opening of the centre, Keppel O&M donated a Marine Structural Tank model together with a training manual to ITE College Central.

Guest-of-Honour at the opening ceremony, CH Tong, CEO of Keppel

O&M, presented both gifts to ITE. He shared, "Keppel O&M wants to help secure Singapore's position as an international maritime centre by helping to groom talents to support the industry. We hope these gifts will inspire youths to build a career in the offshore and marine industry."

CH Tong explained, "It is only when we share knowledge, expertise and best practices with progressive partners that we can develop a world-class workforce in Singapore."

Mr Tan Seng Hua, Principal of ITE College Central, said, "We are thankful of the support given by Keppel O&M. The ITE-Keppel Offshore & Marine Technology Centre, with its 'realistic' industrial model and equipment will help facilitate hands-on training. The partnership bears testimony to Keppel and ITE's commitment towards providing the students with an authentic learning environment."

Designed by Keppel Offshore & Marine Group Training Centre (Keppel O&M Training Centre), the Marine Structural Tank model serves as useful tool for conducting quality control and confined space training. As for the training manual, it includes a comprehensive description of the model, a guide in using the model as a training aid and an introduction to marine vessels.

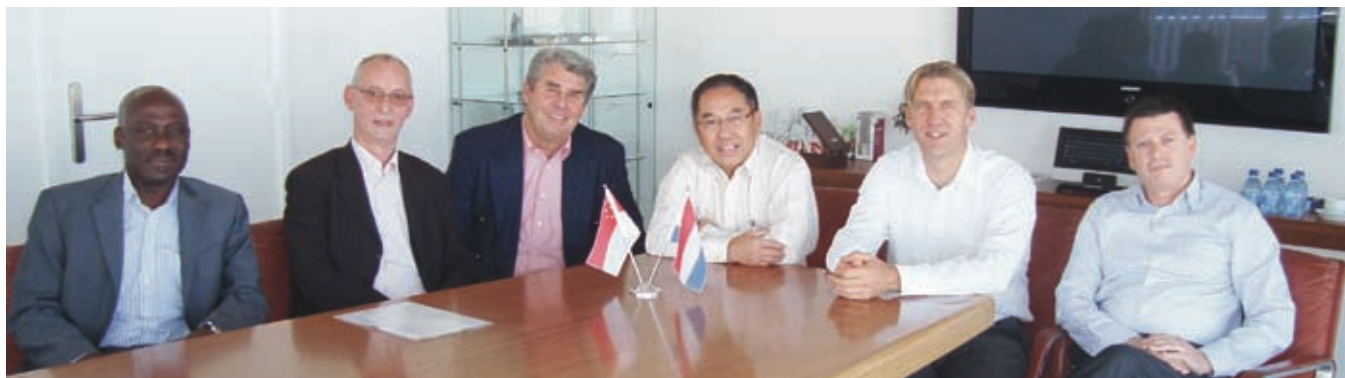
Mr Muhammad Ridzwan Ahmad, training officer of Keppel O&M Training Centre said, "As our trainees are relatively new to fabrication work, they are honoured to be given the opportunity and responsibility to work on the Marine Structural Tank model. The successful completion of the project has been exceptionally rewarding for us because we know that it will contribute to the education of our next generation."



CH Tong, CEO of Keppel O&M (extreme left), presents the Marine Structural Tank training manual, which has been put together by Keppelites, to Mr Bruce Poh Geok Huat, Director and CEO of ITE (extreme right)

# Tiding tough times together

Keppel Verolme's management and its workers' union work hand in hand to tide through current challenging times.



CH Tong, CEO of Keppel Offshore & Marine (third from right), gave his full support to the management of Keppel Verolme and Works Council representatives on the introduction of the flexible working hour regime

Over the years, Keppel Verolme's management and its union, Works Council, have developed a strong collaborative relationship to support the growth of the company's business as well as meet the needs of its employees.

In the face of current challenging economic times, the foundation of mutual trust and support built up over the years have enabled the two parties to work out solutions to help the company effect cost-savings and stay competitive.

One programme introduced is a flexible working hour regime that will involve 290 employees starting from 1 August 2009.

The flexible arrangement ensures that manpower resources are efficiently and optimally utilised without wastage, such as by allowing the workers to work shorter or longer hours according to the workload at the shipyard.

Employees will also need to multitask with each department

leveraging one another's skill-sets. For instance, production workers from the steel department will assist their peers from the mechanical department and vice versa.

Mr Harold Linssen, MD of Keppel Verolme, said, "We have built up trust and rapport with our union over the years as we have been through many good and bad times together.

"We are happy to garner support from them for this flexible working hour regime as this will help the company in cost-savings. By encouraging our employees to multitask, we also hope to better leverage the skill-sets of all employees and indirectly help reduce manpower."

Mr W. van der Hor, Chairman of the Works Council, commented, "We share the same goal and vision as the management. Recognising the need for such a measure to help the company to tide through the current economic

downturn, we have explained the rationale of the new regime to our members and have gathered their support and understanding."

Mr H. Tirion, Project Cost Controller of Keppel Verolme, was one of the union members who gave his full support readily.

"Seeing how the economic downturn has affected our yard business, I can fully understand the rationale behind this regime and see how it can help us tide through these challenging times."

CH Tong, CEO of Keppel Offshore & Marine, is fully supportive of the new regime. He said, "It is gratifying to see Keppel Verolme's management and its Union working in unison to ride out the tough times. I hope this collaborative effort will serve as an inspiring example to other Unions and subsidiaries in Keppel to work closely together to overcome the many challenges ahead."

# People progression



CH Tong

Over the past few years, Keppel has put in place a succession plan for its senior management. In line with this, the following key executive moves have been effected from 1 August 2009.

CH Tong, CEO of Keppel O&M has been appointed to the Board of Keppel Corporation as Executive Director. Formerly the MD and COO of Keppel O&M, CH Tong



Michael Chia

succeeded CB Choo as CEO of Keppel O&M on 1 January 2009.

CB Choo, Chairman of Keppel O&M and CEO of Keppel Corporation said, "I'm pleased to welcome CH Tong to the Keppel Board. He has served the Group loyally for about 40 years, and was instrumental in helping me steer Keppel O&M to its position of a world leading offshore and marine



Nelson Yeo

group today. Over the years, CH has contributed significantly to Keppel O&M's excellent execution and technology capabilities in our yards both here and overseas."

In addition, Michael Chia, ED of Keppel FELS and Nelson Yeo, ED of Keppel Shipyard have been promoted to MD (Offshore) and MD (Marine) of Keppel O&M respectively.

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## Keeping watch round-the-clock

Keppel Shipyard has stepped up its security with the installation of 21 close circuit television cameras (CCTVs) in the Tuas yard. They were launched on 29 July 2009 as part of Keppel O&M's pilot scheme, SecureEYE, to introduce CCTV to all its yards to enhance security.

The CCTVs are linked up through wireless network, which means that live video feed from the CCTV

can be accessed from any computer via internet connection and the password to the site. This enables security personnel to track on what goes on in the yards.

The CCTVs are strategically located at places. During the launch, a demonstration of the CCTV revealed how the actions of suspicious characters trying to orchestrate the theft of some items were captured by the various

CCTVs, which in turn led to the apprehension of the suspects.

Anthony Toh, Group Security Manager of Keppel O&M said, "While security cannot be in all places at one time, CCTV can help us monitor critical areas and increase our vigilance and enhanced the overall security in the yard. With the wireless system, we are able to monitor more places more effectively."



# Home away from home

Keppel's newly opened Juniper Lodge gets workers' thumbs up.

Juniper Lodge is the latest accommodation facility that Keppel Housing has developed for Keppel O&M workers. It was officially opened on 22 July with amenities including a gymnasium, a laundromat, a mini-mart, and



Workers living at new Juniper Lodge get to enjoy many amenities such as mini-mart

an internet centre among other things.

Already, some 1300 workers have moved in to the lodge which is located in the Mandai estate. It will be able to house another 600 persons with tenants expected to arrive in batches in the next month.

Speaking at the opening ceremony, Steven Lee, GM of Keppel Housing said, "This lodge will enable us to provide good housing and holistic living to more of our employees. Like Acacia Lodge, our other accommodation for employees, Juniper lodge is a home where workers can get everything they need here.

"From groceries shopping to recreational activities, we try to

provide a place where residents can relax with their friends and feel at home."

Each of the rooms have 32-inch LCD televisions. Facilities and amenities at the lodge include a canteen, refrigerator, mini-mart, an outdoor TV viewing area, sports and recreation facilities and even a rooftop beer garden for the workers to unwind.

Twenty-three-year-old Chukka Ravi Kiran Reddy said he liked the dorm for its good facilities. He shared, "I like the gym because I want to exercise and make my body look good."

Keppel Housing currently also operates Acacia Lodge for the Keppel O&M Group.



The workers have settled down happily at the new Juniper Lodge.

# Nurturing the next generation

Eager to stretch their minds and potential, budding talents across Keppel O&M are sprinting ahead in their learning curves at school and at work. OffshoreMarine newsletter shares the latest updates on how two Keppel O&M scholars are taking great strides in their development paths.

## CONSTRUCTIVE DREAMS

As a child, Eng Song Keat could not help being nosy, about how things worked that is. At first, he started to dismantle his toys. As his curiosity grew in later years, he progressed to more complex things and began to take apart even his computer, much to the initial mortification of his family.

But Eng did not leave a trail of destruction behind him. Much to the contrary, Eng was consequently so intrigued to learn more about the ways and wonders of the electrical and electronic world, that he decided to delve into electrical engineering at Ngee Ann Polytechnic (NP).

Today, Eng, 21, has fulfilled his childhood dream and more. Graduating as one of the top students of his cohort, he even bagged an industry scholarship from the Association of Marine Industries (ASMI), sponsored by Keppel O&M.

He has started work as an assistant electrical engineer with Keppel Singmarine since April this year.



Eng Song Keat looks forward to growing his roots in Keppel and building camaraderie with his colleagues



Tinagaran Puvanasan is building an eco-car as part of his final year academic project

Currently, learning as much as he can from his superiors and seniors is at the top of his mind.

Eng shared, "Thanks to my mentors and supervisors, I have been able to adapt quickly to the new working environment. In the short few months since I've been here, I appreciate the bonds that I've forged and learning opportunities given to me."

## DRIVEN BY PASSION

Tinagaran Puvanasan is all revved up to floor the accelerator and drive his way to fulfilling his dreams. But it will not be on just any car; it will be an eco-car designed and built by a team of six led by him.

The 20-year-old, a Keppel O&M scholarship recipient through the ASMI Scholarships Programme, is building the eco-car as part of his final year academic project.

When completed, it will run in the Shell Eco Marathon Asia 2010, competing against other prototype vehicles to travel the farthest on the least amount of fuel.

Tinagaran shared, "It is an interesting and meaningful engineering challenge. I believe I will be able to apply lessons and experience from this project to work later on."

Since attaining the scholarship in 2008, Tinagaran has interned once with Keppel, at Keppel Shipyard's Mechanical Department. He shared that this experience has put him a step ahead of his peers at school because it has given him a 'real-world' understanding of mechanical engineering and the marine industry.

# Empowering youths in the Philippines

Through talent management programmes and relationship building activities, Keppel's shipyards in the Philippines are constantly looking for ways to develop their human capital, as well as empowering the lives of those in the community.

Since 2006, Keppel Philippines Marine, Inc and Subic Shipyard and Engineering, Inc have been sponsoring the college education of outstanding youths who are interested, but lack the financial means to pursue marine-related courses.

This year, Keppel scholarships were awarded to two salutatorians and two valedictorians. They will be studying Naval Architecture and Marine Engineering at NAMEI Polytechnic Institute in Mandaluyong City, Philippines.

For one of the recipients, Norwin Dela Cruz, the scholarship is an

opportunity to pursue a dream career. He shared, "I have always had an affinity for ships. With this scholarship, I can take my interest further by undergoing the necessary training that will enable me to work in shipbuilding and design."

For Zarra Mendoza, another recipient, the scholarship provides much needed financial assistance to her education. She explains, "My family has to work very hard to make both ends meet. If I did not receive this scholarship, my college education would be at the expense of another sibling's schooling opportunity."

To date, 11 students have benefited from this scholarship programme.

Building relations through sports Keppel Batangas Shipyard joined other members of the Batangas Province Tripartite Industrial Peace Council (BPTIPC) on 19 June

2009 for the organisation's third Sportsfest.

Through games such as tug-of-war, basketball, darts, billiards, bowling, table tennis and golf, Keppel Batangas employees competed with the employees of other BPTIPC's members, sharing and bonding over much laughter and good-natured jibes.

"Through such fun-filled events, we have not only strengthened our ties with our business partners and co-workers, but also established new friendships," said Mr Israel Sanchez, HR & Administration Manager of Keppel Batangas.

BPTIPC is an association spearheaded by the regional government to promote cooperation and collaboration between the business community and labour sector in the Batangas area.



The Keppel Batangas team with Batangas Vice Governor Marc Leviste (front row, fourth from left)

# Safety moments

Photographic protégé Stefen Chow shares snippets from Keppel Shipyard's Safety Excellence journey.



Blending well with shipyard workers enables Stefen to capture candid moments of subjects at work. (Photo credit: Mindy Tan)

The perils of climbing a mountain and working on a vessel can be very similar. Whether one is facing a potential avalanche or working from heights on a ship, the attention to details is vital to ensuring safety.

Stefen Chow, who surmounted Everest in 2005, made the observation as a photographer documenting Keppel Shipyard's Safety Excellence 2010 initiative. He started his Everest journey as an engineering graduate and completed it as a photography enthusiast. Today, he is the spokesperson for Nikon in Singapore and has won numerous prestigious photography prizes around the world.

When approached to document Keppel Shipyard's Safety Excellence

2010 programme, Stefen said, "As a mechanical engineer by training, I am always fascinated by how shipyards and ship conversions operate. As a mountaineer, safety is the most important issue. Therefore, I was curious how a shipyard would implement their safety programme down the line over a period of two years. And I feel I can make use of my experiences as an engineer, mountaineer and photographer to record the whole process."

Keppel Shipyard's Safety Excellence 2010 programme represents the third and latest phase in the yard's safety enhancement journey. Beginning in 2008, the programme aims to empower its entire workforce, including contractors, through a range of safety schemes and skills upgrading programmes

to create an incident free workplace.

Documenting the project was challenging and complex. "I was trying to understand how the yard geared up their expertise for huge workforce of some 14,000 where everyone comes from different nationalities and cultures," Stefen shared.

"Only when I dove deeper into the issues did I discover an extensive programme to systematically train each worker and customise the programme to their needs so that each worker, who has varied experience or specialization, will be able to learn and revise the different aspects of safety in the shipyard."

Immersing himself fully into the

shipyard culture, Stefen spent many days in the shipyard, observing the evolution of the safety mindset in workers. He has followed the people in the yard, sometimes even to their homes and learning institutions where they upgrade themselves, in order to better understand what safety means to them.

Much like climbing a mountain, the many hours of training and preparation is a vital aspect in ensuring that safety discipline is

observed every step of the way. Noting the similarities, Stefen said, "Climbing a mountain can sometimes take months. It is important not to lose sight of the safety involved in reaching the top.

"Safety is a journey that requires teamwork, whether on Everest or in the Shipyard. We look out for one another and will call out to our team mates if we find them doing something unsafe. This is very much the same in the

shipyard, where safety sessions are conducted every morning such as Take 5 or the 'Together We Care' campaign makes the difference in saving lives."

Having been in the yard for a year, Stefen expressed his admiration, "It is a very comprehensive, mountain-sized effort to devote so many resources into making the shipyard a safer place each day. From an outsider's point of view, I am very impressed and humbled by what I have seen."



The spirit of safety is as much about personal responsibility as it is about team work and camaraderie as candidly captured by Stefen



Keppel Corporation's senior management briefed press and analysts on the Company's performance for the first half of 2009

**1H 2009 FINANCIAL RESULTS SUMMARY FOR THE KEPPEL GROUP**

Company	PATMI* (\$M)	%YOY	EPS# (CENTS)	%YOY
Keppel Corporation	602.6	7.4	37.8	7.1
Keppel Land	95.1	-15.8	8.2	-26.1
Keppel T&T	22.7	0.3	4.1	-

\* Before exceptional items  
# Basic EPS

**KEPPEL CORPORATION POSTS SOLID FIRST HALF RESULTS**

Keppel Corporation delivered a strong set of results with a record first half attributable profit before exceptional items of \$603 million and EPS of 37.8 cents. Group revenue of \$6,180 million was \$1,326 million or 27% above that of the corresponding period in 2008.

Keppel Corporation and Keppel Land will take up interests of 45% and 55% respectively in a 36.8-ha site located in the 4-sqkm Start-Up Area of the Sino-Singapore Tianjin Eco-City. The total capital investment cost of Keppel's development is about RMB705 million (approximately S\$148.5 million).

**EVERGRO PROPERTIES TO DELIST FROM SINGAPORE STOCK EXCHANGE**

Keppel Land and Evergro Properties jointly announced on 12 July 2009 the proposed voluntary delisting of Evergro from the Singapore Exchange Securities Trading Limited (SGX-ST).

**KEPPEL SEGHERS PROVIDES WASTE-TO-ENERGY TECHNOLOGY TO TIANJIN PLANT**

Keppel Seghers, US\$11 million contract for waste-to-energy technology in Hangu, Tianjin, China. The contract was awarded by Tianjin Binhai Environmental Industry Development Ltd.

Located in Binhai Technical & Economic Development Area, Tianjin, the plant will have three incineration lines which will be able to treat 1,500 tonnes of municipal waste per day (combined capacity) to generate more than 20 MW of green energy.

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# Launching into midnight

Global Offshore's derrick pipelay vessel takes to water.



A cause for celebration – project teams toast to the vessel's launch.



Keppel Singmarine's first derrick pipelay vessel successfully slips into the water

At the stroke of midnight on 23 July 2009, project teams and employees of Keppel Singmarine and Global Offshore International Ltd (Global Offshore) gathered around the 180-metre long slipway with a great sense of anticipation in Benoi yard.

H340, a derrick pipelay vessel was getting ready to be launched. Thanks to the good weather, careful planning and execution, the 162-metre pipelay vessel eventually slid into the water, with the crowd cheering.

This is the first time that Keppel Singmarine is building a derrick pipelay vessel with diesel electric propulsion. This pipelay

construction vessel is suitable for worldwide operations and will be delivered to Global Offshore International Ltd.

Hoe Eng Hock, ED of Keppel Singmarine said, "We are pleased with the successful launch of H340, another significant milestone of this project being achieved. This is the biggest vessel and first derrick pipelay vessel that Keppel Singmarine has ever built.

"The construction of H340 has also demonstrated Keppel Singmarine's versatility and expertise in building different types of vessels in accordance with owners' specifications."

With accommodation up to 264 persons onboard, the derrick pipelay vessel is equipped with two units of 4500 KW electric propulsion thrusters, six units of positioning thrusters, a 1200-tonne crane and pipelay equipment capable of operating in water depths of 3,000m and handling pipes of 60 inches in diameter.

Global Offshore is a wholly-owned subsidiary of Global Industries Ltd, a company listed in the US. It is a leading provider of offshore construction, engineering and support services for the oil and gas industry with its premium fleet of vessels.