

Right people, Rigorous execution,
Reputable partners, Robust technology –
Keppel Offshore & Marine delivers superior
solutions across 20 yards in 16 countries.

- Offshore rig design & construction
- Ship conversion & repair
- Specialised shipbuilding

Builder of distinction



Keppel Offshore & Marine

KEPPEL SHIPYARD SECURES MARINE PROJECTS WORTH S\$120M

Keppel Shipyard has secured four contracts worth a total of about S\$120 million from repeat customers.

The first contract secured is from BW Catcher Limited, a wholly owned subsidiary of BW Offshore. The latter is a leading global provider of floating production services to the oil and gas industry. It is the world's second largest contractor with a fleet of 14 Floating Production Storage and Offloading (FPSO) vessels represented in all major oil regions world-wide. It also operates additional two FPSOs.

The contract entails the installation and integration of topside modules for a newbuild FPSO vessel. Upon its completion, the FPSO will be deployed to the Catcher Field located in Central North Sea, UK, which is operated by Premier Oil.

The second contract is from SOFEC, Inc. to fabricate an Internal Turret Mooring System for a Floating Storage and Offloading (FSO) vessel that will operate in Maersk Oil's Culzean Field in the UK's section of the North Sea. Based in Houston, Texas,

SOFEC is an industry leader with proven expertise in marine terminal and floating production system concept, design, fabrication, installation, delivery and service. The company has delivered over 100 mooring systems for FPSO/FSOs and marine terminals around the world. Fabrication of the turret is expected to be completed in third quarter of 2017.

For the third contract, Keppel Shipyard will carry out upgrading work to the pipelay vessel, *Castorone*, for Saipem Offshore Norway AS. Saipem is one of the world leaders in drilling services, as well as in the engineering, procurement, construction and installation of pipelines and complex projects, onshore and offshore, in the oil & gas market. It has distinctive competences in operations in harsh environments, remote areas and deepwater.

Keppel Shipyard previously undertook the completion and integration works for the newbuild *Castorone* in 2011. Upgrading work is scheduled to be completed in third quarter of 2016. The job scope includes the replacement of switchboards to improve

the vessel's power distribution systems, renewal works on 45 kilometres of electrical cables, various pipelay system upgrades as well as the construction of new water ballast tanks and conversion of old ones into fuel oil tanks to optimise the vessel's capabilities.

The fourth contract is from Woodside Energy Ltd for the modification and upgrading of FPSO vessel *Ngujima-Yin* to support the Greater Enfield Project. The job scope includes marine and hull life extension and refurbishment works; installation of new customised water flood module, turret risers and power and control module; as well as modification of swivel system, marine and topside related piping.

Detailed engineering phase is expected to commence in July 2016 while the shipyard construction work is targeted to start in second quarter of 2018. Upon its completion, the Woodside-operated *Ngujima-Yin* FPSO will be deployed back to the Greater Enfield area located in Western Australia.

KEPPEL SINGMARINE TO BUILD DREDGERS WORTH S\$100M

Keppel Singmarine has secured contracts from Jan De Nul Group to build three Trailing Suction Hopper Dredgers (TSHDs). The TSHDs are worth about S\$100 million in total.

The Jan De Nul Group is a leading expert in dredging and marine construction activities, and in specialised services for the offshore industry of oil, gas and renewable energy. Its core marine activities are further enhanced by the Group's in-house civil and

environmental capabilities offering clients a complete package solution.

The first two dredgers are expected to be completed in second half of 2018 while construction of the third dredger will require a notice within six months from Jan De Nul, to exercise the option for the dredger.

To be built to Jan De Nul's design, the dredgers will be able to dredge to a

maximum depth of 27.6 metres, and have a hopper capacity of 3,500 cubic metres. The two dredgers will be built to the requirements of classification society, Bureau Veritas.

A TSHD is mainly used for dredging loose and soft soils such as sand, gravel, silt or clay. The dredged material can be deposited on the seabed through bottom doors or discharged through a floating pipeline to shore and used for land reclamation.

Jan De Nul Group said that it needs such compact dredgers for maintenance work, for coastal restoration and for a variety of land reclamation work around the world.

SEMBMARINE DELIVERED NOBLE LLOYD NOBLE, WORLD'S LARGEST JACKUP RIG

Sembmarine, a global leader in offshore and marine engineering solutions, has delivered the world's largest jackup rig to Noble Corporation.

Noble Lloyd Noble, the seventh ultra high-specification harsh environment jack-up rig successfully completed for Noble Corporation, is based on the GustoMSC CJ70 design as well as Statoil's 'Category J' specifications.

The rig has an operational air gap of 69 metres and is capable of operating in a water depth of up to 150 metres (492 feet) in harsh environmental conditions. It boasts a maximum total drilling depth capacity of

10,000 metres (approximately 33,000 feet).

To be deployed in Statoil's Mariner field development in the North Sea under a four-year charter arrangement, *Noble Lloyd Noble* is the first offshore structure of its kind to fully comply with both Norwegian and UK regulatory standards. It is uniquely suited for operation over a very large platform or in a subsea configuration.

The *Noble Lloyd Noble* project achieved 8 million man-hours worked without reportable incidents onboard the rig. It also scored a low Accident Frequency Rate (AFR) of 0.10 per million man-hours worked over a 31-month construction period.



Noble Lloyd Noble is the world's largest jackup rig built by Sembmarine for Noble Corporation.

ST MARINE COMPLETED REPAIR OF LIVESTOCK CARRIERS SHORTHORN EXPRESS AND OCEAN DROVER

ST Marine has completed the repair of livestock carriers *MV Shorthorn Express* for Vroon BV, and *MV Ocean Drover* for Wellard Ships Pte Ltd.

MV Shorthorn Express arrived at ST Marine's Tuas Yard on 5 May 2016, with many areas that required repairs within a very short time frame of four weeks. The entire aft section of the vessel's fourth deck and innumerable sections of the first deck were re-coated with non-skid synthetic flooring. The exhaust and supply fans for the livestock decks were replaced, along with modifications to the original fan housings.

Work carried out in the dock included silicone painting on the external hull, overhauling of the controllable pitch propellers' shafts, bow thruster and generators. The project team worked round the clock to ensure that the owner's tight schedule could be met.

The partnership between ST Marine and Vroon BV was formed 23 years ago when Vroon BV entrusted its first livestock carrier, *MV Charolais Express* to ST Marine's Tuas Yard for repair work. It was ST Marine's first repair project for a livestock carrier. Since then, a total of 94 vessels from Vroon BV have been drydocked and repaired by ST Marine. Of these, 76% are livestock carriers. The remaining vessels comprising car carriers, chemical tankers, product tankers and offshore support vessels.

MV Shorthorn Express was delivered on time, demonstrating once again the strong teamwork between ST Marine and Vroon BV. The shipyard had earlier repaired and drydocked chemical tanker *MV Iver Beauty*, and livestock carrier *MV Sahiwal Express*, for Vroon BV in the first quarter of this year.

MV Ocean Drover first arrived in ST Marine in 2015 for major repair work as it was fire damaged. In July 2016, the vessel returned back to ST Marine for an



MV Shorthorn Express at sea.



MV Ocean Drover drydocked.

urgent ad-hoc repair and maintenance job for preparation of the ship's voyage to Australia.

The repair scope for the vessel was challenging as ST Marine had to complete the work within seven days to meet the vessel's tight schedule. The work performed include painting of all cattle carrier decks; partial renewal of the ventilation trunks, deck bulkhead plates, engine room sea water pipes and brackets; partial hydro jetting and renewal of angle bars and I-beams on the sundeck.

Repair work were also carried out over multiple decks and close to 100 skilled men were deployed every day on three rotating shifts, enabling the project to be successfully completed within the given timeline. The project was completed on schedule and with zero accident.

SEMBCORP MARINE OFFSHORE PLATFORMS DELIVERED IVAR AASEN TOPSIDES FOR FIELD DEVELOPMENT IN THE NORTH SEA

Sembcorp Marine Offshore Platforms has delivered the *Ivar Aasen* process, drilling and quarters topsides to Det norske oljeselskap ASA on schedule.

The 40-month-long engineering, procurement and construction project culminated in the Sailability Party. The topsides sailed away from Sembmarine's Admiralty Yard location on 6 June for the *Ivar Aasen* field development in the Norwegian North Sea.



Sembcorp Marine Offshore Platforms delivered the *Ivar Aasen* topsides to Det norske oljeselskap on schedule.

SEMBMARINE ACQUIRES LMG MARIN AS

Sembcorp Marine Ltd (Sembmarine) announced that its wholly-owned subsidiary, Sembcorp Marine Integrated Yard Pte Ltd, had acquired a 100% equity stake in LMG Marin AS for US\$20 million.

LMG Marin is a naval architecture and ship design and engineering house headquartered in Bergen, Norway, with offices in Poland and France. Established in 1943, its extensive design and engineering portfolio spans floating structures, platforms and a wide variety of ship types, such as drillships, floating production, storage and offloading vessels (FPSO), floating storage and offloading vessels (FSO), offshore support vessels (OSV), Liquefied Natural Gas (LNG) carriers, LNG-powered ships, car ferries, and cruise ships.

LMG Marin originated several key designs adopted by Sembmarine, including the next-generation *Espadon* drillship design and the FSO design used in the on-going construction of the company's newbuild FSO for deployment in the UK

North Sea.

It also includes the Gravifloat modular LNG and Liquefied Petroleum Gas (LPG) platform solutions that are a cost-competitive alternative to Floating Storage Regasification Unit (FSRU), Floating Liquefied Natural Gas (FLNG) and land-based terminals. The Robusto FPSO hull design, customised for operation in Brazil and West Africa, is another notable LMG creation.

Following the acquisition, LMG Marin becomes an indirect wholly-owned subsidiary of Sembmarine. The acquisition brings a cache of design patents and expertise in naval architectural design, engineering and technology development, into Sembmarine. It will further strengthen Sembmarine's intellectual property and knowledge to execute leading-edge design and engineering solutions for the global offshore and marine sectors.

KEPPEL FELS DELIVERED FIFTH ACCOMMODATION UNIT TO FLOATEL SAFELY AND ON TIME

Keppel FELS has delivered *Floatel Triumph*, a fifth high-specification accommodation semi-submersible, to Floatel International Ltd. Floatel International was established in 2006 to satisfy a market demand for a new generation of offshore floatels. The company provides flexible solutions with high quality and the best possible performance, putting safety first.

The accommodation semi-submersible, which is built to Keppel's proprietary SSAU™5000NG design, will be chartered by Chevron Corporation for work in the Wheatstone field in Western Australia. *Floatel Triumph* is scheduled to arrive on location in mid-October 2016. Thereafter, it will work for INPEX Operations Australia Ichthys Field, off Western Australia.

Developed by Keppel's Deepwater Technology Group, the SSAU™5000NG is an enhanced design that meets the stringent UK HSE requirements to work in the UK sector of the North Sea, as well as the Gulf of Mexico, Brazil and Western Australia. It is also equipped with state-of-the-art accommodation and recreational facilities to provide increased comfort for its 500-person crew.



Keppel FELS has delivered *Floatel Triumph*, a fifth high-specification accommodation semi-submersible built to Keppel's proprietary SSAU™5000NG design, safely and on time.

The accommodation semi-submersibles delivered to Floatel previously by Keppel FELS were *Floatel Superior*, *Floatel Reliance*, *Floatel Victory* and *Floatel Endurance*. *Floatel Reliance* and *Floatel Victory* were also built to the SSAU™ design while *Floatel Superior* and *Floatel Endurance* were built to Keppel's proprietary DSS™ 20NS design. *Floatel Victory* is currently in operations for BP at the Clair Ridge field, West of Shetlands, United Kingdom.

Floating accommodation platforms are needed to provide additional living quarters for drilling and production personnel. Such support is required during hook-up and commissioning in the development phase, for maintenance and upgrading during the production phase, as well as for decommissioning.

KEPPEL SHIPYARD TO DELIVER BUMI ARMADA'S FIRST NORTH SEA FPSO

Keppel Shipyard is on track to deliver a Floating Production Storage and Offloading (FPSO) vessel to Armada Kraken Pte Ltd, a wholly-owned subsidiary of Bumi Armada Berhad.

Bumi Armada is a Malaysia-based international offshore energy facilities and services provider. The company provides offshore services via three business units – Floating Production, Storage & Offloading Operations, Floating Gas Solutions and Offshore Marine Services.

The FPSO *Armada Kraken* is a harsh-environment FPSO unit that is designed for operations in the North Sea under a stringent regulatory regime. The FPSO vessel, which has a design life of 25 years without dry-docking, will be deployed to produce the heavy oil (API degree 14) found in the Kraken field in the UK sector of the North Sea.

This is Bumi Armada's first FPSO unit to operate in the North Sea. With *Armada Kraken*, Keppel Shipyard and Bumi Armada would have completed their 15th conversion/upgrading project together. The FPSO is built in compliance with the strict regulatory guidelines as defined by

the UK Health and Safety Executive and Department of Energy and Climate Change regulations and is classed by DNV GL.

Keppel Shipyard's work scope for the *Armada Kraken* project includes refurbishment and life extension works, upgrading of living quarters to accommodate 90 personnel, installation of an internal turret mooring system as well as

the installation and integration of topside process modules.

Armada Kraken is able to handle a peak fluid rate of 460,000 barrels per day (bpd) and 80,000 barrels of oil per day (bopd), 275,000 bpd of water injection, 20 million standard cubic feet (MMscf) of gas handling and has a storage capacity of 600,000 barrels.



Keppel Shipyard is on track to deliver FPSO *Armada Kraken* to Bumi Armada for operations in the Kraken field in the UK sector of the North Sea.

THREE KEPPEL OFFSHORE & MARINE'S PROJECTS RECOGNISED AS SINGAPORE'S TOP ENGINEERING FEATS

Three of Keppel Offshore & Marine (KOM)'s projects have been recognised as Singapore's Top 50 Engineering feats. These are the semi-submersible DSS™ Series rigs, KFELS N Class rigs and the Arctic icebreakers.

Launched on 1 March 2016 by the Institute of Engineers Singapore (IES), the Engineering Feats @ IES-SG 50 competition looked at projects deemed to have made great economic, societal or infrastructural impact to Singapore since her independence in 1965. Projects from over 20 different industries were shortlisted by an IES Committee, and the top 50 winners were chosen by public voting online.

The winning projects were presented by Singapore Prime Minister Mr Lee Hsien Loong on 1 July 2016 at the IES Golden Jubilee Dinner.

KOM's winning projects by Keppel Offshore & Marine have also been internationally recognised as industry benchmarks, and have helped strengthened the company's position as the world's leader in the development, design and construction of offshore rigs and specialised vessels.

DSS™ Series Semi-Submersibles

The mega drilling semi-submersible DSS™ Series is among the world's most technologically advanced deepwater drilling rigs. KOM is the first in the world to have developed these proprietary semi-submersible designs for advanced deepwater drilling.

KFELS N CLASS Jackup

The KFELS N Class jackup rigs can handle ultra-harsh environments in water depths ranging from 400–500 feet, which is 40 per cent deeper than what traditional units can reach in benign waters. The series was conceptualised to develop an innovative and cost-effective jackup solution for the Norwegian Sector of the North Sea, one of the world's harshest operating environments for offshore exploration and production.

Arctic Icebreakers

As for the Arctic icebreakers, Keppel Singmarine is the first shipyard in Asia to have successfully engineered and built icebreakers designed for operations in the Arctic region. The two icebreakers, *Varandey* and *Toboy*, are designed to cut through solid ice of over 1.7 metres thick and operate in extreme temperatures as low as -45 degrees Celsius.



The three projects from Keppel Offshore & Marine chosen by the public as Singapore's top 50 engineering feats are (from top) mega drilling semisubmersible DSS™ Series rigs, KFELS N Class jackup rigs and Arctic icebreakers.

KEPPEL SHIPYARD DELIVERED FPSO CIDADE DE CARAGUATATUBA MV 27 AND MARSYA TO MODEC AND ROTATING OFFSHORE SOLUTIONS

Keppel Shipyard and Keppel FELS Brasil have completed the conversion of FPSO unit *Cidade de Caraguatatuba MV 27* for MODEC Offshore Production Systems (Singapore) Pte Ltd, a MODEC Inc. group company.

FPSO Cidade de Caraguatatuba MV 27 first arrived at Keppel Shipyard in early 2015 for her installation of modules and integration works. Apart from the installation of 35 modules, Keppel Shipyard also undertook the fabrication and installation of a flare

tower, helideck and crane column.

Following Keppel Shipyard's scope achieved with zero lost-time incidents, the vessel departed for Keppel FELS Brasil's BrasFELS shipyard in Angra dos Reis, Rio de Janeiro, Brazil in first quarter of 2016. BrasFELS completed integration and completion works on *FPSO Cidade de Caraguatatuba MV 27* on time and safely.

Additionally, Keppel Shipyard also delivered *Marsya*, which was converted from a Mobile Offshore Drilling Unit to a Water Injection Facility. Keppel Shipyard's scope of work included major steel renewal of the external hull and internal bulkhead, installation of new living quarters, and installation of topside equipment.

The vessel was completed safely and within schedule after clocking 1.49 million man hours.



Good synergy between Keppel Shipyard, BrasFELS and MODEC ensure *FPSO Cidade de Caraguatatuba MV 27* was delivered on time, and with an excellent safety record.