

InSide

GustoMSC

NOVEMBER 2010 #16

THIS EDITION

Interview with:
Aziz Merchant, Keppel FELS

FPSO P-57

GMS Endurance sets to work in
the Arabian Gulf

How will the Arctic open up?

The future of Brazil: pre-salt



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Preface

**In this issue of GustoMSC "InSide":
 The Brazilian flavour, and our successful
 renewable projects.**

In general, 2009 and 2010 have been influenced by the economic crisis. The drilling and production markets were depressed, with hardly any new orders being awarded. The fourth quarter of 2010 is starting to show some positive trends with drilling contractors ordering new offshore units. We believe that all the markets in which we operate will experience a more positive trend in 2011. The offshore industry is eagerly awaiting Petrobras' decision on their huge investment program for mobile drilling units. The FPSO business is also starting to revive with a leading role for Brazil; a number of these projects are highlighted in this issue.

So far, 2010 has been quite successful for GustoMSC, particularly in the Offshore Construction Market, the second column of our product/matrix. This year, four Wind Turbine Installation Jack-Ups of the GustoMSC NG design series have been ordered by clients at various shipyards. Alongside the selection of the NG designs, GustoMSC has also received orders for the turnkey delivery of the newly developed continuous jacking systems and

"wrap-around-the-leg" cranes. Delivery of these units and associated equipment is scheduled for 2012. The OneGustoMSC identity is clearly being demonstrated in the market with these projects.

In this present issue we are looking at one of the BRIC countries in more detail, namely Brazil. With the election of the new president, the strategy for developing the huge oil and gas reserves offshore Brazil will most likely be continued, and this will result in a lot of work in the offshore drilling, construction and production markets. A number of the more interesting projects are highlighted in this issue.

It is with great pleasure that we introduce our readers to Mr. Aziz Merchant through an interview in which he expresses the views of the Keppel FELS Group, a company with which GustoMSC has a long lasting relationship.

With the end of 2010 in sight, we would like to take this opportunity to wish you and your family a prosperous new year and to wish your company every success in 2011.

**Bertus Bernhard,
 President GustoMSC**



As shown in the "matrix", GustoMSC has a wide range of mobile offshore units with which to serve the industry. We design Jack-ups, Semi-submersibles and Vessels for a wide range of applications, ranging from exploration (drilling) to construction and production.

The future of Brazil: Pre-salt

Brazil bubbles under the pre-salt

By Fernando Frimm and Gerrit Jan Schepman

Exploration successes offshore Brazil over recent years and the huge reserves discovered under the underground salt layers have created a whole new scenario and dynamics for the regional oil and gas industry, on and offshore. Not only are discoveries promising great things in terms of oil and gas output, but they are the key to a massive growth in local design and build activities. A closer look at a BRIC.

As one of the BRIC countries, Brazil is looked up to for its economic expansion. Having a long story of successes in the offshore arena, strong technology and now government support for the local industry, the oil and gas sector has emerged as one of the drivers of Brazil's economic growth.

The challenges to Petrobras and our industry are very large. If one reviews the Petrobras objective of achieving 5,700,000 b/d total production by 2020, one quickly realises that major development plans have to be established and put into action.

It is not only the need of offshore oil and gas equipment, but also of traditional vessels such as 46 oil tankers, bulk carriers, support vessels etc., to be constructed at Brazilian shipyards. The capital expenditure to achieve these production goals is impressive. On the oil and gas exploration and production side the development of Petrobras can be seen in the delivery schedule, as shown in table 1.

Besides this impressive list, new equipment such as 500 wet christmas trees, 1,700 dry christmas trees, 4,000 km of flexible lines etc., is also to be manufactured and deployed.

SBM Offshore and GustoMSC are already recognised players in the oil and gas industry in Brazil. SBM Offshore is the largest independent FPSO operator in Brazil, with 5 units in operation and 4 to come. Besides its operational base in Macae, SBM Offshore has recently opened a new office in Rio de Janeiro.

GustoMSC's roots in Brazil are also well-established. Several Pelican class drillships have operated in Brazilian waters since the mid 1970's. Some have been operating in Brazil continuously for a long time, e.g. the SC Lancer, Noble Muravlenko, Noble Leo Segerius and Peregrine I. The new stars of the GustoMSC presence in Brazil are the recently delivered semi-submersibles Gold Star and Lone Star and the units to come, i.e. Norbe IV, Delba III and Alpha Star.

The pre-salt reservoirs: the Brazilian challenge

The discoveries go back to 2007 when the first mega-field, named Tupi, was found at a depth of 5,000 m below sea level: the first discovery by Petrobras in the pre-salt layer. "Pre-salt" makes reference to an aggregation of rocks located offshore in a large portion of the Brazilian coastline. It is called "pre-salt" because it consists of oil bearing rock formations that lie under an extensive layer of salt which could be as much as

2,000 m thick. The mega-field Tupi alone has recoverable volumes estimated at 5 – 8 billion barrels of oil equivalent. Meanwhile, the Guara well, also in the Santos Basin, holds 1 – 2 billion barrels of light oil and natural gas. In addition, wells tested in the Espírito Santo State also show high productivities in the pre-salt reservoirs. The strategic importance of these mega-field discoveries for Brazil's long-term economic development is unquestionable although the required technologies to bring these oil fields into production are quite challenging.



Challenges to be covered are:

Reservoir characteristics, with the key elements:

- ▶ Interpretation of seismic data
- ▶ Secondary recovery with focus on technical feasibility of water and gas injection

Well engineering (a hot topic with the Macondo well in mind)

- ▶ Deviation of the wells into the salt zone
- ▶ Hydraulic fracture in horizontal wells
- ▶ Wellbore materials, resistant to high CO2 content

Flow assurance issues

- ▶ Paraffin deposition in long pipelines
- ▶ Hydrate control
- ▶ Scaling control

Floating production limits

- ▶ Moored in water depths of 2,200 m and more
- ▶ Interaction with riser's system

Logistics for the associated gas

- ▶ Gas pipeline of over 18" in deep water
- ▶ Long distance to shore
- ▶ New technologies offshore: LNG, CNG, etc.

In spite of these challenges, Petrobras' leadership in deepwater technology was once more proven with the establishment of the Tupi field development strategy. The process started with the pilot FPSO units that will gather field and production data for the full development phase. SBM Offshore and Partners have signed the Letter of Intent for the first dedicated pre-salt FPSO production unit, the Cidade de Paraty FPSO, which will be located at the Tupi Nordeste field.

Drilling for the future

To unlock all these tremendous oil and gas reserves, new highly efficient drilling units will be required for all exploration and development drilling in the years to come. Petrobras has initiated quite a number of different projects to secure units for their future drilling operations.

Starting in 2008 with 34 chartered units, the record of rigs contracted shows that by 2012 Petrobras will have 63 units operating, almost doubling the number of units in operation in Brazilian waters.

To secure the required units, new long-term contracts have been signed that warrant the upgrading of existing units such as Olinda Star, Noble Leo Segerius, Noble Muravlenko and Roger Eason. These old ladies prove to be successful drilling units. Also, long-term chartering of relatively new units, built before the last building boom, has been secured, such as the Pride Rio de Janeiro class units.



Lone Star

Petrobras has also chartered 13 newbuild units to Brazilian drilling contractors enabling Brazilian operated vessels to participate strongly in their own market. Several of these new contracts have chosen GustoMSC designed units: the TDS series of units for Queiroz Galvão Oleo e Gás, Odebrecht and Delba and the DSS series of units for Queiroz Galvão Oleo e Gás.

The last program announced by Petrobras is the 28 rig program which consists of two types of contracts: Petrobras owned units and chartered units (see table 2). Petrobras requires that all these units are built in Brazil. This will certainly provide a boost for the local shipyards, their subcontractors and the offshore industry. And it will remain an important region for GustoMSC.

Table 1: New build program

New vessel delivery plan	2009-2013	2013-2015	2016-2020
Drilling units	29	14	14
Support vessels	92	50	53
Production units (FPSOs and Semis)	15	8	22

Table 2: Contracts and leases to secure needed drilling assets

Water Depth	2009	2010	2011	2012	2013-2017
0-999m	11		1		
1000-1999m	20				
≥ 2000m	10	8	4	9	28 new units to be leased
Total per year	41	8	5	9	28
Cumulative		49	54	63	91

Other E&P activities offshore Brazil

These figures only relate to Petrobras activities. A number of other oil companies - such as OGX, Exxon, Repsol, BP, BG, Anadarko, Shell and others - also have operations in Brazil and have contracted a number of units. All in all, one can expect that more than 100 drilling units, either vessels or semi-submersibles, will be active in the Brazilian offshore province by 2015.

The GustoMSC units spudded in Brazil

A couple of grand old ladies of the well-known Pelican class are Noble Leo Segerius, Noble Muravlenko and SC Lancer, which still perform as efficient drillships. The two Noble units will undergo a new round of conversions to face the future challenges in deepwater drilling. Other GustoMSC designs such as the P10,000 units Jack Ryan and CR Luigs have also been included in the Brazilian scenario.

SBM Offshore will deliver three TDS units designed by GustoMSC. SBM Offshore has turn-key delivery responsibility for these units and is building the units at the GPC yard in Abu Dhabi. The first unit, Lone Star, has recently been named and has been delivered. The second unit, Norbe VI, is in the final stages of commissioning and undertaking sea trials. The third unit, Delba III, will follow shortly.

GustoMSC has collaborated with Keppel Offshore & Marine's (Keppel O&M) Deepwater Technology Group (DTG) to develop the deepwater drilling semi-submersible class DSS38. This design has been based on the experience gained from the development and construction of the DSS20, DSS21 and DSS51 classes of units, built at the Keppel FELS yard. Keppel FELS contracted the first two units of this design to Queiroz Galvão Oleo e Gás. The Gold Star was delivered in early 2010 and the Alpha Star is scheduled for delivery in 2011.

The countdown for the 28 Brazilian-built rigs program has started. GustoMSC continues to be very active in the Brazilian market and is working with several shipyards, planning to meet the challenge to build drilling units in Brazil.

On the drillship side, GustoMSC is promoting the PRD12,000 Qdrill class drillships and collaborating with Keppel O&M's DTG on the DrillDeep DS12000 drillship class. Both designs are focused around the GustoMSC proven line of integrated drill ships. These designs make efficient use of the hull spaces to integrate riser storage, mud systems into the hull, resulting in drillships with smaller overall dimensions, more usable deck space and sometimes even more usable payload space than larger sized drillships. The PRD12000-Qdrill is designed for drilling operations in 3,000m water depth with more than 15,000 ton variable drilling loads. This design is GustoMSC's answer to the challenges of deepwater drilling with a highly efficient and economical unit. The DS12000 class is a 12,000 ft water depth unit with a payload of around 18,000 tons and additional drilling systems features such as a full dual activity drilling center.

On the semi-submersible front, GustoMSC and Keppel O&M's DTG have enhanced the successful DSS38 design to meet the latest Petrobras requirements. Through its BrasFELS subsidiary, Keppel FELS has offered the DSS38E to a number of Brazilian drilling contractors. GustoMSC has a proven track record for spudding in Brazil and the newbuild units are ready to drill for the future.



Unit	DSS38E	PRD12,000 Qdrill	DrillDeep DS12000
Main dimensions	73 * 73 m	198 * 32 m	198 * 35 m
Displacement	45,000 t	54,000 t	57,000 t
VDL and Var. Load	12,300 t	15,000 t	18,000 t
Water depth	10,000 ft	10,000 ft	12,000 ft

Interview with Aziz Merchant, Keppel FELS:

“Project management and execution are our main strengths”

Keppel FELS is the offshore arm of Keppel Offshore & Marine Ltd, a global leader in rig design, repair and construction, ship repair and conversion and specialised shipbuilding. As General Manager of Group Engineering & Design at Keppel Offshore & Marine, Aziz Merchant is responsible for the Group’s engineering centers in Singapore, Bulgaria, China and India, and combined staffing of over 800 engineers. He talks to Inside about his career and his work with GustoMSC and hopes for the future.

By Gerrit Jan Schepman

Keppel FELS has been providing solutions to the offshore industry for more than 40 years. Today, we are the world’s leading designer, builder and repairer of mobile offshore rigs with a portfolio of proprietary designs that meets a broad spectrum of challenging operating requirements from deep waters to harsh environments. We have also built up a strong track record for fast-track repairs and complex conversion work.

Backed by Keppel Offshore & Marine’s global network of more than 20 yards and offices, we have successfully delivered about half of the world’s newbuild jackup rigs and newbuild semisubmersibles in the last five years. We are focused on strengthening our core competencies to provide a wider range of solutions that will address the industry’s evolving needs. We will continue to invest in R&D and knowledge-building to foster multi-disciplinary technology competencies that can be fully leveraged to

create value for our customers. Keppel Offshore & Marine as a whole is supported by a capable, resilient and cohesive workforce comprising some 24,000 people across the world.

Mr. Merchant, could you expand on your own career within Keppel FELS and your present role in the company?

In addition to heading the Keppel Deepwater Technology Group, I am also a Director of the Keppel O&M Technology Centre as well as FloaTEC LLC, a 50-50 joint venture between Keppel FELS and J. Ray McDermott. My career and experience span almost two decades in the global offshore & marine industry in the areas relating to design and engineering. I started my career at Keppel FELS in 1993 after my post graduate studies in Naval Architecture at University College London and rose to the position of Technical Manager for Naval Architecture in 1996. From 1998 to 2001, I worked for American

Bureau of Shipping as a Principal Engineer in their London office. I was promoted to General Manager for Group Design & Engineering for Keppel Offshore & Marine in 2002. I hold an M.Sc in Naval Architecture from University College London and a B.Eng (First Class) in Naval Architecture & Ocean Engineering from the University of Glasgow.

Could you expand on your relationship with GustoMSC from the early starting dates?

Keppel has enjoyed a long and rewarding partnership with GustoMSC, bringing many robust solutions for the offshore industry to fruition. Our affiliation started in the early 1980’s, with the first GustoMSC-designed CJ50 jack-up drilling rig for Vietsovpetro. Keppel built and delivered the unit, then named Ekhabi (now West Larissa) in 1984. After the first CJ50, several other jack-up units from the CJ series have been built at our yard. Shortly after, in 1984, we

signed our joint venture agreement on the development of the DSS™ Series of semisubmersibles. The DSS™ Series of semisubmersible designs is jointly developed and owned by Keppel O&M’s technology arm, Deepwater Technology Group (DTG) and GustoMSC.

My first contacts were in connection with the development of the drilling semisubmersible for the Brazilian market back in 1997. Together with Gerrit Schepman, we marketed the unit with the innovative Vertical Riser Storage system. The vertical riser storage system in our DSS™ Series significantly increases useful deck space by about 40% as compared to conventional riser storage, and this can be used for other equipment. Utilising a very small footprint for the risers, the overall size of the deepwater semisubmersible is kept within practical limits. As it simplifies riser handling, tripping speed is enhanced, boosting the overall efficiency of the drilling campaign. It also reduces roll motion and improves the stability of the unit as the vertical centre of gravity of the risers is lower when stored on the lower deck than on the main deck.

The DSS™ Series was commercialised in 2001 when Maersk Drilling (then Maersk Contractors) ordered the DSS™ 20 to be built for operations in the Caspian Sea. The design was further improved in consultation with Maersk Drilling. In 2004, the enhanced design achieved a breakthrough to provide deepwater solutions in 3,000 metres water depth. Our R&D efforts paid off when more orders were received from Maersk Drilling for three DSS™ 21 units and from Transocean (then Global Santa Fe) for a DSS™ 51 rig. Incidentally, Transocean’s DSS™ 51 rig has successfully completed the drilling of the first relief well in the Gulf of Mexico blow-out crisis.

DSS™ 38, the latest model of the DSS™ Series was created with experience gained from constructing the aforementioned semis, and further feedback from their owners and operators. Orders for two such units have been placed in the last three years by Brazilian drilling contractor group Queiroz Galvão Óleo e Gás. To date, seven of eight of the DSS™ units on order have been delivered, all of them to the customer’s satisfaction. More recently,

DTG and GustoMSC joined hands to develop DrillDeep DS12000, a revolutionary compact drillship design for the ultra deepwater market; this design is more energy efficient and easier to maintain than its larger rivals in the market.

This compact drillship is configured to support high-efficiency drilling and smooth year-round operations at deepwater locations. It is capable of drilling down to 40,000 ft below the rotary table and operating at a water depth of 12,000 ft. It is also able to attain transit speeds as high as 14 knots. Equipped with an advanced dynamic positioning system (IMO DP3 class), DrillDeep DS12000 offers optimum motion characteristics and flexibility during operations.

What have you seen as the main push for the development of the yard?

- Excellent project management & execution – on time and within budget

Our firm resolve for strong project management and execution has ensured that the jobs in our substantial order book are delivered efficiently and with the highest quality, in spite of the heavy workload and crunch for skilled labour, equipment and resources. Keppel FELS in Singapore delivered 24 rigs across 24 months in 2008 and 2009. In 2009 alone, for the record-

breaking 13-rig deliveries, the company was awarded a total of \$22 million bonus for early deliveries of most of these newbuilds.

Our commitment to deliver projects on time and within budget is the reason why our customers continue to entrust us with their major projects time and again. When we say "Can-Do!", our customers know that they can consider the job done.

- Near market, near customer – over 20 yards around the world
- Focusing on customers and having a keen awareness of their markets and operating environments have helped to keep us ahead of the game in the highly competitive global oil and gas industry. We pursue our Near Market, Near Customer strategy through a network of over 20 yards in key markets around the world. Our presence on the doorsteps of our key customers and their markets continues to put us in prime position to capture arising opportunities.

- Technology innovation
- A vital combination of rich shipyard experience and strong design and engineering capabilities continues to propel Keppel FELS as the industry’s preferred rig solutions provider.



Maersk Deliverer



Development Driller III

Our core competencies are reinforced by constant innovation and R&D into new technologies and processes, allowing us to conceive and bring viable solutions to the market promptly.

Our proprietary rig solutions are developed and refined with input from trendsetting operators and drillers. We have the in-house expertise and flexibility to further adapt these solutions to address advancements in technology and the challenges of various operating environments. Having our own proprietary rig designs empowers us to customise solutions to suit the unique requirements of each client in the shortest time possible. It also enables us to optimise our production processes to offer the best possible solution. This provides us with a huge competitive advantage in terms of responding to clients' needs, which are changing with the advancement of drilling technology.

How do you stay ahead of your competition in this technology driven market?

At Keppel O&M, we are guided by a systematic approach to R&D. In pursuing new concepts and products, we consider their commercial viability, customer needs, as well as how we can grow our knowledge pool and achieve process improvements.

Our strategy, spearheaded by four divisions, provides a balanced approach towards technology leadership in our chosen business segments that will sustain us in the long run.

- Keppel O&M Technology Centre (KOMtech) focuses on developing offshore and marine competencies and conducting R&D into new technologies and processes
- Offshore Technology Development (OTD) specialises in jackup rigs and their critical components
- Deepwater Technology Group (DTG) specialises in semisubmersibles and other floating structures
- Marine Technology Development (MTD) specialises in Offshore Support Vessels and tugboats.

All our proprietary solutions have been developed with strong input from our customers, because our technology innovation must ultimately create value for them.

Can you elaborate on potential new directions or technologies? In which market segment do you foresee the new technologies being developed?

As the search for oil and gas moves into deeper waters and harsher frontiers, new technologies will be required to support E&P efforts. We see

growth prospects for new technologies emerging in areas/regions such as Brazil, the Caspian Sea, China and West Africa, as well as in specialised markets related to sustainable development.

Other opportunities include developing new and improved solutions to meet the stringent safety requirements in the Gulf of Mexico, and providing customised vessels for the offshore wind industry.

It will take a measure of flexibility to tap into these opportunities moving forward.

Are you looking for joint developments or is the company's strategy to develop under its own power?

Keppel O&M has formed strategic alliances with various industry partners, designers, operators and universities to develop new products as well as undertake research and engineering projects. The Keppel DTG-GustoMSC alliance is a prime example.

We are always on the lookout for good opportunities to collaborate with like-minded partners to enhance our competencies and develop new capabilities and solutions.

Looking into the near future, what do you see as Keppel's focus?

The long term fundamentals of the offshore and marine industry remain sound, underpinned by continuous world population growth and declining global oil reserves. Oil and gas will continue to be the dominant energy source in the foreseeable future.

To sustain growth in the longer term, we are fortifying our core competencies to provide a wider range of solutions that will address the industry's evolving needs. We will also continue to emphasise R&D and knowledge-building to foster multi-disciplinary technology competencies that can be fully leveraged to create value for our customers.

Petrobras testing FLNG

By Danny Admiraal



The energy industry is interested in the offshore gas market and LNG, and rightly so. In many regions like Australia and Brazil, LNG is a hot topic. Although onshore LNG liquefaction facilities and offshore oil and gas FPSOs have both been successfully proven in operation, combining the two technologies into an LNG FPSO (or FLNG) poses new technical challenges.

Planned for operations in the pre-salt fields of the Santos Basin, the FLNG concept to be developed for Petrobras will have to be able to handle the associated gas that will be produced by the oil and gas production FPSOs. Eight Petrobras-owned FPSOs will be deployed for this development; the construction of the hulls is scheduled to start early 2011, whilst the tenders for the topsides will be launched in 2011.

The FLNG will process and liquefy natural gas, butane, propane and condensate with a processing capacity of up to 14 million cubic meters per day of associated gas. The processed products will be offloaded to the LNG and LPG transport vessels. The tandem LNG/LPG offloading will utilise SBM Offshore's CoolHose which has been specifically developed over the last years for LNG service offshore. The FLNG will be an important source of gas for the Brazilian market; at the same time it will make possible export of processed products, especially LNG, during periods of low domestic demand.

Physically challenging

Important aspects of an LNG FPSO are space constraints and the location of operations. On board an LNG FPSO, the physical hull dimensions must be optimized with the layout of the topside configuration. A safe, constructible, operable and maintainable topside is essential. Other technical challenges include the large size of process equipment, topsides integration and the vessel's performance under motion.

SBM Offshore N.V. (SBM) and Chiyoda Corporation have been awarded the contract for Front End Engineering Design (FEED) and will execute the work jointly during the course of 2010. The scope of work for this FEED is being carried out in three execution centers: SBM-Monaco is performing the scope related to turret mooring and offloading systems. GustoMSC is performing the scope related to hull and marine systems and some topsides modules. Chiyoda-Yokohama is performing the scope related to the topsides (LNG process facilities).

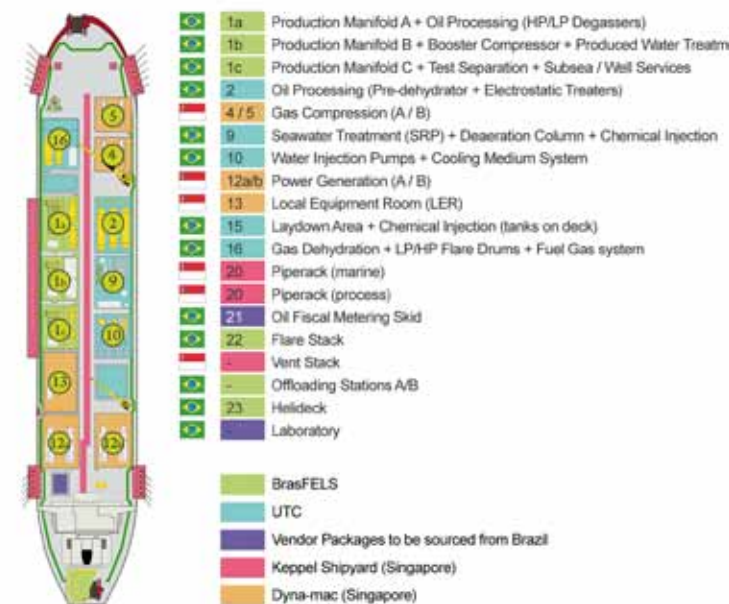
Besides the three execution centers, the classification society (ABS) and shipyard are already providing their input to the FEED. SBM Offshore will bring its experience of the design and operations of the Sanha LPG FPSO and Nkossa II LPG FSO to the table. The environmental conditions considered for the FLNG FEED will require the use of tandem LNG offloading, for which SBM Offshore will be able to offer its specialized and proprietary technology.

It is all a very large job, one for which we might well give our sincere best wishes for success.

FPSO P-57

By Jan van den Boomgaard

The P-57, the first turnkey FPSO to be supplied by SBM Offshore to Petrobras, will initially be moored in the Jubarte Field in Espírito Santo State in Brazil. An existing tanker provided the basis for its conversion into an FPSO. Production capacity will allow it to handle 180,000 bopd, delivered through 15 wells each boosted by electro-submersible pumps drawing power from the FPSO. Gas compression facilities will handle 71 MMScfd. The 360,000 bwpd water injection facilities using sulphate-reduced seawater and reinjected production water are among the largest in the SBM fleet to date. Installed electrical power is over 100 MW. For the first years of operation, SBM will be at the helm.



P-57 FPSO project is developing into a very interesting project for all stakeholders: SBM Offshore's first Turnkey project for Petrobras, all five SBM offices involved, four yards executing work, and final integration at the BrasFELS shipyard in Angra dos Reis.

As part of the SBM project team, GustoMSC was responsible for the engineering and procurement of Topsides and Vessel.

The project has successfully completed the 1st phase of construction with the refurbishment work on the existing VLCC M/V 'Island Accord' in Singapore, and the integration of five new-built process modules and the piperack. These comprise two Power Generation modules (12a and 12b), two Gas Compression modules (4 and 5) and the Local Equipment Room with all electrical equipment (13). These modules have all been commissioned in Singapore, eliminating the need for work to be carried over into the next construction phase in Brazil.

In Singapore, the project involved fabrication partners who have a long history of working with SBM Offshore. This business model excels thanks to the mature alignment between design and purchasing carried out in the Schiedam office and construction management in Singapore by the SBM team. The result is an efficient execution and high end result for the client PNBV. Turn-around time has been optimised by utilising core competences of the cooperating partners, whilst the quality has been ensured by incorporating the lessons learned from previous projects executed with the same partners.

The refurbished tanker, "Island Accord", was commissioned at Keppel Shipyard and proved itself as a reliable foundation during its 8,900 nautical mile sail to Brazil. The transit voyage of the partly converted FPSO was made under its own power to its destination, the Brasfels offshore yard in Angra dos Reis, located some two hundred miles South of Rio de Janeiro City.

One of the unique aspects of this project is the 65% local content; a first for SBM and Petrobras for a contractor-supplied unit.

This new and unique business model will be a benchmark for future FPSO projects in Brazil (and probably not only for FPSOs but also for other projects such as the 28 drilling rig program). To achieve the amount of local content, the project team needs to have the flexibility to attract new business partners, and adapt its working methods to suit the Brazilian culture and customs, blending those with our best practices. By aligning ourselves with the way of working of these new business partners in Brazil, SBM Offshore has succeeded as the industry's first overseas company executing an FPSO project in Brazil for PNBV as the end client.

Five modules have been constructed and commissioned at the UTC yard located in Niterói. These comprised oil processing (2), sea water treatment / SRP (9), water injection (10), laydown module (15) and flare knockout drums (16). These modules have been loaded out on barges and were towed over sea to Brasfels offshore yard. The three production manifold modules (1a, 1b and 1c), the Flare tower and the Helideck were constructed at Brasfels.

P-57 FPSO is equipped with a double Compact Offload and Mooring System, GustoMSC's latest development comprising a highly efficient reeling system designed to handle both the floating cargo offloading hose as well as mooring the shuttle tanker. These systems are located on the bow and on the stern of the FPSO. Being small in size, this system proved to be superior in terms of footage and weight, saving valuable deck space on the FPSO. This Compact Offloading System is also fabricated in Brazil; in Enaval the project found a reliable partner to contribute to the Local Content requirement.

Lifting the modules on board of the P-57 FPSO transformed the VLCC into an FPSO in a very short time. Lifting the 100m tall flare tower within the geometrical constraints has been recognized as a first class technical and operational achievement, using the only capable shearleg in Brazil, Dutch Taklift 4.

Before year end 2010, Petrobras P-57 FPSO will start producing its oil. This milestone will be another example of the realisation of a successful project, demonstrating the ability to execute projects in new regions with new partners to the benefit of its clients.





As of 2013 this converted VLCC will be functioning as FPSO in the Tupi Nordeste area off the coast of Brazil. Keppel Shipyard in Singapore saw conversion work start early August 2010. After refurbishment and conversion and installation of a few topsides modules, the vessel will sail under its own power to Brazil to be fitted with the topsides modules being constructed locally. After integration of these modules, the FPSO will be towed to her final location where it will operate for 20 years without drydocking.

FPSO Cidade de Paraty

By Matthieu Ubas

In May 2010, SBM and Queiroz Galvão Óleo e Gás S.A. (QGOG), a Brazilian O&G Company, received the Letter of Intent from an affiliate of Petrobras, the Operator of the BM-S-11 Consortium (whose partners are in turn affiliates of BG Group and Galp Energia), for a 20 year lease of the FPSO Cidade de Paraty to develop the Tupi Nordeste area. The FPSO is expected to be ready for production in the course of 2013. The project scope of this Contract comprises the engineering, procurement, construction, installation and startup of the FPSO.

The FPSO Cidade de Paraty will be an ABS-classed conversion of the MT Theseus, a Very Large Crude Carrier constructed by Hyundai Heavy Industries in 1988. Conversion works started at Keppel Shipyard in Singapore at the beginning of August 2010. After refurbishment and conversion and installation of a few topsides modules, the vessel will sail under its own power to Brazil to be fitted with the topsides modules that are being constructed in Brazil. After integration of those modules, the FPSO will be towed to her final location where it will operate for 20 years without drydocking.

The FPSO will be spread-moored in 2,100 m water depth in the Santos Basin, approximately 300 km offshore Rio de Janeiro. Some 13 km of chain and 72 km polyester rope will be used to keep the FPSO on station, even in sea states equivalent to a 100-year storm. The FPSO's topsides facilities weigh in at approximately 13,000 t, distributed over 16 modules and deck structures, most of which will be constructed locally in Brazil.

One distinguishing feature of the development plan is to reinject the CO₂ produced with the reservoir fluids. This has a dual objective: 1) to address the issue of CO₂ disposal; 2) to enhance oil recovery. As the injected CO₂ "sweeps" the reservoir, it is anticipated that the amount of CO₂ in the produced gas will eventually increase. This increasing CO₂ content of the gas, combined with the very high injection pressure of 550 bar, results in some interesting engineering challenges for the FPSO's gas treatment and compression plant.

"Dry" processes such as membranes and molecular sieves are used in the gas treatment plant, in lieu of the glycol and amine based processes typically used offshore. The preference for these dry processes, as typically used in LNG facilities, allows SBM and Petrobras the opportunity to gain experience in marinizing these technologies for future applications such as those reported elsewhere in this edition.

Engineering commenced ahead of the award of the project, allowing a quick sourcing of long lead items. The engineering and procurement activities are on schedule to support the ongoing activities in Singapore, and to allow a timely start of module fabrication.

Production particulars for FPSO Cidade de Paraty:

Gross Liquids Production	150,000 bpd (24,000 m ³ /d)
Oil Production	120,000 bpd (19,100 m ³ /d), 28oAPI
Gas Treatment Capacity	177 MMscfd (5 million Sm ³ /d)
Secondary Recovery	
Water Injection	150,000 bpd (24,000 m ³ /d) at 250 bar
CO ₂ & Gas Injection	145 MMscfd (4.1 million Sm ³ /d) at 550 bar



ARB-3 heads out

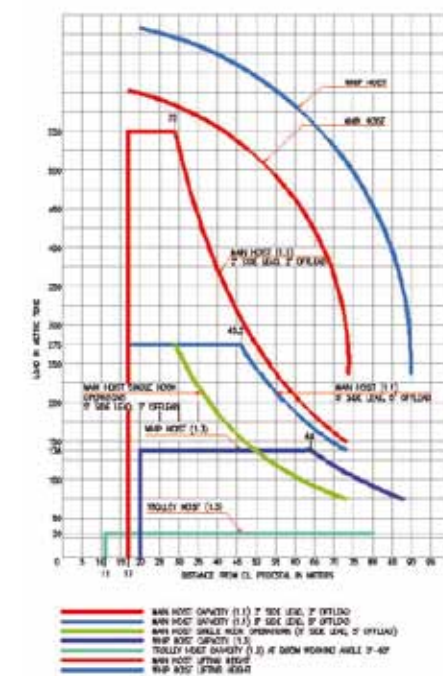
By Ben Leuvekamp

The ARB-3 heavy-lift jack-up barge was handed over to Aramco Overseas by Jurong Shipyard in Singapore Autumn, 2010. Year end will see it start operations in the Arabian Gulf as the new flagship of Saudi Aramco. Its story so far makes for a little interesting reading.

GustoMSC has a longstanding relationship with Saudi Aramco dating back to the early 1980s with the delivery of the design and jacking system for the ARB-2 and Arabiyah I, II and III. At the start of the GustoMSC alliance in 2003, Saudi Aramco requested GustoMSC to carry out design studies for a self-propelled installation and maintenance vessel. This was followed in 2006 with the design of a heavy-lift jack-up barge. Based on their wide experience with offshore maintenance in their fields, Saudi Aramco provided the design specifications for this barge. Operations would focus around the 550 ton heavy-lift offshore crane, the pipeline repair equipment and variable load capacity of 2,500 tons. The barge is designed to operate in the Arabian Gulf in water depths of between 5 and 60 meters. Besides the design of the jack-up and various associated studies, GustoMSC provided the rack and pinion jacking system and heavy-lift offshore crane.

To create an efficient layout for both heavy-lift crane operations and the pipeline installation equipment, the 550 ton crane has been located on the centerline just aft of the deckhouse. The distance was kept as small as possible to allow an unobstructed tail swing. In this position of the crane, the full free deck area can be overseen and no heavy lifts swing threateningly over the accommodation deckhouse. Four knuckle boom cranes of 30 ton capacity each were also provided, and situated on the top of the jacking structures. Six pipeline davits of 50 ton capacity with a 3 meter outreach were installed on the starboard side. In floating condition the barge will carry out pipeline repair operations, while moored by a four-point 2½ inch wire system. Within this mooring spread, the barge can be easily relocated over a distance of

Jacking trials



Capacity graphs

200 meters. Accommodation has been provided for a complement of 119. Galley, mess rooms and main conference room are in the barge hull. The five-story deckhouse provides the accommodation cabins, changing rooms and general office space.

Saudi Aramco signed the construction contract with Jurong Shipyard in December 2006. Subsequently, Jurong ordered the rack and pinion system GLL-80/6 and heavy-lift crane GCC-550-ED from GustoMSC. This crane combines high capacity with high outreach and an extremely short minimum radius. The capacity graphs are shown above. The crane is electrically driven to obtain maximum flexibility. The main hoist is split into two blocks of 275 tons each, offering both combined and separate operations. Load tests were carried out at the Jurong Shipyard in August 2010 and witnessed by the client and the classification society.

The GustoMSC rack and pinion jacking system is driven by electric motors with individual variable speed drives. These drives allow stepless speed control between zero and maximum and distribute the individual loads equally over the drive units. This smooth operation allows the jack operator to raise or lower the jack-up in a very controlled manner. All systems demonstrated their capabilities during the successful jacking trials.

Main dimensions/capacities

Hull (L x B x D)	110 m x 42.5 m x 9 m
Leg length	95.3 m
Variable load	2,500 t
Crane	550 t @ 29 m

Gulf Marine Services is currently one of the largest operators of company owned jack-up barges and offshore supply and anchor handling vessels in the region. GMS aims to become the operator of choice for oilfield clients, focusing on offshore well maintenance, construction and accommodation.



GMS Endurance sets to work in the Arabian Gulf

By Paul Groote Woortmann

When GMS met up with GustoMSC, they were impressed by the general capabilities of the NG-2500X class of units. Its present fleet of jack-ups cannot operate in deeper water as the NG-2500X can, important with the oil and gas maintenance and construction market tending towards deeper water, as in Qatar. Discussions with GustoMSC started end-2007 and led to signing a license agreement for two units in February 2008. GMS' design requirements focused on accommodation (enhanced to 150 POB), location of the 280 ton crane and the variable load of 1,000 tons.

After finalising the basic design by GustoMSC, GMS started to organise construction. The hulls of the units were subcontracted to the Chinese Sainty Marine Corporation, and the keel for the Endurance was laid in October 2008. The hull of the Endurance was ready by May 2009 and the hull of Endeavour by October 2009. Both were towed to Abu Dhabi for completion of decks, topsides, equipment, legs and jacking structures at GMS' own yard in Mussaffah.

GustoMSC delivered the rack and pinion systems, model GLL-50/6, for the two vessels. The GustoMSC jacking systems are driven by electric motors with individual variable speed drives. Stepless speed control from zero to maximum is one of their great features. Jacking trials of the GMS Endurance were completed August 20, 2010 to the full satisfaction of classification society ABS.

The GMS Endurance and Endeavour are both GustoMSC NG-2500X class units. Two other NG-2500X class units, the Seajacks Kraken and Leviathan, currently operational in the North Sea, are involved in the installation of the wind turbines for the Greater Gabbard and Walney projects. The fifth unit is under construction for and by NPCC in Abu Dhabi and will be designated SEP-450.

The GMS units of the NG-2500X class are highly versatile jack-up vessels. To operate in water depths of up to 60 m, the vessels are provided with truss work legs with a maximum leg length of 94.5 m to handle conditions in the Arabian Gulf. With the 0.8 m/min fast jacking systems, the unit can quickly be elevated to its required air gap. As the vessels are equipped with four azimuthing thrusters each of 1,200 kW, the sailing speed is about 8 knots.

Arriving at the offshore site, the DP2 Dynamic Positioning system enables the vessel to position accurately without tugboat assistance. The vessel can maintain its position in 1.5 m high significant waves, a 2 knot current and 10 knot wind with the four legs lowered. After the preloading operation (the four legs diagonal preloading will reduce time), the unit will be elevated to the required air gap and is then ready for the intended operations.



GMS Endurance and Endeavour will focus on all types of offshore well maintenance, construction and accommodation. Provided with single, double and four berth cabins, the accommodation is of a high standard for a total of 150, enabling many installation and maintenance jobs to be carried out. With the 280 ton main crane, the vessel can perform heavy-lift operations for a large variety of installation and construction jobs. As of today GMS Endurance and GMS Endeavour will be making some major contributions to offshore activities in the Arabian Gulf, and that for the coming years.



GustoMSC is proud to be one of the world's leading designers of wind turbine Installation systems. Many of the company's units or vessels are in different stages of construction, outfitting and commissioning, or have recently started operations. We take a look at the key facilitators in the renewable energy market, specifically offshore, and GustoMSC's contributions.



Wind Lift I



NG-9000C

Construction Jack-ups and Wind Turbine Installation Vessels are conquering more than the North Sea

By Paul Groote Woortmann and Andries Hofman

Renewable energy is very much today's news. Contributions of wind energy to energy consumption is growing. All around the world wind farms large and small can be seen, some extending to the horizon. For GustoMSC however, it is the offshore versions that are the most interesting and challenging.

Reference can be made to public discussions for the development of the so called Round 3 programme in the UK. In 5 to 10 years, over 30 GW of capacity is to be installed offshore, to involve wind turbines, transformer stations, field grid and major power lines and connections to relevant infrastructure onshore. The learning curve has been steep, the full supply chain should shortly mature into a fully fledged industrial process.

Readers may recall that the MPI Resolution was the first dedicated new-build Wind Turbine Installation vessel in 2003. GustoMSC delivered the double acting hydraulic jacking system and

prepared all necessary design and class documentation for the vessel. MPI continued their successful line and has since contacted GustoMSC for the next generation. The new vessels are slightly bigger and will boast a number of enhancements including a larger crane (1,000 t), more accommodation (112), greater payload (6,000 t), enhanced jacking system and DP2 positioning capability.

In 2008 Vroon signed construction contracts for two units to be operated by MPI Offshore. At the end of 2009, the keel laying of the MPI Adventure took place at the Cosco Nantong Shipyard in China, and May 2010 saw the laying of the keel of the MPI Discovery. The launching ceremony of the MPI Adventure was held on August 27, when the vessel was skidded down the build pad onto a purpose-built delivery barge. GustoMSC had to keep up the same breakneck pace for the turnkey delivery of the 1,000 ton crane and hydraulic jacking systems. Construction of the main parts of the crane is taking shape, and the winch

house, boom and pedestal are nearing completion. The first crane will be installed by the fourth quarter of 2010. Delivery of the first vessel, MPI Adventure, is scheduled for the first quarter of 2011 and the second, MPI Discoverer, for the third quarter of 2011.

The next pitch in the construction game is the series of four NG-9000C units and one NG-5500C unit. In December 2009, Drydocks World South East Asia announced the building of the first NG-9000C Wind Turbine Installation vessel. GustoMSC and Drydocks World SEA have a longstanding relationship; a total of five CJ46-X-100D drilling jack-ups, one AJ46-X-100D accommodation jack-up, seven SEA series construction jack-ups and two Master Marine units have been built or are under construction at this yard.

In June, Seajacks International entered into an agreement with Lamprell Energy Ltd. in Dubai to construct the Seajacks Zaratan, a GustoMSC NG-5500C type; an option for a second unit of this type was also announced. The first two Seajacks units, the Kraken and Leviathan, are both GustoMSC NG-2500X type units, and GustoMSC also delivered the enhanced rack and pinion jacking system based on variable speed drive transmission. Both vessels are presently installing wind turbines in the North Sea.

A2SEA, the leading Wind Turbine Installation company, selected the GustoMSC NG-9000C as their preferred solution. In July 2010, A2SEA signed a contract with Cosco Shipyard Co. for the construction of the new WTI vessel Sea Installer. A landmark for the NG-9000C type of vessels.

The four NG-9000C and NG-5500C units are all scheduled for delivery in the first and second quarters of 2012. This will be a major challenge, as we have signed fabrication contracts for the five 800 ton "wrap around leg" cranes and the new enhanced continuous jacking systems.

GustoMSC recently signed a design contract with Inwind, a Stavanger based company, for the proposed new-build jack-up vessel Inwind Installer. Model tests were completed for motion, resistance and DP capability in August 2010. Inwind is aiming at installing large wind turbines as well as a large range of foundations and smaller substructures. The self-propelled DP2 jack-up vessel is designed for the harsher environment in North Sea water depths of up to 65 meters. Model tests proved that the triangular

shape of the three-legged jack-up makes possible a transit speed of about 10 knots. The Inwind Installer will be equipped with two main cranes. The 1,200 ton "wrap around leg" crane will have a smart lift-off function for lifting heavy loads from floating barges. The second crane is a 500 ton pedestal-mounted unit. The cranes can be deployed in tandem for handling larger loads.

All these GustoMSC units, either operational or under construction, represent a major contribution to the wind turbine installation market. As these units will primarily operate in European waters, additional new equipment will be needed for other offshore wind farm projects in the USA, China and elsewhere. Quite a number of projects are under development in the USA for which federal grants have been provided. For sure Wind Turbine Installation vessels will be busy these coming years.



MPI Adventure

Main characteristics of Wind Turbine Installation vessels

GustoMSC	SEA2000	NG-2500X	NG-5300	NG-5500	NG-7500/6	NG-9000	CJ50	NG-10000X3
design							jacking technology	
Unit	Sea Worker	Seajacks	Wind Lift I	Seajacks	MPI Adventure	DD L208	Haven	Inwind Installer
	Goliath	Kraken		Zaratan	MPI Discovery	Brave Tern	Nora	
	JB-114	Leviathan				Bold Tern		
	JB-115					Sea Installer		
Hull length	55.5 m	61.0 m	93.0 m	81.0 m	137.0 m	130.8 m	111.8 m	99.4 m
Hull width	32.2 m	36 m	36.0 m	41.0 m	40.8 m	39.0 m	50 m	68.0 m
Leg length	73.2 m	84.8 m	71.0 m	85.0 m	71.5 m	81.5 m	130 m	115 m
Water depth	40 m	52 m	45 m	45 m	40 m	45 m	90 m	65 m
Crane	6,000 tm	300 t	500 t	800 t	1,000 t	800 t	2 * 750 t	800 t
Variable load	1,300 t	1,300 t	2,000 t	3,000 t	6,000 t	6,500 t	8,000 t	4,500 t

The Oleg Strashnov: Largest Crane Vessel ever built in the Netherlands - nearing completion

By Henri Stallenberg and Alain Wassink

The Oleg Strashnov, with its huge 5,000 ton derrick crane, is one of the largest monohull heavy lift vessels in the world. It is also unique, with an innovative hull design and unique patented dual draft concept. The vessel at transit draft (8.5 m) has been designed for lifts of smaller modules, piling operations and transits at a speed of 14 knots. At the operational draft of 13.5 m, and with stability further raised by the incorporation of hull extensions, loads up to 5,000 tons can be lifted.

The hull construction

Seaway Heavy Lifting and GustoMSC worked intensively together at the design stage of the vessel to develop the vessel design. Construction started at the IHC Merwede yard in Krimpen aan den IJssel, and the launch ceremony was in October 2009. After a couple of months (May 2010), the vessel left the shipyard for its outfitting location in the Waalhaven (Rotterdam). From the shipyard to this location the vessel successfully passed under several bridges, with just a couple of meters leeway in terms of both width and height.



The GustoMSC crane's main components have been installed (Slewing Platform, A-Frame and Boom) at the Waalhaven location and final outfitting and commissioning is currently underway.

The 5,000 ton crane

GustoMSC has been selected by Seaway Heavy Lifting to deliver the 5,000 ton crane. The construction and manufacturing of the crane took place at different locations. The slewing platform and tub were fabricated in China and arrived at the construction site near our office in July 2009, and this is where the outfitting of the slewing platform was completed. The slewing platform was installed onto the vessel on May 22nd, 2010. Subsequently, the A-frame and boom (subcontracted to Hollandia in the Netherlands) were installed in July 2010. With the full A-frame erected and the boom installed, the reeving of the 18 km of steel wire ropes could start. Commissioning of the different systems has also started in the meantime.



Final testing and commissioning

By September 2010 the vessel had been moved to its third location in the port of Rotterdam. Sufficient water depth was needed for all final commissioning and testing activities of both the main crane and the thruster systems, so the Maasvlakte - with its 25 m water depth - was selected. This location is where the crane trials with the 5,000 ton test load at the 13.5 m operational draft will take place.

First contract

Seaway Heavy Lifting has signed a contract with Shell for the decommissioning of six platforms in the UK Indefatigable field. This first contract could prove the versatility of the new vessel, undoubtedly leading to further contracts.



How will the Arctic open up?

By Robbert Kant, Cees Wallenburg and Alain Wassink

The Arctic is one of the last frontiers in offshore oil and gas development. The challenges faced by the industry in this area are enormous: extreme low temperatures, harsh environmental conditions, a vulnerable ecosystem, high ice loads and some complex political challenges to name but a few all lie ahead. GustoMSC is working on a development program for Arctic designs encompassing in-house R&D, participation in various joint industry projects and working directly with clients. A glimpse of current status!

Today the industry has revived their interest in the Arctic. The first offshore exploration of the Arctic started as early as in the 1960's. To date, field developments have been comparatively small, but the need to replace reserves has resulted in a renewed interest. All Arctic offshore provinces, from the US and Canada (Chukchi and Beaufort Seas) and Greenland to the Russian Arctic (Barents, Kara and Pechora Seas and Yamal) are today being studied for further development.

GustoMSC has been involved in ice-reinforced units such as the Canmar Explorer III and Pacnorse drilling vessels from the early days of Arctic exploration. The Pacnorse, renamed Frontier Phoenix, was substantially upgraded in 2007. The Valentin Shashin (now Deep Venture), Viktor Muravlenko (now Noble Muravlenko) and Mikail Mirchink (now Peregrine I) drillships and the Kolskaya and Sakhalinskaya (now West Janus) drilling jack-ups were built to GustoMSC design specifically for operations in the Arctic region. Today the most recent examples are the GustoMSC designed drilling vessels Bully I and II, which have been designed to operate in Arctic regions.

As part of our ongoing research and development programs the following Arctic drilling units are being developed:

- **Arctic cantilever jack-up CJ70-50-A**
Exploration drilling in severe ice conditions with a jack-up is feasible in up to 50 m of water depth. The three main structural components of the design are the drilling jack-up, the drilling caisson and the drilling caisson foundation. The jack-up is a winterized cantilever drilling unit with large diameter, steel circular legs. Unlike the more common lattice structure legs, the circular legs can resist the high local ice



load. The hull is designed to resist ice loading during tow, which enables the unit to move to and off location in icy conditions. The drilling caisson is to protect the drill string from ice load, and it provides an additional barrier against oil spill. A self-installing foundation, similar to the large sized spud-cans used on jack-up legs, supports the caisson on the seabed. The caisson foundation also protects the subsea shut-off device from damage by ice ridge keels. The jack-up is intended for year round operations in ice conditions up to a specified maximum thickness.

- **OCEAN850 Arctic drilling semi-submersible**, suitable for drilling operations in up to 5,000 ft water depth with a 9,000 mt variable load. The semi-submersible is winterized and provides enclosed work decks inside and on top of the deckbox structure. A large enclosed moonpool is located in the center of

the deckbox to provide good access and working space below the drillfloor. A riser protection dome is connected to the underside of the deckbox, in way of the moonpool in order to protect the riser against ice loads. Furthermore this unit is equipped with a thruster assisted mooring system for efficient station keeping. The columns and pontoons are reinforced for ice loads and the pontoons are equipped with wave and ice deflectors. The semi-submersible is intended for operational conditions with ice management.



- **NanuQ 5000 drillship**, suitable for year-round operations in the Arctic in shallow to deep water of 5,000 ft and upwards. With a 15,000 mt or higher variable load, the vessel has a high autonomy when working in remote Arctic areas. The vessel can be either turret moored or dynamically positioned and will be of high ice class, allowing the vessel to operate in and transit through all Arctic areas. The vessel is fully winterized, with all working areas entirely enclosed to protect crew and equipment, with the moonpool protected by the vessel's hull. Thorough attention has been given to on-board logistics and mechanical handling inside the enclosed working areas. A full range of environmental protection measures, reducing both emissions and discharges, is being implemented to protect the Arctic environment. The vessel is intended for operational conditions with ice management.

With these designs GustoMSC is ready for discussions with the operators and contractors on their preferred solutions for drilling in the Arctic.



Joint Industry Project Grouted Connections

By Cees Wallenburg

Grouted connections in offshore applications are made by filling and bonding the annulus between two pipes with a pumpable, cement based slurry. Earlier this year, GustoMSC participated in a joint industry project (JIP) intended to improve the knowledge of these very important animals. The first phase of the JIP has been concluded, and will result in updated guidelines for grouted connection design (DNV OS-J-101). Here a short overview and promise for the future.

Grouted connections have a long tradition in the construction of jacket structures, where these connections are used to transfer loads from the jacket legs to the foundation piles. Grouted connections have also been used by GustoMSC for the Siri and Yme production platforms, where the caisson and legs are grouted to the substructure. The grouted connections allow for some misalignment and are easy to establish offshore and subsea.

The JIP was initiated by DNV and supported by offshore companies, contractors and grout suppliers. The scope of work included static and dynamic testing and extensive finite element analysis. The test program has resulted in a better understanding of the interaction between axial loads and moments on the joints, as well as the effect of slippage on the steel to grout interface. DNV is currently preparing a proposal for a second phase of the JIP.

Recent projects

- Basic design package and delivery of jacking system for a SEA-900, ordered by Dai Ichi Kensetsu Kiko.
- Basic design package and delivery of jacking system and main crane for an NG-5500C at Lamprell, ordered by Seajacks.
- Basic design package and delivery of jacking system and main crane for an NG-9000C at Cosco Shipyards, ordered by A2SEA.

Recent deliveries

Unit name	GustoMSC design	Builder	Owner	Date
Maersk Deliverer	DSS21	Keppel FELS	Maersk Drilling	May 2010
Haven	CJ50 jack up technology	Drydocks World	Master Marine	June 2010
Perro Negro 8	CJ46-X100D	Drydocks World	Saipem	August 2010
GMS Endurance	NG-2500X	GMS yard	GMS	September 2010
Naga 3	CJ46-X100D	Drydocks World	UMW Standard Drilling	September 2010
ARB-3	Jack up technology	Jurong	Saudi Aramco	October 2010
Lone Star	TDS2000	IMAC	Queiroz Galvão	October 2010
Deepwater Champion	P10,000	HHI	Transocean	November 2010

8 units to GustoMSC design delivered as of May 2010



Colophon

GustoMSC Inside is a publication of

- Gusto B.V.
- Gusto Projects B.V.
- GustoMSC Houston
- Marine Structure Consultants (MSC) B.V.

Total circulation: 3,500
 This publication is edition 16, November 2010
 Edited by Monique van der Have and
 Gerrit Jan Schepman

Design and production
 Stijlmeester, Utrecht (NL)

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