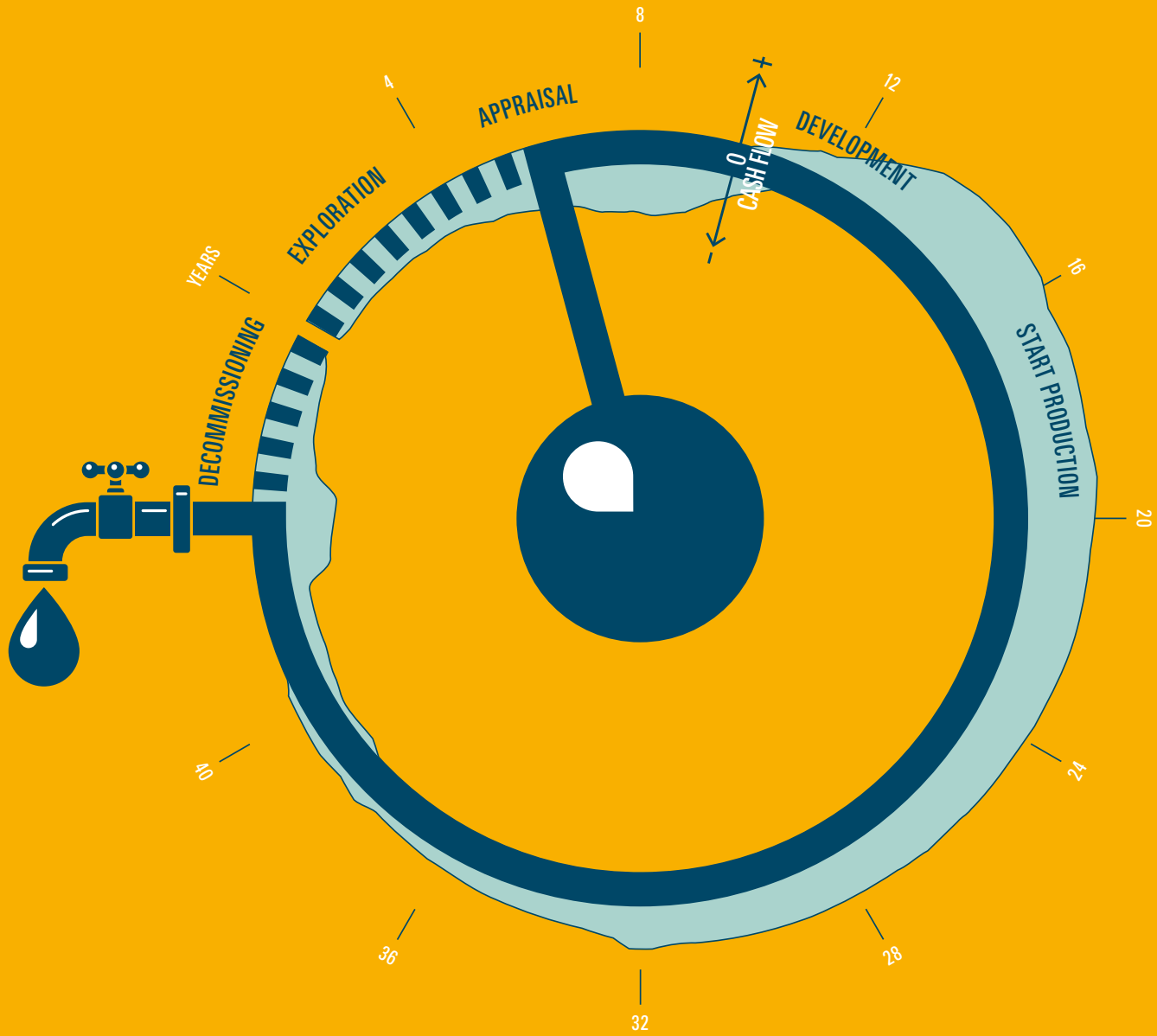


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COLOPHON

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PREFACE

MAINTAINING  
THE FLOW



The title of this edition of GustoMSC InSide is open for multiple interpretations and all of these concern challenges.

First and foremost it refers to the big challenge our industry faces; dealing with the present low oil prices. For the short term stabilized or even reduced production levels are expected, but for the longer term general consensus is that energy demand will again outbalance supply. The current situation causes exploration and development drilling to be at very low levels. Alternative and renewable energy sources are not expected to sufficiently supplement the supply side. As a result energy from (offshore) hydrocarbons will remain a main source for our societies' energy. Hence the flow – of oil – that needs to be maintained.

Maintenance of flow also refers to the tendency to further benefit from existing fields, at relatively low cost, by enhancing production. This more short term focus requires workover, maintenance and well intervention activities for which dedicated mobile offshore units are required. These activities cannot all be done efficiently by existing fleets, which provides opportunities for new builds, albeit a few. Inside magazine #24, which is in front of you, highlights some of GustoMSC's solutions for this market, like our NG-2500X and also our CJ43 jack-ups.

In the meantime the industry remains fully focused on cost reductions, apparently with success for the operators because well costs are coming down significantly.

That cost reduction is caused by use of the better quality rigs in the fleet and on average higher quality of the crews that remain during the industry's downturn. Also a stronger focus on standardization, e.g. GustoMSC's design series of mobile offshore units, and simplifying development and production programs is bearing fruit. This will cause the breakeven level for field developments to come down, which brings the anticipated upturn closer in time. The question however remains when exactly this will happen.

In the drilling market, and other markets, cost reductions can be further incentivized by reevaluating the day rate model that is being used at present. This model does not incentivize innovative solutions that may require a higher initial Capex, but, when also looking at Opex, will lead to higher efficiency, reduced amount of days required and as a result lower overall cost. It is in this field of new ways of thinking and innovative solutions where our clients are presently looking to differentiate themselves. And it is exactly where GustoMSC differentiates itself.

Which brings me to the last interpretation of flow that needs to be maintained: our continuous endeavor, flow if you wish, to improve and innovate our products and solutions. Innovation was the topic of our previous InSide magazine and in this present edition Shell's Vice President Wells Function Sjoerd Brouwer underlines again its importance. Relevant innovation is the result of good cooperation. Cooperation within

the industry, with our clients and business partners and also cooperation within our organization.

In order to enhance all these forms of cooperation we have moved to new offices, which provide us with more room to meet and interact. More room to receive you and to work together. I am really looking forward to welcoming you in our new home and even more so to cooperate on projects and on developing new solutions that will benefit your business as well as your clients' business.

**Nils van Nood**  
Managing Director GustoMSC



Courtesy: Mona Al Marzooqi / The National

## THE FIRST NG-1800X IS NAMED, OPERATIONAL AND ON CONTRACT

On April 22, 2015 a name giving ceremony took place at the facilities of Gulf Marine Services (GMS) located at Mussafah Base, Abu Dhabi, U.A.E. Their first S-Class, which is also the first GustoMSC NG-1800X, was named GMS Shamal. It is the first NG-1800X of in total three units under construction at GMS's own yard.

This project started with a challenge. GMS Technical Director Mr. John Petticrew and Technical Manager Mr. Bas de Blok requested GustoMSC for a smaller version of their E-Class (the NG-2500X design) and in the

shortest possible building time. This first of its kind in the world will bridge the gap between the existing K & P-class of GMS, currently operating in water depths of up to 45 m (147 ft) and equipped with a 36 or 45 t crane, and their E-Class harsh weather DP2 vessels suitable for worldwide operations in water depths of up to 65 m with 300 t and 400 t crane.

We started basic design work on the first two NG-1800Xs in June 2013. Construction of the GMS Shamal started in November 2013 and was planned to be ready in Q2 2015.

All within time and budget, the GMS Shamal was mobilized directly to its first job in the U.A.E. where the unit will work on a 5 year charter. GMS Shamal will be supporting well service work, with the day rate in line with the region for this class of vessel. The second vessel, GMS Scirocco, has also been under contract for one month. One more S-Class, GMS Sharqi, is currently under construction.

**Jan-Mark Meeuwisse**  
Sales Manager

## COLLABORATION AGREEMENT LEG-ENCIRCLING CRANES

On September 19, 2015 GustoMSC has signed a collaboration agreement with Nantong-based crane manufacturer Rainbow for leg-encircling cranes. These cranes are mounted on a jack-up around one of the legs of the unit and are generally used for installation and maintenance of wind turbines.

The agreement gives Rainbow the exclusive right to fabricate these cranes in China for which they will be the main contractor. GustoMSC's supply for these cranes will be the basic design together with associated key components, in alignment with the business model as used for the mobile offshore units. With the assistance of GustoMSC, Rainbow will market and sell the cranes in the local Chinese market where Rainbow will also promote



GustoMSC jack-up designs. For international marketing GustoMSC will remain in the lead.

The first order under this agreement is the delivery of a 1,000 t leg crane which is a further development of our successful series of 800

and 900 t leg cranes. Five of these cranes were delivered in the period 2011 – 2014. The unit is expected to be operational in Q2 2017.

**Arjo van Putten**  
Project Manager



## INTRODUCING THE CALLIRRHOE MOONPOOL TECHNOLOGY

Today's deepwater drillships are equipped with large moonpools for efficient drilling operations. In sailing conditions, these large moonpools cause more resistance, slower speeds and green water on deck due to sloshing water in the moonpool, compromising safety. GustoMSC has developed the Callirrhoe moonpool technology to remove these disadvantages. The Callirrhoe technology differs from existing technologies by being a fully-integrated solution, which does not contain underwater moving parts and protruding parts or add-ons inside the moonpool that could interfere with the drilling operations, such as closing doors or wave breakers. This has been achieved by changing the moonpool design in such a way that instead of trying to keep the flow out of

the moonpool, the flow is allowed to enter, but in such a way that it is also directed out of the moonpool without interruption so that sloshing is avoided. Extensive CFD analysis and tank testing have proven that this results in a significant reduction of the sloshing phenomena and resistance reductions of up to 24 %. GustoMSC obtained a patent for this innovative solution.

The Callirrhoe technology is available on GustoMSC designs. It was presented for the first time at this year's OTC Brasil by Sjoerd Hendriks in his paper 'Designing the rig of the future.'

**Sjoerd Hendriks**  
Design Manager

## SEAJACKS SCYLLA JACKING TRIALS COMPLETED

GustoMSC tested the VSD rack & pinion jacking system successfully. The largest wind turbine installation jack-up vessel in the world, the Seajacks Scylla, is currently under construction at Samsung in South Korea. The Scylla, a NG-14000X design, was launched from its dock last June and is nearing completion. The Seajacks Scylla's first customer will be Offshore WindForce, (a joint venture of Boskalis and Volker Wessels) in March 2016. The first load out of 67 mono piles at the base port of Eemshaven in the Netherlands is expected at the start of April 2016. While working on the 400 MW wind farm project Veja Mate, the Scylla will transport and install mono piles which are 85 m in length and exceed 1,300 t in weight.



Seajacks Scylla

Upon delivery from South Korea, Seajacks Scylla will be the world's largest and most advanced offshore wind farm installation vessel. Sailing at speeds of 12 knots or over, Scylla is outfitted with 105 m long legs that have the ability to install components in water depths of up to 65 m and survive storm conditions out in the field.

The Seajacks Scylla finished sea trials in October, and is expected to be delivered before the end of this year. The vessel will then be transported by a heavy lift transport vessel to North West Europe.

**Arjan van der Spek**  
Project Manager Equipment

Courtesy: Seajacks

9 – 12 NOVEMBER 2015

## ADIPEC ABU DHABI

Stand in IRO Holland Pavilion

1 – 3 MARCH 2016

## SPE/IADC DRILLING 2016 FT. WORTH, TEXAS

Stand no. 109

22 – 25 MARCH 2016

## OTC ASIA KUALA LUMPUR

Stand in Holland Pavilion

# 'THE NEED TO INNOVATE IS GREATER NOW THAN EVER'



**'BY COOPERATING MORE EFFICIENTLY, WE CAN BETTER ASSESS NEEDS, OPPORTUNITIES AS WELL AS RISKS AND THUS SUBSTANTIALLY REDUCE COSTS'**

**Sjoerd Brouwer**  
Vice President Wells Function,  
Shell Projects & Technology

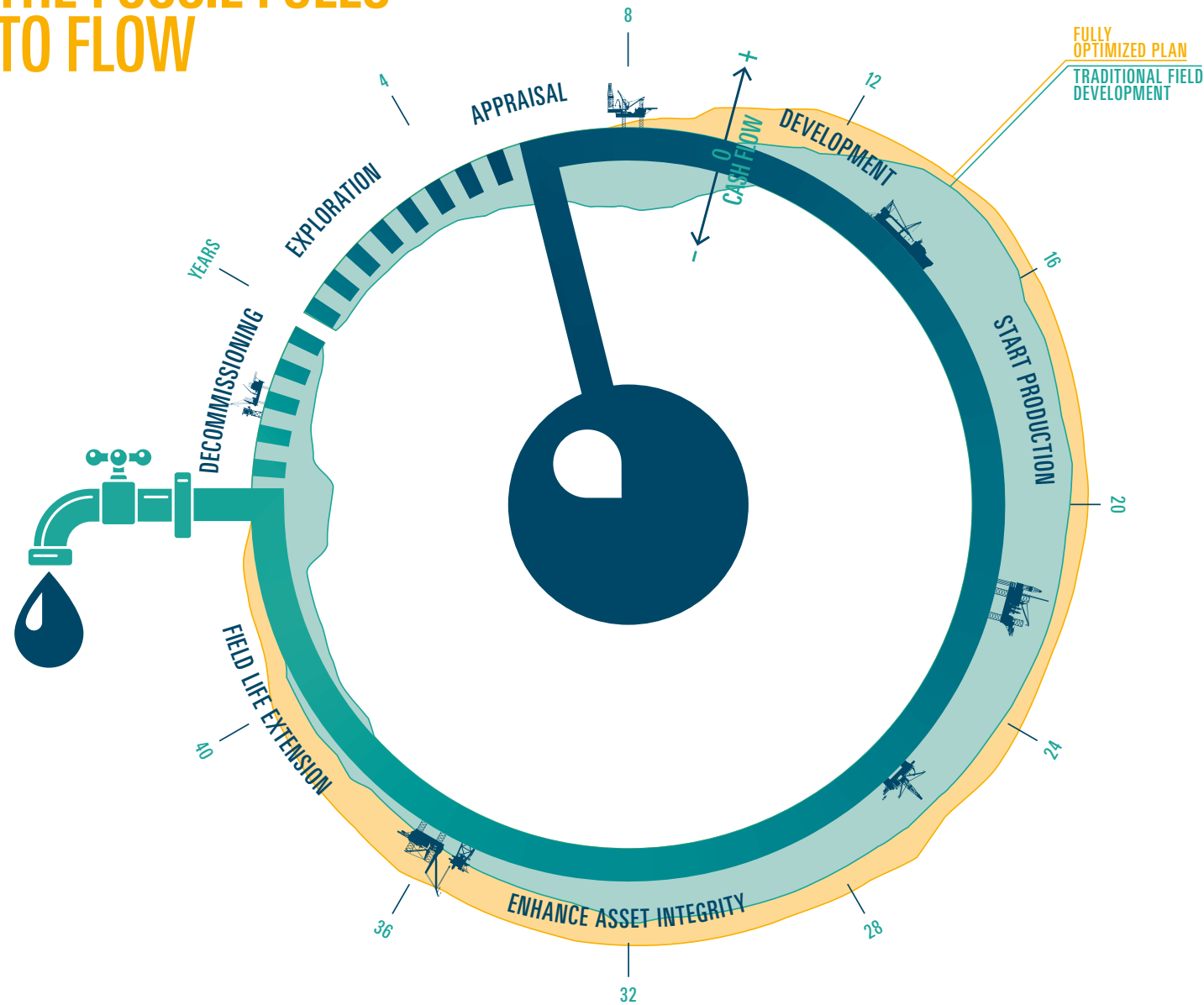
The oil and gas market is currently subject to weakening demand and oversupply. As a consequence, the oil price is low. Han Tiebout, Manager of Product Development at GustoMSC, asked Sjoerd Brouwer, Vice President Wells Function at Shell Projects & Technology, to share his personal views on these developments. Brouwer states: 'Costs for producing oil and gas will have to come down. We have to work together as an industry to be a force for good in society and keep it attractive for investors.'

We meet Brouwer in Amsterdam, where he is attending a Health, Safety & Environment (HSE) conference organized by the International Association of Drilling Contractors. Brouwer comments on the current state of the market: 'Like all companies in the oil and gas market, Shell has to adjust to lower prices for oil and gas. The price of oil and gas is nearly half of what it was a year ago.'

**Does fossil energy still have a future?**  
'Global energy demand is rising. And it will continue to rise. Meeting that demand will be a massive challenge. It is widely acknowledged that hydrocarbons will remain important in the energy mix for decades to come. So, the industry should not be blinded by low oil prices. However, we all know it won't be easy going forward. Rather the opposite.'

Pressures have increased for the oil and gas industry over the years with the threat of climate change and rising stakeholder expectations. These challenges are fair but become harder to tackle particularly in a low oil price environment. As an industry we need to become smarter going forward.'

# CAPACITATING THE FOSSIL FUELS TO FLOW



## An alternative could be renewables. How do you see the development of this energy source in the coming years?

'The current low level of energy prices puts – as can be expected – a strain on further development of renewables, which requires a lot of investment and which is not yet economical at current energy prices. Ideally, the transition to renewables has to come from within the market. And at this point, such is not the case and will require smarter incentives to motivate enterprises to invest more.'

## In your opinion, what would it take to extract more value from oil and gas projects?

'Being innovative will be essential. Not only in the field of developing new technologies, but also in the way we work. Our industry has many areas which all have a high level of specialization and expertise. Good mutual cooperation in these different fields of expertise is not always easy to achieve. Each part of the chain perfects itself. While this is good as such, it is not always very efficient for the chain as a whole.'

Consequently, better cooperation between areas of expertise and specialization is necessary. This way, we can better assess needs, opportunities as well as risks

and thus substantially reduce costs. At Shell, we call this 'competitive scoping', which means we integrate discipline contributions in the early phases of a project to create a competitive concept that has been built up from a minimum technical scope. It aims to avoid unnecessary functionality while all stakeholder and technical requirements can be met appropriately. For example in the Appomattox development in the Gulf of Mexico we have managed to achieve a cost reduction of 20% by using this approach.'

## You already indicated that technological innovation is essential. What are good examples of this in your opinion?

'Innovation often starts with the exchange of experience and knowledge between projects. Fortunately, we have been doing this successfully for years. For example, we have combined deepwater drilling knowledge with years of North Sea subsea wells knowledge at Olympus and Stones in the Gulf of Mexico. Another example are the concrete gravity-based support structures for offshore platforms used in the Brent field that have also been placed in our fields in Norway – offering the advantage of more durability in a marine environment and less

maintenance requirements compared to the traditional steel-jacket substructures.

In addition, there is a number of promising new technologies being developed that might just have the same impact as horizontal drilling. Consider, for example, the development of managed pressure drilling and monodiameter wells that allow drilling through depleted reservoirs and getting to hydrocarbon zones that previously were considered as out of reach from an economic or technical standpoint. Another example of technological innovation is expandable tubing, to which Shell has contributed. These innovations and sharing of knowledge help to ensure that we can profitably and safely develop and maintain new and existing fields.

It is clear that our drive towards competitiveness must not compromise the safety of people and the protection of the environment. This requires effective risk management which in turn warrants deep knowledge of the technology we use, the environmental impact and the means to manage and control risks. We stimulate innovation and continuous improvement through the creative application of knowledge and external focus, so we are well aware of what others are doing in the field of innovation.'

## What opportunities in the area of cooperation and innovation do you see for a company like GustoMSC?

'A high-cost item for IOCs and NOCs is restoration and decommissioning. This offers an opportunity to the entire industry to start thinking innovatively on how good use of proprietary technologies can be made, as well as tapping into expertise which is used in other sectors, such as recycling.'

Another area which could benefit from more cooperation and innovation is subsea well intervention for asset integrity maintenance and production enhancement of a well. If you look at the ultimate recovery of offshore reservoirs developed by subsea wells, you'll see that this on average is some 10% lower than that of comparable reservoirs developed onshore.

The need to innovate is greater now than ever. That's the very reason we also aim for better collaboration within the industry.'

## How do you see the world in 20 years from now?

'I don't have a crystal ball to predict the future, but as the world's population and standards of living continue to rise, so too does energy demand. All resources will be needed to meet it. Thus I think we will still produce oil and gas in 20 years, provided we maintain the license to do so. In addition to innovation and collaboration, acceptance for the way the oil and gas industry goes about its business will be crucial in the coming years. When we develop new technologies, we must not only make sure those innovations allow us to tap into resources economically but also responsibly in terms of health, safety and the environment.'



**Sjoerd Brouwer**  
Vice President Wells Function,  
Shell Projects & Technology

### Qualifications and career summary

- MSc in Mining Technology from Delft Technical University in 1979.
- Coal mining in Germany with Ruhrkohle AG before joining Shell's metal mining subsidiary Billiton International Metals in Surinam.
- Shell Exploration and Production in 1986. Held positions in Well Engineering and Production Operations management in Scotland, Indonesia and Nigeria before returning to Shell's E&P corporate headquarters in the Netherlands in various leadership roles between 1997 and 2008.
- Transferred to Aberdeen in 2008 as Regional Wells Manager Europe and assumed additional responsibility for sub-Saharan Africa and Iraq in 2013 as VP Wells Operated.

# ALL-YEAR ROUND

## NG-2500X MULTIPURPOSE WORKHORSE

The NG series provides safe, stable and solid platforms for a wide range of services throughout the total lifecycle of an offshore energy facility. The deployment of these platforms will provide substantially more uptime than competing designs.

Like the other NGs, NG-2500X units are four-legged, self-propelled jack-ups that move and position themselves independently, with no requirement for tugs. They have a large open deck space, high crane capacity and reach, and modern accommodation with state-of-the-art facilities.

Furthermore, NG-2500X units are faster on and off location, are able to continue to stay on location and have an enhanced operational envelope in harsher weather. These features result in more uptime: optimal efficiency and a minimum of non-productive hours during operational charters, while maintaining its flexible multipurpose design.

In 2009, the first NG-2500X (Seajacks Kraken) with multipurpose capabilities entered the market. Presently these units are in high demand in the offshore oil & gas and wind industries. By the end of 2016, a total of 14 units will be operational. They are capable of operations in the southern North Sea, the Middle East, South East Asia, West Africa and the Gulf of Mexico.

Applications for these multipurpose jack-ups include: coiled tubing, wire-line services, well work-over, electric-line, remove/install modules, construction support, maintenance support, well testing and early production, light drilling, diving support, inspection and repair, hook-up and commissioning, accommodation and/or decommissioning.



Jan-Mark Meeuwisse  
Sales Manager

### DAYLIGHT CABINS FOR 150 POB

Up to a maximum of 217 POB in single, double and quadruple cabins. Sufficient facilities for temporary living quarters.

### PRELOAD 2,750 T

The four legs design results in stable, secure and solid preloading. Sufficient preload capacity for harsh weather conditions and crane operations. Reduces punch through risks.

### MAXIMUM WATER DEPTH 80 M

With a maximum leg length of 104 m, the NG-2500X is able to operate in a water depth of up to 80 m (262 ft).

### HIGH NUMBER OF JACKING CYCLES ≥ 1,000 TRANSFERS

The electrical Variable Speed Drive (VSD) system provides high redundancy and flexibility during preloading and jacking. The VSD system allows for jacking speeds up to 1.2 m/min, and leg handling speeds up to 1.6 m/min. Life time up to 20 yrs and 50 transfers per year.

### WIDE RANGE OF CRANE CAPACITY 400 T AT 18 M

Multiple crane options possible to suit envisaged operations and specific requirements. Auxiliary cranes can be placed on various locations on each side of the hull or on the accommodation to preserve deck space.

### FREE DECK AREA 1,000 M<sup>2</sup>

Space for mission equipment, temporary living quarters and defined EX-areas for oil and gas operations.

# PRODUCT LAUNCH CJ43

## A MODERN REPLACEMENT FOR SPECIFIC FOOTPRINTS

In mature oil and gas fields, particularly in the Middle East, India, Gulf of Mexico, West Africa and Asia, a specific footprint is required due to earlier campaigns. The key reference is the LeTourneau-116 design. With its specific footprint, it is the most widely used jack-up design in these regions. The CJ43 drilling jack-up, based on its successful predecessors, is the modern replacement and sets a new standard for jack-up drilling rigs used in these mature oil and gas fields.

Drilling technology has evolved over the years. The focus has been on drilling equipment reliability, mechanization, partial automation and advanced well control. However, when reviewing the overall jack-up technology – excluding the drilling related equipment – a large part of what has been ordered recently resembles the same design philosophy of thirty to forty years ago. Using innovative technology, a more modern jack-up design such as the CJ43 delivers operational benefits to owners and operators in terms of lower Opex and higher operational flexibility.

### Enhanced capabilities

The CJ43 is a three-legged cantilever type jack-up drilling rig and is part of the successful and well-established GustoMSC CJ series. The rig features enhanced capabilities and robustness with its innovative design solutions for everyday operational benefits. It is well equipped with a modern drilling setup for exploration and field development drilling.

Key jack-up design elements, which are part of every CJ design, are well balanced in the CJ43. Its leg design, leg handling (including jacking and fixation systems), cantilever reach and derrick movement in combination with hook load capacities and the applied philosophy of rig survivability in realistic operational and survival modes are brought to a new standard for mature oil and gas fields with this design.

### Robust X-brace truss type leg design

A major design parameter typically required for working on fields where the older generation of units have been working before is the maximum spudcan bearing pressure of 39 t/m<sup>2</sup>. The CJ43 can match this value by reducing the maximum preload capacity, while still maintaining higher environmental

capability than the competition. The modern, innovative and robust X-brace truss type leg design, in combination with the essential jacking and fixation systems, provides a high elevated operational and survival capability while not ignoring the installation conditions, where damage to the legs typically occurs most.

### Large drilling envelope

The innovative X-Y-cantilever skidding system provides the large drilling envelope of 70 x 36 ft (21 x 11 m) and much appreciated additional deck space as it raises the entire cantilever and drill floor structure above the main deck by approximately 12 ft (4 m). This allows for improved material handling as forklifts can drive underneath and thus reduces crane lifts from PS to SB side and vice versa. It also provides additional container storage space and most of all provides additional means to handle mud return, cuttings and SWARF waste. The 36 ft transverse reach with full combined cantilever load independently of the transverse position, enables more flexibility for the operator to perform development drilling with long horizontal sections without the typical hook load capacity limitations which the traditional drilling rigs have at the outer transverse position of the cantilever reach.

### VSD-controlled jacking system

Additional safety and reliability is introduced by the VSD-controlled proven jacking system. This is a proven jacking system which allows the rig master to get his rig on site in a safe, smooth and fully controlled process. The system is fully redundant and each pinion is torque controlled with stepless-speed ability. The controlled ramp up and down, with brakes still engaged, results in a significant reduction of peak loads on the

electric system and reduces the wear and tear of the leg rack, pinions, gears and brakes. The system improves the safety of each rig move as it will monitor on the fly RPD values and will inform the jacking master if critical limits, set in advance with reference to rig capability, are being exceeded.

### Large inner hull space

The large inner hull space allows for below deck placement of the P-tanks, where typical jack-up designs in this range have to store this equipment on the main deck. This arrangement ensures the shortest material handling routing between the sack store, mixing equipment and mud pits. The mud pits are arranged such that there are no protruding girders or stiffeners on the inside and therefore have the best possible mud quality since there are no dead zones where solids can settle down, which also eases the cleaning process of the pits.

### More available deck space

The cantilever is sized such that all mud treatment equipment is located inside the enclosed part, consisting of two decks, which creates more available main deck space for the ever increasing amount of third-party equipment. Being able to place all this equipment within enclosed spaces also reduces the overall maintenance costs, as it is no longer exposed to the outside environment.

### Lower weight

One would assume that having all the above advantages would come at the cost of additional weight. However, by employing the latest design techniques, modern calculation methods and using high strength steel in the highest loaded areas the CJ43 has a significantly lower weight than its closest competitors.

Concluding, the CJ43 provides more for less. It is a truly best-in-class jack-up solution for the mature oil and gas fields found in the Middle East, India, Gulf of Mexico, West Africa and Asia.

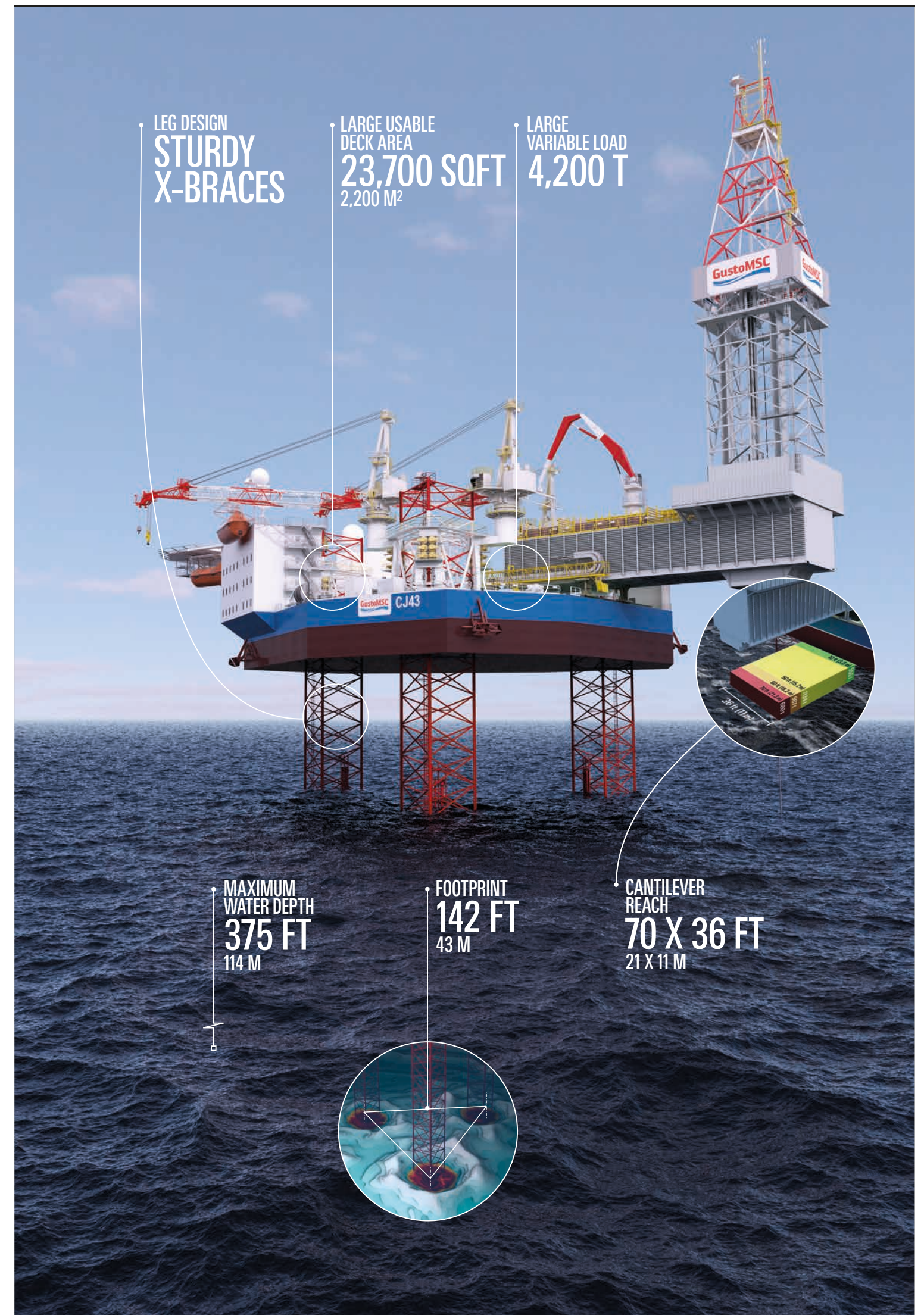
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## INTERVIEW GMS

# 'FLEXIBILITY IS THE KEY TO OUR SUCCESS'

Founded in Abu Dhabi (U.A.E) in 1977, Gulf Marine Services (GMS) has become the largest provider of self-propelled, self-elevating support vessels (SESVs) in the world. The fleet comprises Small Class, Mid-Size Class and Large Class SESVs, which are capable of supporting worldwide operations in variable water depths and weather conditions. In collaboration with GustoMSC, GMS developed its Large Class and lately its Mid-Size Class. John Petticrew, Technical Director: 'Being flexible is one of our strategic pillars. What we find is that the more flexible the fleet, the greater the playing field we can enter into in terms of charters for our clients. Our high utilization rates show that this strategy is right.'



**John Petticrew**

Mr. John Petticrew joined GMS in 2009. He brings with him more than 25 years of experience in the project and new-build management of small to large projects, ranging from harbor tugs and naval frigates to major refurbishment and new-building of semi-submersible and jack-up oil rigs. Mr. Petticrew has spent a number of years in the U.A.E working for two of the region's largest new-build and repairs companies, Dubai Drydocks World and Lamprell Energy. Prior to this, he spent 17 years with Irving Shipbuilding, the largest ship repair and construction company in Canada.

### Initially, GMS was the first company to really promote four-legged self-propelled self-elevating support vessels.

Petticrew: 'Around 2008, we worked with four or five different designs. In our opinion, the GustoMSC design offered exactly the flexibility we were looking for. Over the years, by working closely together with GustoMSC we developed the Large Class, self-propelled jack-ups in accordance with the GustoMSC NG-2500X design, and recently the Mid-Size Class. In all those years, we have experienced great support from GustoMSC during the design and building phase and excellent after sales services during operations.'

The first two Large Class SESVs were named GMS Endurance and GMS Endeavour, built in 2010 and 2011 respectively. The design was further improved and, as a result, GMS Enterprise (2014) is even more advanced. We are currently building the fourth Large Class vessel. One of the most critical parts of the Large Class is the jacking system. The GustoMSC jacking-system really differentiates us from our competitors. Obviously, when you are moving to a lot of different wells and jacking up and down very frequently, you have to rely on an efficient and robust jacking system. That is definitely what we are providing with our Large Class.'

### What do you mean by flexibility with regard to your Large Class?

'Flexibility is provided by the free deck space. Fifty percent is taken up by accommodation, the bridge etc., the other fifty percent consists of free deck space. Clients can use this space, for example, to increase accommodation. Some clients use the free deck space for well service equipment. The fast jacking system enables our clients



GMS Endurance

to move frequently. The Large Class is able to work in the Middle East and North Africa region, North West Europe, South East Asia and West Africa. The vessels support well services, wind farm-related operations and provide accommodation: essentially, these units cover all the aspects of the oil & gas and renewable energy offshore industry.'

### GMS has one of the youngest and most sophisticated fleets in the industry. Do you have a long-term investment program to keep your fleet technically advanced and up-to-date?

'Our oldest vessel was built in 1982 and is still going strong. The next oldest vessel was built in 1999. All our other vessels were built from 2005 onwards. The average age of our fleet is only seven years. When you exclude the oldest vessel, it is only five years. Our new-build program, which commenced in 2014, will expand the SESV fleet by 66% – from 9 to 15 vessels – by the end of 2016. The program is now more than half complete, and units continue to be delivered on time and within the budget. The four new vessels most recently commissioned have been deployed immediately for new contracts, the latest being GMS Scirocco (Mid-Size Class) following delivery in Q3 2015. Given our continued success in winning contracts for the new vessels, we expect to see growth in our revenue earning capacity. Demand for our SESVs remains strong, with the Middle East particularly buoyant. We are therefore reviewing the prospects for a further increase in the scale of our fleet beyond 2016, on a vessel-by-vessel basis.'

### Did the objectives of GMS' investment program change due to the recent fall in prices?

'We are definitely steering our own course and we continue to believe that the demand for our vessels will be strong. Focusing on existing wells, we seek to grow our market share either by expanding our own fleet by building vessels at our yard or by expanding the services to our clients.'

### About the GustoMSC NG-2500X units, your Large Class: in which regions are these units put to work? And what type of work do they perform?

'Two Large Classes are in the UK sector of the North Sea working for different clients; the first one started there five years ago. One will now start working with the same operator on a well abandonment program, an area in which we are seeking to increase our business. The third one is working in the Arabian Gulf for a major oil company as an accommodation unit. The four-year charter commenced as scheduled at the end of Q1 2015. The extra free deck space, which we mentioned earlier, has been turned into temporary living quarters. The unit is able to accommodate 375 people instead of the basic 150.'

### Could you tell us more about the performance of these units?

'In general, GustoMSC delivers well-recognized, well-integrated and reliable designs and associated equipment. The Large Class and Mid-Size Class, which are built to GustoMSC designs, are capable of supporting worldwide operations in variable water depths and weather conditions. They are all self-propelled, with fast and reliable jacking systems as well as accurate positioning equipment. Specific characteristics, such as





GMS Enterprise

accommodation capacity, crane tonnage, deck space, leg size and well intervention capability, increase the attractiveness for our clients. And because we had the opportunity to build a series, we have gained experience. In time, this results in a better product and a better performance. If you look at the key performance indicator, utilization – the number of days the vessel is available to the client – is one of the main advantages. Of course, we have to mobilize the vessel for a contract or demobilize it for maintenance activities. For the Large Class, the utilization rate in the first half of 2015 was 98 percent. The first Mid-Size Class vessel, GMS Shamal, was on hire as from the very end of Q2 2015, so performance statistics are not available yet.

Furthermore, we can be very flexible with regard to our clients' needs because we have an in-house construction facility in Abu Dhabi. We can customize our vessels easily to the requirements of our clients because of the flexibility of the designs.'

**Could you tell us more about the challenges you presented to GustoMSC when you were looking for a smaller version of the Large Class SESV?**

'Basically, we wanted a smaller version of the Large Class because it costs less money, but we also wanted the same capabilities. These units are able to operate in the same areas as the Large Class, but in slightly shallower waters. We gave a set of parameters to GustoMSC and together we worked very closely for three months to come up with the Mid-Size Class design. It was a very fast and short track altogether: it took only about six months from the first talks with GustoMSC to sending the design to the Chinese yard where the hull was being built. Normally

such a process would take at least a year. The hulls were then shipped to GMS' Mussafah facility in the U.A.E for assembly and outfitting. We have the ability to ramp up manpower to handle the simultaneous construction of our vessels, which we did for these two Mid-Size Class vessels. In this way, we are in direct control of new build construction. Therefore, we are able to build cheaper and provide our clients with cost-saving solutions, which is especially relevant in the current low oil price environment. The first GustoMSC NG-1800X unit, our Mid-Size Class, is named GMS Shamal and has been operational since June 2015. The second one, GMS Scirocco, has also been under contract since October 2015. One more Mid-Size Class, GMS Sharqi, is currently under construction.'



**Thomas Lerchenmüller**  
Senior Engineer



As of September, we have moved our headquarters to the former carpentry factory of Wilton-Fijenoord in Schiedam, the Netherlands. Our new office is a fully renovated historical building where design, engineering and co-creation come together. We believe that this special location is a place where our people can continue to grow and where we can intensify our collaboration with our business partners and customers.

As you can see from the pictures, the housewarming party for our staff and their families, which was held on October 10th, was a big success. The staff enjoyed showing their family members the interesting and impressive surroundings in which they work.

We expect to create a place full of new energy, both for GustoMSC and the offshore industry. Our talented technical staff continue to come up with innovations and thus help to boost growth in the offshore energy industry.

You are welcome to visit us. Even more so to cooperate on projects and on developing new solutions that will benefit your business as well as your clients' business.



# DESIGNS SUITABLE FOR OPERATIONS IN MODERATE CONDITIONS FROM MIDDLE TO FAR EAST



**P10,000 DEEPSEA METRO I**  
 Owner: Odfjell  
 Position: South China Sea



**NG-2500X SEP-450**  
 Owner: NPCC  
 Position: Arabian Gulf



**CJ50 UMW NAGA 7**  
 Owner: UMW Standard Drilling  
 Position: Indian Ocean

### Middle East

- CJ43
- NG-1800X
- CJ46
- NG-2500X
- CJ50
- NG-5500X
- CJ54
- NG-5500C
- AJ46
- SEA-1250
- AJ50
- SEA-2000
- SEA-2750
- SEA-3250

### India

- OCEAN400-TD
- CJ43
- NG-1800X
- OCEAN500-(WI/TD)
- CJ46
- NG-2500X
- OCEAN850
- CJ50
- NG-5500X
- OCEAN1200
- CJ54
- NG-5500C
- SCYLAX
- AJ46
- SEA-1250
- P10,000
- AJ50
- SEA-2000
- MAGELLAN
- SEA-2750
- SEA-3250

### South East Asia

- CJ43
- NG-1800X
- OCEAN400-TD
- CJ46
- NG-2500X
- OCEAN500-(WV/TD)
- CJ50
- NG-5500X
- OCEAN850
- CJ54
- NG-5500C
- OCEAN1100
- AJ46
- SEA-1250
- OCEAN1200
- AJ50
- SEA-2000
- OCEAN1500
- AJ54
- SEA-2750
- SCYLAX
- SEA-3250
- P10,000
- MAGELLAN



**NG-1800X GMS SHAMAL**  
 Owner: Gulf Marine Services  
 Position: Arabian Gulf



**SEMI-SUBMERSIBLE MAERSK DISCOVERER**  
 Owner: Maersk Drilling  
 Position: Mediterranean Sea



**SEA-3250 JB-118**  
 Owner: Jack-up Barge BV  
 Position: Arabian Gulf



**CJ46 TAM DAO-01**  
 Owner: Vietsovetro  
 Position: South China Sea

- Cantilever Jack-ups (CJ series)
- Accommodation Jack-ups (AJ series)
- Accommodation Semi-submersibles (OCEAN series and DSS series)
- Accommodation and Maintenance Jack-ups (NG series and SEA series)
- Drilling vessels (Magellan, P10,000, Scylax)

- Under construction
- Delivered
- Best-in-class and game-changing solutions

SAFE, STABLE AND SOLID PLATFORMS

# LIFTBOAT VS SELF-PROPELLED JACK-UP



In the industry, vessels with legs, jack-ups with propulsion or self-elevating support vessels have many different names while all definitions look the same. The differences in Capex are clearly visible, but the operational performances and risks involved may be hard to comprehend. The traditional liftboat is an often unclassified boat to which no international standards apply. GustoMSC introduced a robust alternative providing substantial additional uptime and lower Opex in the form of the New Generation (NG) self-propelled jack-ups. In this article, the authors discuss the fundamental differences between the GustoMSC NG series of self-propelled jack-ups and traditional liftboats.

## Capex, uptime, Opex and safety

The primary function of a self-propelled jack-up is standing on its legs, jacked-up on an offshore location. The unit has to be a safe, stable and solid platform to execute the services it is hired to perform, in all conditions it can expect at the specific location. This takes into account soil, water depth and environment and a unit properly designed for these specific conditions will in principle provide its owners close to 100% uptime\*. Additional modes of operation are transit to and from the offshore location, positioning and jacking up at the offshore location where it has to be safe, stable and solid in a different way.

Designing a unit for anything less than the maximum condition it can expect at the specific location while standing on its legs, will result in the necessity to apply a hit and run strategy, targeting a particular weather window that needs to be large enough to accommodate the entire operation from port to port. This undoubtedly results in less uptime and multiple runs to and from port, which all will result in higher Opex.

Comparing the designs starts with the regulations: classification and class notations. Originating in the Gulf of Mexico, liftboats were originally uninspected vessels. On the contrary, propelled or non-propelled jack-ups are always classed by a Classification Society (e.g. ABS, DNV GL or any other major classification society). After a number of accidents, liftboats were brought under US Coast Guard inspection but certification and inspection generally remained domestic. This compared to the international recognition of quality and safety standards for jack-ups classed, built and inspected by a recognized international classification society. For liftboats, there is still only one guide for building and classing liftboats, which is issued by ABS. Whereas all major classification societies have dedicated rules and regulations for jack-ups.

## How to compare liftboats and self-propelled jack-ups

The easiest way to distinguish a self-propelled jack-up from a liftboat is to compare the legs. Liftboats have very long, slender legs, typically three (a few have four legs). In addition, liftboat legs are mostly tubular, while

## SUMMARIZING, WHAT IS A . . .

### Liftboat

- Self-propelled
- Typical 3 legs – preloading by ballast water
- Transit speed 4 – 6 knots
- Deck load carrying capacity 75 – 600 t
- Deck area less than 500 m<sup>2</sup>
- Crane capacity 50 – 500 t
- Identified by leg length
- Protected waters – ‘hit and run’, less operational hours
- Mostly domestic use

### Self-Propelled Jack-up (NG series)

- Self-propelled and up to DP-2
- Typical 4 legs – for fast and secure preloading
- Transit speed 8 – 12 knots
- Deck load carrying capacity 650 – 8,500 t
- Deck area 600 – 5,000 m<sup>2</sup>
- Crane capacity 150 – 1,500 t
- Identified by water depth, for survival and operational conditions (no ‘hit and run’)
- Survival capability – more operational hours
- Worldwide use

self-propelled jack-up legs tend to be of the truss-type for greater water depths. These truss-work legs are lighter, stronger and more transparent to waves and currents. This benefits the capabilities in elevated condition for operations in larger water depths and the variable load and stability in transit condition.

Liftboats are often identified by their total leg length. For example, a Class 335’ liftboat has a leg length of 102 m (335 ft). There is no mentioning of the specific conditions under and the water depth in which the unit can operate and possibly survive. Actually the leg length below the hull is about 85 m (280 ft), and the question is in what environmental conditions can the unit actually operate and survive? The leg length (below the hull) can only serve as a first indication to compare a capability of a unit but it is not painting the full picture.

# SAFETY ASPECTS OF SESVs

Bijali Nair, the Regional Manager Offshore of DNV GL, is responsible for the region Middle East and India and is the head of the Dubai jack-up service center. We asked mr. Bijali to comment on the safety aspects of self-elevating support vessels (SESVs), as an important performance indicator for the industry:



**Bijali Nair**  
Regional Manager Offshore of DNV GL

'The demand for self-elevating support vessels, also known as liftboats or self-propelled jack-ups, is increasing in the offshore business. The ratio of fixed platforms per SESV is quite high in Asia and especially in the Arabian Gulf compared to other parts of the world. Many old production platforms require maintenance and modifications. Considering the present oil price, this is the right time to carry out maintenance of these aged platforms. The main operational characteristic of SESVs are the large number of field moves every year and the propulsion arrangement. Due to operational requirements SESVs are capable of for example making one rig-move every day within fields which requires a high safety standard for preloading and jacking operations. The preloading operation of four-legged jack-ups is entirely different than traditional drilling jackup preloading operation. Therefore preload operations,

jacking system design and safety control functions have to be considered accordingly for SESVs. Generally the rig operators / owners must give more focus on the health of the jacking system for SESVs due to its operational criticality and carry out site specific assessments for all new locations. Additionally, from a safety perspective, many operators / oil majors are demanding minimum DP-2 capability to increase control and redundancy when approaching a fixed platform in order to reduce the risk of hitting critical assets. Concluding, applying only the Mobile Offshore Drilling Units (MODU) code for SESVs is sometimes a challenge. At DNV GL, we have a different approach for SESVs; by using the relevant requirements from the various applicable codes, we make the requirements more fit for purpose and maintain the necessary high safety standards.'

The GustoMSC NG series is identified by preload capacity and maximum water depth for specific conditions. Before chartering a unit, the operator and end user know what they can expect of the capability of such a unit. In the design considerations of these units and in all site-specific assessments, SNAME RP and/or ISO 19905 are considered. These units are designed for a range of environmental conditions for both operation and survival.

## Survivability

The majority of liftboats is operational in the Gulf of Mexico (GOM) or working in (partially) protected waters. In the open waters of the GOM, liftboats use a 'hit and run' strategy which means that liftboats have to sail to a harbor when a storm approaches. Therefore, liftboats can only operate near shore, within 12 to 24 hours of a harbor or protected waters. They are not designed to survive severe storm conditions. Consequently, they can be built lighter and with less structural requirements. Thus, the overall investment is lower, but having these operational limitations results in less uptime.

On the contrary, self-propelled jack-ups, provide a stable platform that limits interruptions of operations to the very minimum. In regions such as, for example, the Southern North Sea (SNS), the environmental conditions are more severe and units usually operate relatively further offshore. Jack-ups working in the SNS area, but also in other regions further offshore, are designed and capable to survive in severe storm conditions with return periods of 50 to 100 years. The ability to continue to stay on location results in more workable days, optimum efficiency and a minimum of non-productive hours during operational charters.

## Preloading

Preloading is a safety measure for jack-ups to ensure that the seabed is solid enough to support the unit during elevated operational – and possibly storm conditions. Because the pads of the liftboat are resting on a muddy, unstable seafloor, most liftboats practice a safety measure called a preload. The preload outcome determines the capacity that the unit can stand on. It is essentially pre-pressing the soil to test its load-bearing capacity. Liftboats usually have three legs and can only preload by taking in ballast water. Four-legged jack-ups, like the NG series, achieve preload by alternatively loading diagonally opposed legs, utilizing the jacking systems. This is a faster and safer operation.

Overall pre-load time is significantly less because the preload can be applied much faster and without taking on ballast water. Therefore, the unit can be operational faster at the new location, resulting in more uptime. Safer as soil settlement can be corrected in a more controlled manner than is the case for a unit with three legs, especially when making use of a Variable Frequency Drive (VFD) jacking system. This simple and fast preloading is one of the main benefits of the GustoMSC NG series.

## Dynamic positioning (DP)

Self-propelled jack-ups can be designed with a DP system for propulsion and positioning. DP systems are complex and require DP crew to operate, which increases the operation costs of the vessel. In general, a DP system enhances the overall safety and uptime when approaching or leaving any job site especially when weather or wind direction changes!

# LIFTBOAT

- Relatively low investment
- Low structural requirements
- Simple to construct, operate and sail
- Low operational costs
- Majority not classed, low cost

- Not designed for severe weather – Operational window is small
- No survival capability – More downtime, back to port
- Accommodation below work deck! – No 21st-century safety standards
- No DP when approaching platforms – Operational risks
- No or slow preloading – Operational risks
- Long tubular leg – Less stable, less sturdy – e.g. seasickness
- Rack welded on tubular leg – Fatigue sensitive, operational risks and downtime
- Low carrying capacity – Supply vessel requirement or return to port
- Small cranes – In capacity and reach
- Low jacking system redundancy – Operational downtime and risks
- High resistance – Low transit speed – High fuel costs
- Usually restricted by minimum freeboard
- Lack of forecastle – Green water

## The NG series on the rise

Starting from the harsh Southern North Sea, the GustoMSC NG series have re-entered the Middle East successfully, with operators like GMS, NPCC and Eversendai. In the eighties, the first self-propelled DP jack-ups were operated by Saudi Aramco, namely the Arabiya 1, 2 and 3 and ARB-2, which are all still in operation. The latest in the series of GustoMSC NG designs, the NG-1800X (the GMS S-Class) is now operational and will bridge the gap between the existing K-Class and E-Class of GMS. The popular NG-2500X, of which eight are operational and six are under construction, is the leading GustoMSC design in the Middle East. You can read more in this InSide about the main particulars of the NG-2500X in the Facts & Figures article.

The NG-2500X has been a trendsetter and a valuable addition to the successful GustoMSC design range, offering customers high value for money. This trend

# SELF-PROPELLED JACK-UP (NG SERIES)

- Classed – Self Elevating Unit
  - IMO MODU (leading code)
  - SPS code where and if applicable
  - ISO 19905 / SNAME RP – Site specific analyses
  - Designed for a range of environmental conditions
  - Jacked up survival capability
  - Optimized resistance – Transit speed and fuel consumption
  - Fast on and off location
  - High utilization – Ability to continue to stay on location
  - Enhanced operational envelop in harsher weather
  - Accommodation and facilities in accordance with modern standards
  - Sufficient carrying capacity (payload)
  - Large open deck area
  - Truss leg reduces weight and drag forces, increases water depth and stiffness
  - Large crane capacity and reach
  - Fast preloading – Safe, stable and solid
  - Fatigue analyzed – Less O&M costs/repairs – Less risks
  - Creates new market opportunities as they have more to offer
- Investment relatively higher
  - Operational costs (DP-crew etc.) higher



**Thomas Lerchenmüller**  
Senior Engineer



**Jan-Mark Meeuwisse**  
Sales Manager

# THE PIONEERS OF OFFSHORE ENGINEERING



SEA-3250  
NON-PROPELLED  
JACK-UP BARGE  
**MULTIPURPOSE  
& HIGH CAPACITY**



NG-1800X  
SUPPORT & MAINTENANCE  
JACK-UP VESSEL  
**MULTIPURPOSE  
OIL & GAS  
AND WIND  
HIGH UTILIZATION**



NG-2500X  
SUPPORT & MAINTENANCE  
JACK-UP VESSEL  
**PROVEN &  
ROBUST DESIGN  
DP-2 CLASS**



CJ43  
CANTILEVER  
DRILLING JACK-UP  
**BEST-IN-CLASS  
SOLUTION  
FOR MATURE OIL  
AND GAS FIELDS**

**GustoMSC**

GustoMSC is an independent, world renowned and leading design and engineering company, thanks to the vast knowledge and expertise of our dedicated professionals and our close relationships with the most influential players in the offshore market. We serve the offshore industry by providing best in class solutions for mobile offshore units.

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