

INSIDE

APRIL 2014 # 21

UPTIME



MINIMIZING
RISKS
MAXIMIZING
PERFORMANCE

GustoMSC

THE PIONEERS OF OFFSHORE ENGINEERING

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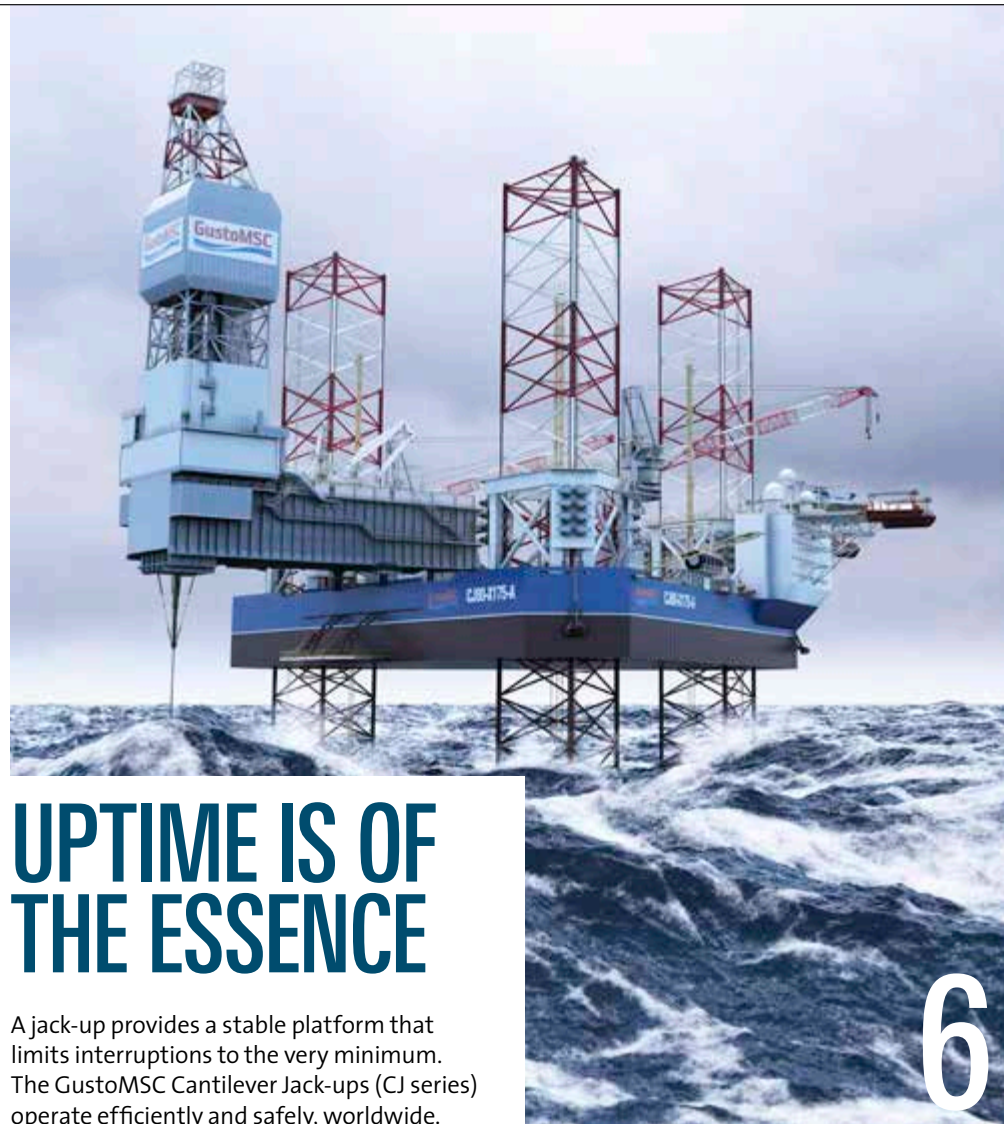
Bas Buchner, president of Maritime Research Institute Netherlands (MARIN), reflects on 'uptime'.



INTERVIEW FROM CJ70 TO CATEGORY J

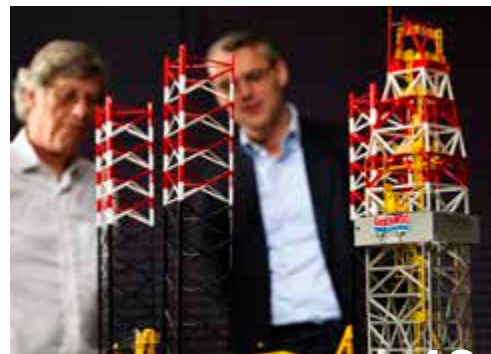
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Statoil recognized the need for a new rig design optimized for harsh environments, the Category J (Cat J) rig. Statoil worked closely together with GustoMSC to customize the rig to their needs. Geir Ove Eikill, Vice-President Mobile New Builds of Statoil, looks back on a very interesting learning process.



UPTIME IS OF THE ESSENCE

A jack-up provides a stable platform that limits interruptions to the very minimum. The GustoMSC Cantilever Jack-ups (CJ series) operate efficiently and safely, worldwide.



INNOVATION "LOOKING AHEAD IS VITAL FOR US"

Innovations have made GustoMSC a very successful company. Nils van Nood, Managing Director of GustoMSC, and Han Mommaas, former Managing Director and current Advisor of GustoMSC, about the innovation agenda of the company and more.

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PREFACE SUCCESS OF THE CJ SERIES



As part of our successful strategy we will continue to invest and we will certainly continue to cooperate with our clients to develop the next best practices for the global offshore energy market.

Nils van Nood
Managing Director GustoMSC

GustoMSC is currently enjoying an increased demand for the CJ series of jack-up drilling rigs: GustoMSC's global market share for drilling jack-ups rose from 20 to more than 30 percent of all orders placed in 2013. A good enough reason to place the CJ series in the limelight in this edition of InSide. But why are they so popular? What are the features of the CJs and their associated equipment and why are the CJs the ideal unit for any area including harsh environments? We have found Geir Ove Eikill, Vice-President Mobile New Builds of Statoil, willing to tell us more about the customization of the CJ70 for the Norwegian Continental Shelf.

Freedom of choice

Our large selection of first class proven basic designs for jack-ups, semi-submersibles and vessels is a good reason for our clients to find their way to the Netherlands. Moreover clients select GustoMSC designs because they provide them with freedom of choice. We are an independent company, so clients are free to have their mobile offshore units, based on our proprietary basic designs, constructed at the shipyard of their choice. This is an important reason why GustoMSC is a key supplier for the most demanding clients worldwide.

Uptime

By taking market demand as the starting point, GustoMSC is able to develop the right solution or offer an existing proprietary basic design. Safety remains on top of everybody's list and, as in any business, reducing cost is a main driver. Reducing the total of the initial

investment cost and the operating cost are at the core of any investment decision. Hence operational efficiency, a large operating area and a high number of workable days are key features of our designs. We have captured these key subjects in this edition of InSide under the heading 'uptime'.

Looking ahead

Looking ahead is vital for us. Because harsh environments and Arctic areas are on the operators' agendas, we are developing solutions for employing jack-ups, drilling vessels and semi-submersibles in those areas. Besides that we are continuing to contribute to the development of offshore renewable energy, in particular offshore wind, through our designs and associated equipment for wind turbine installation vessels and floating wind turbine foundations. The global need for energy is such that renewable sources cannot yet cope with the demand. Energy based on offshore oil and gas will therefore continue to play an important and even growing role for the years to come.

Besides improving and optimizing our designs, we are working on new designs and we continuously develop and add to the fundamental know-how which forms the foundation of our company. This includes new engineering approaches and calculation methods which we verify with tests where necessary. At the same time, we are also working on new associated equipment to supply with our designs.

COLOFON

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NOBLE BULLY I WINS SHELL'S RIG OF THE YEAR AWARD

Shell recently granted the global Rig of the Year Award 2013 in the floater category to the Noble Bully I. The vessel received the award because of its performance level between mid-2012 to mid-2013. The KPIs for safety and drilling performance were important criteria.

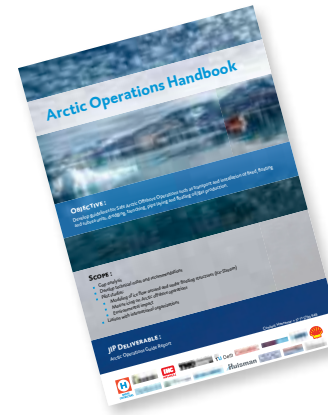
The Bully concept is based on GustoMSC's PRD12,000 drillship design. It is a vessel with a compact size, which makes it economic to operate. Noble has two Bully rigs at sea, both delivered in 2011. The Noble Bully I operates for Shell in the Gulf of Mexico, the Noble Bully II works for Shell off the Brazilian coast.

NEW NG-1800X SERIES: INCREASED SURVIVABILITY

The NG-1800X is the latest addition to the NG series of Jack-Up Vessels (JUVs), the new workhorse for the oil & gas support and maintenance market. The NG-1800X is able to work in water depths of up to 40 m in the southern North Sea and in 55 m in the more benign Persian Gulf and Gulf of Mexico.

The new JUV has been designed under IMO-MODU for the oil & gas service market which gives a substantial uptime improvement. Where lift boats are restricted in their operability due to weather windows, the NG-1800X is designed for survivability and will be able to continue to operate. The first units are being commissioned by GMS. Their intention is to start construction of their first S-Class early 2014. It will be aimed at use for well services in the oil & gas market and for offshore wind farm maintenance in northwest Europe, the Middle East, South East Asia and West Africa.

GUSTOMSC MAKES A CONTRIBUTION TO JIP ARCTIC OPERATIONS HANDBOOK



The Arctic Operations Joint Industry Project (JIP) recently published the Arctic Operations Handbook, a new reference for safe working practices in arctic waters.

GustoMSC participated in JIP as expert engineering company aimed at offshore construction and dredging. The aim was to formulate safe and reliable operational guidelines for working in arctic waters. The guidelines deal with all aspects of offshore operations – logistics, safety, translation, installation – in areas where low temperatures can have a significant impact on the development and execution of projects.

The handbook was presented during the Arctic Technology Conference in February 2014. It is available on www.arctic-operations-handbook.info.



STRIKING STEEL FOR BRAZILIAN QDRILLS

Estalerio Enseada do Paraguacu (EEP) and Engevix Construções Oceânicas (Ecovix) both struck steel for their first unit in a series of Qdrills that each of them is going to build. The detailed engineering phase has been successfully completed; the first blocks of the drill ships are being constructed.

Based on GustoMSC's design, EEP has received an order for six and Ecovix for three Qdrills. The vessels have been ordered by Sete Brazil and will be operated by the Brazilian drilling contractors Etesco and Odebrecht Oil and Gas (OOG). Characteristic of the GustoMSC drillships is the compact and efficient design; hull and equipment are efficiently integrated. This leaves plenty of deck space available making the unit very flexible in use.

EEP started with the construction of 'Ondina'. Ecovix started its first unit 'Cassino' on the Estalerio Rio Grande 2 site in Brazil.



LARGEST INSTALLATION JUV UNDER CONSTRUCTION

The world's largest wind turbine installation Jack-Up Vessel (JUV) presently under construction is based on GustoMSC's NG-14000X design. It is the Seajacks Scylla, with a variable load of 8,200 tons, a large open deck space of 4,600 m² and a 1,500 ton leg crane. This design has been prepared within a short period of time for Seajacks UK. The vessel will be ready in 2015.

Seajacks UK currently has three GustoMSC designs in operation. With the design for the Scylla, GustoMSC is meeting Seajacks' need for a large jack-up vessel. Around 65 percent of the offshore wind farms in the North Sea stand on monopiles. Those foundations are made entirely on shore. The Scylla has the large deck space and a heavy lift crane, essential features if it is to transport and place the monopiles.

5-8 MAY 2014 OTC 2014 HOUSTON

GustoMSC stand no. 121.01

11 - 12 JUNE 2014 GLOBAL OFFSHORE WIND CONFERENCE & EXHIBITION GLASGOW

GustoMSC stand no. 232

18 - 19 JUNE 2014 IADC WORLD DRILLING CONFERENCE & EXHIBITION VIENNA

GustoMSC stand no. 65

25 - 28 AUGUST 2014 ONS 2014 STAVANGER

Participation in IRO Stand at the Holland Pavilion

15 - 18 SEPTEMBER 2014 RIO OIL & GAS RIO DE JANEIRO

GustoMSC stand in IRO Holland Pavilion

28 - 29 OCTOBER 2014 OFFSHORE ENERGY AMSTERDAM

GustoMSC stand no. 10.021

10 - 13 NOVEMBER 2014 ADIPEC 2014 ABU DHABI

GustoMSC stand in IRO Holland Pavilion

UPTIME IS OF THE ESSENCE

BORN IN HARSH ENVIRONMENT
SAFE AND RELIABLE
JACK-UPS

LESS RIG MOVES
X-Y CANTILEVER
IMPROVED
LOAD CHART

DEEPER WATER
STRETCHING
LEGS THROUGH
ANALYTICAL
STRENGTH

EFFICIENT
OPERATIONS
LOWER
COSTS

CJ80
The latest addition
to the CJ series

Mobile drilling units are leased by operators with the highest workability and efficiency figures in mind. Uptime needs to be maximized and, as such, jack-ups are seen as the most efficient tools. A jack-up provides a stable platform that limits interruptions to the very minimum. The GustoMSC Cantilever Jack-ups (CJ series) operate efficiently and safely in moderate and harsh environments and in ever deeper water, worldwide.

Since the 1970s GustoMSC has been developing technical tools and insights to take the design, analysis and optimization of jack-ups a step further than its competitors. This has resulted in the very successful CJ series, which has recently been expanded with the largest jack-up ever: the CJ80.

In moderate environments and in up to 300 ft (100 m) water depth, the jack-up is the most popular option. A platform that rests on the ocean floor is stable: there are no large excursions due to wave, wind and current, as seen on floaters. The jack-ups are now being taken into deeper waters, for example into the harsh environment of the Norwegian Continental Shelf (NCS). Even under adverse weather conditions the workability is unequalled as the jack-up rests on the seabed. Needless to say, more uptime is an important advantage for a drilling unit that is leased by an oil company on a day-rate basis.

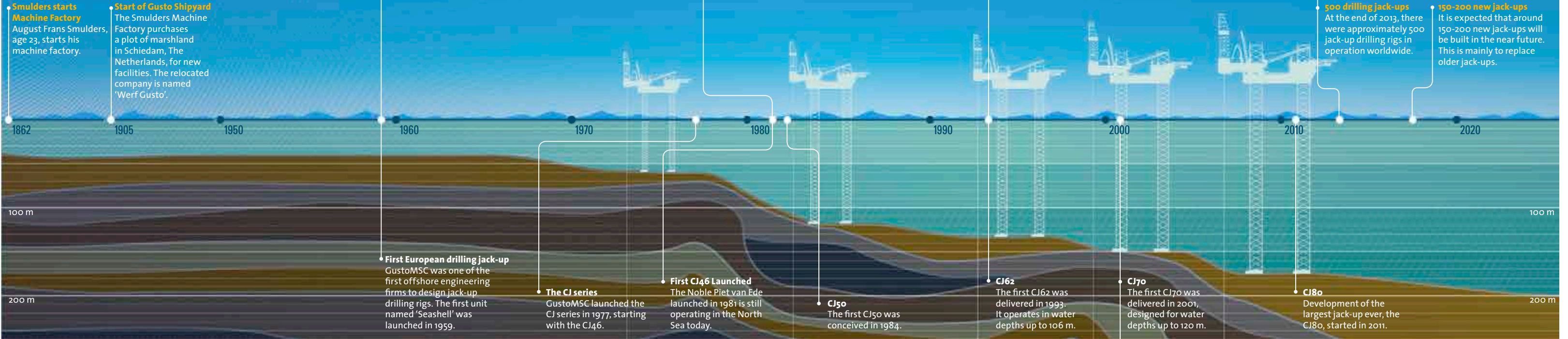
Harsh environment

GustoMSC has its roots in the challenging North Sea environment for which the CJ was initially developed. The combination of environmental forces – high, short waves, strong currents and strong winds – and the soil conditions were taken into account in the design of the Cantilever Jack-up. It led to the broad acceptance of the CJ series in this harsh environment by operators and drilling contractors alike. From the first CJ46s, still active in the North Sea, through to the latest CJ70s, these units have proven their reliability over the past thirty years.

Deeper water

The first CJ46 was developed for operations on the southern UK and Dutch Shelf, in water depths up to

THE EVOLUTION OF THE CANTILEVER JACK-UP



62 meters (203 feet) and 23 meters (75 feet) wave height. Ever since, GustoMSC developed and extended the CJ series with designs capable of operating further north in the North Sea with harsher environment and deeper water. The first CJ62, designed for operations in water depths up to 106 meters (348 feet) and 30 meters (98 feet) wave height, was delivered in 1993. Ten years later, the first CJ70 designed for 120 meters (393 feet) and 30 meters (98 feet) wave height succeeded. Further development of the CJ62 and CJ70 designs resulted in boosting their water depth capability to respectively 130 and 150 meters (426 and 492 feet) in the same harsh environment. Currently, 11 CJ70s are in operation or under construction. GustoMSC's latest development is focused on the CJ80 with a capability to operate in the northern North Sea in up to 175 meters (575 feet) water depth. The Drydocks World shipyard in Dubai signed a Letter of Intent for the construction of this world's largest jack-up drilling platform in January 2014.

Moderate environment

The quest for oil and gas in the benign and moderate environment regions is also pushing into deeper water. To date, 106.7 meters (350 ft) looks like the minimum water depth requested by drilling contractors. The CJ46 is the unit suitable for these water depths, and 31 units have currently been built or are under construction. The next step is the 121.9 meters (400 ft) unit, for which the CJ50 was developed. 12 units are presently under construction or in operation. The latest family member is the CJ54, capable of operating in 137.2 meters (450 ft) water depth in a moderate environment or 110 meters (160.9 ft) in a harsh environment. There is also a variant of the CJ54 that is fully compliant to the NORSOK standards.

X-Y Cantilever

The major groundbreaking innovation was the introduction of the X-Y cantilever in 2000, for which a patent has been registered. The X-Y skidding system allows the combined drill floor, substructure and cantilever to be moved in longitudinal and transversal direction. The cantilever load chart is impressively enhanced, as the full combined load can be used over the full envelope. The drilling process is more efficient and the reduction in the number of flexible lines allows for an improvement in BOP handling. Last but not least, the characteristically elevated position of the cantilever ensures a larger usable deck area.

Investors are looking for certainty

Although the demand for the large GustoMSC cantilever jack-ups has grown strongly in recent years, the biggest demand increase in numbers is for the smaller types of jack-ups, the CJ46 and CJ50. This success can also be attributed to the reliability of the CJs, but then in a different manner. Remco van der List, design manager jack-ups: "Chinese shipyards, which focus traditionally on building merchant vessels, are receiving fewer orders as a result of the worldwide economic crisis. A number of these shipyards have shifted their focus to the offshore industry. Within a short period of time, these shipyards have developed into serious competitors for the established offshore shipyards. Investors, primarily from Singapore and China, have ordered a significant number of jack-ups from these Chinese shipyards. With an existing track record based on the CJ46s built in China, GustoMSC was selected by many of these yards. The main reasons for this are that GustoMSC is an independent design house and GustoMSC has a good track record

with proven designs." The market for the CJ46s and CJ50s is considerable, as deeper waters are being explored and the replacement market of existing over-aged units is starting to pick up.

Room for new jack-ups

The growth of the new build market has only just started. About half of the jack-up fleet has been in operation now for over thirty years and is scheduled to be phased out in the coming years.

Mature fields will not become exhausted in the coming decades at least. The new generation jack-ups are using more efficient drilling equipment and new drilling technologies, so that this remaining oil can also be accessed relatively easily. In addition to the mature fields, new fields are still being discovered and developed, for example the Johan Sverdrup Field in the North Sea. Nils van Nood, Managing Director of GustoMSC: "There is growth offshore Mexico, West Africa, Middle East and South East Asia. Large sections of these areas are very suitable for jack-ups as far as water depths and conditions are concerned. Therefore, this requires that the existing active fleet of drilling jack-ups will have to grow."

Van Nood estimates that at least 150-200 new jack-ups will need to be built in the coming years, in addition to the 135 jack-ups that are currently under construction. The shipyard capacity for this is still available.



West Linus
During jacking trials.

MAXIMUM WATER DEPTH

175 M

The CJ80 can operate in harsh environments in a water depth of up to 175 meters (575 ft).

IMPRESSIVE LOAD CHART

36.5 X 25 M

The skidding envelope of the CJ80 is 36.5 x 25 meters (120 x 82 ft). This is two times as large as that of a conventional rig.

HUGE UNOBSTRUCTED DECK AREA
3.5 M CLEARANCE

The free deck space is maximized: air intakes and exhausts are centralized, so there are no mushrooms on the work deck. A free height of approx 3.5 meters underneath the cantilever provides ample space for container storage.

WRAP-AROUND-THE-LEG ACCOMMODATION BLOCK

UP TO 200 POB

The accommodation areas are arranged around the forward leg. They consist of two wings: a wing for cabins and another wing for offices, galley and mess room. This creates more free deck space between the aft and forward legs.

100%

OPERATIONAL EXCELLENCE

Sales of the CJ series basic designs have risen rapidly in the last three years. What makes these jack-ups so popular? The secrets of the CJ series unveiled.

The current CJ series consists of six distinct types for moderate and harsh environments. Contractors have a fairly wide range from which to make their selection. The latest and largest, the CJ80, is shown here.

X-Leg bracing

All CJ legs are arranged with X-braces. Compared to competing designs, the X-bracing provides the legs with increased structural capability in those operational conditions in which the fixation system is not engaged such as during relocation. During these transition operations, the shear forces acting on the leg structures are counteracted by the bracing system. Although not required by most design codes or classification societies, GustoMSC also considers these transition operations to be one of the design cases. With inhouse developed software, these conditions are checked on the basis of a time domain analysis.

Leg footing

GustoMSC has developed the expertise to design the leg footings for different soil conditions. At present, two types are used for the CJ series: the standard Diamond shape or the more sophisticated Skirted footing. The latter type enhances the water depth capability of the unit in any given environment.

Associated equipment

In addition to the basic design, GustoMSC also delivers the associated equipment for its CJ series. This consists of:

- The VFD driven rack and pinion jacking system
 - The X-Y skidding systems for the cantilever
 - The VFD driven leg fixation system
- More detailed descriptions are given on page 14 and 15.





“WE REALLY HAD TO USE ALL THE COMPETENCE AND CAPACITY AT STATOIL AND GUSTOMSC”

Geir Ove Eikill
Vice-President
Mobile New Builds Statoil

FROM CJ70 TO CATEGORY J

MEETING STATOIL'S NEED FOR INCREASED EFFICIENCY AND SAFETY

Statoil aims to increase efficiency when operating in mature fields on the Norwegian Continental Shelf. Consequently, the company identified the need for a new rig design optimized for harsh environments, the Category J (Cat J) rig. Rutger Baan, Project Manager at GustoMSC and Team Leader of the Cat J project, interviews Geir Ove Eikill, Vice-President Mobile New Builds at Statoil, on the development and customization needed to achieve the final Cat J CJ70. Eikill: “Part of the success was that we broke through company boundaries.”

In essence, Statoil presented a challenge to the industry. To meet their production goal for 2020, 2.5 million barrels of oil equivalent per day, Statoil needs more rig capacity. However, the market is largely focussed on deep water and the existing fleet for the shallow and mid water segment is ageing. Statoil decided that with their own rig concept they could operate more efficiently and introduce the latest standards on safety and the working environment. This led to the Cat J concept for a harsh environment jack-up rig for the Norwegian Continental Shelf: to operate more efficiently, facilitate subsea development and meet their demanding health, safety and environment (HSE) standards. GustoMSC's CJ70 design was closest to this concept. Statoil worked with GustoMSC to customize the rig to their needs. That included upgrading the jack-up's strength, weather window for installation, vessel impact capability, handling of subsea equipment and various other elements. This concept should make production drilling and subsea development up to 20% more efficient.

After working on the design with GustoMSC and three topside suppliers, Statoil approached five yards and multiple drilling contractors. Eikill: “Hence we had good competition in all areas when we placed our orders for the three rigs that are now being built.”

You mentioned the increased robustness compared with other designs.
“When working next to an existing platform, we have to consider the combination of the

two structures. We believe that by increasing the strength of the legs you will get more structural integrity and more operability, so you have a longer operating window. The greater vessel impact capability allows us to optimize logistics. We also looked at HSE and the lifeboats. That is important when we are working alongside an existing platform, when the hull is quite high up. Overall, it gives us a more robust concept and improved safety.”

Sometimes you operate a field with partners. What do they think about the design?

“When we went through the Cat J process we had a ‘fitness for purpose’ strategy. We were also aiming for standardization rather than customizing each rig. There are now three Cat J rigs under construction. That not only reduces the capital expenditure but also brings operational advantages. Two of the three Cat J rigs are owned by the licensees – operators – rather than Statoil. So we had to involve these partners and demonstrate that this was the best solution in terms of HSE, cost and quality.

We have been very open with our partners. Normally, a client buying a rig has a speculative business case. But here we had a specific business case for the NCS, where we wanted to increase the operability. We also wanted more flexibility for the subsea development aspect of the business case. That's not covered by a standard CJ70. It has been an interesting learning process.”

GustoMSC had a number of meetings with Statoil's technical people. Statoil really challenged the industry practices and the verification models which used to demonstrate the structural integrity of the design.

“We have a good technical group at Statoil who can challenge a design house about a project. I was very impressed by how GustoMSC met our requirements for documentation and technical details to verify the rig integrity at the boundary of the operating envelope. When there were gaps they were quickly sorted out with creative modifications to the original concept to step it up. We added a lot of steel to the legs to get

around 20% greater strength. It must have been challenging for GustoMSC to meet these requirements but I think we ended up with a better concept. We had open discussions; we all came out of it stronger. GustoMSC did a brilliant job.

When doing a process like this you have to work as a team. I think that part of the success was that we broke through company boundaries, that we had good and direct communications. There was an exchange of ideas and suggestions to overcome the challenges. I think we had a splendid relationship with you and your team. We really had to use all the competence and capacity in both companies.”

What are Statoil's main goals now?
“We are focussing on cost control and making our projects predictable. The emphasis is on HSE, efficiency and costs, and the many smaller field opportunities. Cat J will help us with its cost efficiency. Incidentally, Statoil does not own the design rights, so GustoMSC can supply the rig design to others.”



Geir Ove Eikill
Vice-President Mobile
New Builds of Statoil

ASSOCIATED EQUIPMENT

THE GREAT GADGETS OF THE CJ SERIES

Each GustoMSC CJ is delivered with associated equipment: the X-Y cantilever skidding system, the fixation system and the jacking system with variable speed drive. Three fascinating solutions.



JACKING SYSTEM SAFE & DURABLE

With the need to improve efficiency, operability and reduction of the relocation times of offshore jack-ups, speed and precise control of the leg handling system are of paramount importance. The GustoMSC jacking system offers a safe operational environment due to the multi layer safety and control systems to protect both people and equipment.

Two features make the GustoMSC jacking systems extremely durable: the special treatment of the jacking pinions and the continuous load and speed control provided by the variable speed drives. Both ensure that the jacking system is subject to hardly any wear.

The electric motors of the rack and pinion systems are driven by individual variable speed drives (VSDs). This arrangement allows for step-less speed control between zero and

maximum speed. By ensuring the torque is equally shared by all motors and pinions, the operation is smoother with less stress.

One potential challenge is that if the spudcan, at the bottom of the leg, encounters an uneven seabed. It can deflect the leg, and this deflection causes rack phase difference (RPD). The GustoMSC jacking system uses encoders on the motors to monitor the position of each chord on a leg to detect RPD before damage can occur.

The jacking systems are operated using a fully computerized operator interface situated on the control desk in the central jacking control room. Fall back local control stations are located at each leg. An automatic platform leveling feature is incorporated in the automation system for lifting and lowering operations.



FIXATION SYSTEM STURDY LEG CONSTRUCTION, INCREASED UNIT CAPABILITIES

When the jack-up has reached the desired elevation above the sea, the counter racks of the fixation systems are moved into the rack of the leg. In elevated conditions, the weight of the jack-up and the environmental loads are distributed through the fixation system.

This load distribution is more efficient than in a jack-up without a fixation system. The use of the fixation system results in a lighter leg, as the brace system can be designed with less weight and a smaller diameter. The slender leg attracts less wave and current loads and results in either harsher environmental conditions or deeper water capability. The fixation system is low maintenance, thanks to its electric motor drive, and can easily be operated by one person.

X-Y CANTILEVER SKIDDING SYSTEM HUGE LOAD CHART, LESS RIG MOVES

The idea behind the X-Y cantilever is simple: it can move in two directions instead of one. It is not only possible to extend the cantilever with the derrick in a longitudinal direction (the X-direction), it can also move in a transverse direction over the width of the deck (the Y-direction).

The effect is huge. The X-Y cantilever has an approximately two times larger drilling envelope than a conventional cantilever. The jack-up therefore needs to be moved less frequently. Of course, the transverse reach – the Y-direction – is much larger, as the cantilever moves back and forth over the deck instead of the derrick moving over the width of the cantilever.

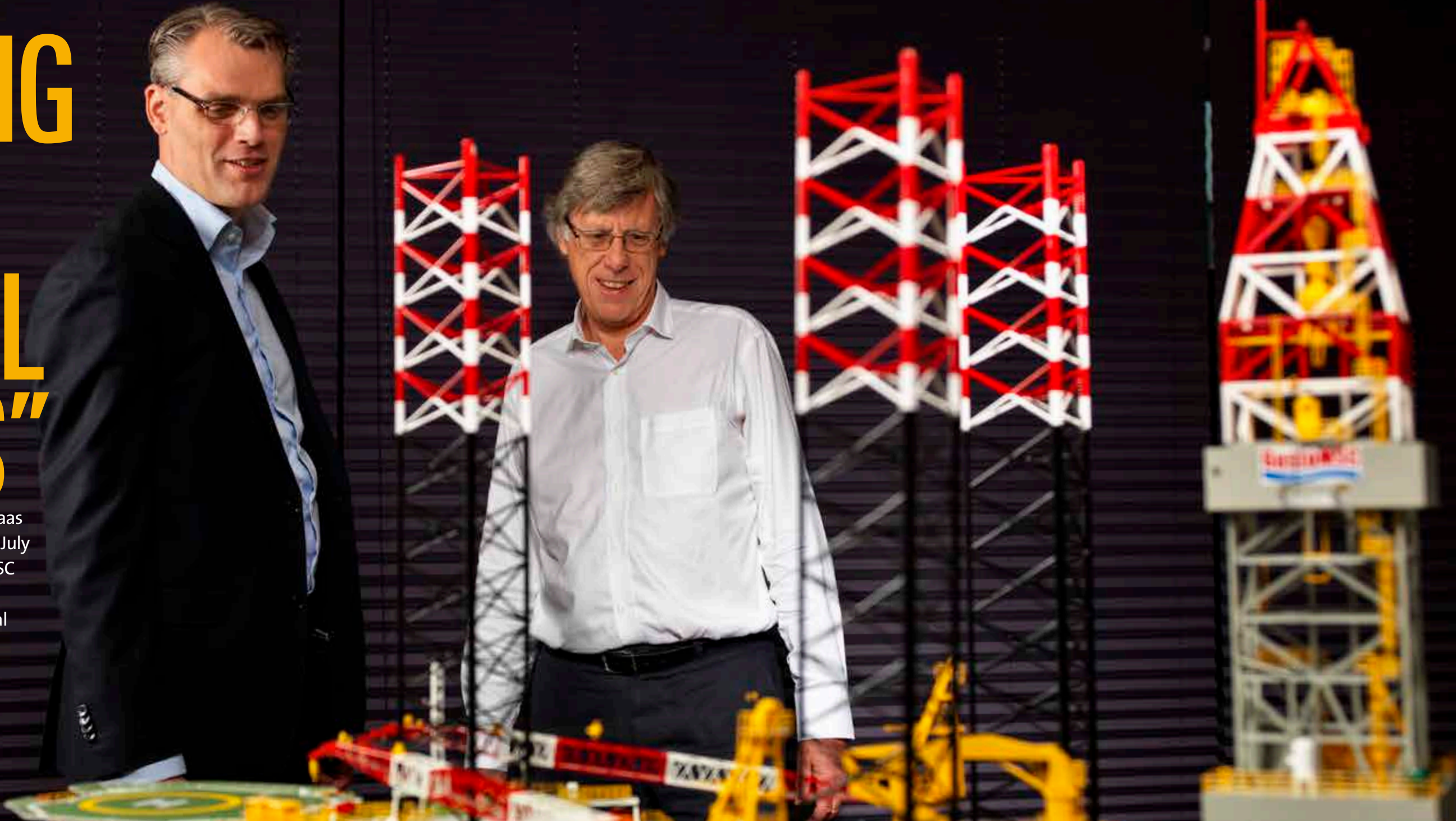
The large envelope is not its only advantage. The derrick is always located near the center line of the cantilever, thus the weight and loads are always evenly distributed. As a result, the cantilever steel weight is lower, the combined load is constant over the transverse reach and the longitudinal reach is greater. The capacity of the X-Y cantilever is approximately 1.5 times higher than a comparable conventional cantilever.

The position of the X-Y cantilever above the main deck is approximately 3.5 m. This, together with the reduced width of the cantilever, minimizes deck obstruction. The required air gap of the hull is also minimized. This reduces the length of leg below the hull and therefore also the overall loading on the jack-up.



“LOOKING AHEAD IS VITAL FOR US”

Nils van Nood succeeded Han Mommaas as Managing Director of GustoMSC in July 2012. Innovations have made GustoMSC a very successful company. Van Nood: “GustoMSC’s know-how and analytical abilities continue to be first class.”



When the Gusto shipyard closed down at the end of the 1970s, the design activities were continued in two separate companies: Gusto Engineering and Marine Structure Consultants (MSC). One of the chief analysts at the time was Han Mommaas. At MSC he was responsible for all the analyses, calculations and design activities for the Cantilever Jack-ups (CJ series) which have helped to make GustoMSC so successful.

An interesting detail: Mommaas’ initials are also C.J. He comments: “After a while, people notice that my initials are the same as the initials of the series. So this is a conversation topic with new clients that always breaks the ice. But the CJ series was not actually named after me.”

Mommaas was Managing Director of MSC for nearly twenty years and one of the initiators of the combination of MSC and Gusto: GustoMSC. Van Nood: “He has largely built up the company and its business model to what it is today.” Mommaas is still connected to GustoMSC as an Advisor. Van Nood started his career at Gusto as a structural engineer. He later headed the Structural Design Department and the Product Development Group and was ultimately responsible for all engineering

activities within Gusto. After the creation of GustoMSC, he volunteered to join and became the Manager Designs.

Perfectionist engineers

One of MSC’s first clients was a combination of the Dutch oil company Nederlandse Aardolie Maatschappij (NAM) and drilling company Neddrill. They were looking for the optimal jack-up design for the NAM fields on the Dutch continental shelf. The somewhat conservative design approach in this project was what prompted the development of the CJ46. Mommaas: “As perfectionist engineers, we believed that the design should be better, more cost effective, more efficient. With the knowledge that we already had, and the ideas that came up during this process, we started to create a new design. One with three legs, with a distance of 46 meters between the legs: the CJ46. We performed very extensive and detailed calculations of the loads and structural capacity.”

Van Nood adds: “GustoMSC’s analytical abilities have always been and still are first class. We develop our own software and test it thoroughly so that we know exactly what we are doing; no black boxes. We are able to analyze

“IT IS ALL ABOUT IDENTIFYING THE REAL DEMANDS OF THE MARKET AND TAKING INITIATIVE.”

Nils van Nood
Managing Director GustoMSC (I)

our designs down to the detail and to optimize them. Consequently, our units can operate in deeper waters, in higher waves and stronger currents than comparable units designed by our competitors. The area in which the GustoMSC jack-ups can work is therefore larger. We are not easily satisfied; there is always room for improvement.”

How do innovations come about at GustoMSC?

Mommaas: “You can sit down together and brainstorm about something new. This usually does not directly result in anything concrete. Sometimes, you suddenly get an unexpected idea. This is, in fact, the way the idea for the X-Y Cantilever arose. Nonetheless, it was not until two years later that we were able to incorporate the X-Y Cantilever into a CJ being built for Maersk as the launching client. Another idea – one that remained on the shelf for about twenty years – was a self-propelled jack-up with four legs, the later NG series. The NG, hinting at New Generation, turned out to be the ideal solution for the installation of wind turbines thanks to a combination of useful features: it is self-propelled, has a fast and efficient pre-load procedure and provides a stable platform. Moreover, we constantly interact with the end users of our units: each of them has their own wishes and requirements. When we hear similar requirements more often, we look into it and see what we can do.” Van Nood: “It is all about identifying the real demands of the market and taking initiative.”

After giving the matter some thought, Mommaas states that pressure from competitors is also an important



“OUR MOST SUCCESSFUL INNOVATION AMONG THE CJS IS CERTAINLY THE X-Y CANTILEVER.”

Han Mommaas
Former Managing Director,
current Advisor GustoMSC

driver for innovation: “When the competition has a better position or threatens to obtain a better position in the market, this is an incentive to come up with something better in order to improve or maintain our position. It is the same the other way around. The X-Y Cantilever is an innovation that we developed, and many of our competitors would like to have something similar.”

Why invest in innovation?

Van Nood: “As a company we have to invest considerably in new developments. For example our newly developed CJ80 jack-up is suitable for a record water depth of 175m in North Sea conditions. As the market for these products is relatively limited, there are only a few competitors that enter this niche market. And it is only by investing that we can stay ahead of the competition.”

Mommaas adds: “A lot of the development work we do also concerns optimizing and continuously improving our know-how and design as well as customizing designs in accordance with our client’s wishes. By means of an intensive interaction between the engineers and the outside world, we are able to come up with ideas that correspond to what the market wants.”

What is GustoMSC’s most successful innovation?

Mommaas: “Our most successful single innovation among the CJs is most certainly the X-Y Cantilever. Without this system, the CJs would have been less distinctive and we would have sold fewer of them. Moreover, we have a complete series in various sizes, a commercial system with licenses and we also supply the associated equipment.”

Van Nood: “We are always working on new developments. We developed a new type of crane for the NG series of which five have now been delivered. This crane is located on a jack-house and revolves around the leg providing more efficient operations and more deck space. Because of this innovation and our knowledge of construction jack-ups, we have been able to acquire a majority market share in the installation units for offshore wind farms in the North Sea.”

What are the most important future developments in the market and for GustoMSC?

Van Nood: “We have been separate from SBM for almost two years now. Initially, the sector adopted a wait and see attitude as to whether we would be sold to a competitor. Now that it is clear that we will remain independent our clients are having no difficulty finding us. Our independent position is very important to us: we are less sensitive to

conflicting interests and we remain accessible for a large part of the market. Another advantage is that we can continue to pursue our own innovation agenda.”

Van Nood continues: “Mobile offshore units are increasingly being built in China, where labor costs are lower, but the shipyards in China and their clients need reputable designs and technology partners. Our products and services fulfill this need and are also attractive for the more well-established shipyards in Korea, Singapore and the rest of the world. The choice for our designs is also driven by the fact that clients demand the maximum possible capability and the maximum possible uptime, i.e. the time in which their units can effectively work. Our designs satisfy these demands. After the recent success of the CJ46, we expect for the coming years an increase in the demand for larger family members of the CJ series, in particular the 50, 54 and possibly also the 62 models. These CJs are very suitable for use in Mexico, for example, or in parts of the North Sea, the Middle East and the Far East.”

Mommaas anticipates another development: “Over the years, there has been a development towards deeper waters and more equipment, so more weight, and towards a larger useful surface area and a larger number of people on board. When we started out in the eighties, 70 people were already considered a lot. Oil companies now want to be able to accommodate 150 people or more on board. And not only in deeper waters, but also in Arctic waters. With the CJ80, we are now active in areas where previously only semi-submersibles could work. While such a large CJ is not cheaper than a semi-submersible, it does offer a higher number of workable days.”

What is on GustoMSC’s innovation agenda?

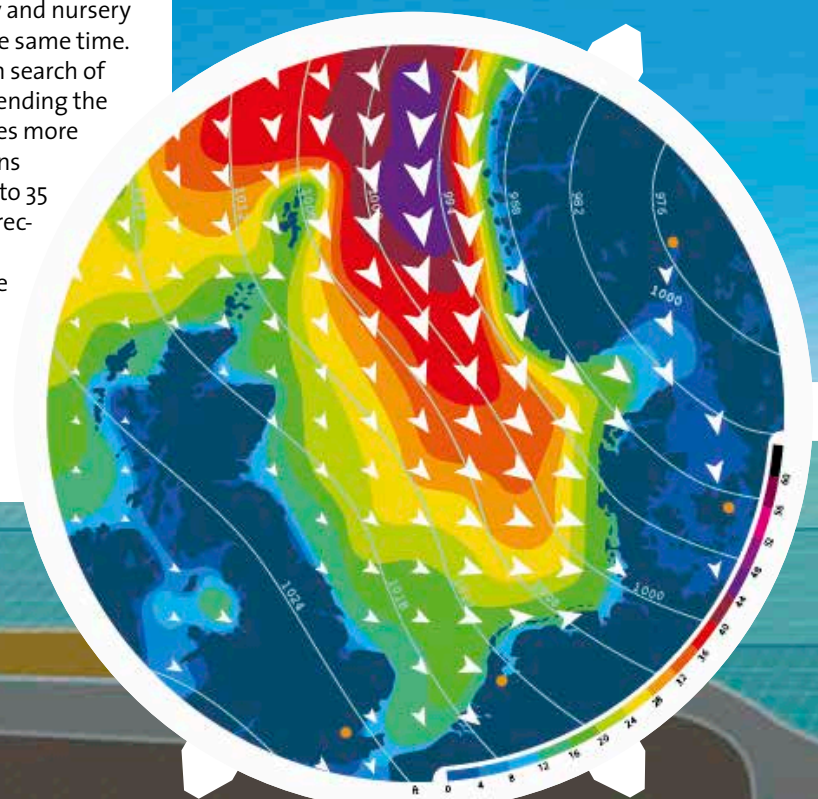
Van Nood: “Looking ahead is vital for us. For instance, we see that harsh environments and Arctic areas are on the operators’ agendas. We are developing new ideas to be able to employ jack-ups, drill ships and semi-submersibles in those areas. New engineering approaches and calculation methods will have to be further defined, refined and verified, where necessary based on model tests.

GustoMSC has already built up a strong reputation as engineering company, but we also supply associated equipment with our designs and we are constantly improving and innovating in that field as well. That includes the services we provide with our equipment. We will certainly continue to cooperate with our clients and develop the next practices for mobile offshore units that serve the global offshore energy market.”

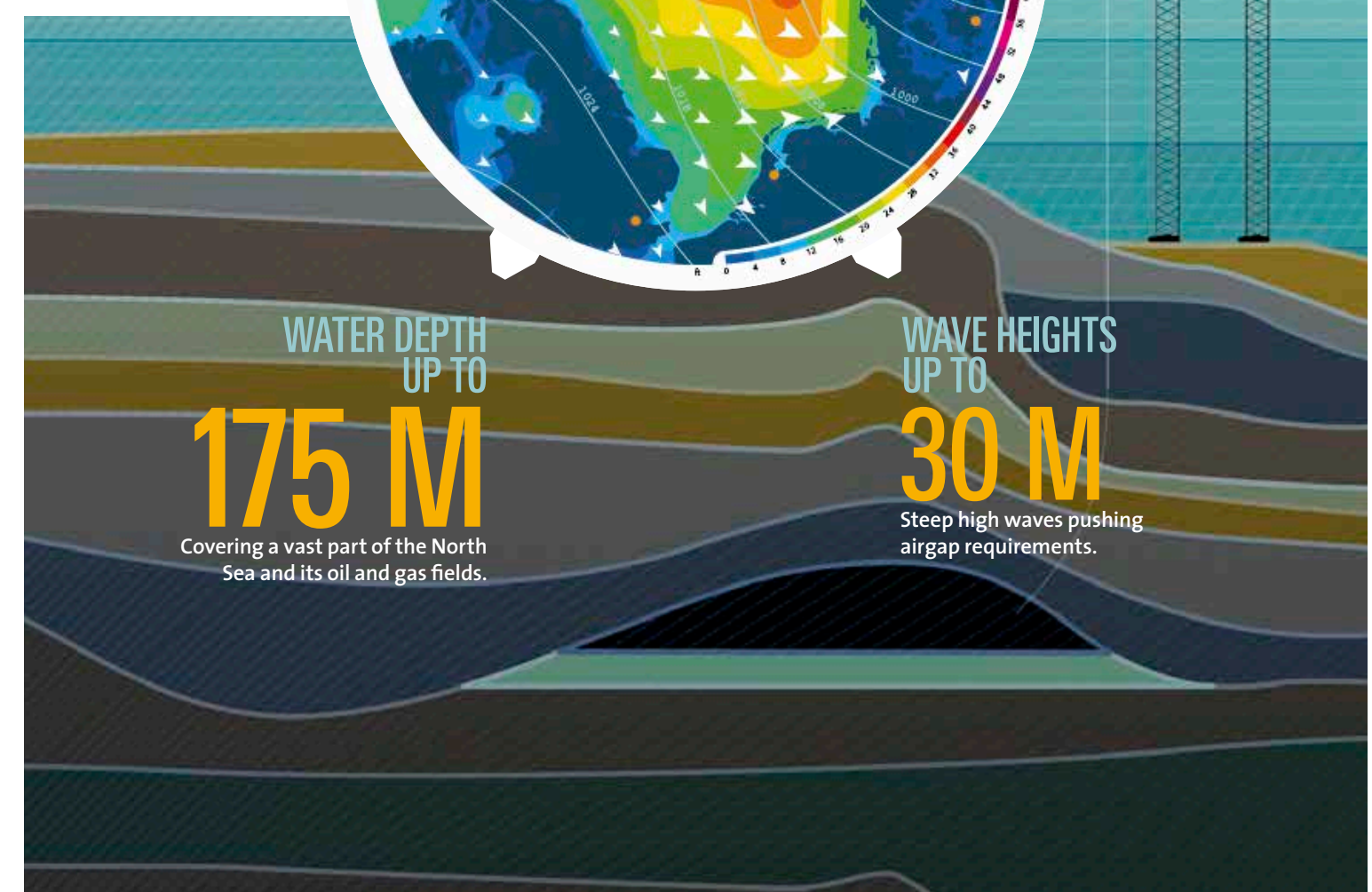
CONDITIONS

OPERATING IN HARSH ENVIRONMENTAL CONDITIONS

The North Sea is one of the toughest offshore regions to operate in. It is the driver for innovations in the jack-up technology and nursery of many GustoMSC designs at the same time. By venturing into deeper water in search of new oil and gas reserves and extending the lifetime of mature fields, one faces more extreme environmental conditions with increasing wave heights up to 35 meters with a more dominant direction combined with wind speeds up to 60 m/s. Designed to survive this baptism of fire in the North Sea, the GustoMSC jack-up series is now fully developed to meet the requirements for worldwide services combined with a safe and cost effective operation.



WIND VELOCITY UP TO **60 M/S**
135 mph storm, comparable to a 100y hurricane.



WATER DEPTH UP TO **175 M**
Covering a vast part of the North Sea and its oil and gas fields.

WAVE HEIGHTS UP TO **30 M**
Steep high waves pushing airgap requirements.

UNITS ON ORDER & RECENT DELIVERIES

This map shows the GustoMSC designs currently on order worldwide. After completion, the units will be operated all around the world.

DSS20-NS FLOATEL SUPERIOR

Floatel Superior, an accommodation semi-submersible, was built in 2010 for Floatel International at Keppel FELS



NG-9000C SEA INSTALLER

Built at Cosco Nantong Shipyard for A2SEA.



CJ70 MAERSK INTREPID

CJ70 ultra harsh environment drilling jack-up rig, here at full height test.



SEA 3250 JB-118

JB 118 is a multipurpose jack-up.



DPV7500 HAI YANG SHI YOU 201

Is a pipe lay crane vessel that was designed for COOEC and is currently employed in the East Chinese Sea.



CJ46 COSL GIFT

COSL Gift recently delivered by CMHI



P10,000 OCEAN BLACKRHINO

Ocean BlackRhino, named at HHI shipyard for Diamond Offshore, is the sister ship to the recently delivered Ocean BlackHawk.



DSS38 GOLD STAR

Gold Star, a semi-submersible drilling unit owned by Queiroz Galvao Perfuracoes, operates in South America.



NG-2500X SEP-450

SEP-450, built in 2012 for NPCC, is a multipurpose jack up.



- Drilling units**
 - Jack-up (CJ series)
 - Semi-submersible drilling (DSS series, Ocean series)
 - Drilling vessel (PRD12,000 Pro,000)
- Construction units**
 - Accommodation jack-up (AJ series)
 - Accommodation semi-submersible (DSS series, Ocean series)
- Renewables**
 - Installation/maintenance jack-up



Sound solutions that enhance your operation

Siemens is a long-standing solution provider for the oil and gas industry with decades of expertise in power supply, drives, EIT and water treatment. We provide innovative, efficient and environmentally sound solutions that help stakeholders in offshore drilling to capitalize on their strengths. Siemens is proud to be a key supplier to GustoMSC for their Rack & Pinion Jacking Systems: we are responsible for motors, brakes, drives and automation. Our partnership enables us both to share technical knowledge in order to achieve operational excellence. Together we have reached the quality of design as it is found today.

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COLUMN UPTIME OR DOWNTIME?



'It is better that the optimist is wrong than that the pessimist is right.' I used to have a colleague who added this wisdom to every e-mail he sent. It came to mind when I was asked to write a column for this InSide Magazine on the theme of 'Uptime'. Uptime? I had never related the topic of workability to uptime, but rather to the other side of the same coin: downtime. And I always thought I was an optimist...

But seriously: uptime is a very important topic in our maritime industry. It couples the design to the operation. That is why we often refer to it as 'operability' or 'workability'. It forces the designer to concentrate on the specific tasks of a ship. A ship is only fit for purpose when it can perform its tasks safely and effectively for a major part of the time. Only in that part of the time does it offer value for money.

This all sounds logical, but ship design and ship operation have seemed to inhabit different worlds for far too long. In shipbuilding, the resistance and propulsion of a ship were (and sometimes still are) optimised for one specific draft. The result: a completely optimised ship, but for conditions under which it will hardly ever sail. Something similar happened in the offshore sector when we were engineering our structures for the '100 years storm', without asking whether these highest waves would actually be critical for the safety and operability of the ship. A smaller wave with a more critical wave period could, for instance, be far more important.

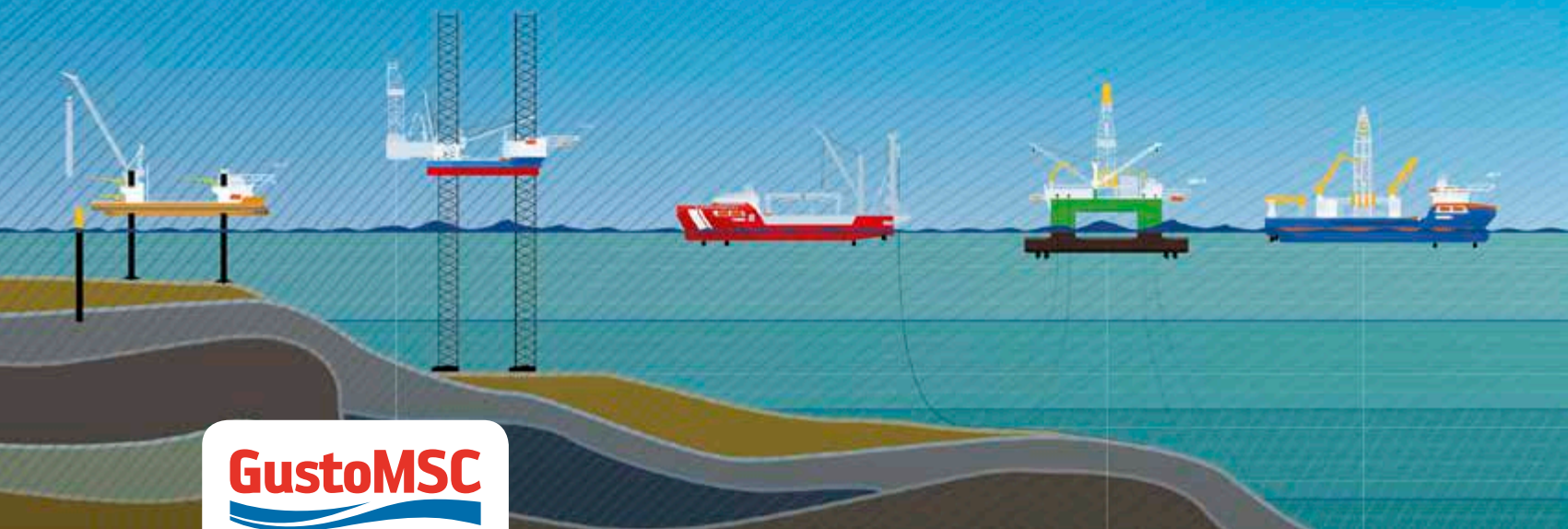
It is good to see that there is nowadays a strong focus in shipbuilding on the actual operation of the ship. The hull is not just optimised for this one 'design' draft and speed anymore, but for the complete operational profile of speeds, drafts, trim angles and weather conditions it will encounter during its lifetime. We call it 'design for service' or 'design for operation', and the resulting ship will be very different.

Also in the offshore we now use a 'response based' methodology to check the survivability of the structure in a much wider range of realistic conditions than just the highest wave. For the actual operability the situation can be even more complex, especially for structures that perform a series of tasks. As an example: a wind turbine installation jack-up has to load the wind turbines, manoeuvre safely in port, sail rapidly to the offshore location, lower its legs on DP, touch the seabed, jack up, perform the installation, raise its legs and sail back to port in quite a different loading condition. The operability levels of all these steps will be different and the sequence of events is very important. We cannot just add the downtime of the different tasks to come to the total operability. Within the complete chain of tasks, the weakest link determines the operability of the entire operation. For this purpose we need 'scenario simulations', linking a representative time sequence of the weather conditions of wind, waves and current at the location(s) to the actual sequence of tasks in the operation of the structure.

Only when we couple the time sequence of the weather conditions to the time sequence of the tasks during the design phase can our structures be optimised for the ultimate operation phase. So the 'up' or 'down' are not essential, but the time is!

Bas Buchner
President of MARIN
(Maritime Research Institute Netherlands)

THE PIONEERS OF OFFSHORE ENGINEERING



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 the best in class solutions for mobile offshore units.

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