INSIDE

MAY 2016 # 25

THINKING OUTSIDE THE BOX

GustoMSC

THE PIONEERS OF OFFSHORE ENGINEERING

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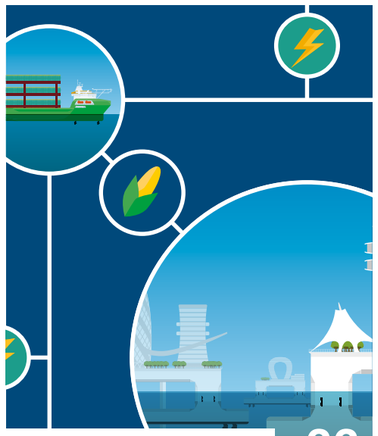
INTERVIEW PUSHING THE BOUNDARIES

GustoMSC developed the largest wind-turbine installation vessel in the world: Seajacks Scylla. Blair Ainslie, CEO of Seajacks: ‘We always try to be ahead of the game.’



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4 SCENARIOS LOOKING FORWARD TO 2036

The UN climate agreement could lead to a turning point in the use of fossil fuels, and to gradually switching to alternative energy sources. We outline four possible scenarios for 2036, written by GustoMSC authors.

COLOPHON

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PREFACE

CROSSING BORDERS

Nobody has a crystal ball. That continues to be the message in the offshore oil and gas markets, and to a certain extent also in the offshore wind industry. How and especially when these markets will pick up is impossible to predict.

Prices remain under pressure and the need to lower cost is greater than ever. For oil and gas, this clearly is caused by the imbalance of supply and demand. For offshore wind, the long-term need to reduce energy costs remains a driving topic, leading to larger-scale wind turbines, which causes installation challenges due to the need for increasingly heavier and taller objects. The NG-14000X as portrayed in this edition of InSide is an answer to this trend. Seajacks CEO Blair Ainslie explains why his company is ahead of the game with its newest unit Scylla, at present the largest installation jack-up in the world.

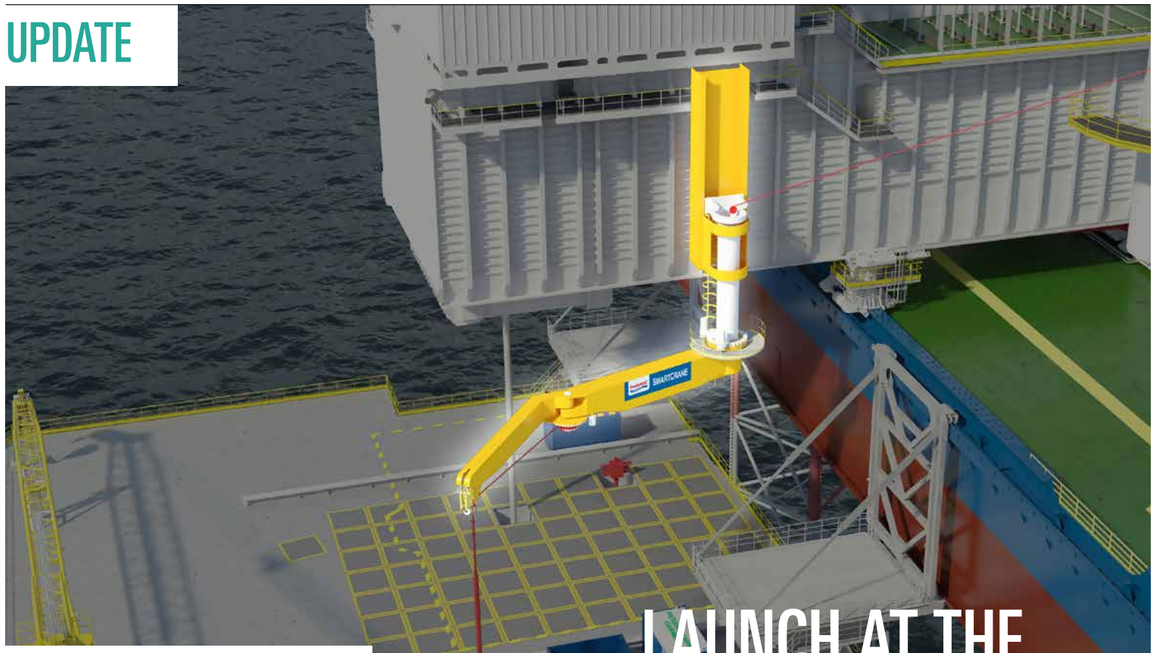
As ‘right-sizing’ continues, the industry also realizes that future business can only be gained when operational efficiency improves. Innovative and integrated technical solutions are often seen as a means to make the difference: differentiating is becoming the standard which can make or break a new deal.

Differentiating solutions come about in close cooperation between all parties involved: operators, contractors, designers, equipment suppliers, shipyards, etc. It requires balancing the requirements and needs of all parties, and protecting the interests of those involved. As a designer, GustoMSC is used to playing a central role in such processes, always with the objective of developing optimal fully-integrated solutions. A company with whom we have a long track record of developing such differentiating solutions on jack-ups and semi-submersibles is Maersk Drilling. CEO Claus Hemmingsen explains how he aims to position Maersk Drilling in these challenging times.

Besides optimized and integrated overall solutions that can make the difference, a new piece of equipment can sometimes bring an innovative way of working. Our newly developed cantilever SmartCrane is an example of such an innovation. It improves efficiency by enabling simultaneous operations under a drilling cantilever. The option to lift objects in one lift from the jack-up deck to any place under the cantilever while the drilling center is operational, further improves its functionality and, even more important, improves the safety of the operation. The SmartCrane can be retrofitted on any cantilever jack-up.

As business activities slow down, at GustoMSC as well, we have more time to think outside the box about technical challenges and about the future of our markets. Exemplifying the latter are the scenarios presented on the final pages of this InSide. We will continue to invest in our proprietary solutions as well as in developing solutions together with our business partners and with clients, existing and new. In all those activities, we aim to positively surprise you with solid ideas and innovative solutions that you need to excel in the present and future markets.

Nils van Nood
CEO GustoMSC



LAUNCH AT THE OTC HOUSTON 2016

SMARTCRANE ENABLING SIMOPS

The SmartCrane directly addresses the call for cost reduction from the operators, while providing drilling contractors with a means to distinguish themselves.
Two elements were high on the agenda when developing this piece of equipment: facilitating SIMOPS independently of any operation in progress at the well center and easing material handling underneath the cantilever. The SmartCrane provides a 20 metric ton lifting point underneath the cantilever at any position, independently of the well-center position, and also has access to the main deck. With this ability, two types of operations are made possible. A sheave and winch arrangement facilitates commonly used wireline operations at any given position. And it can transfer containers and other pieces of equipment (<20 mt) from the main deck to underneath the cantilever and back.
This is a unique feature greatly enhancing safety and efficiency, as access to the well head from the drilling rig is difficult due to the area being blocked by the cantilever. At the same time, the topside crane cannot be used, due to the fact that the drilling rig is cantilevering over the platform.

Rutger Baan
Commercial Director

BIODEGRADABLE GREASE COMPARISON TESTS

All rack and pinion systems need lubrication grease to operate smoothly. Operators increasingly obligate rig owners to use biodegradable grease for their jacking systems. In order to be able to advise our clients, GustoMSC started a test project to compare the different brands of biodegradable jacking greases.
These tests were performed in a laboratory and on a specially designed one-to-one scale GustoMSC test rig. In the laboratory, the general grease performance was tested with respect to wear, corrosion resistance, oil separation, water spray off and pumpability at lower temperatures. Endurance tests for load-bearing capacity and wear resistance were held at the test rig.
This dedicated test rig is a back-to-back test arrangement with one driving pinion and one braking pinion. A gear-rack module 50 is mounted in between the two drives moving automatically backwards and forwards.
The load and the speed of the system can be adjusted precisely with the VSD electric drives. This way, a large number of cycles can be tested equivalent to a total life time of a CJ-drilling rig in a relatively short period of time.
The results of this test campaign show that, under test circumstances, a number of these biodegradable greases are performing quite well and comparable with standard mineral/synthetic greases. The following step will be to analyze how these biodegradable greases will perform under real offshore circumstances.

Wim Woldring
Senior Consultant

NG-3500X LATEST ADDITION TO THE NG SERIES

GustoMSC launched its latest design in the successful series of self-propelled jack-up designs – the NG series – at the OTC Asia in Kuala Lumpur last March. The NG-3500X is a solution for maintaining and carrying out interventions in the large number of mature fields and infrastructure in the Middle East and South East Asia. The conditions of these fields are characterized by deeper water and larger expected penetrations.
Until now, this was the domain of classic drilling jack-ups and work barges with associated rates and operational restrictions. As with all NG series designs, one of the key features of the NG-3500X is that it is designed with survival capability in mind. It means that the unit can remain offshore when adverse weather conditions occur. The unit does not have to go back to port. The ability to stay on location results in more workable days, optimum efficiency and a minimum of non-productive hours during operational charters.
In order to carry out the various types of work, the NG-3500X comes in two distinct designs. One type is a multipurpose version with various crane options for any type of service for the oil and gas industry, from simple maintenance jobs, accommodation and support to light well intervention.
The other type is a dedicated unit for heavy well intervention and light drilling. It is fitted out with an X-Y cantilever and derrick. The cantilever unit truly bridges the gap between the successful shallow to mid-water service units and the full-fledged drilling rigs for the Middle Eastern and (South East) Asian markets. The unit is equipped with a cantilever featuring the X-Y skidding system. This system provides a large drilling envelope of 50 ft x 24 ft (15.2 m x 7.3 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 (3.5 m).

Jan-Mark Meeuwisse
Commercial Director

RACK AND PINION SYSTEMS LOAD MEASUREMENT WHILE ON THE BRAKES

Courtesy: BROSA

GustoMSC is now introducing a new pinion load measurement sensor enabling measurement of direct pinion loads while the jacking system brakes are engaged.
This type of load measurement is particularly useful on three-leg rigs for leg load and chord load monitoring during the ballast preloading process and buoyancy leg pulling. The measurements can also be used on four-leg rigs for monitoring the load distribution over all legs during preloading. As these units are typically not equipped with rack fixation systems, the readings are also used while at airgap for monitoring storm situations and heavy deck load operations.
Pinion loads are measured directly both in jacking and leg pulling direction. The readings are displayed on the central control desk.
The application for pinion load measurement was lab-tested before applying it on one of our full-scale test rigs. The system has now been commissioned on two CJ50 drilling jack-ups as well as on the four-leg NG-14000X wind turbine installation unit Seajacks Scylla (see page 18).

Arjan van der Spek
Project Manager Equipment

AGENDA

2 – 5 MAY 2016
OTC 2016
HOUSTON
Stand 11007

21 – 22 JUNE 2016
GLOBAL OFFSHORE WIND
MANCHESTER
Stand 143

29 AUGUST – 1 SEPTEMBER 2016
ONS 2016
STAVANGER
Stand in Holland Pavilion

24 – 26 OCTOBER 2016
ATC 2016
ST. JOHN'S NEW-FOUNDLAND AND LABRADOR
Stand 1002

7 – 10 NOVEMBER 2016
ADIPEC
ABU DHABI
Stand in Holland Pavilion

29 NOVEMBER – 2 DECEMBER 2016
OSEA
SINGAPORE
Stand in Holland Pavilion

Courtesy: Maersk Drilling

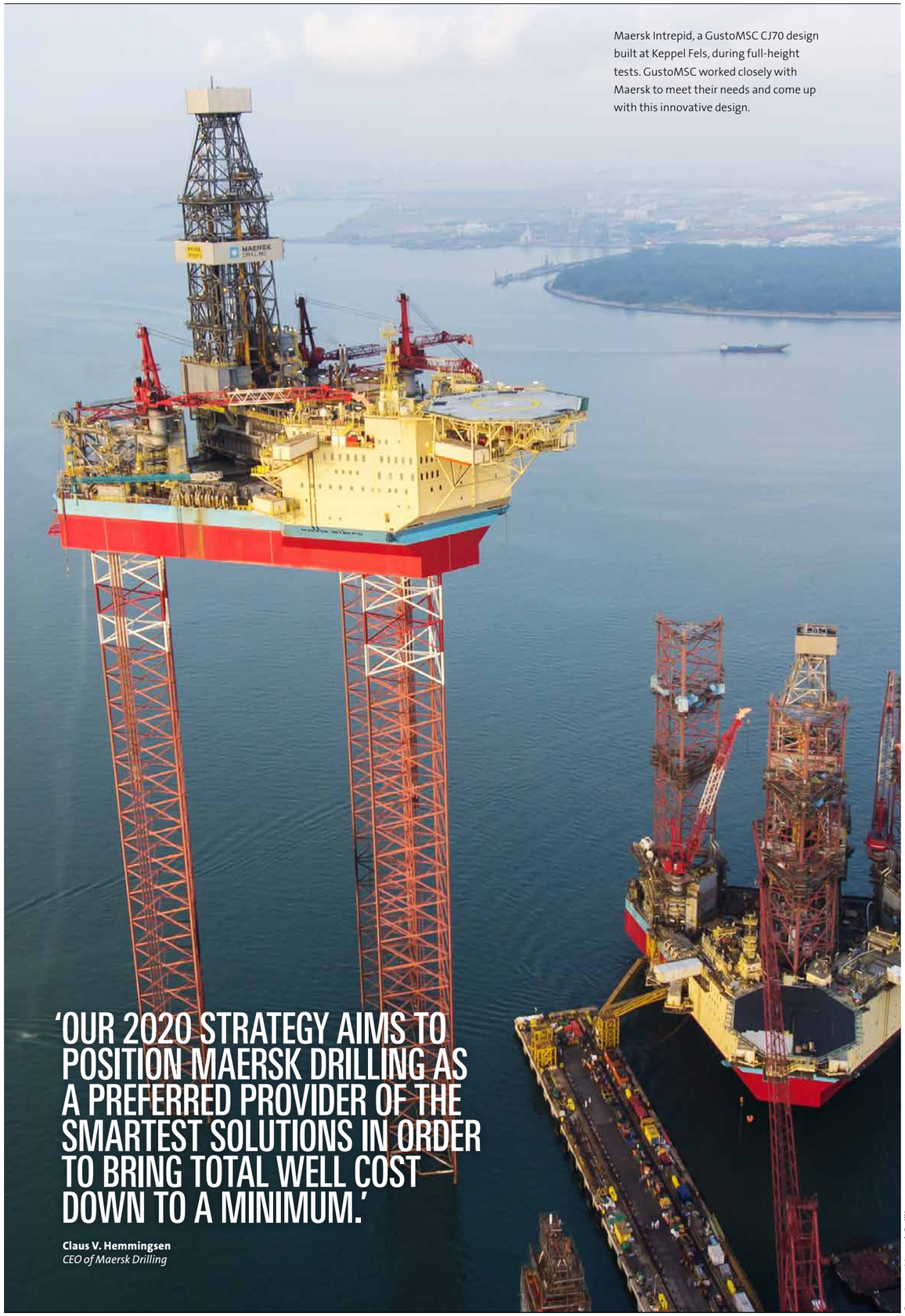
RECALIBRATING TO THE NEW OIL REALITY

Maersk Drilling is a leading global drilling contractor that provides high efficiency drilling services to oil companies around the world. Last year, despite tough market circumstances, Maersk Drilling made a profit of USD 751m and an underlying profit of USD 732m. The results were positively impacted by good contract coverage, fleet growth, cost savings and a strong operational performance. For 2016, Maersk Drilling expects lower results due to lower day rates and more idle days. Nils van Nood, CEO of GustoMSC, asks Claus V. Hemmingsen, CEO of Maersk Drilling, to share his views about the challenges the offshore industry and Maersk drilling are facing. Hemmingsen: ‘We have to watch our costs. Every dollar we spend is a dollar taken away from the bottom line and taken away from the future. So we keep on watching our performance and safeguarding our high uptime.’

Despite challenging market conditions, Maersk Drilling is performing well and executing its fleet renewal program according to plan. How do you keep your company on track in the current volatile macroeconomic environment?
Given the new oil reality, we have to conduct our operations at a completely different cost level. We cannot focus solely on operational excellence, we also have to focus on efficiency. However, the new oil reality also provides additional opportunities for us to solve our customers’ needs and pain points. We have to prepare for the future by recalibrating to the new oil reality by differentiating from our competitors and focusing on value creation for our customers in order to bring down their total well costs.
It goes without saying that we have to achieve that and at the same time maintain and improve our high safety performance.

What will be decisive for continuing the fleet renewal program?
First of all, we already have the second youngest and most modern rig fleet in the industry. Given the current market situation, and lack of forward visibility, for the time being we will only order rigs that are backed by solid, long-term contracts.

What would it take to extract more value from oil and gas projects taking into account the actual low oil and gas prices?
The offshore rig market is experiencing a downturn, due to cost inflation, oversupply of rigs and oversupply of oil, resulting in a low oil price. It is evident that the market situation requires another cost level in order to compete. Our focus will be on servicing our customers by de-risking and reducing their total well costs, collaborating on optimizing their drilling programs and providing superior drilling performance. We can’t do that by focusing on our own internal cost savings alone. Our 2020 Strategy aims to position Maersk Drilling as a preferred provider of the smartest solutions in order to bring total well cost down to a minimum.



Maersk Intrepid, a GustoMSC CJ70 design built at Keppel Fels, during full-height tests. GustoMSC worked closely with Maersk to meet their needs and come up with this innovative design.

‘OUR 2020 STRATEGY AIMS TO POSITION MAERSK DRILLING AS A PREFERRED PROVIDER OF THE SMARTEST SOLUTIONS IN ORDER TO BRING TOTAL WELL COST DOWN TO A MINIMUM.’

Claus V. Hemmingsen
CEO of Maersk Drilling

Courtesy: Maersk Drilling

Technological innovation is essential to keep overall costs low and your company at the forefront. The balance between Capex and Opex is quite fundamental here as typically cost reduction on the operational side can only be achieved by higher initial investments. How does Maersk seek to achieve this balance and what innovations in the past are good examples in your opinion?
We have the best engineers in the world working for us, and we must utilize their ability to develop technical solutions that help our customers. Although I am tremendously proud of our rigs and their capabilities, it is not about building the biggest rig anymore. Instead, it is about developing technical solutions and implementing these on our assets in order to unleash new drilling prospects. Within this area, we can do a lot, also in the supply chain, through collaboration and knowledge sharing in order to drive innovation and cost savings. Having said that, the best rig will only excel in performance with the best and most competent rig management and crew – I firmly believe we have that in place at Maersk Drilling.

How do you regard the market’s common day-rate driven business model, as higher efficiency rigs, like Maersk’s, may result in less operational days, hence less income? As such this model might be blocking innovations leading to higher efficiency, less rig days and lower cost, unless operators are willing to pay an acceptable premium on day rates for higher efficiency rigs. Are operators becoming more open to alternative models, or is the day-rate driven model there to stay?
The market is and should be crying for change. Oil companies are looking for suppliers who can help them with cost reductions and an overall more efficient value chain. If we do not start offering something different to our customers, somebody else will. Whether or not this will eliminate the day-rate model for a more performance-based model is too early to tell.

Do you see a future for Maersk Drilling in innovative business models like BOP leasing?
No, not really. As a drilling contractor, we need to stay close to our well control and well control equipment.

How do you boost technological innovation within the company, and what role can partners play?
Our strategy is to differentiate ourselves based on our three unique key capabilities: operational excellence, technical problem solving and deep customer acumen. Without technical problem solving, we will not get a seat at the table with our customers. We have to show that we can solve their well challenges with technical solutions that at the same time lower the total well costs. Collaboration in the value chain is going to play a key role in order to improve cost levels and recalibrate to the new oil reality.

Claus V. Hemmingsen
CEO of Maersk Drilling

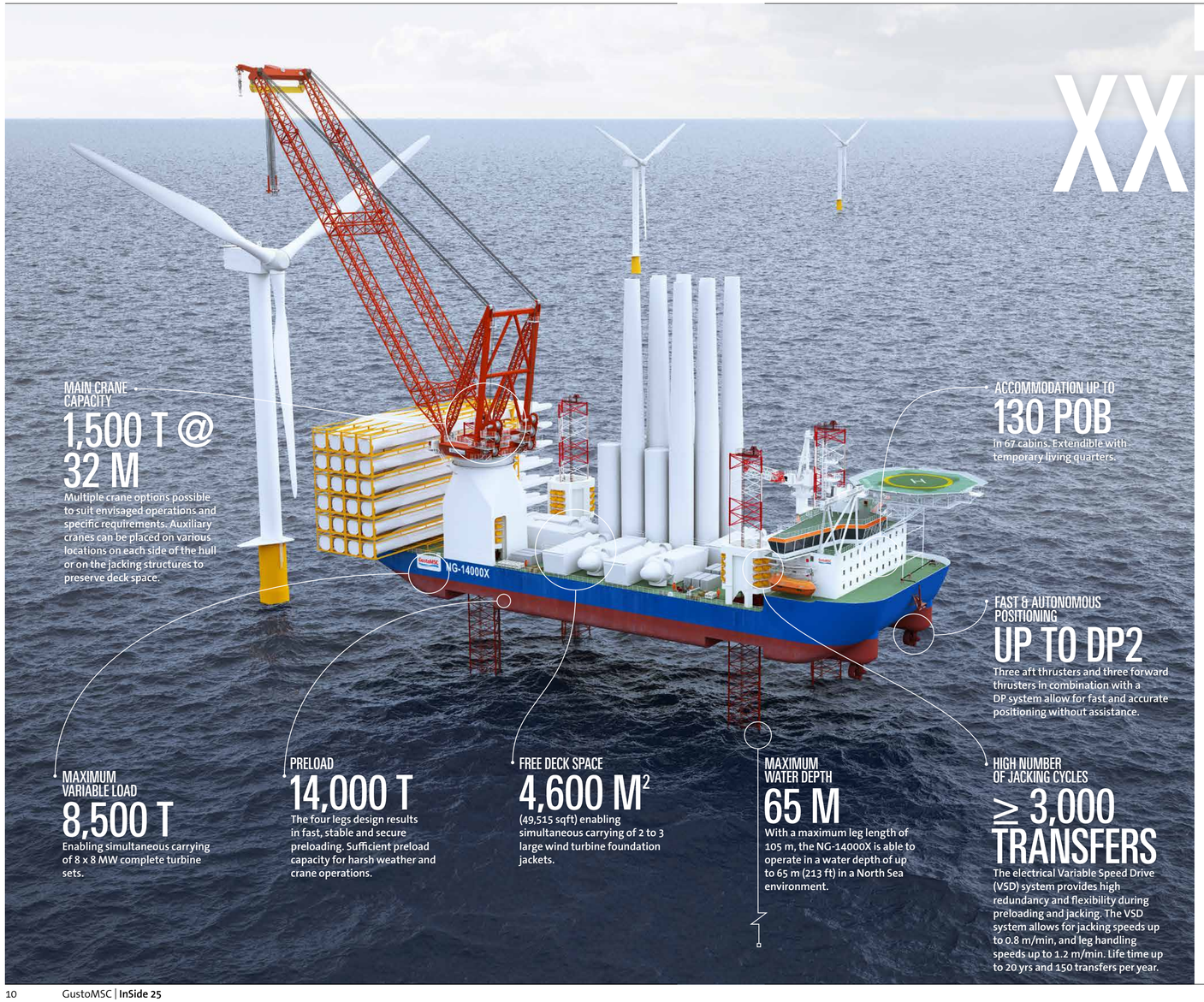
Claus V. Hemmingsen is a member of the Group’s Executive Board and CEO of Maersk Drilling.

Mr. Hemmingsen joined the Maersk Group in 1981 as a shipping trainee and after having completed his shipping education, he joined Maersk Drilling’s Human Resource Department.
After being stationed in Hong Kong for Maersk Line (1992-1997) and in Singapore (1997-2000), Mr. Hemmingsen returned to Hong Kong in 2000 where, as Managing Director, he had the overall responsibility for Maersk’s activities in the Hong Kong SAR.

In 2003, Mr. Hemmingsen returned to the head office in Copenhagen as Senior Vice President responsible for the container activities’ Global Service Delivery, including Global Shared Service Centers. He simultaneously held responsibility for APM Terminals until June 2004, before assuming responsibility for Maersk Drilling and Maersk Supply Service in 2005, for SVITZER A/S in 2008 and for Maersk Tankers in 2012. As of January 2014, he was appointed CEO of Maersk Drilling and became a member of the Group Executive Board.

Since the launch of the Cantilever Jack-up, our companies have worked together on several studies and concepts, for example on the Arctic. Which themes can be essential in the area of cooperation and innovation in the near future?
Bringing down the total well costs will be the main theme for many years to come. Not only for us, but also for everybody else in the value chain. Collaboration is going to play a key role in order to drive down costs.

How do you see the future of fossil energy in twenty years from now?
The future is hard to predict. At Maersk Drilling, we acknowledge that the industry is impacted by and plays a role in the climate change challenge. However, there continues to be a need for energy, including fossil fuels, in developing countries in order to support the rising middle class and increasingly advancing societies. Renewable energy sources cannot be expected to meet the demand on their own, and fossil fuels are still needed in the energy mix to provide the global energy demand.



MAIN CRANE CAPACITY

1,500 T @ 32 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 jacking structures to preserve deck space.

ACCOMMODATION UP TO

130 POB

in 67 cabins. Extendible with temporary living quarters.

FAST & AUTONOMOUS POSITIONING

UP TO DP2

Three aft thrusters and three forward thrusters in combination with a DP system allow for fast and accurate positioning without assistance.

MAXIMUM VARIABLE LOAD

8,500 T

Enabling simultaneous carrying of 8 x 8 MW complete turbine sets.

PRELOAD

14,000 T

The four legs design results in fast, stable and secure preloading. Sufficient preload capacity for harsh weather and crane operations.

FREE DECK SPACE

4,600 M²

(49,515 sqft) enabling simultaneous carrying of 2 to 3 large wind turbine foundation jackets.

MAXIMUM WATER DEPTH

65 M

With a maximum leg length of 105 m, the NG-14000X is able to operate in a water depth of up to 65 m (213 ft) in a North Sea environment.

HIGH NUMBER OF JACKING CYCLES

≥ 3,000 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 0.8 m/min, and leg handling speeds up to 1.2 m/min. Life time up to 20 yrs and 150 transfers per year.

FACTS & FIGURES

XX

NG-14000X HIGH LOAD AND HOISTING CAPACITIES

The NG-14000X is the largest self-propelled jack-up in the world. It is intended for the future high-end installation works of the larger wind turbines. The unit is also well positioned to perform heavy-duty support services in the oil and gas sector.

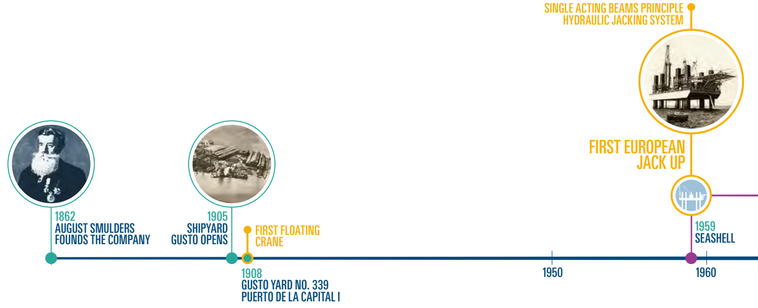
The NG-14000X is the most capable and efficient wind turbine installation jack-up for the future wind farms in deeper waters and further offshore. Thanks to an impressive 1,500 t high-reach offshore leg crane and large open deck space in combination with a high variable load capacity, the NG-14000X is capable of meeting the installation needs of the future.
This large NG-14000X has four truss type legs and still has a relative small footprint on deck, meaning that maximum use can be made of the available deck space, especially between the aft legs. Its width of 50 m and massive deck enables transportation of complete sets of up to eight 8 MW turbines, multiple jackets or XL monopiles which can be transported longitudinally instead of transversely. Another advantage of its considerable crane capacity and variable load is that XL monopiles of 10 m diameter weighing 1,300 tons plus or large jackets can be handled with ease, compared to earlier larger installation jack-ups.
The NG-14000X is intended for use in water depth of up to 65 m in a North Sea type of environment. This unit is equipped with a well-balanced DP2 maneuvering capability enabling swift positioning and relocation.
The GustoMSC made Rack & Pinion Jacking System is controlled by electrical variable speed drives (VSD). The system enables controlled jacking at any time, with low wear and tear, making it possible to control the jacking speed and loads on each individual leg accurately during the entire jacking process, including preloading. This is essential for fast and safe installation of the jack-up at each location.

Jan-Mark Meeuwisse
Commercial Director

MILESTONES

MORE THAN A CENTURY OF GAME-CHANGING INNOVATIONS

GustoMSC has evolved during the last 150 years from an engineering workshop to a world-renowned design and engineering company in the maritime industry. Years of design, construction and supply of equipment, ships and offshore units are ingrained in GustoMSC's culture. The engineers at GustoMSC are living up to the company's history. Many recent designs show that innovation is keeping us at the forefront of the offshore energy industry.



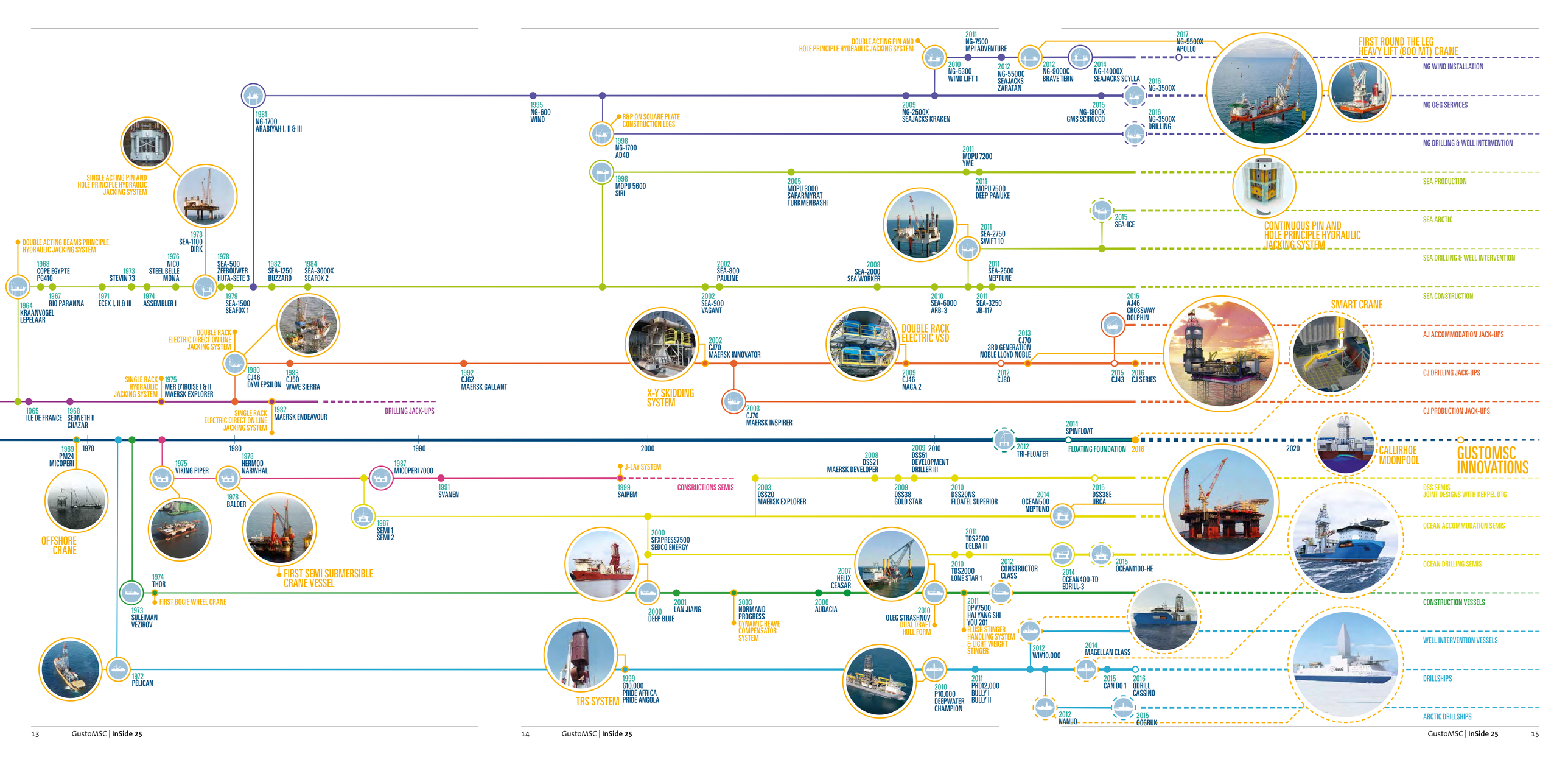
The power of development

Working closely with customers, our specialist teams of consultants, designers and engineers offer the power of development. As a top-level engineering company, our business approach is to stay at the forefront of solutions and technologies. We know how to work together towards developing and safeguarding intellectual property with all stakeholders.

It is for this reason that we are able to make the next step in the offshore energy production possible. Our knowledge enables our customers to look ahead. By pushing the boundaries and going technically much further when needed but also by thinking outside the box on technical challenges.

Milestones

This innovation timeline demonstrates that GustoMSC has provided a series of innovative solutions to many sectors of the offshore industry. Besides the impressive pioneering past of the company, actual innovations are included since both existing and new solutions ensure that our clients stay ahead of the game.


1964 KRAANVOGEL LEPELAAR
1965 ILE DE FRANCE
1967 RIO PARANNA PG410
1968 SEDNETH II CHAZAR
1968 COPE EGYPTE
1969 PM24 MICOPERI
1971 ECEX I, II & III
1973 STEVIN 73
1973 SULEIMAN VEZIROV
1974 ASSEMBLER I
1974 THOR
1975 MER D'IROISE I & II MAERSK EXPLORER
1975 VIKING PIPER
1976 NICO STEEL BELLE MONA
1978 BALDER
1978 HERMOD NARWHAL
1978 SEA-1100 DIRK
1978 SEA-500 ZEEBOUWER HUTA-SETE 3
1979 SEA-1500 SEAFOX 1
1980 CJ46 DYVI EPSILON
1981 NG-1700 ARABIYAH I, II & III
1982 MAERSK ENDEAVOUR
1982 SEA-1250 BUZZARD
1983 CJ50 WAVE SIERRA
1984 SEA-3000X SEAFOX 2
1987 MICOPERI 7000
1987 SEMI 1 SEMI 2
1991 SVANEN
1992 CJ62 MAERSK GALLANT
1995 NG-600 WIND
1998 NG-1700 AD40
1998 MOPU 5600 SIRI
1999 G10.000 PRIDE AFRICA PRIDE ANGOLA
1999 SAIPEM
2000 DEEP BLUE
2000 SFXPRESS7500 SEDCO ENERGY
2001 LAN JIANG
2002 CJ70 MAERSK INNOVATOR
2002 SEA-800 PAULINE
2002 SEA-900 VAGANT
2003 CJ70 MAERSK INSPIRER
2003 DSS20 MAERSK EXPLORER
2003 NORMAND PROGRESS
2005 MOPU 3000 SAPARMYRAT TURKMENBASHI
2006 AUDACIA
2007 HELIX CEASAR
2008 DSS21 MAERSK DEVELOPER
2008 SEA-2000 SEA WORKER
2009 DSS38 GOLD STAR
2009 DSS51 DEVELOPMENT DRILLER III
2009 NG-2500X SEAJACKS KRAKEN
2009 CJ46 NAGA 2
2010 DSS20NS FLOATEL SUPERIOR
2010 NG-5300 WIND LIFT 1
2010 SEA-6000 ARB-3
2010 OLEG STRASHNOV
2010 P10.000 DEEPWATER CHAMPION
2011 NG-7500 MPI ADVENTURE
2011 MOPU 7200 YME
2011 MOPU 7500 DEEP PANUKE
2011 SEA-2750 SWIFT 10
2011 SEA-2500 NEPTUNE
2011 SEA-3250 JB-117
2011 TDS2500 DELBA III
2011 DPV7500 HAI YANG SHI YOU 201
2011 PRD12,000 BULLY I BULLY II
2012 NG-5500C SEAJACKS ZARATAN
2012 NG-9000C BRAVE TERN
2012 CONSTRUCTOR CLASS
2012 CJ80
2012 TRI-FLOATER
2012 WIV10.000
2012 NANUQ
2013 CJ70 3RD GENERATION NOBLE LLOYD NOBLE
2014 NG-14000X SEAJACKS SCYLLA
2014 SPINFLOAT
2014 OCEAN500 NEPTUNO
2014 OCEAN400-TD EDRILL-3
2014 MAGELLAN CLASS
2015 NG-18000X GMS SCIROCCO
2015 SEA-ICE
2015 AJ46 CROSSWAY DOLPHIN
2015 CJ43
2015 DSS38 URCA
2015 OCEAN1100-HE
2015 CAN DO 1
2015 006RUK
2016 NG-3500X
2016 NG-3500X DRILLING
2016 CJ SERIES
2016 GDRILL CASSINO
2017 NG-5500X APOLLO
1970
1980
1990
2000
2010
2016
2020
SINGLE ACTING PIN AND HOLE PRINCIPLE HYDRAULIC JACKING SYSTEM
DOUBLE ACTING BEAMS PRINCIPLE HYDRAULIC JACKING SYSTEM
DOUBLE RACK ELECTRIC DIRECT ON LINE JACKING SYSTEM
SINGLE RACK HYDRAULIC JACKING SYSTEM
SINGLE RACK ELECTRIC DIRECT ON LINE JACKING SYSTEM
DRILLING JACK-UPS
R&P ON SQUARE PLATE CONSTRUCTION LEGS
DOUBLE ACTING PIN AND HOLE PRINCIPLE HYDRAULIC JACKING SYSTEM
X-Y SKIDDING SYSTEM
DOUBLE RACK ELECTRIC VSD
J-LAY SYSTEM
CONSRUCTIONS SEMIS
FIRST SEMI SUBMERSIBLE CRANE VESSEL
FIRST BOGIE WHEEL CRANE
OFFSHORE CRANE
TRS SYSTEM
CONTINUOUS PIN AND HOLE PRINCIPLE HYDRAULIC JACKING SYSTEM
FIRST ROUND THE LEG HEAVY LIFT (800 MT) CRANE
SMART CRANE
FLOATING FOUNDATION
CALLIRHOE MOONPOOL
GUSTOMSC INNOVATIONS
DSS SEMIS JOINT DESIGNS WITH KEPPEL DTG
NG WIND INSTALLATION
NG O&G SERVICES
NG DRILLING & WELL INTERVENTION
SEA PRODUCTION
SEA ARCTIC
SEA DRILLING & WELL INTERVENTION
SEA CONSTRUCTION
AJ ACCOMMODATION JACK-UPS
CJ DRILLING JACK-UPS
CJ PRODUCTION JACK-UPS
OCEAN ACCOMMODATION SEMIS
OCEAN DRILLING SEMIS
CONSTRUCTION VESSELS
WELL INTERVENTION VESSELS
DRILLSHIPS
ARCTIC DRILLSHIPS

ASSOCIATED EQUIPMENT

22
THRUSTER RETRIEVAL SYSTEMS

1236
FIXATION SYSTEMS

70
VSD RACK & PINION JACKING SYSTEMS

4047
HARDENED STEEL PINIONS

ENABLING INTEGRATED SOLUTIONS

In order to increase the operational capabilities and guarantee the optimal functionality of our design solutions, GustoMSC has developed a range of critical equipment and systems that are supplied to the shipyard as a package together with the basic design of the mobile offshore unit. This equipment and these systems are developed in-house, based on the knowledge and experience gained over the past fifty years, and based on feedback from operators all over the world. For the delivery of certain key equipment, we maintain a long-term relationship with key suppliers with whom we share in-depth knowledge and experience, in order to ensure that we can continue to deliver state-of-the-art equipment.

Design

GustoMSC's equipment teams take care of the design of the equipment in close cooperation with GustoMSC's basic design teams which specify the design and performance criteria for the equipment to be supplied for the mobile offshore unit in question. Both teams pay special attention to the proper integration of the equipment with the interfacing structure of the mobile offshore unit. The equipment design team completes the equipment design to such a degree that design approval can be obtained from the Classification Society and manufacturing of the equipment or system can be subcontracted in packages to various suppliers. We have a number of product coordinators. Each one is a specialist with specific knowledge and experience of certain equipment or systems to ensure that all aspects of the equipment or system are well covered.

Manufacturing

Manufacturing of the equipment and systems is outsourced in packages to reputable suppliers with a long track record, and with proven experience in the kind of products we ask them to manufacture for us. Our equipment project managers, together with a project team, control the complete project from start to finish. From design of the equipment to delivery, the process includes manufacturing, inspection and factory acceptance testing. Equipment and systems are normally delivered with certification by the applicable Classification Society.

Installation

Installation of the equipment on the unit under construction takes place by the yard. GustoMSC provides written step-for-step instructions for the installation and, in addition, our commissioning team provides technical assistance to the yard. The interface of the equipment with the structure of the mobile offshore unit is designed for easy installation in order to reduce the installation time as much as possible. After completion of the mechanical installation, the yard continues with the electrical and hydraulic hook up of the equipment with the technical assistance of the GustoMSC commissioning team.

Commissioning & Testing

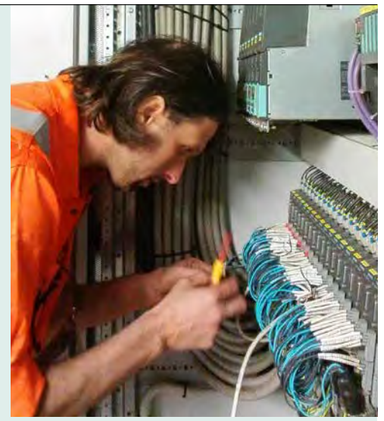
The various operational modes of the equipment are verified and fine-tuned after powering up. The GustoMSC commissioning team will be on site during this phase.
This team consists of a GustoMSC supervisor with specific equipment knowhow, if necessary assisted by commissioning engineers of the relevant subcontractors. The GustoMSC commissioning supervisors head the commissioning teams on site to ensure the completion of the work as per specification and to the customer's satisfaction. The final test is the Site Acceptance Test (SAT). After successful completion of this SAT, the equipment or system is handed over to the yard. Within GustoMSC, the project is handed over to the Customer Service Department. They take responsibility for the proper follow-up of any claims during the warranty period and for providing various operational support services during the lifetime of the unit. These services include training, supply of spare parts, inspections and surveys of the equipment as well as modifications and upgrades.

Theo Badenberg
Manager Equipment

19
OFFSHORE CRANES

7
GLC LEG CRANES

COMMISSIONING LIKE CLOCKWORK



Next to the abundance of intellectual skills present at GustoMSC, there is a need for practical aptitude. A few grease monkeys are required to complete the final stage of the GustoMSC equipment projects: commissioning. Climbing onto scaffolding in the tropical climate of Singapore, spending hours on end behind a jacking console in the middle of the night, or working outside in the scorching heat of the Arabian Desert sun; the life of a commissioning engineer is not always a walk in the park. But every once in a while a dream job comes by, where everything falls into place and things go smooth as clockwork.
The commissioning team starts when the yard has finished the installation and hook-up of the equipment supplied by GustoMSC. The skidding, jacking or fixation system is then completed in three steps: loop-checks, power-up and functional testing. The progress of these steps depends largely on factors like weather, yard workmanship, site-team experience and design repetition. During the commissioning of the GMS Sharqi in February 2016, all these pieces of the puzzle turned out to be exactly right.
The weather in Abu Dhabi in February is no punishment, the GMS yard has a great deal of experience in building NG units and has an excellent track record on good workmanship, the soil conditions for jacking at the GMS yard are excellent, and the site-team has a great deal of experience. This led to a record short commissioning period of just six days.
A real challenging goal to beat for next projects!

Chris Rademakers
Project Engineer

60
X-Y SKIDDING SYSTEMS

28
HYDRAULIC PIN IN HOLE SYSTEMS

INTERVIEW SEAJACKS

PUSHING THE BOUNDARIES

We find Blair Ainslie, CEO of Seajacks, in a very good mood. In collaboration with GustoMSC, Seajacks developed the largest wind-turbine installation jack-up vessel in the world. The vessel was christened Seajacks Scylla. On the morning of the interview she jacked to airgap and raised the massive main crane boom in Great Yarmouth's outer harbor. During her first assignment for Offshore WindForce, she will install 67 monopiles (85 m in length, exceeding 1,300 t in weight) for the 400 MW wind farm Veja Mate. There she can truly demonstrate what she is capable of. Altogether enough reasons to congratulate Ainslie with Seajacks' newest vessel and ask him a few questions.

The current negative market situation is also kicking in at Seajacks. When Ainslie looks out of the window in his office, he can see three vessels out of five lying in the harbor. Zaratan, Seajacks' third vessel is working as an accommodation jack-up, work she should not be doing as she was intended for more demanding construction work. Ainslie: 'The market is as low as it has ever been. It reminds me of the situation in the late 1990s when the oil price was as low as 10 dollars per barrel. But I think that we probably have hit rock bottom by now and that the oil price will rally. And in addition to that, the operating companies are starting to understand that they need to cut their coat according to their cloth and adapt to new times in which the oil price is not going to be triple digits again but somewhere between 30 to 70 dollars. They are starting to do some essential operation and maintenance work. We hear good noises coming in from the oil and gas companies. This is encouraging. Of course, we are in a situation where jack-up day rates are at a very low level. Companies will survive but it will not encourage them to grow their businesses. We need to get the day rates back up a little in order to bring back development.'

Did the objectives of Seajacks' units change due to the recent price fall?

'I don't think anything has changed. We are targeting 50/50 the oil & gas market and the offshore wind market. It is fair to say that the offshore wind industry has developed to such an extent that our three NG-2500X's are no longer vessels that should be in the category of offshore wind installation vessels. They were tested for that when the turbines were still 3.6 Mw. They could still do wind installation work in more exotic markets

Courtesy: Seajacks

From left to right:
Mr. Inoue, one of the Marubeni Corporation Directors, Mrs. Inoue and Blair Ainslie, CEO of Seajacks, during the naming ceremony.

Blair Ainslie
CEO of Seajacks

Blair Ainslie holds a BSc in Physical Geography from the University of London. From 1999 to 2006, Mr. Ainslie was employed by Workfox UK Limited as Business Manager, responsible for marketing, contracts and commercial and general management of the Seafox fleet. From 1995 to 1999, he was Contracts Manager at Kvaerner Oil and Gas. From 1986 to 1995, Mr. Ainslie worked as Senior Quantity Surveyor at Babtie Group.

‘WE ALWAYS TRY TO BE AHEAD OF THE GAME. THAT IS WHY WE LIKE TO WORK WITH GUSTOMSC.’

Blair Ainslie
CEO of Seajacks

About your choice for the NG design of GustoMSC: could you elaborate on how GustoMSC met your requirements?

‘One of the important things for us is that we have to raise equity capital. If you go to equity capital partners, they want to know what the track record of the vessel designer is. When you go with the name GustoMSC, you have the most trustworthy and tested company at your side. Sometimes, I wonder whether we encourage GustoMSC to overkill specifications when you look at some of the other self-propelled jack-ups that are being built right now. But, I am very much a believer that it will pay off in the long term: when we get to our second five-year survey, there will certainly be no fatigue problems. We try to do things the right way for the long term.’

How do the units meet your expectations?

‘I am extremely proud of all of these units. Kraken has done a fabulous job for Shell UK and NAM on one of the largest well repair and maintenance campaigns in the Southern North Sea on a three-year contract. The vessel visited nearly fifty platforms and performed tasks such as coiled tubing interventions, installation of velocity strings, in addition to well testing and well head maintenance. This campaign is expected to extend the life of some wells by up to 10 years.
Zaratan was superb on the Meerwind wind farm development in the German North Sea. The vessel managed to load, transport and install three monopiles in a staggering 36 hours. The experience at Meerwind provides Seajacks with vital experience for future projects that will be even more technically challenging. As a result, we are well respected and high up on people’s lists when it comes to selection for projects.’

What makes these units stand out?

‘We are always pushing the boundaries. With Scylla, we own the world’s largest wind-turbine installation vessel. The christening of Scylla was a great event with almost 400 guests at the reception held on the quayside of the outer harbor in Great Yarmouth. It created a lot of interest. Starting in April 2016, Scylla will install 67 monopile foundations at the 402 MW Veja Mate offshore wind farm in the German sector of the North Sea. These foundations are also the largest in the world: one foundation weighs a total of 1,302.5 tons, its diameter is 7.8 meters, and it is 82.2 meters long. Scylla will be able to carry three of those per installation trip. Scylla has 4,600 square meters of deck area, and a variable load of 8,390 tons. She is equipped with a Huisman 1,500-tonne leg-encircling crane. I know we always have the specifications, but I think we might have underestimated the capabilities of Scylla. I foresee that she will be able to achieve much more than calculated for the original design. Let’s see what she can do when she is out in the field.’

Do you foresee growth of the offshore wind installation and maintenance market?

‘The UK offshore wind market is generally seen as the biggest potential opportunity for offshore wind in the world, if you exclude China. UK-wise, wind farm projects are picking up, such as the Beatrice Wind Farm, the deepest and northernmost offshore wind installation in the world, NNG in Scotland, and Hornsea. With government support in the UK, the Netherlands, Denmark and Germany, the offshore wind market is starting to grow again. Within the next two to three years, it will get back to a position where it will be very busy again. The supply and demand characteristics for offshore vessels like ours will swing back into a more balanced situation. The same will apply to the oil and gas markets. We are seeing signs that work is coming in this summer. By next summer and certainly by 2018, we will be back to a more normal supply and demand market. It will take a while longer before day rates recover to decent levels. Right now, this applies to essential Opex-work, such as operation and maintenance and decommissioning.’

Courtesy: Seajacks

Massive deck space at Seajacks Scylla

Courtesy: Seajacks

NG-14000X Seajacks Scylla

Do you foresee big changes in the offshore energy industry in 20 years from now? Will there be a major shift?

‘I was an offshore wind skeptic. I now formally believe that that is a no-brainer. The technology in offshore wind is centuries old. Oil should not be used for making electricity at all because it is a rare commodity. It should be used for plastics and fuel. The same applies for gas. And nuclear energy, although it has some major drawbacks, will generate much power. Besides this, I think there are too many operators in the supply chain at the moment. I expect there will be some consolidation.’

Apart from consolidation, do you think innovation will trigger change?

‘When it comes to innovation, it is in our blood that we look to push the boundaries. We always try to be ahead of the game. That is why we like to work with GustoMSC. They have the same mentality, try to incorporate new ideas and make things better.
In my opinion, the oil and gas market is pretty mature, but in offshore wind it is difficult to envision what will happen when it becomes possible to erect turbines in higher wind speeds. Of course, there is a breaking point where it becomes unsafe. In my opinion, there should be more envisioning in offshore wind; that would have a big impact on the market place. I like to think that building a ship like Scylla is a big step forward. If we decide to build another vessel, it will certainly be for offshore wind and it will again be bigger. I wonder if the physical size of the hull can be expanded, with a crane that can lift 1,600 tons.’

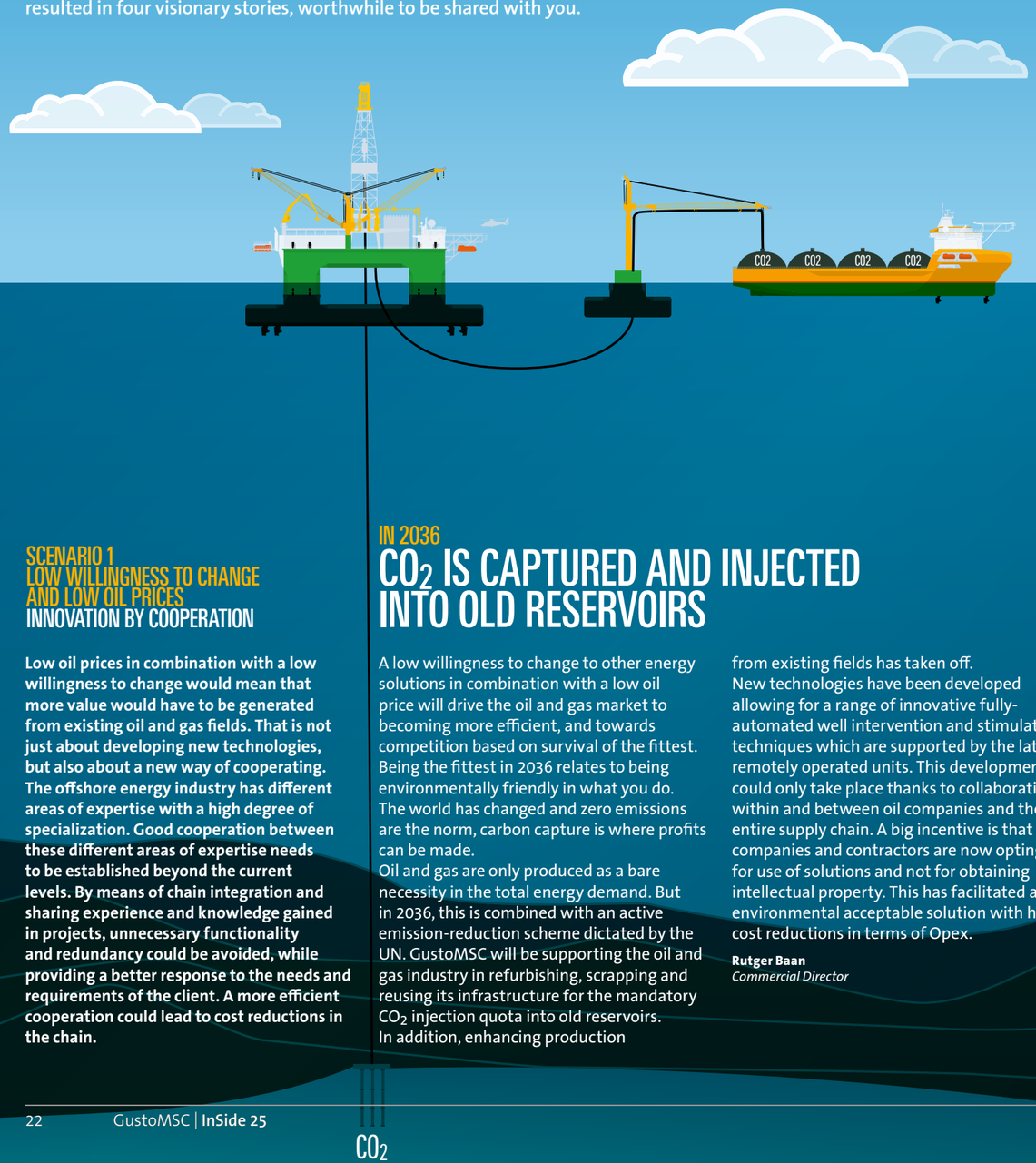
How does Seajacks anticipate the challenges that it is facing?

‘The biggest challenge at the moment is demand. Oil companies are in shock. People are being fired and made redundant. When there is a panic, you have no time or inclination to develop new projects. But we are at the end of this now. Companies that are still here, will be here for a long time. If the oil price stabilizes at a level of 50 to 60 dollars, everyone will adjust and carry on.’

Thomas Lerchenmüller
Product Coordinator

4 SCENARIOS FOR 2036

The UN climate agreement in Paris aims to reduce greenhouse gas emissions and global warming. This could lead to a turning point in the use of fossil fuels such as oil, gas and coal. As there is a growing willingness to change, it is possible that market participants and public authorities may decide to stop investing in fossil fuels and to gradually switch to alternative energy sources. What does this willingness to change in combination with oil prices mean for the future? We have asked four GustoMSC authors to work on four possible market scenarios for the year 2036. Without any restrictions from our side, their insights have resulted in four visionary stories, worthwhile to be shared with you.



SCENARIO 1
LOW WILLINGNESS TO CHANGE AND LOW OIL PRICES
INNOVATION BY COOPERATION

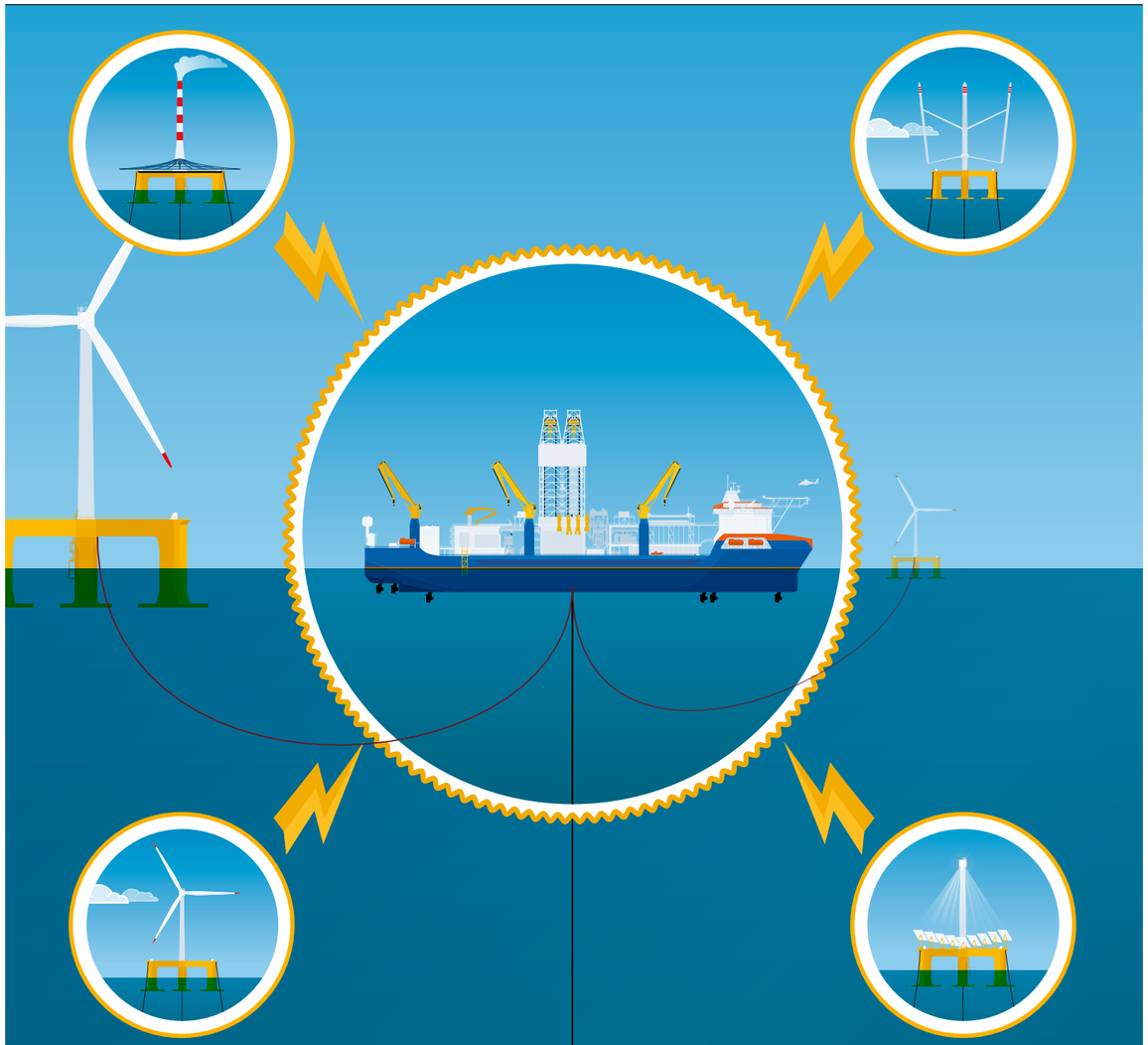
Low oil prices in combination with a low willingness to change would mean that more value would have to be generated from existing oil and gas fields. That is not just about developing new technologies, but also about a new way of cooperating. The offshore energy industry has different areas of expertise with a high degree of specialization. Good cooperation between these different areas of expertise needs to be established beyond the current levels. By means of chain integration and sharing experience and knowledge gained in projects, unnecessary functionality and redundancy could be avoided, while providing a better response to the needs and requirements of the client. A more efficient cooperation could lead to cost reductions in the chain.

IN 2036

CO_2 IS CAPTURED AND INJECTED INTO OLD RESERVOIRS

A low willingness to change to other energy solutions in combination with a low oil price will drive the oil and gas market to becoming more efficient, and towards competition based on survival of the fittest. Being the fittest in 2036 relates to being environmentally friendly in what you do. The world has changed and zero emissions are the norm, carbon capture is where profits can be made.
Oil and gas are only produced as a bare necessity in the total energy demand. But in 2036, this is combined with an active emission-reduction scheme dictated by the UN. GustoMSC will be supporting the oil and gas industry in refurbishing, scrapping and reusing its infrastructure for the mandatory CO_2 injection quota into old reservoirs.
In addition, enhancing production from existing fields has taken off.
New technologies have been developed allowing for a range of innovative fully-automated well intervention and stimulation techniques which are supported by the latest remotely operated units. This development could only take place thanks to collaboration within and between oil companies and the entire supply chain. A big incentive is that oil companies and contractors are now opting for use of solutions and not for obtaining intellectual property. This has facilitated an environmental acceptable solution with huge cost reductions in terms of Opex.

Rutger Baan
Commercial Director



SCENARIO 2
LOW WILLINGNESS TO CHANGE AND HIGH OIL PRICES
INNOVATION WITHIN THE CURRENT MARKETS

In this scenario, we basically go back to the former situation of high oil prices, with innovative and traditional parties who are willing to invest in innovation. In this market, innovative parties are primarily examining the extraction of oil in deeper and more remote areas as easily extractable oil in shallow areas is running out. Higher oil prices will justify drilling in complex and demanding areas, including ultra-deep water, harsh environments and the Arctic. This challenge requires specialist knowledge to be shared in new collaborations.

IN 2036

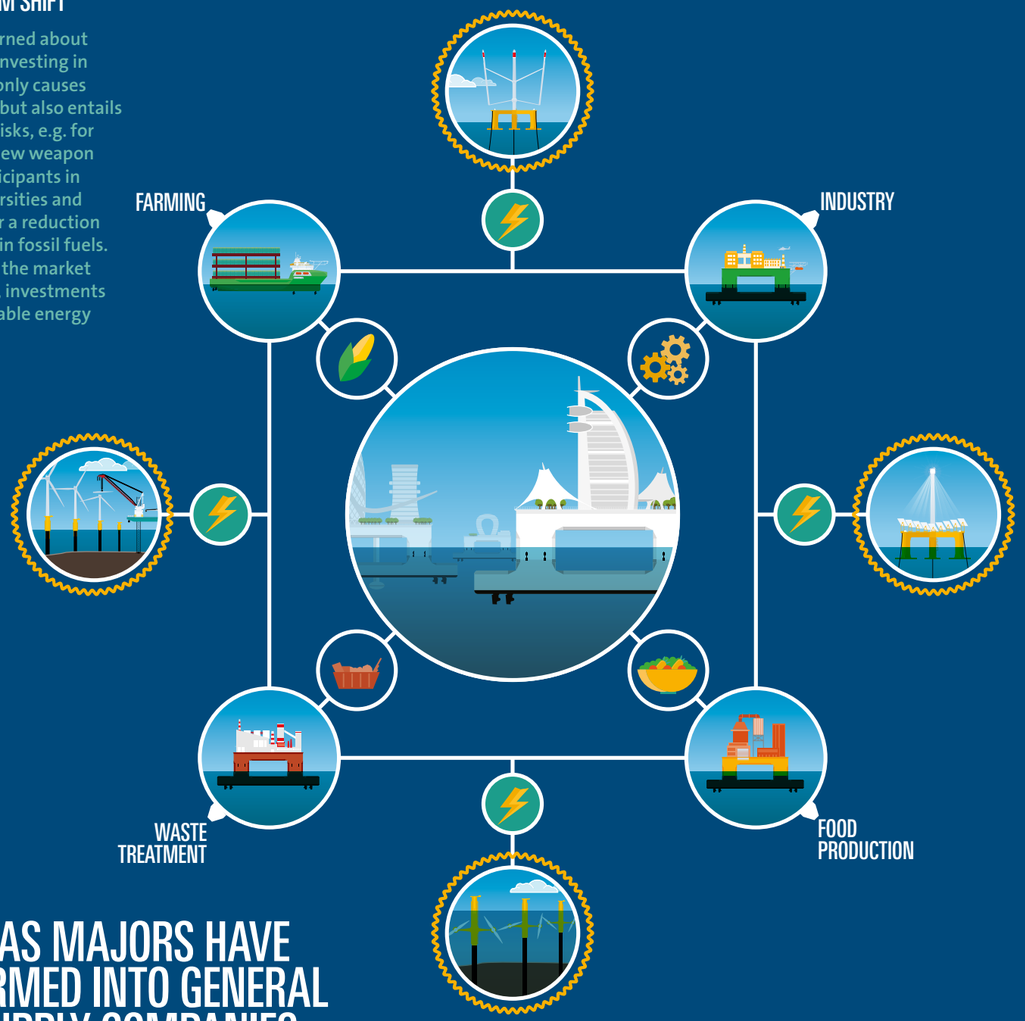
RENEWABLES WILL BE USED FOR EXTRACTING HYDROCARBONS

Energy demand has grown, and a substantial part of it is filled in by fossil fuels like coal and oil. It is crucial that burning these fuels will take place as efficiently and economically as possible, so that all the potential energy is obtained and losses are minimized. In this manner, 'grey energy' will be colored green. Driven by the need for oil there is a requirement for floating solutions to extract oil in extreme deep water depth, drill more complex wells and even move into the Arctic. These floating solutions, such as drill ships and semi-submersibles, will be optimized to be efficient with resources and minimize environmental impact. Zero accidents, 100% fail safe, zero-discharge, extensive spill-prevention measures and ultra-low to zero emissions are the norm. Contractors will have anticipated this requirement by changing their business models for deep water rigs. Instead of owning the operational equipment, they will buy performance for their drilling rigs. This is driving innovation at a high speed as it is now to the benefit of the unit designer, shipyard and equipment vendor to make the best product possible to reduce total well costs within the strict environmental constraints as efficiency will increase their own profitability.
One major innovation derived from this new business model is that all the resources involved are used in the best possible way. In 2036, renewable energy will be used to extract hydrocarbons. Drilling rigs will be powered by wind and solar energy.

Sjoerd Hendriks
Design Manager

SCENARIO 3
LARGE WILLINGNESS TO CHANGE AND LOW OIL PRICES
ENFORCED PARADIGM SHIFT

Large banks have warned about the 'carbon bubble'. Investing in coal, oil and gas not only causes rising temperatures, but also entails significant financial risks, e.g. for pensions. With this new weapon in hand, activist participants in pension funds, universities and other funds called for a reduction of their investments in fossil fuels. Under pressure from the market and the government, investments were made in renewable energy instead.



IN 2036

OIL AND GAS MAJORS HAVE TRANSFORMED INTO GENERAL ENERGY SUPPLY COMPANIES

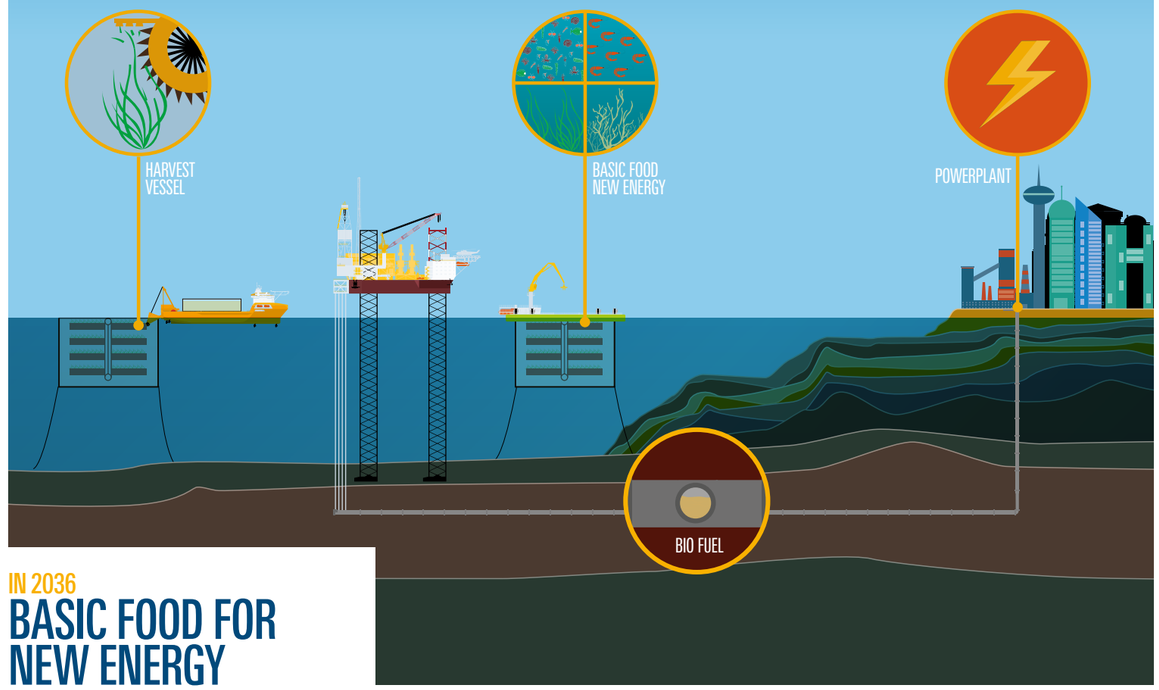
After the rapid decline in oil prices two decades ago and due to the change in investment appetite for large-scale fossil fuel projects, the traditional oil and gas industry has gone through a huge transformation.
The surviving oil and gas majors have transformed into general energy supply companies with a predominant focus on renewables, energy storage and transmission.
Renewable energy sources such as solar, hydropower and wind have become fully competitive and the predominant source of energy. The race for efficient nuclear fusion is ramping up, after the initial impasse due to lack of global cooperation, and is currently boosted by attractive national long-term subsidy policies and by having attracted large private investment interest. Tidal energy and wave energy converters, geothermal and biofuels have a marginal share, but are still battling to become truly competitive.

Wind energy production matured and peaked between 2020 and 2025. Growth levels significantly slowed down and reached a stable production capacity in Europe. Developments outside Europe are also starting to reach maturity. Solar energy remains a major contributor, but the efficiency gains are for a large part offset by the shortage of raw materials for the PV industry.
The main energy producers, formerly known as oil and gas majors, have now recovered their leading position via a healthy balance in renewables, energy storage and transmission and supply of oil to the remainder of the traditional transport sector, to the plastics and intelligent fabrics market and the pharmaceutical industry.
GustoMSC has been at the forefront of the energy transformation. Our licensed floating wind solutions flourish and the traditional leading role in bottom-founded offshore wind installation has been transformed into a leading role for smart maintenance solutions. The company is also heavily involved in several complex oil and gas decommissioning projects, lean and clean maintenance and sustainable oil supply for the pharmaceutical and fabrics industry.
It has acquired a leading role in transforming the traditional transportation sector to more sustainable solutions. Furthermore, GustoMSC is striving to expand its business in support equipment for shore protection works, and has a leading advisory role for the development of floating independent communities to meet the challenges of the ongoing worldwide migration of populations and traditional food producing areas.

Andries Hofman
Expert Engineer

SCENARIO 4
LARGE WILLINGNESS TO CHANGE AND HIGH OIL PRICES
INVESTING IN GREEN DESIGN

If oil prices have risen again to or above 80 dollars per barrel, the offshore energy market remains interesting for investors. Existing carbon energy suppliers are prepared to invest in renewable energy. Significant social pressure and a proper return on investment drive the offshore energy industry to advance in 'green developments'. Major technological developments are taking place.



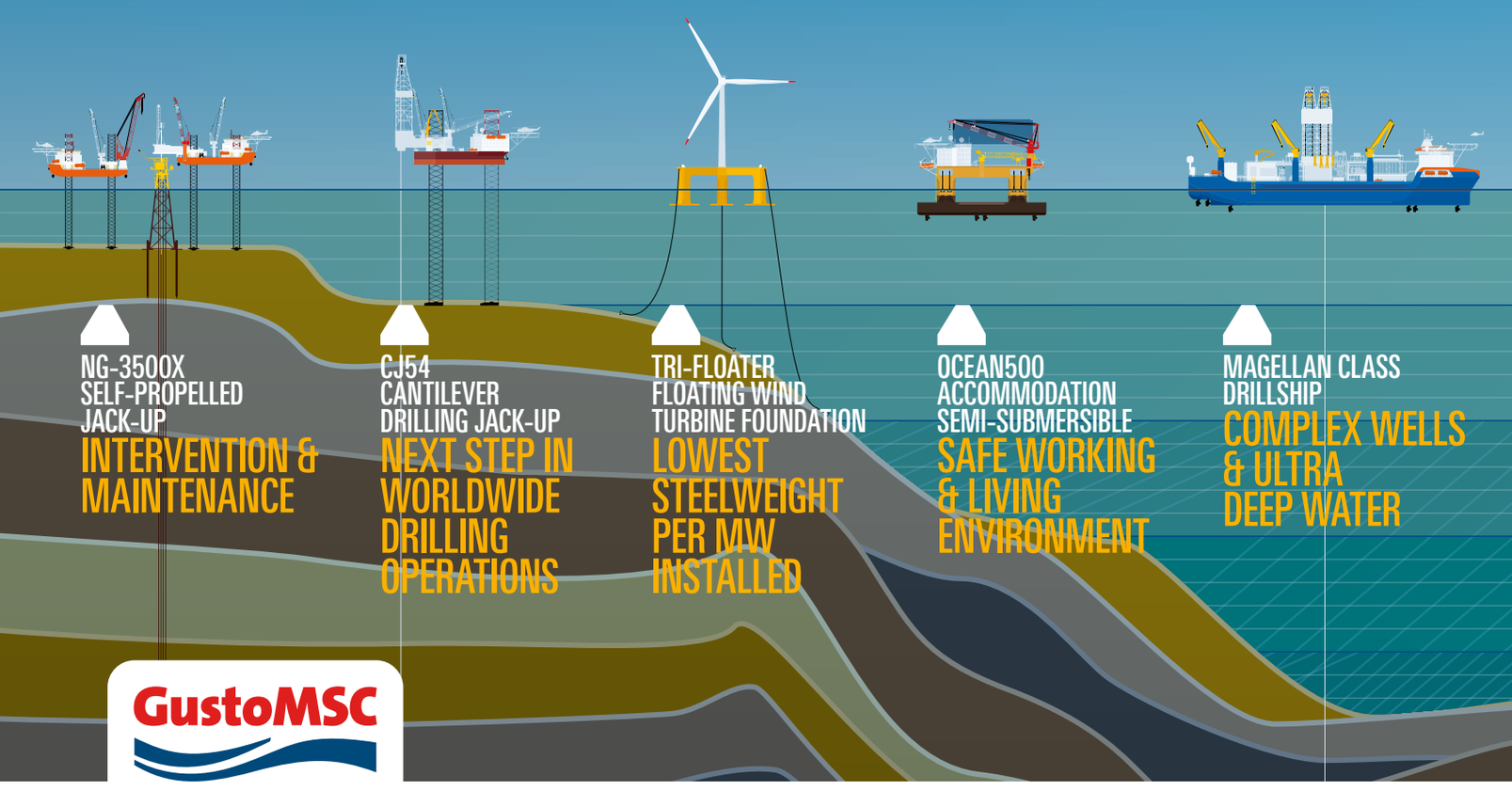
IN 2036

BASIC FOOD FOR NEW ENERGY

The meaning of the word 'energy' has changed since the beginning of this century. The 'old school type of energy' – oil, gas and coal – is now called 'carbon energy' since it is taxed per ton equivalent CO_2. Crude oil is produced and traded above 80 Dollars per barrel, but consumer energy prices of 'carbon energy' have increased enormously due to global carbon tax policies.
In the years 2020 to 2025 several large 'new energy companies' arose. They harvest 'renewable energy' which is now called 'New Energy'. Mainly heat and electricity are harvested from sources like sunlight (PV), tidal flows, geothermal heat and wind. 'Basic Food' is the latest form of New Energy that is becoming huge. The New Energy Companies grow, harvest and process 'Basic Food', typically existing of algae, krill, plankton and seaweed. Basic Food is recognized as a 'stored energy'. It is grown and harvested on a large scale in offshore – even very remote – locations.
Basic food is usually 'upgraded' to human and animal food, but since 2030 the process of converting Basic Food into energy-dense fuels (similar to carbon fuels) and plastics has proven to be commercially attractive.
The scaling up of this New Fuel production at floating remote locations is in full progress. New Fuels are expected to replace Carbon Fuels for 80% before 2055.
The majority of the GustoMSC involvement in the New Energy market is in the design and engineering of 'Basic Food harvesting vessels' and 'Basic Food processing islands'.
A close collaboration with the larger and successful New Energy Companies was established in the early twenties. This close joint multidisciplinary development has contributed significantly to the success of Basic Food in the New Energy market.
Recent vessel design developments are focusing on further robotization of the harvesting vessels and the scaling up of the processing islands. The processing islands are basically multiple coupled semi-submersible vessels.
The future is bright. GustoMSC has proven that it remains valuable in its offshore energy businesses. Vessels are still being designed for the production of carbon energy, but also for the New Energy market among which the Basic Food market. GustoMSC has succeeded in maintaining its innovative high-quality reputation.

Michiel Mol
Expert Engineer

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 best in class solutions for mobile offshore units.

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