INSIDE

FORESIGHT IN OFFSHORE

APRIL 2006
7

FPSO CAPIXABA
"READY TO SET SAIL"

MOPU AND FSO CASPIAN
SEA DEVELOPMENT >>

FPSO KIKEH

FIRST DP3 PIPE-LAY/CRANE
VESSEL BUILT AND OPERATED
IN CHINA

ENSCO 8500 SEMI-SUBMERSIBLE
DRILLING RIG NEW CONSTRUCTION
ENGINEERING

GustoMSC
Member of the SBM Offshore Group

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PREFACE

FROM THE MANAGEMENT

2006 – ALL SYSTEMS GO!

'No doubt about it: 2006 will not be boring'. With this expectation we concluded our previous edition of Inside. Indeed, no-one in the offshore oil & gas industry has had an opportunity to go into hibernation for a while. Golf handicaps are being impaired…..

The exploration market remains buoyant.
GlobalSantaFe contracted KeppelFels for our DSS-51 design deepwater drilling semi-submersible which will be named 'Development Driller III'. Ensco contracted another GustoMSC designed TDS series deepwater drilling semi-submersible from KeppelFels. The units will be designated 'Ensco 8500' and 'Ensco 8501'. The article on page 20 tells you all about this exciting order.
Labroy Shipbuilding & Engineering Pte. Ltd. has contracted GustoMSC for the supply of our proprietary CJ-46 jack-up design. Two units will be built for a Norwegian owner with delivery scheduled for the end of 2008 and early 2009. Our Hardware Department will supply the rack & pinion jacking systems, the leg fixation systems and the X-Y cantilever systems.

The offshore construction market is heating up as well. We exhibited at MCE 2006 in The Hague, where many industry experts attended the conference.
Worldwide there is an uptake in offshore pipelay activities. Allseas has upgraded the 'Solitaire' for deepwater operations (see article on page 10). But contractors are venturing out to frontier areas as well. MRTS contracted us for the concept and basic engineering to convert a transport barge into a pipelay barge for Varandey Bay, which is East of the Barents Sea. Again for Allseas we have finalised the basic design to convert the bulkcarrier 'Audacia' into a self-propelled pipelay vessel.
Similar activities are planned in the Far East. COOEC was attracted to our DPV 7500 design derrick/pipelay vessel and awarded us a contract to customize this design to their specific needs. The vessel will go to work for CNOOC on a worldwide basis.
For Seaway Heavy Lifting we completed the design for their planned new built heavy lift vessel.

Some offshore construction and maintenance activities require a large complement of workers on location. Petrobras has contracted the converted semi-submersible 'Etesco Millennium' for accommodation duties. The floatel is equipped with 270 beds. Our Houston office provided the ABS approved basic engineering for the conversion work.

Together with sister company SBM Systems we completed another record project. As mentioned previously, the SBM Offshore group is supplying an Extended Well Test system for the Caspian Sea. Recently the new built MOPU started to produce first oil just 17 months after contract award by Petronas Carigali. Oil is temporarily stored in the new built FSO. Also for the Caspian Sea we are finalizing the engineering for three flash gas compressor barges. As you will read in the ensuing article, this project for AGIP KCO poses some real technical challenges. And then there is SBM's serial number 5 FPSO for Petrobras. After FPSO's 'II', 'Espadarte', 'Brasil' and 'Marlim Sul', our engineering project team have now completed the 'FPSO Capixaba' project in record time. The vessel arrived offshore Vitoria on April 4 and is being readied for hook-up in the Espirito Santo basin.
'FPSO Kikeh' is under construction for duties offshore Malaysia. Our engineers are in the final stages of the basic and detailed design.

OTC 2006 promises to be as busy as ever. We are looking forward to meeting up again with friends, old and new. We hope you will have time to visit booth 4141 where we will have some interesting new developments on display.

Han Tiebout
*Manager Marketing & Business Development – **GustoMSC***

FROM LEFT TO RIGHT:
FERNANDO FRIMM, BUI DAO, RAJAN BHAMBHANI, TOM CONDON.

GustoMSC INC. MANAGEMENT TEAM

A COUPLE OF CHANGES TOOK PLACE WITHIN THE GustoMSC INC. MANAGEMENT TEAM IN THE SECOND HALF OF 2005. WE WOULD THEREFORE LIKE TO PRESENT OUR MANAGEMENT TEAM AS IT IS TODAY.

Rajan Bhambhani took over the duties of Jim Ochs as Operations Manager in May 2005. Jim Ochs moved to Vancouver to live closer to his family. Rajan has 30 years of professional experience in the engineering and management of shipbuilding and offshore construction projects. Rajan has been with the company since 1998 and had worked as Engineering Project Manager before moving to his new job.

Tom Condon replaced David Loader as Engineering Manager last summer. David Loader returned to his home country England. Tom joined us from Exmar Offshore Company, where he had worked as Engineering Manager for 9 years.
Tom has more than thirty years experience in the design, construction and operations support of mobile offshore drilling units and floating systems.

Fernando Frimm joined the team in December 2005, replacing Gerrit-Jan Schepman as Vice-President Marketing and Sales. Gerrit-Jan moved back to The Netherlands where he continues his work within the GustoMSC office in Schiedam.
Fernando has more than 25 years of experience in the offshore oil & gas industry. His experience spans a wide range of offshore platforms, FPSO's, spars and semi-submersibles. Fernando was previously Director of Exmar Offshore Company where he was responsible for development of new concepts and project sales and marketing.

Completing the GustoMSC Inc. Management Team is Bui Dao, President of the company. He has led the company ever since the beginning in 1997, and continues to do so with all his heart.

by Astrid Schuurmans]

ETESCO MILLENNIUM FLOTEL SEMI-SUBMERSIBLE CONVERSION ENGINEERING

The Etesco Millennium, a semi-submersible drilling rig (ex-Laffitte Pincay) has been contracted by Petrobras to work in Brazil as a Flotel, accommodating 270 beds with workshops, galley, offices, conference room, theaters, swimming pool and other facilities.

The unit will be moored in up to 250-meter water depth to service surrounding platforms via gangway.

The total variable deck load required in transit for Petrobras supplies is 1,000 MT. Additional life boats are required for the additional people on board. New cranes were added to augment the lifting capacity available on board for construction support work.

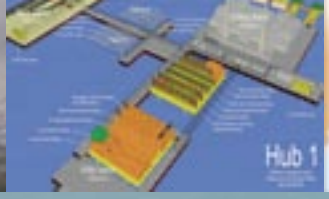
Modifications to the piping, electrical and instrumentation systems were made to support the new additions. Extensive telecommunication systems upgrades are being carried out to support Petrobras Operations.

The basic engineering work undertaken by GustoMSC included the development of all structural and mechanical design drawings to enable the shipyard to develop detailed shipyard drawings for fabrication, mooring and stability analyses and ABS design approval.

The conversion work is being carried out at Signal International in Pascagoula, Mississippi. Delivery is scheduled for early second quarter 2006.

by Harvey Fleisher (Etesco Millennium) and Rajan Bhambhani

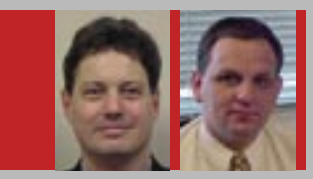


FLASH GAS COMPRESSOR BARGES FOR CASPIAN SEA

HISTORY

EARLY 2003 GustoMSC WAS APPROACHED BY SIEMENS INDUSTRIAL TURBINES TO ASSIST WITH THE BID FOR THE SUPPLY OF FLASH GAS COMPRESSION BARGES FOR THE AGIP KCO KASHAGAN FIELD DEVELOPMENT EXPERIMENTAL PROGRAM. THE ITT PACKAGE WAS RECEIVED IN THE SUMMER OF 2003 AND THE CONTRACT FOR THE SUPPLY OF THREE FLASH GAS COMPRESSION BARGES (BARGE NUMBER 3, 4 AND 16) WAS AWARDED 29 JULY 2004.



by Alex Buijs and Andries Mastenbroek]

CLIENT

Agip KCO is the Operator of the appraisal and development operations for the Kashagan Field Development Experimental Program on behalf of seven companies and under the North Caspian PSA (Production Sharing Agreement).

Given its size, Kashagan will be developed in three sequential phases. During the three phases, production will increase from an initial level of 75,000 bopd to a peak plateau production of 1.2 million bopd in the second half of the next decade.

Companies	Participating Interest
Agip Caspian Sea B.V. (Operator)	18.52%
KazMunayGas	8.33%
ExxonMobil Kazakhstan Inc.	18.52%
Shell Kazakhstan Development B.V.	18.52%
Total E&P Kazakhstan	18.52%
ConocoPhillips	9.26%
INPEX North Caspian Sea, Ltd.	8.33%

FIELD

Kashagan is the largest oil field so far discovered in the North Caspian Sea.
It is located offshore, about 80 kilometers from Atyrau and extends over a surface of approximately 75 km by 45 km.
It is currently estimated that there are 38 billion barrels of oil-in-place, 13 of which are recoverable if the gas re-injection process is used. Kashagan is also the largest oil field discovered worldwide in the last thirty years.

The Experimental Program (EP) is the first phase of the development of Kashagan. Successful exploration of the giant Kashagan Field will lead to Full Field Development (FFD).

The supply of the three Flash Gas Compression Barges for the Kashagan Experimental Program (EP), currently in execution, will cover the first phase of the field development from an initial production of 75,000 bopd to 450,000 bopd.

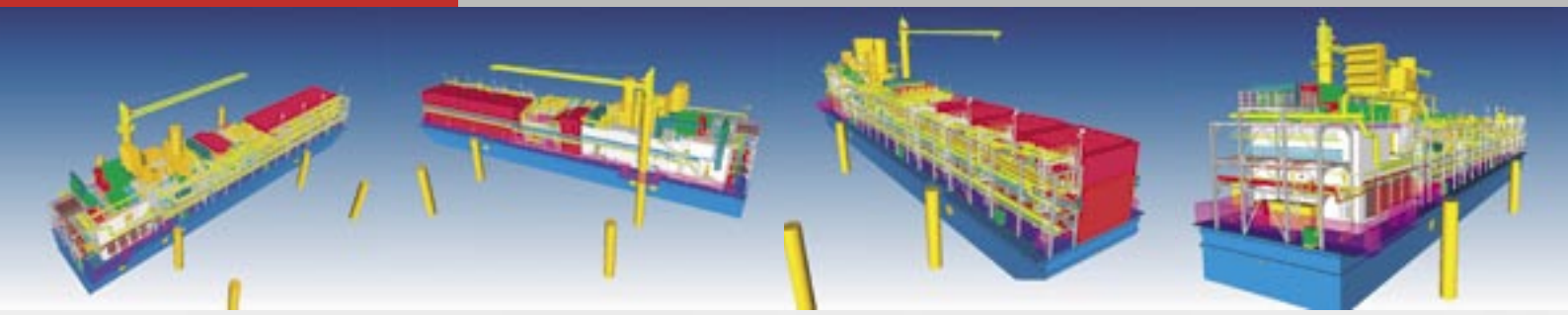
HYDROGEN SULPHIDE (H_2S)

1 PPM - SMELLS LIKE ROTTEN EGGS
7 PPM - CAN WORK FOR 8 HOURS
15 PPM - CAN WORK FOR 15 MINUTES
20 PPM - NEED BREATHING APPARATUS
100 PPM - KILLS SENSE OF SMELL IN 3-5 MINS
200 PPM - BURNS EYES AND THROAT. NO SMELL
300 PPM - IMMEDIATELY LIFE THREATENING
500 PPM - LOSS OF REASONING & BALANCE
700 PPM - IMMEDIATE UNCONSCIOUSNESS
1000 PPM - DEATH

FUTURE

Full Field Development, the second and third development phases of Kashagan that will continue after the Experimental Program, will take the production from 450,000 bopd to 900,000 bopd at the end of phase two and to the plateau of 1.2 million bopd by the end of phase three.

By analogy with the Experimental Phase, Hubs will be the main processing and re-injection centers. In addition to Hub 1, whose re-injection capacity will be increased, Hub 2 and Hub 3 will be built during FFD. Further satellite drilling islands connected to the Hubs will be constructed.



BARGES

The purpose of the Flash Gas Compression System is to compress the associated gas from the LP and MP separators located elsewhere for further treatment in the Dehydration Unit and final compression and re-injection.

Each Flash Gas Compression Barge is designed to handle the gas associated with a production of 225,000 bopd. Each Flash Gas Compression Barge contains:

- A first stage suction KO drum to remove any liquids prior to first stage compression.
- A first stage compressor (Siemens) which raises gas pressure from 7.5 to 28.5 bara. The first stage is installed in one casing with the second stage in a back to back configuration.
- A first stage after-cooler to cool the gas back to 50°C in summer and 35°C in winter.
- A second stage suction KO to remove any liquids from first stage compression. Subsequently the liquids are removed in case the compressor recycles gas via the anti surge control valve.
- A second stage compressor which raises gas pressure from 27 to 95 bara.
- A second stage after-cooler to cool the gas back to 50°C in summer and 42°C in winter.
- A second stage discharge KO drum to remove any liquids from second stage compression.
- A first stage recycle air cooler to cool the gas back to 50°C in summer and 35°C in winter in case some of the gas from the first stage is recycled.
- LP condensate recycle pump to route the liquids form the first stage suction drum to the LP condensate system.
- Siemens SGT 600 25MW Gas Turbine to drive the Siemens compressor.
- A fuel gas system for the primary compressor seals and the gas turbine consisting of seal gas buffer vessel and two 100% fuel gas filters.
- Primary vent recovery ejector package to recover the gas from the compressor primary seals back to the inlet compressor.

CHALLENGES

The field location and characteristics provide a number of challenges for the design of the Flash Gas Compressor Barges.

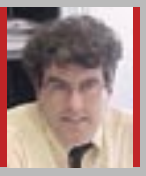
- Dimensional restrictions related to the transportation from the Black Sea through the Volga-Don Canal system to the Caspian Sea
- Wet Sour Gas with high concentrations of H_2S (up to 25%) and CO_2
- Shallow waters that range from 3 to 4 meters and freeze from November to March, with sea-level fluctuations during the rest of the year
- Wide temperature variations from -40C to +40C
- A very sensitive environmental area necessitating zero emissions and discharge
- Strict adherence to Company specifications, no functional specification approach
- Design life of 40 years
- Republic of Kazakhstan Certification of equipment and instruments
- Republic of Kazakhstan design verification against local codes and standards.

FPSO CAPIXABA

FPSO CAPIXABA AT ANCHORAGE

FPSO CAPIXABA "READY TO SET SAIL"

FPSO CAPIXABA SUCCESSFULLY LEFT THE QUAYSIDE OF KEPPEL SHIPYARD (SINGAPORE) ON WEDNESDAY 22ND OF FEBRUARY 2006 AT 10:05 A.M. AFTER 7 DAYS OF SEA TRIALS, TANK STAGGER TESTING AND FINAL COMMISSIONING WORK AT ANCHORAGE OFFSHORE SINGAPORE SHE WILL SET SAIL FROM SINGAPORE TO HER FINAL DESTINATION IN THE GOLFINHO FIELD, 50 MILES OFF THE COAST OF THE STATE OF ESPIRITO SANTO, OFFSHORE BRASIL, AS PER SCHEDULE ON MARCH 1ST AT 11:30 A.M. ONCE ON SITE, THE FPSO IS ANTICIPATED TO BE ON LOCATION, READY FOR FIRST OIL PRODUCTION, IN LATE MAY 2006.



by Joost van Sonsbeek]

Only 15 months earlier, Petróleo Brasileiro S.A. (Petrobras) had awarded the contract for the design, engineering, procurement, construction, installation and operation of the FPSO Capixaba to Single Buoy Moorings Inc. (SBM). The FPSO will be owned by SBM Production Contractors and leased to Petrobras for an initial contract period of 7 years.

The project was executed with GustoMSC being responsible for the engineering, procurement and project management services required for the topsides, vessel refurbishment, conversion and the turret integration. The internal turret design was done by SBM Monaco.

The FPSO Capixaba is a conversion from the 273,000 DWT VLCC size tanker Stena Congress, built in 1975 by IHI Japan, and features a large internal "multi bogie bearing" turret to allow weather-vaning and direct berthing of export tankers to the FPSO. This design is more compact compared to FPSO Marlim Sul, a previous SBM leased FPSO for Petrobras, now that one deck has been removed. The turret is still fitted with 36 risers. The topsides of the FPSO include crude oil separation and stabilization (rated for 100,000 bpd), gas compression and treatment (123 MMscfd), seawater injection (69,000 bpd) and various utility systems. The topsides consist of 13 modules and the central pipe rack, which provides all the interconnections between the modules, the turret and the vessel systems (see Table 1).

Optimizing the topside layouts resulted in the elimination of three (3) modules and associated heavy lifts compared to previous FPSO designs. The forward wooden lay down area has been moved to the upper deck level. Almost all the HV drives have been located on one side of the FPSO, reducing the number of cables and support/ladders.

The offload system is fitted with a hydraulically operated hose and hawser reel designed by GustoMSC. The initial hose installation has been simplified and improved.

To cut maintenance costs, new turbine alternators have been introduced just like on FPSO Marlim Sul. Both former HFO storage tanks have been completely

STENA CONGRESS ON ARRIVAL IN KEPPEL SHIPYARD
SINGAPORE – JANUARY 2005

sacrificed in order to allow installation of the two new 12 MW turbo alternators, condenser and main seawater cooling pumps on either side of the engine room. This means that we could fabricate new machinery spaces without interfering with the layout of the existing engine room.

The project has been designed on an ultra fast-track schedule. The construction phase, including the delivery of main rotating equipment, has been very successful and was completed on schedule, despite the present market situation for long lead mechanical equipment, such as power generation turbines, compressor packages and titanium coolers and the heavy workload at conversion and module yards.

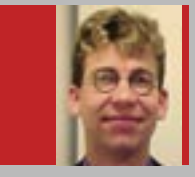
TOPSIDES MODULES (TABLE 1)

MOD 01	HP SEPARATION
MOD 02	LP SEPARATION
MOD 04	GAS DEHYDRATION
MOD 05	GAS LIFT COMPRESSION (TRAIN A)
MOD 11	GAS LIFT COMPRESSION (TRAIN B)
MOD 12	POWER GENERATION
MOD 13	LOCAL EQUIPMENT ROOM (LER)
MOD 15	PS LAY DOWN AREA
MOD 16	FLARE KO DRUMS/WI PUMPS
MOD 18	WELL SERVICE
MOD 20	CENTRAL PIPE RACK
MOD 21	FISCAL METERING
MOD 22	FLARE

AERIAL SHOT OF FPSO CAPIXABA
UNDER CONSTRUCTION AT KEPPEL
SHIPYARD - JANUARY 2006

DEVELOPMENTS IN DYNAMIC POSITIONING

FOR MANY YEARS GustoMSC HAS BEEN A LEADING ENGINEERING COMPANY IN THE DESIGN OF DYNAMIC POSITIONED OFFSHORE UNITS. THE WELL-KNOWN PELICAN CLASS DP DRILL SHIPS WERE DESIGNED AND CONSTRUCTED AT THE FORMER IHC GUSTO YARD AND MANY ARE STILL OPERATIONAL TO THIS DAY. AFTER CLOSING THE YARD, GustoMSC CONTINUED DESIGNING AND ENGINEERING STATE-OF-THE-ART DYNAMIC POSITIONED PIPELAY VESSELS, SEMI-SUBMERSIBLES, DRILL SHIPS AND OTHER DEDICATED OFFSHORE UNITS. THIS LEADING POSITION HAS BEEN SECURED OVER TIME BY CONTINUOUSLY IMPROVING OUR MODELS AND METHODS.



by Jaap-Harm Westhuis]

The design of a successful Dynamic Positioned offshore unit is a result of the balanced interaction between engineering disciplines. Within the Naval Architectural Department, the hydrodynamic discipline group is responsible for the DP design aspects. The DP capability is directly related to power generation, thruster size/location and vessel operability. These aspects cannot be isolated from the general arrangements, overall design and concept feasibility. Therefore GustoMSC has been actively developing tools and methods to assess the DP capability, feasibility and accuracy in the very earliest stages of the design. This allows us to achieve complete and balanced designs in the concept phase.

The most detailed type of DP analysis we perform is a full time domain simulation of the dynamic positioned vessel. The results of these simulations have been successfully used by IHC Systems and Imtech to assess and calibrate their DP/DT systems.

These DP/DT systems were specifically designed to allow dredging vessels to maintain position or to follow a prescribed track (Dynamic Tracking) under a yaw-angle. The simulation software is however capable of modeling any DP system and has also be used to assess weathervaning DP concepts for example [1]. The simulations comprise the determination of the vessels' hydrodynamic coefficients including the complete quadratic transfer functions to model the low frequent wave excitation. More importantly, however, the simulation mimics the DP control and thrust allocation algorithms that form the heart of the DP system.

Currently we are integrating these functions with the software package AQWA – a state-of-the-art hydrodynamic analysis suite – so that we can combine its extensive multi-body simulation capabilities with our specific DP simulation technology. As part of this effort, and as part of his Master's Thesis, Jeroen Snijders - a student of Applied Mathematics at

the Delft University of Technology - has developed new algorithms to facilitate this integration. Working at GustoMSC in Holland for 9 months, he has been using recent advances in systems and control theory to develop a mathematical framework in which stable and optimal 'observers' can be constructed. These 'observers' act as estimators: they are algorithms that have as input only that part of the simulation that would also be measurable in real life, and they use it to estimate those quantities that cannot be measured directly but are the essential input for the DP control algorithms. The method showed promising results and was presented at the MTS-DP conference in Houston [2].

Based on this collaboration with Delft University and by synthesizing the benefits of mathematics and engineering, GustoMSC remains at the forefront of developing models and methods to design and evaluate DP units. We are now in a position to fully integrate multi-body hydrodynamics with DP controlled units, making it possible to simulate complex offshore operations with DP vessels in a single environment.

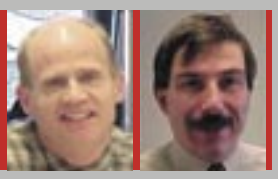
Through these continuous developments and collaboration with universities and other institutes, GustoMSC strives at excellence in engineering as a way to increase the quality of our services to our clients.

[1] O.A.J. Peters, J. Westhuis and J. Pinkster, A Feasible Concept of Bi-axial Controlled DP for FPSOs in a Benign Environment, Marine Technology Society (MTS) DP Conference September 28-30, 2004

[2] J.G. Snijders, J.W. van der Woude and J. Westhuis, Nonlinear Observer Design for Dynamic Positioning, Marine Technology Society (MTS) DP Conference November 15-16, 2005

DEEP-WATER MODIFICATION SOLITAIRE

IN APRIL 2005 ALLSEAS ENGAGED GustoMSC TO ASSIST THEM ON A FAST TRACK PROJECT FOR THE PIPELAY VESSEL SOLITAIRE. THE SECOND PHASE OF A PLANNED DEEP-WATER UPGRADE OF THE VESSEL WAS STILL TO COME, AND ALLSEAS WANTED TO USE THE AVAILABLE LEAD TIME TO PREPARE FOR AN EVEN MORE COMPREHENSIVE CONVERSION.



by Wim Woldring
and Wim de Boom]

By early 2005 Allseas had already completed a major modification of the vessel, carried out at the Keppel Verolme shipyard. This first phase deep-water upgrade comprised the installation of a new elongated (140 m long) stinger arrangement, and the preparation for increased A&R capabilities by the installation of four traction winches in SB and PS pipe storage holds. To increase the load carrying capacity of the aft ship, two large steel sponsons, 1,400 t in weight (designed by GustoMSC), were fitted to the Solitaire's aft ship, resulting in an extra buoyancy of 5,000 ton. The sponsons also provided the added strength required for the large pipe hang-off loads in ultra deep water. These activities were combined with a major Class survey of the hull. The second phase of the planned deep-water upgrade included the installation of new (double capacity) tensioners and a stinger hang-off system capable to allow for full operational profit from the elongated stinger.

However, during this project (in between the two phases) Allseas was forced to change plans because the hang-off frame, fabricated by a subcontractor prior to the first phase, suffered from serious weld defects. Therefore, in between the two phases Solitaire operated with a shortened stinger, while an alternative solution was sought for hang-off of the new 140 m stinger. Allseas found such alternative in using an already existing cantilever structure for the support of the elongated stinger via an additional winch/tackle system, while future expansions will still remain possible (see picture above). GustoMSC was requested to engineer that solution in detail, for execution by Keppel-Verolme in the second phase upgrading project.

For determination of the loads on the stinger suspension system, GustoMSC has modeled the stinger and vessel in AQWA (multi-body hydrodynamics software). This modeling demonstrated that the hang-off system needs to handle loads of nearly 3,000 tons. For the specified (post A&R) stinger recovery condition, with a significant wave height of 5 m, uplift of the stinger can be encountered during the passage of the stinger through the splash zone, which means that the suspension wires may slacken. The dynamic impact when the wires become tight again is very significant and unacceptable. The conclusion drawn from this analysis was that a tensioner in the wire system was

required so as to keep the wire rope tight during the entire operational process. A buffer is required at the end of the stroke of the wire tensioner to smoothly synchronize the rotational speed of the stinger with the rotational speed of the vessel.

By the time GustoMSC started the fast track engineering for the stinger hang-off system, to be installed in the second phase of the Solitaire's upgrade project, not only the cantilever beam but also the hydraulic components for the wire tensioner system (tensioning cylinders and hydraulic buffers) were already existing, and had to be incorporated in the design.

Thus, the main concept design issue became the geometrical arrangement of the tensioner and buffer. The space between upper and lower block of the stinger tackle arrangement was too small to create the required stroke of 4.4 m for the wire tensioner. The final location of the "flipper"-type tensioner was found in the front of the cantilever beam, relatively far away from the upper block. Additional guide sheaves were required to get the flipper incorporated into the hoist system. A separate dynamic analysis was carried out to prove the feasibility of the chosen concept. The final result of the flipper design is shown in the upper right hand corner picture.

In May 2005 the concept design phase was finalized and Keppel Verolme ordered material based on this preliminary info. Meanwhile GustoMSC started with the fabrication drawings and strength analyses. Production and engineering continued in parallel in the subsequent period from June to October 2005.

GustoMSC's scope of fabrication drawings:

- All modifications to the cantilever structure
- Cantilever support structure, including winch support structure
- Design tensioner (flipper) system
- All modifications to the vessel's outrigger (Fr -33 up to Fr +11).

Fabrication drawings that were finalized went directly into production, to speed up the process. Arrangements were made afterwards. This kind of procedure inherently involves the risk of mistakes, and of course mistakes happened. But thanks to the excellent flexibility of all three parties (Allseas, GustoMSC and Keppel Verolme) new revisions were implemented very quickly, almost without any delay at all.

Such flexibility proved to be an important factor for success.

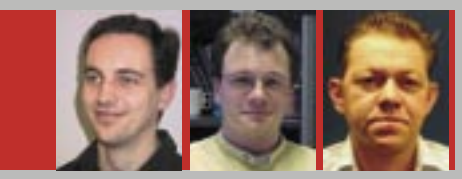
During the project execution, the scope of GustoMSC was extended with a full structural strength analysis of the aft ship. Finally a complete FEM analysis was carried out, including the vessel's outrigger (Fr -33 up to Fr+11), the cantilever support structure and cantilever beam. The FE model had already been made by Allseas and was updated by GustoMSC to confirm the new configuration of the aftship. The design and analysis was made in full compliance with the requirements of Lloyd's Register of Shipping in London. Despite the large sponsons, already fitted in the first phase of the upgrading project, which enlarged the strength of the aft ship considerably, several other locations in the vessel's outrigger needed to be further reinforced to cope with the extreme pipe and stinger loads, additional weights and future loads.

GustoMSC supported Allseas with engineering services right through to the very end of the project. In December 2005 the Solitaire was ready to sail to the Gulf of Mexico with its new 140 m stinger, the 62 m long cantilever beam and all required reinforcements incorporated.

PICTURE 1 FSO AND MOPU LONGITUDINAL BARGE NEXT TO EACH OTHER ON THE SWIFT

MOPU AND FSO FOR CASPIAN SEA DEVELOPMENT

INSIDE 5 AND 6 INTRODUCED THE MOPU AND FSO EXTENDED WELL-TEST FACILITIES FOR PETRONAS CARIGALI (TURKMENISTAN) SDN. BHD. AT THAT TIME, LAUNCHING OF THE FSO AND THE TWO MOPU BARGES IN THE UAE WAS BEING EFFECTUATED. BUT A LOT HAS HAPPENED SINCE THEN...



by Remco v.d. List, Taco Terpstra and Ronald Noijons]

LAUNCHING THE FSO

The FSO was built horizontally on land instead of on an inclined slipway in a way that more closely resembles an offshore approach than traditional shipbuilding. Hence a different launching procedure was developed. The FSO was built on blocks aligned with the hull's main structural components. Platform trailers were positioned under the FSO to take the full weight of 2,800 tonnes. A total of four trailers, hydraulically interlinked, were used for the load out. Subsequently the trailers loaded the FSO onto a submersible barge. Once the FSO was properly positioned on this barge, the barge's ballast tanks were filled such that the barge achieved its pre-calculated trim. Resting the stern of the barge on the harbor bottom and continuously filling the ballast tanks allowed the FSO to float off the barge.

ON THE MOVE

The MOPU (Mobile Offshore Production Unit) for Turkmenistan consists of two individual barges, designated longitudinal and transverse barge. They were built at the Lamprell yard in Jebel Ali, UAE, in the period February-September 2005.

From September 11th to 13th 2005, the MOPU barges were launched in a similar fashion as the FSO and towed to the quay. From there they were towed to Abu Nayar, some 50 miles offshore Dubai on September 18th, where the Dockwise heavy lift vessel Swift was waiting for load-on of the MOPU and the FSO. After the Swift was ballasted down to 17.7m draft, the FSO was the first to be secured in place. Next the longitudinal barge was secured alongside the FSO at a slightly deballasted draft of 16.2m for the Swift. The transverse barge was positioned in transverse direction and had a precise fit (with less than one meter clearance!) between the stern of the FSO and the deckhouse of the Swift.

The Swift left the UAE on September 19th for an eighteen day voyage via the Suez Canal and the Bosporus to Kerch in the Black Sea. After a few days of waiting for the weather to improve, the offloading operation went smoothly and the units were towed to the entrance of the Don-Volga canal system.

The trip through the Don-Volga canal system took approximately one month. The most spectacular aspect of the

PICTURE 7 ASSEMBLY OF THE MOPU IN BAKU

PICTURE 5 MOPU TRANSVERSE BARGE IN TRANSIT

PICTURE 2 FLOAT OFF OF THE FSO

PICTURE 12
MOPU INSTALLED IN BLOCK 1, WITH THE FSO IN THE BACKGROUND

PICTURE 6 MOPU LEGS IN TRANSIT

transport operation to the Caspian Sea was the clearance left between the extremes of the FSO and the restrictive canal and locks dimensions in the Don Volga Canal. Ultimately only 7.5cm was left at either side of the hull. The maximum clearance under the keel was 20cm, with a corresponding maximum clearance between the top of accommodation and underneath the crossing bridges in the canal of only 4cm. The well-planned operation resulted in a smooth transit through the canal as shown in picture 4.

After exchanging the river tugs for Caspian Sea tugs in Astrakhan, the FSO was towed to site, where she eventually arrived early in November 2005.

The MOPU barges were towed to Baku, where the legs had arrived one month earlier. These three 87m long, 3.5m diameter upper leg sections had been transported on a 77.5x17.2 meter barge, along with some additional material. The route led from Antwerp, where they were constructed, through Finland and St Petersburg, down the north route to the Volga and ended in Baku.

MOPU ASSEMBLY IN BAKU

The first major work in Baku was the mating of the two individual barges into the final cross shape of the assembled MOPU. This required the transverse barge to be ballasted down to only 1 meter freeboard. It was then secured to the quay-side and the longitudinal barge was towed/pulled over the U-shape gap in the transverse barge. When the longitudinal barge touched the quay-side the transverse barge was moved along its sister barge to its final position using a winch arrangement.

When the barges were in the correct position, they were then welded together at the maindeck level. The final connection between the barges, at bottom level, could only be made after the legs had been inserted and the platform was jacked-up above the water.

The 425t legs were inserted through the roof of the jackhouses by two heavy land cranes, to mate with the lower leg sections through a flange connection with 84 M60 bolts per leg. They were slowly lowered into the jacking system by purpose-designed guiding structures on top of the jackhouse and the use of a specially constructed leg clamp. For this operation the spudcans had to be lowered about 30cm, in order to avoid having the whole weight of the leg resting on the temporary support structure of the spudcan. The holes in the flanges of the upper and lower part of the leg were aligned to within one millimeter and the spudcan was lifted to mate with the upper leg section. The connecting bolts were pre-tensioned to 100t each, providing a connection strong enough to withstand storm and installation forces.

Once all three legs (and the flare tower) had been installed, the MOPU was jacked out of the water to allow for the final weld at bottom level to be made.

ON THE MOVE AGAIN

The MOPU was ready to leave Baku early in January 2006, but bad weather delayed departure until January 17th. The water was calm in the Baku canal, but once in open sea the weather was rough, waves had a height of almost 2.5 meters; staying on the MOPU was like “a three-day rollercoaster experience”.

On Friday the 20th of January the MOPU arrived in the bay of Turkmenbashi, to wait for a suitable installation weather window. The waiting time was used to carry out final modifications and tests for the local control systems on the unit (even though it was freezing cold…).

By the 27th of January the weather had improved and the MOPU was towed to site.

INSTALLATION

The Conductor pipe, complete with X-mas tree, had already been installed mid 2005 by Petronas Carigali (Turkmenistan) Sdn. Bhd.

The 6-leg mooring system was installed end 2005, ready for hook-up after arrival of the FSO. The FSO design allowed for trimming the vessel so that the chain table came just above sea level, facilitating the hook-up operation.

On January 27th the MOPU was carefully positioned next to the X-mas tree, after which it was jacked-up, preloaded and further jacked to its final elevation some 10m above the seawater level.

On March 8, 2006 first oil was produced.

PICTURE 11 TRIMMED FSO, ANCHOR LINE AND FLOWLINE HOOK-UP

PICTURE 8 LEG INSERTION INTO THE MOPU IN BAKU

PICTURE 3 COLD WEATHER

PICTURE 1 FSO ON PLATFORM TRAILER DURING LOAD OUT

PICTURE 10 CONDUCTOR PIPE WITH X-MAS TREE

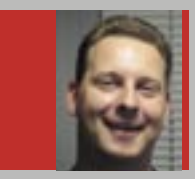
PICTURE 4 SUCCESSFUL PASSAGE THROUGH DON VOLGA CANAL

CONVERSION FSRU (MOSS TYPE)

NEW-BUILD FSRU

SBM OFFSHORE GROUP
LNG BUSINESS UNIT

GustoMSC PROVIDES CONVERSION AND TOPSIDES ENGINEERING AND PROCUREMENT SERVICES TO SBM FOR ITS FSO AND FPSO PRODUCT RANGE. APART FROM THE WELL-KNOWN FPSO PROJECTS, THIS ALSO INCLUDES ENGINEERING CONSULTANCY SERVICES FOR THE DEVELOPMENT OF NEW PRODUCTS FOR THE GROUP.



by Matthieu Ubas

The tremendous potential that the predicted growth in the gas market has to offer has not passed the Group by unnoticed. A new Business Unit has been created within the SBM organization to bring offshore solutions to the growing gas market (LPG, GTL, Methanol, etc.) with a short-term focus on offshore LNG solutions. As the pioneer in offshore loading and offloading and owner/operator of the world's largest fleet of FPSO's, including the largest-ever purpose built LPG FPSO "Sanha", SBM aims to be a strong and reliable partner in the development of LNG projects.

In order to achieve its objectives, SBM has capitalized on its unmatched track record in designing, building and operating offshore terminals and floating storage / production / offloading facilities, and has developed strategic partnerships and cooperation with key players in the LNG arena from the shipping, engineering and equipment supply fields.

Three main families of products have been developed to cover a wide range of project parameters:

- The Cryogenic Offshore Offloading (COOL) and Loading Terminals
- The Floating Storage and Regasification Units (FSRU)
- The Floating LNG Production and Storage and Offloading Unit (LNG FPSO)

While the development of offloading terminals has mainly been carried out within SBM's own research and development department, GustoMSC, as engineering consultant, has collaborated with SBM in the development of the FSRU and LNG FPSO concepts.

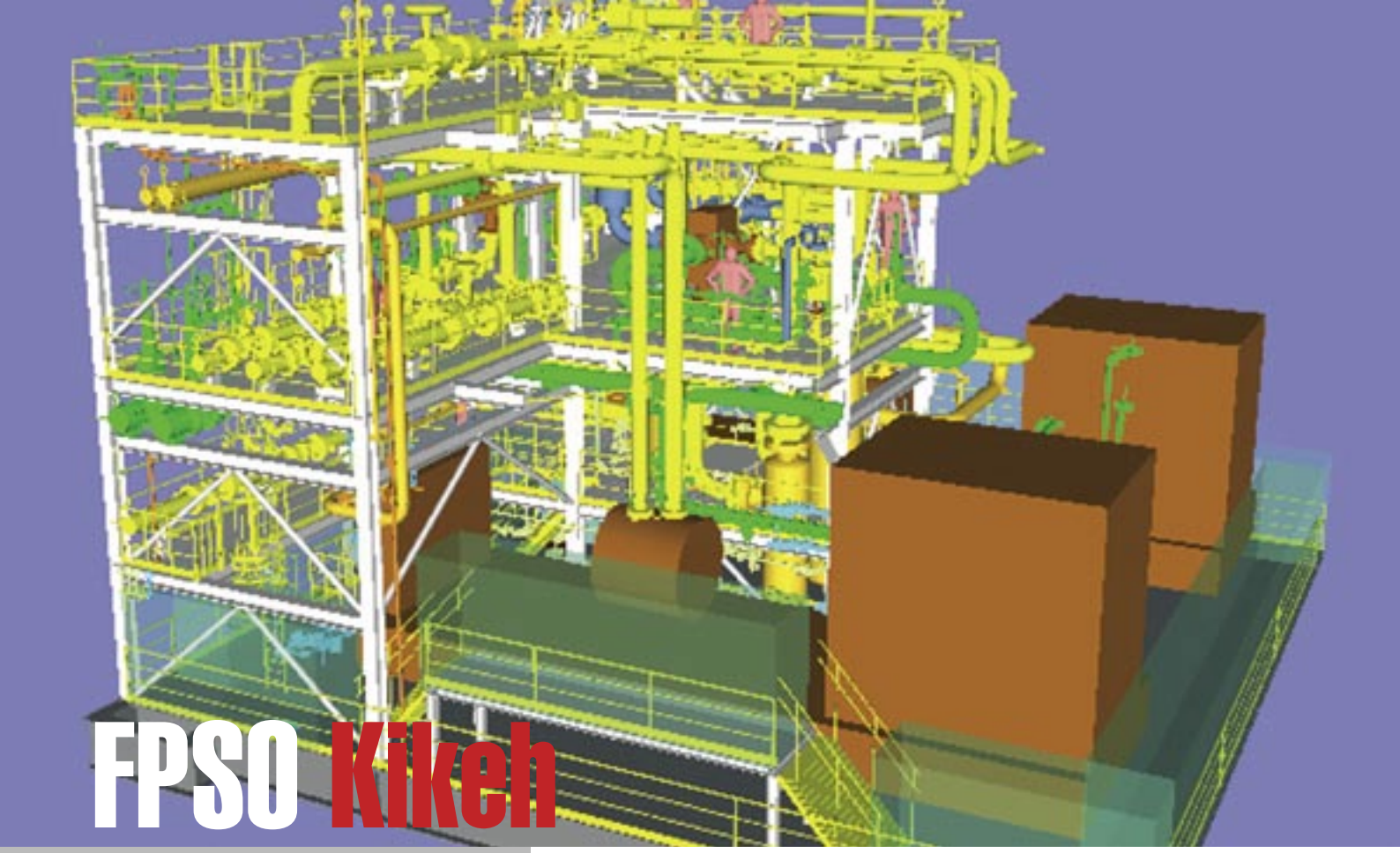
This development commenced three years ago with an assessment of available current technologies, future developments and ways to marinize these technologies. From these early screening studies, conceptual designs were developed for new-build FSRU's, conversion of existing LNG Carriers to FSRU's and new-build LNG FPSO's.

NICHE LNG[SM] FPSO

The new-build FSRU is intended as a large-capacity, base-load facility servicing large gas grids. The typical capacity range for such a new-build facility ranges from 600 MMscfd up to 2 Bscfd. Storage capacity on the vessel can be anywhere between 200,000 m^3 and 350,000 m^3. At this moment, the main market for such facilities is the USA, where the Group is assisting various energy companies in their project development. For the hull design and construction, a strategic alliance was set up with a reputable ship builder.

The conversion FSRU is intended for smaller capacities, typically up to 600 MMscfd. These facilities would allow gas import into smaller markets, such as in developing economies, or directly feed into large-capacity power plants or other industrial consumers. Concepts for Moss type vessels as well as membrane type vessels are available; these vessels feature storage capacities in the order of 130,000 m^3.

A more recent development is the LNG FPSO, developed in collaboration with ABB Lummus Global/Randall Gas Technologies, who have developed the Niche LNG[SM] process which has been specifically developed for marine applications. The LNG FPSO is intended to cater for medium scale liquefaction, as opposed to the large capacity base-load plants currently installed onshore. The liquefaction capacity is typically in the range of 1 – 2 million tonnes per year, but studies are being carried out to increase the capacity.



FPSO Kikeh

GustoMSC PERFORMED THE MAJORITY OF THE ENGINEERING AND PROCUREMENT WORK FOR FPSO KIKEH. GustoMSC'S COMMISSION COMPRISED DESIGN AND PROCUREMENT FOR THE REFURBISHMENT AND CONVERSION OF A VLCC TANKER INTO FPSO KIKEH. THE TANKER IS THE EX-STENA CONDUCTOR, A MID 70'S VLCC.

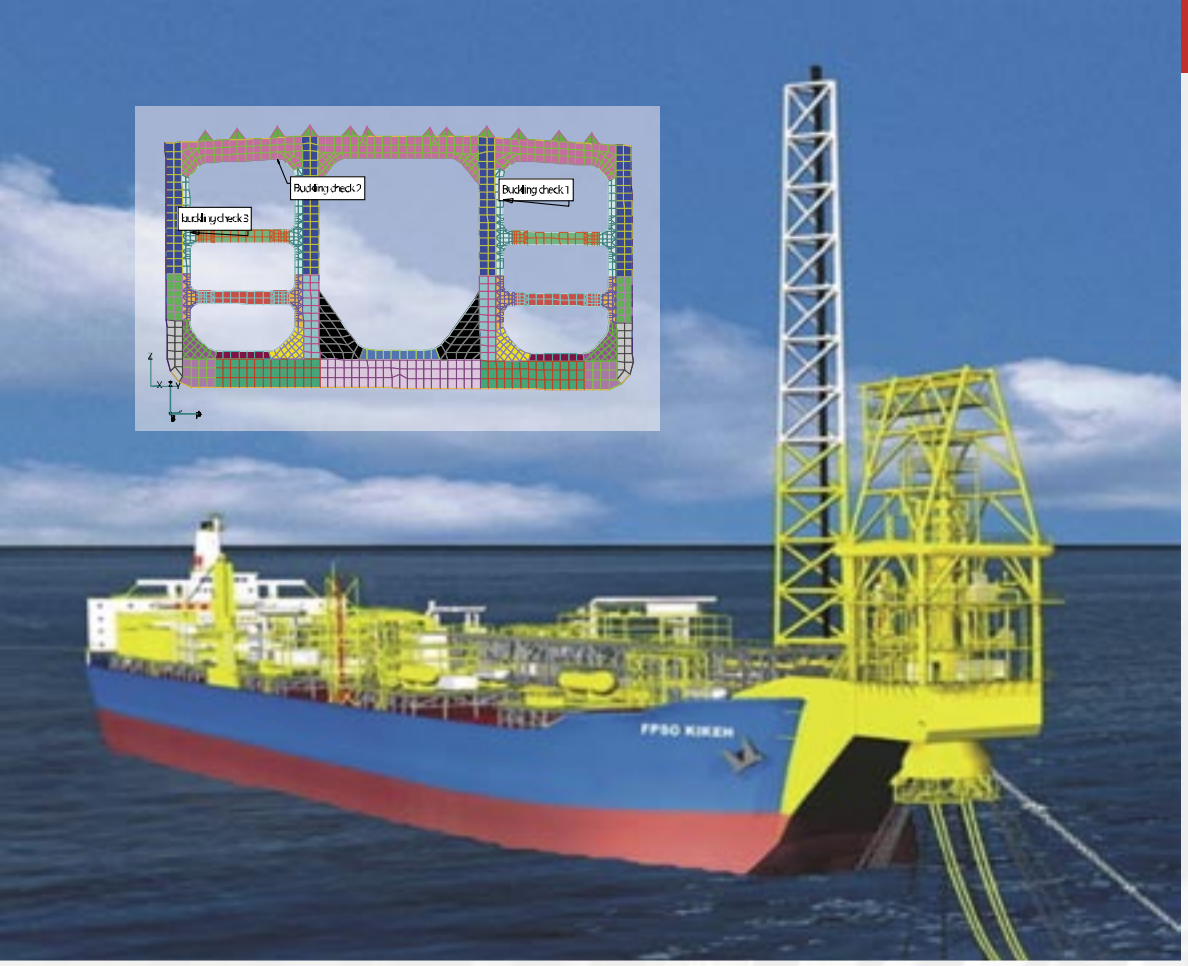
by Jan van den Boomgaard

Once operational, scheduled for 1st quarter 2007, the FPSO will be moored in the Kikeh field, located 120 km northwest of the island of Labuan, offshore Sabah, East Malaysia in approximately 1,300m water depth. The area is within the Murphy Sabah Oil Co., Ltd. (Murphy) and Petronas Carigali Sdn Bhd (PCSB) Block K. The FPSO operator will be MDFT, a joint venture between SBM and MISC.

The work started with an extensive survey of the well kept existing hull in Singapore. Survey results were analyzed thoroughly and formed the input for the state-of–the-art refurbishment programme, to ensure the design life time of the vessel is met without the need for dry-docking. Steel renewal and steel modifications resulted from this programme.
Engineering continued in GustoMSC's office in Schiedam with the Topsides oil processing plant design undertaken by an engineering team comprising GustoMSC and SBM staff, with support from MISC in GustoMSC's office for procurement. GustoMSC also hosted a team of junior MISC engineers in various disciplines to provide them with hands-on training on FPSO design.
The FPSO will be capable of producing 120,000 BOPD, injecting 260,000 BWPD back into the wells to enhance production. The 135 MMSCFD gas will either be injected back into the wells or exported as sales gas.

High level topsides layouts went through various optimization stages. This was to ensure that the plant is safe and efficient to operate and is cost effective to build.

All the plant components are placed on modules (separate elevated steel decks), to enhance parallel construction of the total plant and to ensure that the



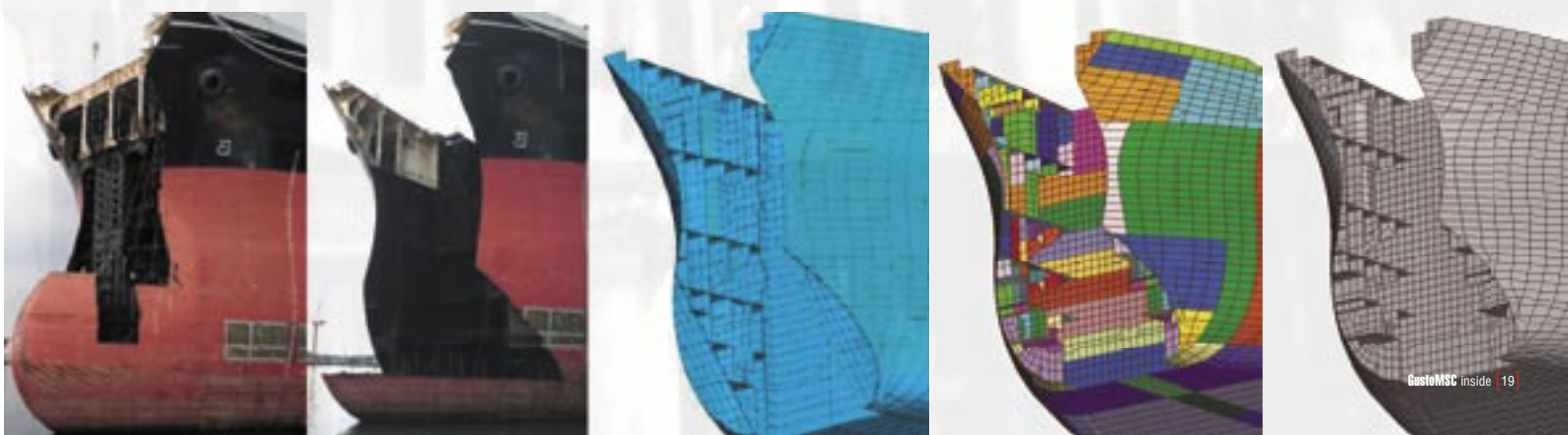
components with long delivery can be installed later in the construction period without fabrication impact. Sophisticated 3D modeling software is used to ensure the quality of the engineering construction drawings, whilst 3D design reviews enable designers and SBM PC operators to check that all construction and operational requirements are met. During this phase Murphy oil representatives joined GustoMSC office for a significant period to ensure swift and effective communication.
All the drives for the gas compression trains as well as the water injection pumps are electric.

The required power, some 60 MW, is generated by a total of 5 new generators: 3 gas turbine driven generators on a topsides module and 2 steam turbine driven generators located in the engine room.
Offloading is done by tandem tanker transfer, whilst the required mooring hawser reel system for the mooring of the shuttle tanker is a hardware delivery from GustoMSC.

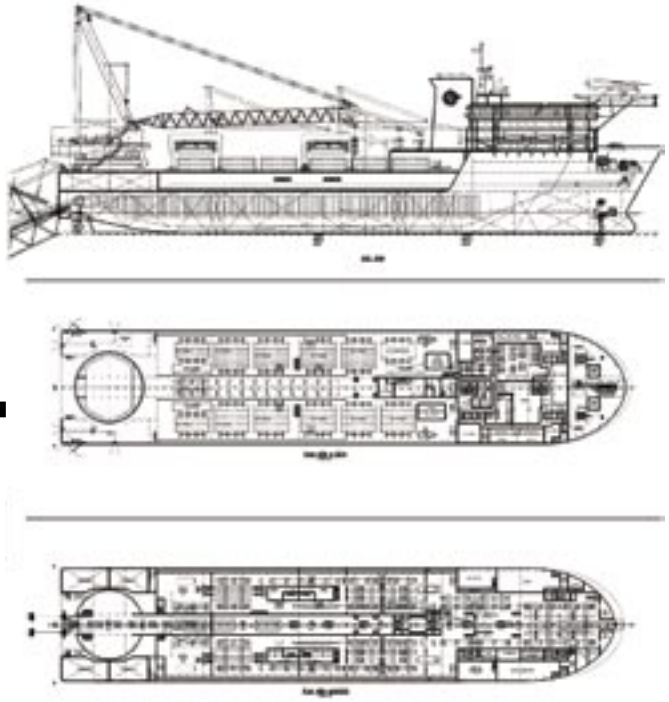
MMHE shipyard in Pasir Guidang, Malaysia, is carrying out the conversion and refurbishment works for both topsides and vessel.

The engine room has been significantly converted by removing the complete ship's propulsion system.

The existing ship's boilers, providing steam power for topsides as well as the power to drive the generators, have been extensively converted to gas fuel firing and refurbished to new standards.
The support services for the topsides and enlarged accommodation block (lodging 120 persons) are now located in the engine room.



FIRST DP3 PIPE-LAY/ CRANE VESSEL BUILT AND OPERATED IN CHINA



GustoMSC BASIC DESIGN DPV7500C FITS INTO COOEC'S DEEP WATER STRATEGY.

LAST SUMMER CNOOC'S OFFSHORE OIL ENGINEERING COMPANY (COOEC) APPROACHED GustoMSC FOR ASSISTANCE IN DEVELOPING A NEW VESSEL THAT WOULD BE CAPABLE OF DEEP WATER PIPE-LAY AND LIFTING OPERATIONS IN THE CHINESE AND GLOBAL MARKET. A STATE-OF-THE-ART DP3 VESSEL, SUITABLE FOR QUICK MOBILIZATION ALL OVER THE WORLD, WOULD BE REQUIRED FOR SUCH PURPOSES.

by Marco Beenen]

During initial discussions and technical exchange meetings it became clear that one of GustoMSC's existing class approved Basic Design packages would suit the Client's Deep Water Strategy and could be used as a good basis for further customization to COOEC's needs. As GustoMSC and COOEC had already successfully carried out three design projects together in the past, i.e. the design of the Pipe-Lay / Heavy Derrick Vessel Lan Jiang, the 8,000T Jacket Launch Barge 'Hai Yang Shi You' and the 30,000T Jacket Launch Barge, there was a good basis for further cooperation which has now resulted in a Basic Design contract for both the vessel and the stinger.

The double Class (ABS and CCS) DPV7500C belongs to the largest class of DP3 pipe-lay vessels and lifting vessels in the world as she is equipped with a center fire line with 5 welding stations on the main deck, fed from both SB and PS by two double joint factories, capable of laying pipes from 6 – 60 " diameter.

Pipe storage for up to 9,000 tons of pipes is provided on the upper deck above A-deck where two gantries equipped with pedestal cranes ensure quick and efficient transfer and handling of the pipes. The three section type fixed stinger provides maximum flexibility in water depths varying from shallow water to ultra deep water up to 2,500 meters.

For offshore lifting operations the vessel is equipped with a 4,000 tons fully revolving offshore crane, again providing COOEC with the largest capacity in the Far-East offshore areas.

To keep track and position during pipe-lay operations and lifting operations respectively, the DPV7500C is equipped

VESSEL DATA	DPV7500 C				
Length pp	185.00	m	LSW (excl Crane)	26,000	t
Length oa	204.65	m	LSW (incl Crane)	30,000	t
Breadth mld	39.2	m	Max Dpl (non-lifting)	59,000	t
Depth mld - Main deck	14.0	m			
Depth mld - A-deck	20.3	m	Crane capacity	4,000/3,500	mt
Draft max	9.5	m			
Draft transit	7.0	m	Pipelay capacity	12" in 2,000 m	DJ's
Ballast	32,500	m3	Propulsion Azi	2x4,500kW	9MW
Fuel	6,000	m3	Rectractable Azi	5x3,200kW	16MW
Fresh Water	3,000	m3			
Pipe storage	9,000	mt	Power	6x5,440 kW	32.6MW
Accommodation	389	pob	Transit speed	12	knots

with an optimized and sophisticated DP3 position keeping system. The thruster arrangement consists of 7 thrusters, i.e. two main azimuth thrusters aft (for propulsion) of 4.5 MW each plus 5 retractable azimuthing thrusters of 3.2 MW each. The two main azimuth thrusters will provide the DPV7500C with a sailing speed of at least 12 knots, which allows her to quickly mobilize to any suitable offshore installation project in the world.

Power is generated by six 5,400 kW diesel generator sets, divided over two A60 separated Engine Rooms and Switchboard Rooms. Further data on capacities and performance are provided in the table below.

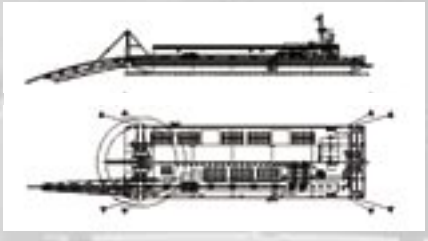
In February 2006 the Basic Design was approved by CNOOC/COOEC management and preparations were made for the next phase of this challenging project. Depending on the occupancy of the selected Chinese shipyards, we all hope that the vessel can be delivered in 2007/2008, which will be another milestone achieved in the co-operation between GustoMSC and COOEC.

COURTESY OF HANS LINGBEEK

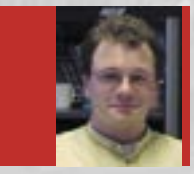
COURTESY OF HANS DE JONG

FIT-FOR-PURPOSE LAY BARGE

LAYING PIPE IN VARANDEY BAY, OFFSHORE NORTHERN RUSSIA, WITHIN THE SHORT SUMMER PERIOD OF 2006 WITH ONLY LITTLE TIME LEFT TO



CONSTRUCT A LAY BARGE, CALLED FOR GustoMSC'S PARTICIPATION IN FINDING A FIT-FOR-PURPOSE SOLUTION. MEZ HREGIONTROBOPROVODSTROY (MRTS) APPROACHED GustoMSC TO ACT AS DESIGN CONSULTANT PROVIDING CONCEPT AND BASIC DESIGN FOR THE CONVERSION OF AN EXISTING TRANSPORT BARGE INTO A PIPE-LAY



by Taco Terpstra

In Varandey Bay, just south of the Barents Sea, a single point offloading terminal is foreseen 18km offshore in a water depth of 22m. The terminal will be used to offload crude from the Russian tundras into shuttle tankers for further shipment to Murmansk or Rotterdam. Two 36" (OD 820mm) transfer pipes from shore to the offloading terminal have to be laid in the summer of 2006 during the ice-free period of approx. 90 days.

The design philosophy for the conversion engineering is to minimize modifications to the barge structure and leave existing systems intact. All new equipment will be installed on main deck. The following facilities are foreseen:

- Fully enclosed firing line
- Accommodation block
- Pipe-lay equipment
- Pipe storage racks
- Central track along the full length for a crawler crane, so that every part of the barge is within the crane's operating radius
- 8 (eight) point anchor mooring system.

Prior to conversion, the barge that MRTS had bought made a spectacular arrival in the port of Rotterdam carrying bare steel hulls from China. Towage operator ITC of Heemstede, Holland, towed the barge from China to Holland as illustrated in the pictures.

After conversion the lay barge will have the following main particulars and performance characteristics:

- Length 135.4m
- Breadth 40.0m
- Depth 7.5m
- Pipe diameter 36" (820mm)
- Pipe wall thickness 20.4-25.4mm
- Lay speed 750-1,000 m/day
- Tensioner capacity 100Te

At the time of writing, the basic design for the conversion has been completed by GustoMSC and we trust we have given our customer the right tools to both convert the barge and lay pipe in a record setting time.

ENSCO 8500 SEMI-SUBMERSIBLE DRILLING RIG NEW CONSTRUCTION ENGINEERING

by Rajan Bhambhani

GustoMSC worked with Ensco in the pre-construction engineering of the ENSCO 8500/75XX prior to submission of drawings to the ABS. This work involved preparation of column and pontoon structural drawings for submission to ABS for scantling approval. Design drawings for the hull, main deck, deckhouses and accommodation building were prepared and submitted to the shipyard for construction.

GustoMSC performed global strength, redundancy and fatigue analysis for submission to ABS. Substructure and drill floor structural design analyses were performed for drilling load combinations along with environment loads. FEA of critical connections on the hull and main deck were performed and submitted to ABS for approval.

NOBLE CLYDE BOUDREAUX SEMI-SUBMERSIBLE DRILLING RIG UPGRADE ENGINEERING

THE NOBLE CLYDE BOUDREAUX IS A SEMI-SUBMERSIBLE UNIT CONSTRUCTED IN THE 1970'S AND LAST UPGRADED BY NOBLE IN 2002. THIS UPGRADE, TARGETED AT DEEP WATER GOM, WAS NEVER ACTUALLY COMPLETED. NOBLE NOW HAS ANOTHER CONTRACT FOR THE UNIT AND PLANS TO COMPLETE THE UPGRADE AND INCORPORATE CERTAIN ADDITIONAL REQUIREMENTS.

by Tom Condon

The quarters were expanded from a capacity of 150 men to a capacity of approximately 200 men. This was achieved by enlarging the existing accommodation block and adding an additional level on top of the existing quarters' roof. Because of the increased capacity of the accommodation, the forward and aft lifeboats and platforms were also upgraded.

GustoMSC carried out the structural analysis and design of the drill floor, substructure, longitudinal bulkhead and associated cross bulkheads and beams for revised drill floor loads.

The Noble Clyde Boudreaux will be upgraded to 16 mooring lines, comprising an eight-point traction winch/windlass wire-chain arrangement coupled with an eight-point traction winch pre-set wire system.

GustoMSC designed the addition of buoyancy and stability sponsons to upgrade the transit payload and operating variable deck load, the foundations for the installation of additional mooring winches and storage reels on the main deck, including extension of the main deck, strengthening of existing structure, including tubular braces, and associated structural and naval architectural calculations including motion, stability, global strength, redundancy, fatigue and detailed finite element models for developing fatigue SCFs.

IMPORTANT DATES

01 – 04 May 2006	*Offshore Technology Conference, Houston*
05 – 09 June 2006	*World Gas Conference & Exhibition, Amsterdam*
13 – 15 June 2006	*DeepGulf 2006 Conference & Exhibition, Houston*
21 – 22 June 2006	*IADC World Drilling 2006 Conference & Exhibition, Prague*
11 – 14 September 2006	*Rio Oil & Gas 2006 Expo & Conference, Rio de Janeiro*
05 – 08 November 2006	*12th ADIPEC (Abu Dhabi International Petroleum Exhibition & Conference), Abu Dhabi*
28 – 30 November 2006	*Deep Offshore Technology International Conference & Exhibition, Houston*
04 – 07 December 2006	*Gastech, Abu Dhabi*
05 – 08 December 2006	*OSEA International Oil & Gas Industry Conference & Exhibition, Singapore*

RECENT PROJECTS

EXPLORATION MARKET

- Basic design Gusto10,000 drill-ship with extended capacities
- Basic design for a DSS51 drilling semi-submersible to be built by KeppelFels for GlobalSantaFe
- Basic design for two MSC CJ46-X100D cantilever drilling jack-ups to be built at Labroy Offshore Ltd Batam, Indonesia for a Norwegian investor
- Delivery of fixation systems, X-Y skidding systems and rack & pinion jacking systems for the above CJ46 drilling jack-ups to Labroy Offshore Ltd

CONSTRUCTION MARKET

- Basic design crane jack-up for Saudi Aramco
- Basic design for two multi-purpose jack-ups
- Life extension program DB101 for J. Ray McDermott
- Stinger review and re-design for Petrobras' "BGL-1"

PRODUCTION

- Revamping/feed verification studies of 6 units for Petrobras
- Basic, detailed design and procurement assistance for the conversion of the VLCC "Capella" into an FPSO for SBM
- Delivery of a mooring hawser storage reel for "FPSO Kikeh"
- Various studies for dynamically positioned FPSO's, and definition of an FSRTU (floating storage re-gasification terminal and unit)
- Consultancy for deep sea diamond mining unit

COLOFON

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