

Semi-submersibles

Our Activities

Technology
Creating
Value



SBM
OFFSHORE

The horizon is just the beginning. Our challenge is to see beyond it.

Applications for offshore energy



Semi-submersibles

As exploration and production operations have expanded into increasingly deeper waters, the semi-submersible has fast become the industry standard for efficient operations combined with high payloads, large net deck areas and high workability percentages.

With a history dating back to the mid 1970s, GustoMSC, a member of the SBM Offshore Group, provides semi-submersible designs for drilling, construction and production.

Exploration

DSS series of drilling semi-submersibles



DSS20-CAS-M



DSS38

GustoMSC has been involved in the design, engineering and construction of different types of semi-submersible vessels. In the early 1980s, we introduced the proprietary DSS semi-submersible designs.

GustoMSC and Keppel Offshore Marine DTG jointly developed several sizes of drilling semi-submersibles within GustoMSC's DSS series, which is widely recognised by the industry for its cost effectiveness and robustness. The DSS series is charac-

terised by its vertical riser storage forward of the derrick and the huge pipe rack capacity aft of the derrick. The DSS20 and DSS38 are aimed primarily for exploration drilling, while the DSS21 and DSS51 also target development drilling activities. These DSS21 units can be equipped with a dual derrick system and a 350-tonne capacity subsea knuckle boom crane. To date, eight units of the DSS series have been built or are under construction.



DSS21

	DSS20-CAS-M	DSS38	DSS21/DSS51
Number built or under construction	1	2	4
Deck size	63.5 x 64.5 m	69.5 x 69.5 m	77.5 x 78 m
Draft	20.5 m	20.5 m	20.5 m
Displacement	30,500 t	39,500 t	53,000 t
VDL operating	4,000 t	4,700 t	8,000 t
Total VL	6,500 t	9,250 t	13,000 t
Gen sets	4 x 2,700 kW	10 x 3,600 kW	8 x 4,800 kW
Positioning	Moored	DP2	DP2
Thrusters	n/a	8 x 3,000 kW	8 x 4,000 kW
Accommodation	130 POB	130 POB	150 POB
Derrick	1,500 kips	2,000 kips	2,000 kips / 1,000 kips
Mud pumps	3 x 2,200 hp	4 x 2,200 hp	3 (+1) x 2,200 hp
Mud capacity	950 m3	1,400 m3	2,200 m3

Exploration

OCEAN class of semi-submersibles



OCEAN450



OCEAN850BR

Based on the experience of all its previous projects, GustoMSC introduces the OCEAN class of drilling semi-submersible vessels. This OCEAN class is a further improvement in efficient fabrication and optimum lay out. It is based on the 4-column integrated deck box structure.

The OCEAN450 size targets 'shallow' water operations in a moored configuration. The 8-point mooring spread is a traction winch driven system with the storage reels in the

pontoons. For deepwater operations this system can easily be attached to a pre-laid system without any modification to the equipment.

The OCEAN850 size is an exploration drilling unit with development drilling capabilities, designed for depths of up to 10,000 ft with a full DP2 positioning system.

The OCEAN1100 size is the tool for development and exploration drilling in deep waters and remote areas with a variable load capacity of 14,000 tonnes.



OCEAN1100

	OCEAN450	OCEAN850	OCEAN1100
Deck size	65 x 65 m	73 x 73 m	78 x 78 m
Draft	20.5 m	19.8 m	20.5 m
Displacement	32,000 t	43,500 t	55,000 t
VDL operating	4,000 t	8,000 t	8,500 t
Total VL	7,000 t	12,000 t	14,000 t
Gen sets	4 x 2,500 kW	10 x 3,800 kW	8 x 4,800 kW
Positioning	Moored	DP2	DP2
Thrusters	n/a	8 x 3,000 kW	8 x 4,000 kW
Accommodation	120 POB	140 POB	200 POB
Derrick	1,500 kips	2,000 kips	2,000 kips
Mud pumps	3 x 2,200 hp	4 x 2,200 hp	4 x 2,200 hp
Mud capacity	1,000 m3	1,750 m3	3,000 m3

Exploration

Semi-submersibles built or under construction



Stena Tay



Sedco Express

In the 1990s GustoMSC assisted Transocean with the engineering of the SFXpress class of semi-submersibles by preparing the full set of documentation of the class package, including the class approval assistance.

Another example of major engineering support provided to Keppel Fels is the class approval documentation for the conversion of an accommodation semi-submersible in the 5th generation deepwater drilling semi-submersible Stena Tay in the mid 1990s.

In early 2006 GustoMSC and SBM Atlantia contracted semi-submersible vessels as turnkey projects to several Brazilian drilling contractors. GustoMSC is providing the design and detailed engineering of these three units:

- Lone Star for Queiroz Galvão
- Norbe VI for Odebrecht
- Delba III for Delba

The delivery of these units is scheduled from 2010 to 2011.

	LONE STAR	NORBE VI	DELBA III
Class	TDS2000P	TDS2000P	TDS2500
Displacement	30,000 t	30,000 t	36,500 t
Water depth	2,400 m	2,000 m	2,400 m
VDL	7,000 t	7,000 t	7,750 t
Delivery	2010	2010	2011



Norbe VI and Lone Star

Construction

Accommodation semi-submersibles



OCEAN500

The first accommodation semi-submersibles were the OCEAN100, Semi 1 and Semi 2, which are presently operating in the Gulf of Mexico as accommodation support units.

The Semi 1 and Semi 2 of the OCEAN100 class are compact-size units with an operating displacement of just over 10,000 tonnes. Based on the DSS series, GustoMSC and Keppel Offshore Marine DTG have developed the DSS20-NS-DP3, delivered as Floatel Superior to Floatel. This unit is capable of operating in the Norwegian sector in compliance with the NORSOK regulations. Equipped with one-person cabins, the unit has a total capacity of 440 POB.

For moderate environments GustoMSC developed the OCEAN500 with a 650 POB accommodation.

	OCEAN100	OCEAN500	DSS20-NS-DP3
Number built	2	-	1
Deck size	50 x 43.2 m	66 x 67 m	63.5 x 64.5 m
Draft	12.6 m	20 m	18 m
Displacement	11,250 t	32,000 t	29,000 t
Variable load operating	1,750 t	4,800 t	4,600 t
Gen. sets	6 x 1,900 kW	6 x 4,000 kW	6 x 3,680 kW
Positioning moored	6 point 2.8" wire	8 point 3" wire	8 point 3" wire
Positioning DP	6 x 1,250 kW	6 x 3,000 kW	6 x 3,200 kW
Accommodation	Up to 150 POB	650 POB	440 POB
Crane	225 t	2 x 70 t	2 x 50 t



Floatel Superior



OCEAN100

Construction



Balder

In the 1970s GustoMSC was one of the frontrunners in the design, engineering and construction of units for the construction and installation markets. The 'Viking Piper' (now 'Castoro 7') was built at the Gusto Shipyard.

This unit was followed by the design of the heavy lift crane semi-submersible vessels 'Hermod', 'Balder' 'Narwhal' (now 'DB101') and Saipem 7000. With these units, GustoMSC established a reputation for large semi-submersible vessels with displacements of over 100,000 tonnes.

From the huge semi-submersible vessels, the advanced small installation, diving and construction vessels 'Semi 1' and 'Semi 2' illustrate the versatility of the GustoMSC design capabilities.



Saipem 7000



Viking Piper

Construction

Equipment



Stanislav Yudin

Cranes

Essential equipment for construction semi-submersibles is heavy duty offshore cranes. GustoMSC has been involved in the design and construction of offshore cranes since 1967. Reliability and enhanced safety are key issues as clearly demonstrated by the continued operations of Hermod, Balder DB101 and Stanislav Yudin cranes.

Today the latest cranes introduced to the market are the 4,000-tonne crane for the deepwater pipe laying vessel Hai Yang Shi You 201 of CNOOC and the 5,000-tonne crane for the Oleg Strashnov of Seaway Heavy Lifting.

Unit	GustoMSC type GDC-4000-ED	GustoMSC type GDC-5000-ED
Number built or under construction	1	1
Main hoist	Tieback 4,000 t @ 43 m Revolving 3,500 t @ 33 m	5,000 t @ 32 m 2,500 t @ 54 m
Max hook height	85 m	98 m
Aux. hoist	800 t @ 90 m	1) 800 t @ 72 m 2) 750 t @ 40 m
Whiphoist	1) 70 t @ 105 m 2) 50 t	110 t @ 118 m
Power supply	4,000 kW	6,500 kW

Telescopic gangways

GustoMSC has designed and delivered several telescopic gangways. The latest was delivered to Chevron for the Compliant Tower Tombua Landana offshore field in Angola. This gangway has an effective stroke of 14 m, with a 23.5 m minimum and 37.5 m maximum extended reach.



Gangway for Tombua Landana Platform



Oleg Strashnov



Hai Yang Shi You 201

Production



Independence Hub



Independence Hub

In early 2000, a trend developed for semi-submersible designs to be applied as Floating Production Units (FPUs). The standard industry Floating Production Units provide reasonable motions and can be scalable to handle very large payloads. But these FPUs could not meet the challenge of supporting Steel Catenary Risers (SCRs). The DeepDraft® FPU of SBM Atlantia focuses on optimising vessel motions. The result was the extended draft to reduce the wave-induced motions and increase the unit's life cycle.

The construction and fabrication of the hull benefited from GustoMSC's experience gained in the design and construction of drilling and construction semi-submersibles. The topside design and fabrication methods stem from the group's knowledge of Tension Leg Platforms (TLP).

In 2007, the industry's first DeepDraft Semi® was installed in a world record 8,000 feet of water on the Independence Hub project in the Gulf of Mexico. This facility is equipped to process gas from 10 fields with excess payload capacity to tieback as many as 10 additional fields.

In 2009 Thunder Hawk, as near-clone of the Independence Hub semi-submersible, produced first oil. This unit incorporates the latest industry-accepted metocean criteria and is equipped to process both oil and gas from the Thunder Hawk field. The facility will mark the first such unit in the Gulf of Mexico to be owned by SBM Offshore and operated by Murphy under a production handling agreement.

The scope of work for the production units can be from full EPCI and lease and operation to third party review or design of the topsides. GustoMSC performs the full review of the Petrobras units P-51, P-52 and P-56 on behalf of Keppel Fels and the FEED for the redesign of the topsides for Petrobras-55.



Petrobras-51

Production



Thunder Hawk



Thunder Hawk

Name	Enterprise 'Independence Hub'	SBM / Murphy 'Thunder Hawk'
SBM Atlantia SCOPE	EPCI	EPCI
Schedule Milestones		
Project award	July 2004	September 2006
Platform installation	1Q 2007	2008
First gas	July 2007	2009
Field Facts		
Location	Mississippi Canyon, Block 920	Mississippi Canyon, Block 736
Water depth	8,000 ft*	6,050 ft
Oil throughput	-	45,000 b/d (60,000 b/d future)
Gas throughput	1,000 MMscfd**	70 MMscfd
Condensate throughput	5,000 barrels per day	-
Water throughput	2,960 barrels per day	30,000 barrels per day
Number of production wells	-	4 (sub-sea)
Production risers	Twelve 10" SCRs, Four 8" SCRs	Two 8" SCRs (Six 8" SCRs future)
Export	20" SCR (gas)	12" SCR (oil), 12" SCR (gas)
DeepDraft Semi® Specifications		
Payload (deck / facilities / risers)	19,300 tonnes	13,800 tonnes
Mooring	12-leg mooring system, 9" polyester rope	12-leg mooring system, 9" polyester rope
Hull dimensions	232 ft x 232 ft x 160 ft	232 ft x 232 ft x 170 ft
Hull columns dimensions	46 ft x 46 ft	46 ft x 46 ft
Draft	105 ft	105 ft
Pontoon dimensions	38 ft x 26 ft	38 ft x 26 ft
Deck dimensions	140 ft x 220 ft (two levels)	140 ft x 180 ft (two levels), 140 ft x 40 ft (future module)

* World record

** Gulf of Mexico record



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