



SEVEN ATLANTIC

IHC MERWEDE DELIVERS SOPHISTICATED DIVE SUPPORT VESSEL

Builders:
IHC Merwede Offshore & Marine,
Hardinxveld-Giessendam,
The Netherlands
Owners:
Subsea 7

After the successful collaboration between IHC Merwede Offshore & Marine and Subsea 7 on the newbuild vessels *Seven Oceans* in 2007 and *Seven Seas* in 2008, this year sees the delivery of *Seven Atlantic*. While the previous two vessels were built for pipelay and subsea construction activities, the new horse in the stable is a saturation-dive support vessel. Like her predecessors, the *Seven Atlantic* is one of the most modern vessels of its type. Not only does she have a broad range of diving and ROV equipment onboard, but she is also a dynamically positioned DP-3 class vessel, with a 120 ton active heave compensated crane for subsea construction. In addition, she has been fitted with a well treatment system to improve the productivity of subsea oil wells. The vessel is one of the largest and most capable diving support vessels in the world.

Saturation diving

A total number of 24 divers can be

housed in six saturation chambers under a pressure level corresponding to a 350 m water depth. The diving system can be divided at the centerline to allow for two crews working at different depths. The panoply of diving chambers and connecting tunnels is comparable to the International Space Station. From their living quarters, on-shift divers can

access either of the two saturation dive bells through two large transfer-under-pressure (TUP) chambers without disturbing the off-shift divers. The chamber control system is of the SCADA type using remotely operated valves, which is a significant departure from the conventional approach with manual pneumatic valves.

Key Features

| | |
|------------------------|------------|
| Length o.a. | 144.79 m |
| Length b.p.p. | 128.96 m |
| Beam mld. | 26.00 m |
| Depth to maindeck | 12.00 m |
| Design draught | 7.00 m |
| Trial speed | 13.6 knots |

Capacity

| | |
|-----------------|-----------------------|
| Deadweight | 8.700 ton |
| Deck cargo | 10 ton/m ² |
| Deck area | 1200 m ² |
| Occupants | 150 persons |

Tank capacities

| | |
|-------------------------|-------------|
| Marine gasoil | 2275 cu.m |
| Ballast water | 5070 cu.m |
| Potable water | 1060 cu.m |
| Fresh water | 129 cu.m |
| Low sulphur diesel | 129 cu.m |
| Lub oil | 42 cu.m |
| Chemical tanks | 5 x 20 cu.m |

Helium-Oxygen mixture

Below the diving installation is a huge storage area for pressure vessels with a helium/ oxygen mixture. Some of the oxygen bottles (% O₂>20%) are stored on deck for fire safety reasons. The divers breathe a helium-oxygen mixture for the entire work shift - up to 2-3 weeks - which gives their speech a "Donald Duck" effect. While they quickly get used to this when talking amongst themselves, the communication lines with the normal environment are equipped with a voice transformer ("unscrambler") to adjust the tone of voice back to normal.

As helium is a costly gas, it is carefully



The diving control system uses remote operated valves



A large supply of helium/oxygen mixture is stored under deck

retrieved from the divers' exhaled air and recycled back to storage.

A control room and machinery room are provided to maintain the climatic conditions inside the divers' living quarters, as experience has shown that divers in pressurized conditions are much more sensitive to temperature variations.

Diver transport

Dive bells can be lowered through moonpools on either side of the centerline. These are located in the position near the centre of the ship where motion is felt least. The moonpools have open cofferdams on the inside to reduce the wave movements.

The dive bells are lowered by the three dive bell winches. A fourth winch is used for the umbilical, which brings breathing gas, hot water and a communication cable from the ship to the dive bell. When working, the divers' suits are continuously injected with hot water.

Besides the saturation diving equipment, the *Seven Atlantic* also has an extensive spread for regular air diving. Divers can be lowered in baskets from both sides of the vessel. Once lowered safely through the splash zone, they can swim out and start the dive. A telescopic hoop boom can extend 20m from each side of the ship to keep the diver umbilicals safely away from the ship's thrusters.

The bulkheads of the tunnel thruster room received a visco-elastic damping treatment to reduce the noise



ROV's

The *Seven Atlantic* is equipped with two eyeball ROV installations, which are lowered through the moonpools. These observation class unmanned vehicles are used to closely monitor the divers' activities as well as for inspections in water depths up to 3,000 metres. A fifth and smaller moonpool is located on the aft deck and may be used to lower equipment. All moonpools have a hatch at main deck level, but at the bottom level, they remain always open.

Well treatment system

Below the aft deck are five 20 cubic metre tanks for storing well treatment fluids. These chemicals are used to dissolve the sediment in oil wells and restore a good flow. They can break down the scale which builds up in pipelines and thus prolong the life of the oil well.

DP-3

With divers working from the ship, a Class 3 Dynamic Positioning system is required. This means that any compartment, including an engine room or control room, may be flooded or on fire and the vessel will still be capable of maintaining position. On the *Seven Atlantic*, this is achieved with three entirely separate engine rooms, three azimuthing

stern thruster rooms and three bow thruster rooms. Two bow thrusters are retractable and one is a tunnel thruster. Each of the engine rooms houses two generating sets, with an output of 3360 kW each. The voltage of the generators and propulsion installation is 6,600 V. For other consumption, 440V and 230V networks are supplied.

On the aft side of the bridge, there are two Kongsberg dynamic positioning consoles, so the operator can choose to work on the port or starboard side. Since an incident on the bridge qualifies as a single failure, a further DP console is located in a separate fireproof room on the deck below.

Propulsion

The total installed thruster power is 15,850 kW, of which 13,650 kW can be used for forward thrust. The stern thrusters are rated at 2,950 kW, the retractable bow thrusters at 2,400 kW and the tunnel thruster at 2,200 kW. All this power gives the *Seven Atlantic* a service speed of 13.6 knots. All thrusters are equipped with a propeller nozzle to increase the thrust and to minimise the chance of fouling a wire or umbilical.

The entire propulsion installation runs on marine gasoil. The absence of heavy fuel means less equipment, less maintenance

Two hyperbaric lifeboats can evacuate divers while maintaining pressure conditions





The spacious wheelhouse has a large navigation console facing forward...

nance and cleaner emissions. The cooling water of the engines is cooled by seawater in APV plate heat exchangers, supplied by AMW.

The entire electrical installation on the vessel was performed by Bakker/Croon. Their delivery included the alternators for the gensets and emergency generator, the main switchboards, various frequency drives and propulsion motors, the motors for the thrusters and several rotating converters.

Automation

The DP system is from Kongsberg Maritime, type kPos. As reference systems, it uses three DGPS's, two HiPAP's, two taut wires, a Radascan which measures the distance to a fixed object, an HPR interface and a Fanbeam interface. Besides the DP system, Kongsberg also delivered the alarm and monitoring system and the power management system. These systems use a multitude of pressure sensors, pressure switches, thermostats and manifolds from Trafag, supplied by Marktechnical BV.

The bridge electronics were delivered by SAM Electronics. Their NACOS 35-5, short for Navigation and Command System, includes a 5 ft X-band radar, a 14 ft S-band radar, four Chart radar 1100 displays, two Chartplot 1100 for electronic charts, a Trackpilot 1100 and a Conningpilot 1100. Input from the multitude of sensors and AIS goes into the system and is used by the various equipment. An output of this backbone goes to the Voyage Data Recorder, Debeg 4300 type.

The wheelhouse onboard the *Seven Atlantic* is spacious. Measuring 28



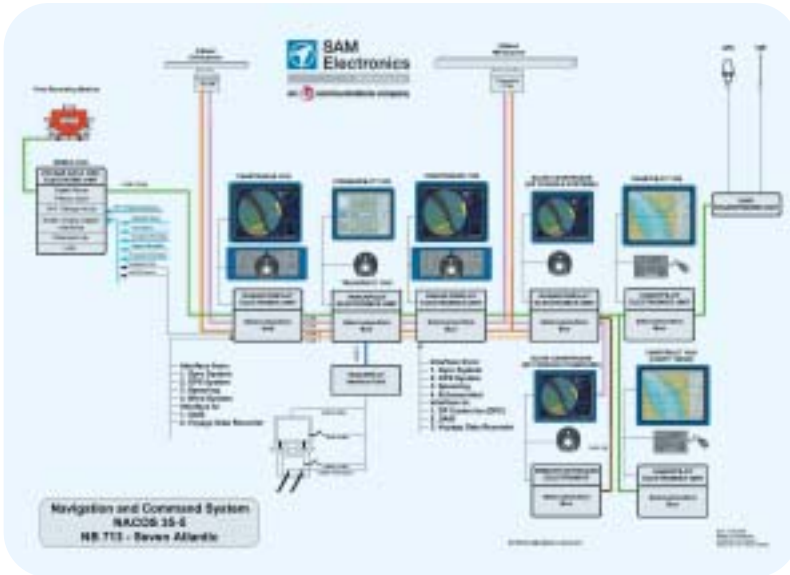
and two dynamic positioning consoles facing aft

Power is generated in six diesel generators divided over three engine rooms





All propulsion equipment is fully redundant to achieve DP-3 class



The mast houses two radars and two large satellite domes for communication



metres long by roughly 12 metres wide, it accommodates the navigation consoles at the front and DP consoles in the rear. In addition, there is room for a radio corner, a separate coffee corner and a bridge office equipped for 5 people. Two lounge areas are provided on port and starboard.

Construction

The *Seven Atlantic* was built in sections at IHC Merwede Offshore & Marine in Hardinxveld-Giessendam. The superstructure was built by Maatschappij de Maas, in the port of Rotterdam. After launching, the hull was towed to Rotterdam where the vessel received its superstructure. She then returned to Hardinxveld for the remainder of the outfitting phase.

Accommodation

The *Seven Atlantic* is the first IHC Merwede vessel to be built under so-called comfort class notation CAC (2). This notation imposes stringent noise levels on the crew quarters. These were achieved by placing the cabins in the accommodation block outside the fore-castle and by adopting floating floors to create a box-box construction with only flexible contact between the steel construction and the interior. In addition, a visco-elastic damping treatment is applied to the hull and bulkheads in the tunnel bowthruster room, which is a major source of noise during DP operations.

The accommodation caters for 150 personnel, including six captain class cabins with dayroom, 14 single cabins and 130 double cabins. The public spaces are particularly spacious on this vessel. The crew also has ample recreation facilities, with a sauna, a large gymnasium, a smoking lounge, a library/internet room, a quiet lounge and a recreation room.

The entire class notation of the vessel reads LR 100A1, SDV, LMC, UMS, DP (AAA), CAC(2), EP, ICC, UD Strength for load of 10 t/m², Heli Landing Area. The ship sails under the flag of the Isle of Man.

The helideck is approved for Super Puma and S61 helicopters and was supplied by Marine Aluminium from Norway. Above the wheelhouse, there is a waiting room and reception facility for helicopter passengers.

Safety

Besides the four normal lifeboats, two hyperbaric lifeboats are also available, each with capacity for 18 divers. They are connected with the decompression chambers through a vertical trunk on each side of the ship.

The 120 ton SWL from Huisman-Itrec has active heave compensation on its main hoist



The rescue boat is a search and rescue boat which can be launched by davit from the aft working deck. The lifeboats and fast rescue boat are all made by Norsafe and delivered by Technoship BV. While the engine room is protected by CO₂ and a watermist system for local protection, some other technical areas, such as several diving spaces and the pump room for the well treatment system, are protected by FM-200, a non-toxic extinguishing gas which is located within the protected space, thus minimising the required pipe runs.

Deck gear

The large deck crane was built by Huisman Itrec (Schiedam) and uses the secondary hydraulic drive principle. The crane can lift a hefty 120 tons at a reach of 7.4 to 12 metres with a wire length of 1500m. At 30 metres, it can lift 30 tons on a single fall. It has a whipline which is certified for 12 ton man-riding operations and 24 ton regular operations. Two auxiliary deck cranes on the aft deck each have a safe working load of 10 tons at 14 metres.

Summary

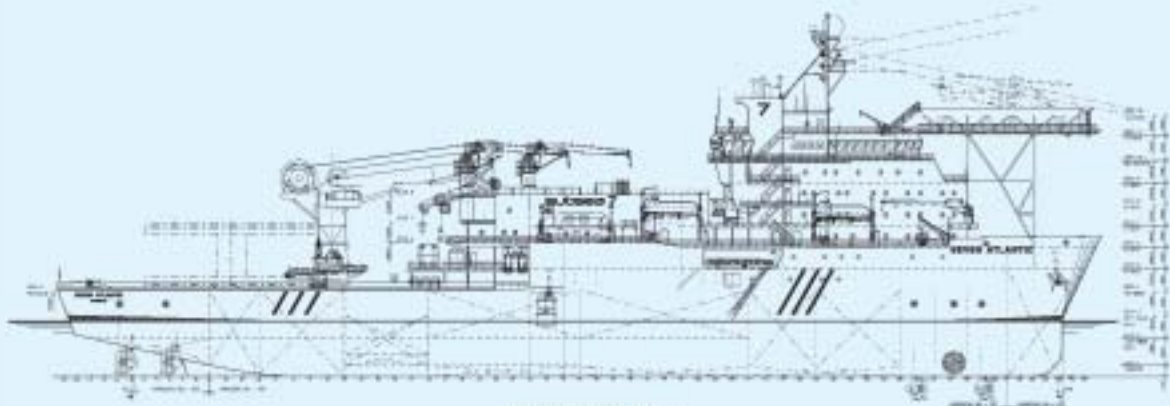
As described, the Seven Atlantic is truly one of the largest and most capable diving support vessels in the world and she will bring a new dimension to the Subsea 7 fleet when she joins it later in 2009. In the meantime, IHC Merwede Offshore & Marine has started work on the *Seven Pacific*, the next state-of-the-art pipelay and construction vessel for Subsea 7, following on from the *Seven Oceans* and *Seven Seas*.

Subcontractors and suppliers of equipment fitted on board the 'Seven Atlantic' (partial list)

| | |
|---|---|
| Aalborg Industries , Spijkenisse | hot water heating installation |
| ALLWEILER Pumps Benelux , Utrecht | centrifugal- and screw pumps |
| AMW-Marine , H.I. Ambacht | APV plate heat exchangers |
| ArcelorMittal Projects , Moerdijk | steel |
| Bakker Sliedrecht Electro Industrie , Sliedrecht | main & emergency alternators; msb; propulsion and thruster-transformers, drives and motors; transformers; design, installation, commissioning and testing of electrical equipment |
| BIS Industrial Services , Zwartewaal | scaffolds |
| Boer Staal, De , Uitgeest | steel plates, profiles and bulb flats |

| | |
|---|--|
| Bouter Grootkeuken Techniek , Zoetermeer | galley equipment & messroom |
| Brabant Mobiel , Oosterhout | paint applications |
| Börger Machinefabriek , Hoogeveen | complete package WT steel hatches |
| Centa Nederland , Stellendam | flexible couplings |
| Croon Elektrotechniek , Spijkenisse | electrical installation |
| Dekker & Stam , Hardinxveld-Giessendam | fuel, lubricants, hydraulics |
| Divex , Aberdeen | dive installation |
| Econosto Nederland , Capelle a/d IJssel | valves |
| GS-Hydro Benelux , Barendrecht | pipings dive installation |
| Hagglunds Drives , Gorinchem | power unit ROV |
| Hamworthy , Rotterdam | sewage treatment units including vacuum system |
| Hassink , Ridderkerk | cleaning services |
| Hatenboer-Water , Rotterdam | Demitec RO seawater desalination system; post treatment skid; fresh water hydrophore & treatment module; hot water calorifiers |
| Helder & May , Europort RT | Nautec SD, VCD and Nautec FS floors |
| Holland Marine Lifts , Hardinxveld-Giessendam | crew lift, dumbwaiter |
| Huisman-Itrec , Schiedam | crane |
| IHC Metalix , Kinderdijk | work preparation services, pre-manufactured metals |
| IHC Piping , Sliedrecht | pipings installation |
| Indurisk , Sliedrecht | insurance |
| Intersona , Heerde | noise and vibration calculations; sea trial measurements |
| Johnson Controls Systems & Service , Dordrecht | HVAC |
| Jong & Lavino, De , Geldermalsen | steel |
| Kongsberg Maritime A.S. , Kongsberg (N) | dynamic positioning installation |
| Kroon , Hoogeveen | ship's hardware |
| Lloyd's Register EMEA , Rotterdam | classification |
| Maatschappij De Maas , Rotterdam | sections |
| Marine Aluminium , Norway | helicopterdeck |
| Marktechnical , Dongen | pressure transmitters and switches; thermostats; valves; level transmitters |
| Merwede Interior , Hardinxveld-Giessendam | outfitting accommodation |
| Observer Instruments , Ridderkerk | JDV sunblinds, Hepworth windowwipers |
| Pinta Nieuwburg & Zn. L. , Krimpen a/d IJssel | insulation |
| Pipingcare , Veghel | pipings systems |
| Roemeg Trading Company , Waalwijk | Grenamat-MBM walls & ceilings |
| Rosmark Waterbehandeling , Ede | RWO oily water separator |
| Rubalas Montage , Rotterdam | sections |
| SAM Electronics Nederland , Rotterdam | communication and navigation equipment |
| Statendam Steel Plates , Oosterhout | steel |
| Stout Technisch Installatiebureau , Hardinxveld Giessendam | manufacturing & mounting of hot/cold and hot circulation water and black water lines. |
| Stout Pipleidingen , Hardinxveld Giessendam | pipings installation |
| Technoship , Apeldoorn | Norsafe lifeboats, fast rescueboat and davits |
| Trinox , Rotterdam | flame arresters |
| TTS Marine ASA , Norway | cranes |
| VDS Staal- en Machinebouw , Vlissingen | sections |
| Wärtsilä Netherlands , Zwolle | Wärtsilä generator sets; steerable thrusters, for the main propulsion and DPS system during pipe laying application; retractable steerable thrusters, each, for DPS; tunnel thruster, for both Dynamic Positioning or mooring of the vessel. |
| Winkel , Assen | Albatros watertight sliding doors, watertight and weathertight musketeer doors, tank vent check valves |
| Wingerden & Zonen H.K. van , Vuren | windows; side lights |

GENERAL ARRANGEMENT



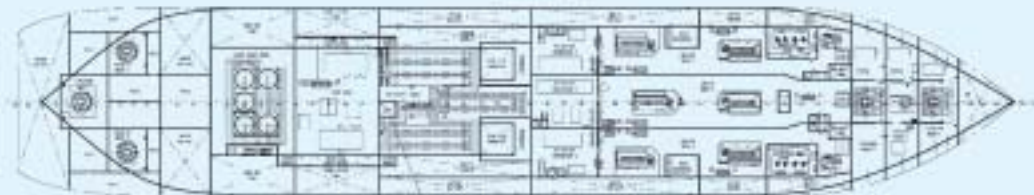
DECK 4 (MAINDECK)



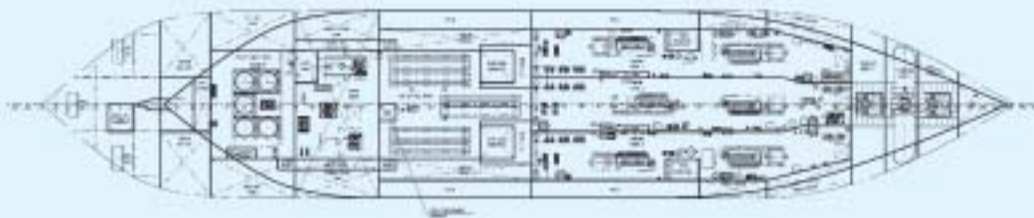
DECK 3 (UPPER TWEENDECK)



DECK 2 (LOWER TWEENDECK)



DECK 1 (TANKTOP)



DOUBLE BOTTOM TANK ARRANGEMENT