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Special

Fast Forward & Rewind 2015/2016

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Experienced strategist

Maritime prizes galore!

Acta Orion
Ilembe
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Acta Orion

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Photo by Flying Focus

In early November 2015, wind farm support vessel *Acta Orion* was handed over to her owners, Acta Marine. 22 October saw CIG Shipbuilding host a grand celebration at their facilities in Harlingen, during which Didi te Gussinklo Ohmann, project manager for offshore wind projects at Van Oord, performed the naming ceremony. The vessel immediately embarked on successful sea trials and, two weeks later, was handed over to start her first project under operational management of Seamar Services.

As the largest ship in Acta Marine's fleet, it will be deployed on behalf of Van Oord to work on the Gemini Offshore Wind Farm, 85 kilometres off the northern Dutch coast. The DP2 vessel of 108 by 16 metres will assist with the construction and commissioning of the 600 MW project of the Northland consortium. *Acta Orion* will begin her charter, supporting cable-laying vessel *Nexus*, accommodating technicians working on the turbine foundation and connecting cables.

Based on their 6000 GC-E model, CIG have optimised the design, in close collaboration with Van Oord and Acta Marine, to create a vessel with optimum uptime for operations in challenging sea states, employable for wind farms further offshore. The goal was to customise the 6000 GC-E into a stable and comfortable hotel accommodation with transfer facilities for personnel and equipment, to efficiently support the offshore wind industry in North Sea conditions.

CIG Shipbuilding's pioneering offshore wind support vessel for the Acta Marine fleet born under a lucky star

This market presents an additional challenge: most employees are skilled technicians in 'land-based' specialisms, like electro technical or civil engineering, but do not have a maritime background, and are not used to the 'charm' of water-based accommodation or transport.

Circumstantial evidence

To satisfy the Van Oord and Acta Marine requirements, *Acta Orion* had to be capable of operating around the clock in up to 2.5 metre significant wave heights in Dynamic Positioning (DP) mode. The uptime compared to current vessels on the market had to be increased by approximately ten per cent, reducing the customary winter stop to almost nil. The vessel design needed to achieve minimised rolling motions and reduced accelerations, increasing cost effectiveness by reducing (sea) sickness absence rates to an absolute minimum.

In a nutshell, the hull of the vessel was primarily required to provide a constantly level platform and so it was designed to dampen movements and accelerations in the prevailing sea states. CIG abandoned the conventional perception of smaller ships being cheaper to build and maintain than larger ships. They adopted the philosophy of 'size matters': applying more mass to the vessel with larger main dimensions. Athwartships, the idea behind this pioneering approach, resulted in a relatively low GM (metacentric height) combined with a comparatively large beam and freeboard. This led to an increased range of stability (area under the righting lever curve) and pleasant roll motion, featuring a natural roll frequency of approximately nine to ten seconds. The extended length resulted in more wave periods spanning the length of the hull, whereby the vessel rests on multiple wave crests as opposed to the disturbing pitching motion of smaller vessels.

For CIG Maritime Technology, the naval architecture and design office of CIG, this meant developing a vessel somewhere between a dive support vessel and a cargo vessel/supplier. After finding the right configuration, supported with the knowledgeable input of Van Oord and Acta Marine, with optimal vessel dimensions resulting in the desired behaviour, the hull form and lines were thoroughly tested at the Maritime Research Institute of the Netherlands (MARIN). The research institute tank-tested the vessel in the simulated and downscaled wave spectra data typical for the North Sea. Real-time data of the Gemini Offshore Wind Farm location formed the input for control software, including occasional extremes in wind influence and swell over a representative period of time. This comprehensive testing deviates from the average testing in standard repetitive wave patterns and requires a lot of computing power, but creates a highly accurate reflection of almost all possible combinations of sea states.

SIZE MATTERS

Putting the pieces together

Naval architecture in hand, attention was then paid to the selection parameters of the propulsion components to satisfy the requirements of the DP2 system, and a well-balanced selection of equipment, located efficiently on board, was high priority.

The project manager for offshore wind projects at Van Oord performed the naming ceremony

CIG Shipbuilding hosted a grand celebration at their facilities in Harlingen

A motion-compensated walkway is fitted to facilitate safe and comfortable transfer of crew and equipment to and from the platform deck on top of a transition piece of a wind turbine. The choice of an aft-positioned walkway, as opposed to the more common midship position, is a sophisticated assessment of CIG. By positioning the walkway system all the way to the stern, the vessel's master has more freedom to choose the heading relative to wind, waves and current. Whilst a midship walkway would only allow for passage over the side, the aft walkway combined with the advantageous ship length allows the bow to face the wind and waves, minimising rolling motions.

An added advantage of the walkway to the stern is its location right above the main propulsors, making effective use of the available thrust. The ship's ergonomic heading in combination with its strategic length-to-wave period ratio allows for considerable fuel savings as less propulsion power is needed for station keeping. This is the result of reduced resistance, due to less pitching, and the simple fact that due to the heading, no adverse wind or wave encounters the side of the vessel.

Although crew transfer via the motion compensated gangway is the preferred method, *Acta Orion* can be assisted by CTVs (Crew Tender Vessels). Accordingly, each side of the vessel is equipped with a dedicated boat landing, consisting of a tapered recess with a ladder from the water level all the way up to the upper deck, and refuelling installations are provided on main deck near the boat landing.

For extended loading and unloading duties, *Acta Orion* is equipped with a Lagendijk semi-custom built crane, with a lift capacity of ten ton at 17.5 metre or five ton at 21.5 metre outreach. The knuckleboom crane, with a constant tensioning system, sits on a foundation column amidships to starboard side and is intended for lifting cargo from the quayside or the CTVs and moving equipment on board.

Furthermore, a technical room amidships contains two 1.2 metre diameter moonpools. These overboard pipes with closing valves at the bottom are dedicated to possible future use of hydrographic survey equipment, like a multi-beam sonar.

BUILT AROUND SEAKEEPING CHARACTERISTICS

More than meets the eye

Below deck, almost half of the ship's length is available for cargo, in one large box-shaped hold with a capacity of 3,500 cubic metres. Its size is maximised in relation to the layout of the vessel, featuring a length of 25.2 metres in the lower hold and 32.9 metres at tween deck level. The upper hold acquires its extra length as a result of an enclosed extension over the (lower) engine room; this area is in line with the workshop on main deck and has a versatile applicability. The accessibility of the hold area is restricted by the dimensions of the four hatch covers, being 24.4 to twelve metres in total. Hatch covers and gantry crane are supplied by Coops & Nieborg.

The cargo hold of *Acta Orion* is computed, towing tank tested and equipped to meet the open top notation. As a result, the vessel is suitable for the transportation of special project cargo, protruding outside

Access to the hold area is provided by four hatch covers, handled by a gantry crane, both supplied by Coops & Nieborg

For loading and unloading duties, a semi-custom built knuckleboom crane with a constant tensioning system is provided

the hold with the upper deck hatch covers open, as well as other voluminous goods or equipment. Equipped with sockets, container fittings and ample lashing points, the hold can also be composed of reefer containers and accommodation units. When accommodation units are installed, the upper hold area (or even the top of the upper deck hatch covers) will be used to allow daylight into the units, whilst the lower hold can still be utilised for other purposes. All side and bottom tanks in the cargo area, as well as the side tanks in the engine room are primarily for ballast purposes, to compensate trim and stability effects of various cargoes.

For your convenience

The additional requirement for a high level of comfort in the accommodation dictated low sound and vibration levels, hence the designers, in consultation with Acta Marine and Van Oord, opting for an aft engine room with accommodation located as far forward as possible. CIG also invested in sophisticated insulation techniques and special precautions in the placing and mounting of the propulsion and DP components.

The vessel can accommodate 80 persons: 25 crew and 55 wind farm technicians. Being classed and outfitted according to the requirements for the SPS2008-code for more than 60 (and less than 240) passengers affords opportunity to increase passenger capacity, making container accommodation facilities very handy.

Below the superstructure, on the same level as the tank top (deck one), are primarily technical spaces. This forward hull section also comprises fresh (potable) water, sewage, grey water, marine diesel oil and ballast tanks, most of which are related to the domestic machinery and equipment, providing facilities for the accommodation. Above this reduced height deck is the entertainment deck (deck 1a) featuring two saunas and a gymnasium with dressing rooms, a cinema, conference room and more technical spaces. On tween deck (deck two) are a HVAC room plus storage, laundry and linen rooms in addition to 17 single berth cabins. Above them, on main deck level (deck three), are the galley with provision, cool, freeze and garbage stores, the mess room, four twin-berth and one single-berth cabin.

Moving up to deck four, upper deck, there are seven single-berth cabins for the ship's staff plus three single-berth and four twin-berth cabins for technicians, the hospital, changing rooms, duty mess and reception area, supplemented with another HVAC room. All accommodation below this deck is primarily dedicated to technicians, whilst from this deck up, the lodging is segregated, with crew

The upper hold acquires its extra length as a result of an enclosed extension over the (lower) engine room

The wheelhouse is separated into two effective bridges: the forward facing part is used solely for transit sailing

in the forward part and technicians to the aft. Above, deck five (officer's deck), holds twelve twin-berth cabins for technicians, eight single-berth crew cabins and two single-berth officer's cabins. The sixth or captain's deck houses the captain's cabin and a further single-berth crew cabin, along with a dayroom, smoking room, offices and conference rooms, one of which is usable as a cinema.

The seventh deck is a half-height technical deck, comprising the UPS/server room, the DP (Dynamic Positioning) room and a technical space with all dedicated wheelhouse electronics including junction boxes. The wheelhouse is separated into two effective bridges: the forward facing part, used solely for transit sailing, and the aft facing area where the DP assisted operations can be controlled during personnel transfer, loading or unloading. Between the two bridge parts are the radio console/chart table and stairs to lower decks. The bridge wings each feature a console in which a wired small panel with all relevant ship's controls can optionally be plugged in. Alphatron navigation and communication instruments predominantly populate the wheelhouse desks.

Although the bridge wings are enclosed, an exterior walkway around the wheelhouse provides an observation post and maintenance access. This feature is replicated on every superstructure deck, giving outside cabins the spatial impression of having a balcony. The interior is optically spacious, with wide corridors and staircases, and a high standard of finish runs throughout the accommodation.

PIONEERING APPROACH TO STATION KEEPING

Tying up loose ends

The vessel is fitted with a full suite of Ten Horn anchoring and mooring equipment, appropriate to its size and purpose, delivered by SEC, also a CIG company. The anchors are connected to steel wires instead of chains to allow for upgrading to a four point mooring system in the future, further economising on fuel costs.

Against each aft corner of the superstructure is a Hatecke Totally Enclosed Life Boat (TELB) in its dedicated davit installation. The installation is partially recessed into the superstructure sides and extends up to the captain's deck. On the captain's deck above the TELBs are two inflatable life rafts, one on either side in a rack, with matching Global Davit cranes for recovery.

Cranking the flywheel that turns the gears

Considerable thought went into the design and selection of equipment, to permit the vessel to perform efficiently and operate under the DP system. As a result, a diesel-electric power option was inevitable. To achieve a high level of redundancy, to meet the Class requirements and to obtain a high ENR-notation, the power plant of *Acta Orion* is considerably overpowered and most systems are duplicated for that same reason. On average, this will result in 20 per cent usage of the available power. These precautions prepare *Acta Orion* for future employability in the Scandinavian regions under stricter Norwegian rules.

Power is generated by five diesel alternator sets, four of 1,200 kW and one of 800 kW. The prime mover diesel engines are Caterpillar units, delivered by Pon Power, driving Leroy Somer Stamford alternators. The four larger generator sets are located in the lower aft engine room, whilst the smaller unit is situated in the upper engine room on portside, forward of the control/switchboard room. On that same level on starboard side is the engineer's office, paint store and CO_2 room with Minimax firefighting equipment, all enclosing the technicians workshop.

In the bow of two retractable azimuthing thrusters of 750 kW at 900 rpm each, delivered by Veth, are fitted

The anchors are connected to steel wires to allow for upgrading to a four point mooring system in the future

Partially recessed into each aft corner of the superstructure, are the life boats in dedicated davits installations

In accordance with SOLAS and Class requirements, an emergency generator is located on the captain's deck in the superstructure. An air-cooled Agco Sisu Power unit coupled to an alternator delivering 150 kW powers this set. The entire electrical system was designed and installed by Piet Brouwer Elektrotechniek, whilst Cofely delivered all engine room equipment.

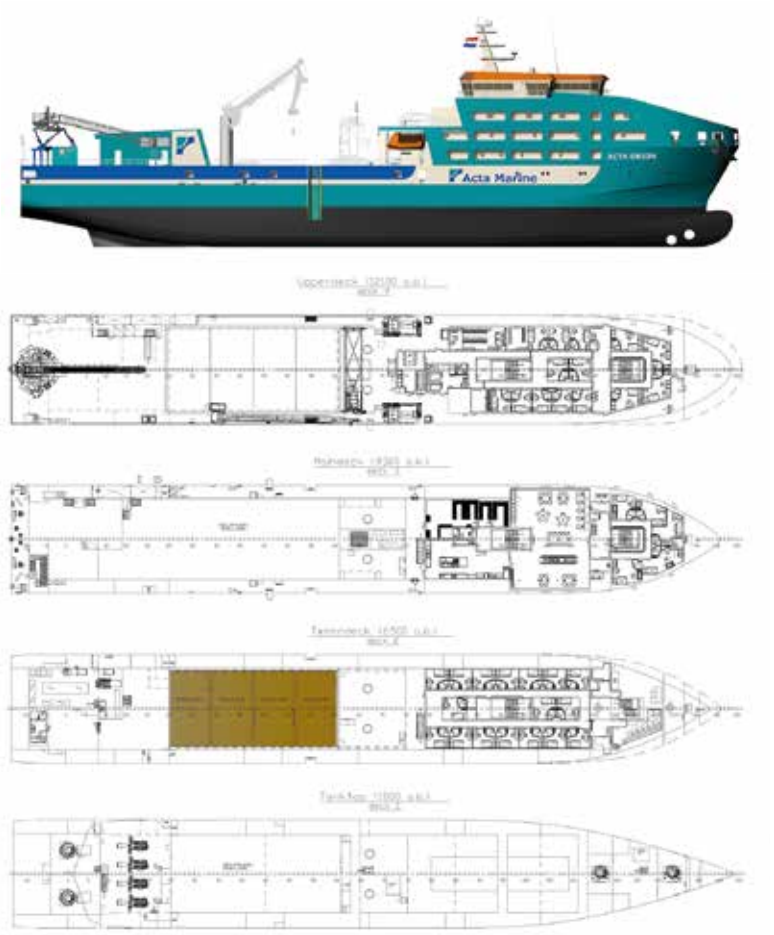
Two azimuthing Z-drive thrusters in the stern and three bow thrusters form the propulsion system. The stern thrusters are Veth VZ-1800A units with fixed pitch propellers, operating at variable speed within a nozzle. The propellers, driven by fresh water cooled electro-motors of 1,500 kW each, are capable of producing their maximum thrust throughout a full 360-degree steering range. The speed control of the thrusters is by means of a variable frequency converter.

In the bow of *Acta Orion*, one transverse tunnel thruster and two retractable azimuthing thrusters, also delivered by Veth, are fitted. The tunnel thruster is a type VT-550e of 485 kW at 1,500 rpm, whereas the retractable thrusters are of type VL-900 and VLT-900 delivering 750 kW at 900 rpm each. All bow thrusters feature fixed pitch propellers and are driven by air-cooled e-motors, operating at variable speed and controlled by a variable frequency converter.

Still waters run deep

Acta Marine, now an independent subsidiary company of Van Oord, started out 45 years ago as a family-owned business. Their expertise lies within the fields of supporting dredging & marine construction, oil and gas, and offshore wind projects. With the acquisition of *Acta Orion*, they are exploring new options to better serve the offshore energy market. Ambitiously investing in the offshore wind market by adding CTVs to their fleet, they are also considering obtaining more vessels like *Acta Orion*, once fully evaluated. CIG Shipbuilding have, meanwhile, scored on points, and may well turn out to be the pioneering partner in crime.

Tom Oomkens



Principal particulars

Builder
CIG Shipbuilding, Groningen, the Netherlands

Owner
Acta Marine, Den Helder, the Netherlands

Length o.a.	107.95 m
Beam mld.	16.00 m
Depth mld.	9.30 m
Draught design	5.50 m
Speed max. at T = 5.00 m	12 kn

Complement

Twin-berth cabins	20 x 2 persons
Single-berth cabins	40 x 1 person
Total, incl. crew	80 persons

Cargo capacities

Deadweight at T = 5.50 m	4,000 t
Gross tonnage	6,293 GT
Nett tonnage	1,888 NT
Hold volume	3,500 m^3
Deck area	545 m^2

Tank capacities

MGO	562 m^3
Fresh water	127 m^3
Ballast water	3,374 m^3
Sewage treatment	20 m^3

Subcontractors and suppliers of equipment fitted on board the *Acta Orion*, YN 132

Adviesbureau Intersona, Heerde: noise and vibration; **Alphatron Marine,** Rotterdam: nautical navigation and communication equipment, DP system; **Ampelmann Operations,** Delft: motion-compensated gangway; **Bakker Vakkeuken,** Berlikum: galley equipment; **Bijlsma Wartena,** Wartena: outfitting assistance; **Borger Machinefabriek,** Hoogezand: landing with handrails and stairs around *Ampelmann* systems; **Bureau Veritas,** Rotterdam: classification; **CIG Centraalstaal,** Groningen: steel building kit; **CIG Maritime Technology,** Groningen: engineering; **Cofely West Industrie,** Roden: engine room equipment; **Coops & Nieborg,** Hoogezand: main deck and tween deck hatch covers, hatch crane; **Datema Nautical Safety,** Delfzijl: safety equipment; **Delftship Marine Software,** Hoofddorp: loading computer; **Den Breejen & Zn Schilderwerken,** Sliedrecht: paint work; **Gebr. De Haan,** Hoogezand: HVAC; **Hatecke GmbH,** Drochtersen: life and rescue boats; **Helmers Accommodatie en Interieur,** Sappemeer: carpentry and insulation; **International Paint (Nederland),** Rhoon: paint; **Kroon,** Hoogezand: mounting hardware; **Lagendijk Equipment,** Wemeldinge: motion-compensated knuckleboom crane; **Lankhorst Ropes,** Sneek: *Tipto* winches, *Euroflat* premium ropes; **Materiaal Metingen Europa,** Ridderkerk: gangway, ICCP; **Minimax Brandbeveiliging,** Almere: CO_2 and water mist; **Piet Brouwer Elektrotechniek,** Urk: electrical installation; **Pon Power,** Papendrecht: *Caterpillar* main propulsion system, generator sets, exhaust silencers; **Pronomar,** Hendrik-Ido-Ambacht: boot and clothes drying system; **Reikon,** Spijkenisse: *Azcue* pumps; **Sandfirden Technics,** Den Oever: *Agco Power* emergency generator set; **Sanitas Milieukundig Adviesbureau,** Barendrecht: material assessment for Green Passport; **Schutte Metaal,** Stadskanaal: manhole rings; **Ship's Equipment Centre Bremen GmbH & Co. KG,** Bremen Germany: lashing equipment; **Ship's Equipment Centre Groningen,** Groningen: *Ten Horn* anchor and mooring winches, chains; **The Greenmachine,** Maarssen: waste disposal system; **Theunissen Technical Trading,** Malden: *Zenitel* telephone and P.A. system, *Seematz* searchlights, *SeaRecovery* fresh water maker; **Trinoxx,** Hardinxveld-Giessendam: windows; **Veth Propulsion,** Papendrecht: *Veth* Z-drives, retractable bow thrusters, tunnel bow thruster; **Winteb,** Winschoten: air pipe heads; **Winel,** Assen: *Albatros* watertight doors, *Musketeer* doors, hatches.