VOLUME 61

JUNE
2012

4
NO.

Maritime by Holland.
Magazine

Vessels highlighted
Simon Stevin
Chang Jiang Kou 01
River Discovery II

The vision of
Wilco Ooms
Managing director
Carpe Diem
Inland Shipping

Special
Dredging

The first contact between Damen and the Belgian maritime research institute VLIZ (short for Vlaams Instituut der Zee, Dutch for the Flemish Marine Institute) was in 2005. Their current research vessel for the North Sea, the *Zeeleeuw*, was due for renewal. VLIZ approached Damen Shipyards for a budget quotation for a sister ship of an earlier Damen vessel, the *Prince Madog*. This is a 34 metre diesel-direct, single-screw research vessel with a quiet sailing mode through a PTI (power take-in) on the main gearbox.

After an extensive inquiry with the Belgian academic community to establish the requirements for the new vessel Vloot invited Damen and other yards in August 2009 to tender, based on a more complete bid package. An important addition to the list of requirements was that the new ship should comply with the ICES 209 norm for underwater noise. ICES stands for International Convention of Exploration of the Seas. In 2002, Damen Shipyards had built the *Celtic Explorer*, a 66 metre research vessel which also complies with this norm and at the time was the most silent research vessel in the world.

The new ship, to be named *Simon Stevin*, would be used for maritime research in the southern part of the North Sea as well as fishery inspections and for daytrips with students. The maximum draught was to be 3.5 metres, allowing operation over shallow North Sea sandbanks. Also the length was restricted, due to the available berth in homeport Ostend in Belgium.

Silent Mode

Damen Shipyards' design engineer Harrold van Vliet, who was responsible for the project during the tendering and design phases, explains: "To comply with the ICES 209 norm in silent mode, we proposed a diesel-electric installation. This allows the main diesel generators, three in total, to be completely flexibly mounted. Even with a separate thrust bearing, a direct-diesel drive introduces a lot of vibrations into the structure, resulting in significant underwater noise."

SIMON STEVIN

DAMEN SHIPYARDS DELIVERS RESEARCH VESSEL 3609 TO BELGIAN FLEET

Builder
Maaskant Shipyards Stellendam
(Damen Shipyards Group), the Netherlands

Owner
Vloot dab (Flemish Government), Ostend, Belgium

Principal particulars

Length o.a.	36.31 m
Length b.p.p.	32.12 m
Beam moulded	9.40 m
Depth moulded	4.50 m
Draught max. (baseline)	3.10 m
Draught to underside keel	3.50 m
Speed	12.0 knots

Occupants

Crew	10
Scientists	10 (overnight)-20 (daytrips)

Tank capacities

Diesel	47 m³
Fresh water	17 m³
Ballast water	26 m³
Grey and black water	18 m³
Hydraulic oil	0.5 m³
Dirty oil	0.9 m³

Power

Generators	3 x 600 kVA (@ 690V)
Emergency generator	n.a.
Propulsion motors	2 x 520 kW AC

For redundancy reasons, the *Simon Stevin* has two propellers, each driven by an AC electric motor. Direct-current motors would have been even quieter, but their large size and cost made them prohibitive. Research in conjunction with the Dutch research institute TNO showed that the ICES 209 norm could be achieved with flexibly mounted AC motors if they were based on friction bearings instead of the standard roller bearings and if a sinus-filter was installed. The sinus-filter decreases the high frequency sound produced by the propulsion motors and is used during silent mode, at a speed up to eight knots.

The 520 kW electromotors are of the low-speed type (up to 350 rpm), which makes them three to four times as big for the same power rating, but which eliminates the need for reduction gearboxes and the associated noise. The propellers, supplied by Wärtsilä, were carefully designed for low noise and cavitation tests were carried out at MARIN.

For the electrical installation, Damen contracted Bakker Sliedrecht, as they have ample experience in this field. In addition to the low noise signature, the diesel-electric installation enables the vessel to run on just one of its three 597kVA/477ekW generators, during the often long times spent at low speed, and still have both propellers working. The Sandfirden generator sets feature a Scania engine and a water-cooled generator from Stamford. Due to reduced radiation heat in the engine room and lower noise, water-cooled generators are specified increasingly often, according to Rob Olijerhoek from Caldic, the Dutch distributor of Stamford generators.

For maximum noise reduction, the generators are mounted in heavy base frames, which themselves are mounted on anti-vibration mounts on the bottom structure. The mounts as well as the complete shaftlines were supplied by Rubber Design. To eliminate the passage of vibrations through the piping, flexible pipe bellows are used on each pipe in two perpendicular directions.

Dynamic positioning

Furthermore, the *Simon Stevin* has a dynamic positioning system without redundancy (DP-0), which is practical for research when the

The hull construction and basic outfitting took place at Damen Shipyards Galati (Romania)

vessel can be kept stationary without having to drop the anchor. For the DP-capability, flap-type rudders were specified in conjunction with rotary vane steering gears, allowing larger rudder angles (up to 45 degrees to either side) than with hydraulic-ram type steering gears. The result is that the vessel can move perfectly sideways, and can be easily controlled by a joystick. In DP-mode, the rudders are individually controlled - with one propeller being used for fore/aft thrust and the other for transverse thrust - but they can be coupled electronically. The DP system was supplied by Alphatron.

50 Hz or 60 Hz?

Because of the restricted space, Damen's engineers wanted the onboard power network to run at 60 Hz, as 60 Hz generators and motors have higher power ratings than their 50 Hz counterparts of the same size. The owners however preferred 50 Hz because of the wish to hook up to shorepower and to allow sourcing of onboard equipment in Europe. Ultimately, a compromise was reached by having the generators and the heavy consumers (such as propulsion and winches) on a 690V-60 Hz network, and have a separate 'hotel' network running at 230/400V and 50 Hz.

Research tasks

For the research of fishing methods, the *Simon Stevin* can do experimental fishing both with a bottom beam trawl or pelagic fishing with trawl doors. To change over from one method to the other, the cables can be moved from inside the A-frame on the stern to the outside. Often a conventional fishing net is towed next to an experimental fishing net, so results can be obtained directly by comparing the catch. The aft deck required space to accommodate two containers, a 20 ft and a 10 ft standard container. Therefore, the large winches were placed below the deck. The container fittings are also used for fixing a net drum, which is only installed when required. The rescue boat doubles as a tender for activities nearby the mother vessel.

For inspections of the bottom and water quality, an A-frame and a CTD-davit are provided on the

The flap-type rudders with rotary vane steering gears enable transverse thrust from the main propellers

The wheelhouse features an unconventional C-shaped console

starboard side of the vessel. Bulwark doors allow easy pulling inboard of a basket with bottom samples from the A-frame, and sliding it into the adjoining wet lab, which is equipped with a stainless steel sorting table. Such a basket can also be filled with sampling bottles which automatically open at given depths, giving a sample of the water conditions at the whole depth range. The dry lab is on the port side of the wet lab. The CTD davit is a side boom which slides out hydraulically and is served by two winches: one with a simple steel cable to lower a load, the other with a coaxial cable, which allows lowering equipment while sending a signal back up through the cable. The information is sent to the servers placed in the research room, which has a central table and six workstations on the sides.

Blister

Other research equipment is installed in the blister: a teardrop-shaped box, integrated in the keel, which houses research equipment, such as an Acoustic Doppler Current Profiler (ADCP), a multi-beam echo sounder for 3D imaging of the seabed and a single-beam echo sounder.

Construction

Damen Shipyard's project manager Ton van Oorschot explains: "The *Simon Stevin*'s hull was built at the Galati Shipyard in Romania, part of the Damen Shipyards Group. After construction, painting, insulation, installation of the engine room and switchboard room and the placement of major components, the vessel was transported to the Netherlands on a heavy-lift ship. At Maaskant Shipyards Stellendam, another Damen yard, further outfitting took place, such as the installation of the wheelhouse equipment, accommodation and research equipment." Maaskant Shipyards, with a long tradition of fishing vessel construction, proved to be the ideal yard for this.

The steel hull features a bulbous bow, and classic round-bilge hull shape with bilge keels. Corrosion protection is with an impressed current system (ICCP).

The A-frame can be used both for bottom beam trawling and pelagic fishing

Piping leading to the gensets have bellows in two directions to eliminate the transfer of vibrations

The propulsion motors are of the low-speed kind

Auxiliaries

There is currently no requirement, and almost no suitable technology for the treatment of water ballast on these small ship types. Furthermore one can question the necessity if the *Simon Stevin* will stay in the North Sea. Nevertheless, space has been reserved in the engine room for the possible retro-fitting of a ballast water treatment system. This space is now conveniently used for a workbench.

A heat exchanger in the HT freshwater cooling system of the generators supplies hot water to the jacket-type hot water boilers and the central heating system. When moored in port, the water is heated with an oil-fired boiler, as the limited available shore power of just 63 Amps would not suffice for heating. Given the limited autonomy, up to five days, it was not necessary to install a watermaker and a sewage treatment plant. Air-conditioning is with a central air handling system which distributes a mix of fresh and recirculated air to the cabins.

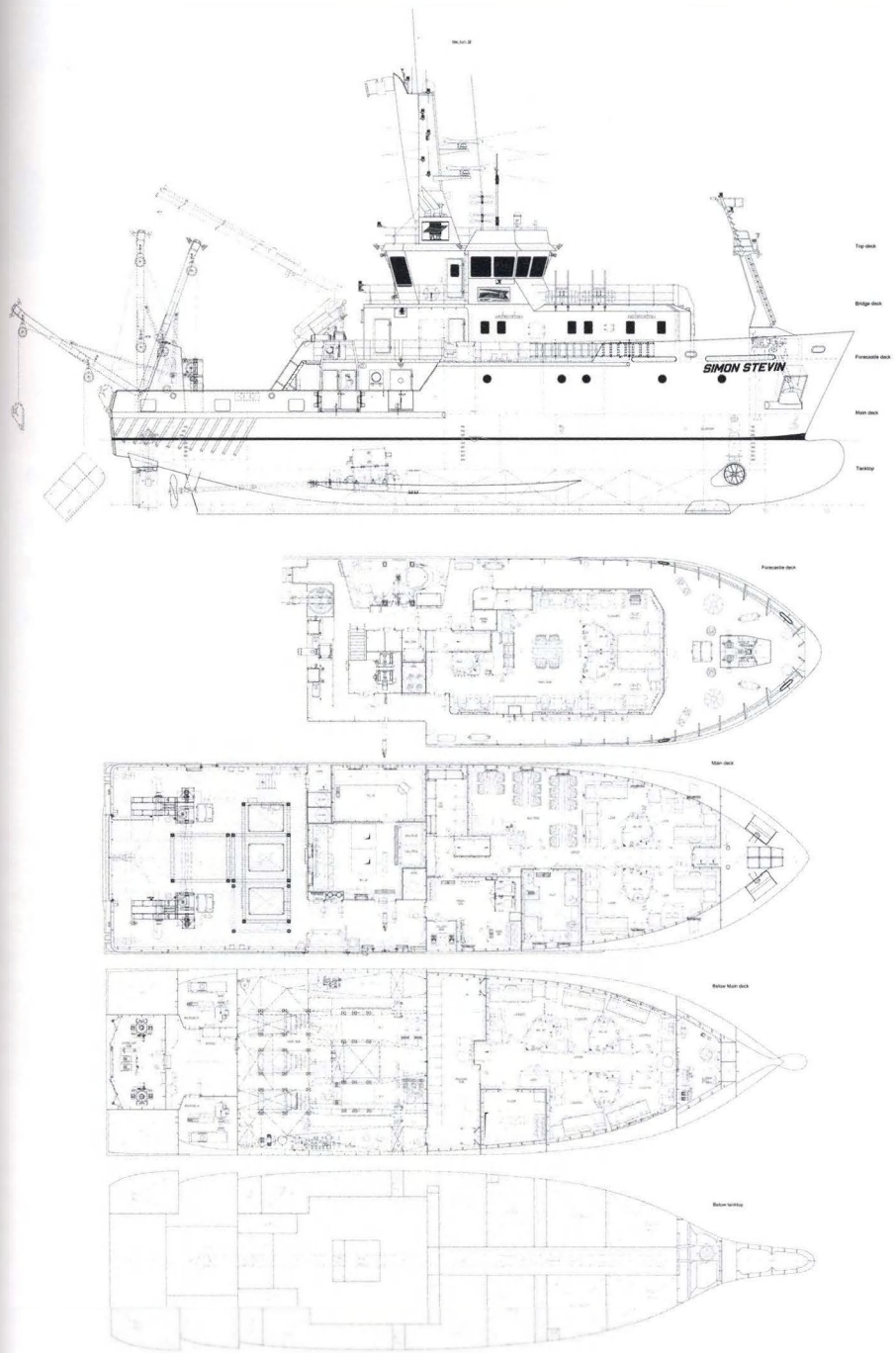
Accommodation

During the day, up to 20 scientists can be accommodated. For overnight trips, the capacity of berths is limited to ten scientists, which avoids the application of the Special Purpose Code (requiring, for example, additional provisions to comply with damage stability requirements). Five double cabins are provided for scientists on the lower deck. The permanent crew is housed in four double cabins on the main deck and two single cabins for the captain and chief engineer on the forecastle deck. The wheelhouse features a C-shaped navigation console supplied by Alphatron, with the helm seat surrounded by desks on three sides. Facing aft is a dynamic positioning console with controls for the fishing gear. On top of the wheelhouse is the crow's nest, with seating arrangements for observation and counting of bird populations.

Simon Stevin

The *Simon Stevin* was named after the mathematician and engineer, born in Bruges, Belgium, in 1548, which is often called the 'Da Vinci of the Low Lands' because of his prowess in both theoretical mathematics and applied sciences. He spent most of his life in the north of Netherlands, where he published mainly about hydraulic engineering, including dredging and coastal protection, ship's navigation and shipbuilding. For Prince Maurice of Orange, he developed a land yacht (sail chariot). He was a driving force behind the decimal system and explained the tides by the attraction of the moon.

Bruno Bouckaert



Subcontractors and suppliers of equipment fitted on board the *Simon Stevin* - YN 556055

Ajax Chubb Varel, Amsterdam	: fire protection equipment
Alfa Laval, Spijkenisse	: heat exchanger
Alphatron Marine, Rotterdam	: navigational equipment; DP system; consoles
Anchor & Chain Factory (AKF), Schiedam	: anchors & chain
Axces, Tholen	: silencers
B.Hepworth and Co. Ltd, England	: *Wynn* window wipers
Bakker Sliedrecht Electro Industrie, Sliedrecht	: electrical installation; alarm and monitoring; *Indar* propulsion motors
Bosch Rexroth, Boxtel	: 2 drum pneumatic winch controls
Bouter, Zoetermeer	: galley equipment
Bureau Veritas, Rotterdam	: classification
Caldic Technics, Rotterdam	: *Stamford* generators
Corrosion & Water-Control, Moerkapelle	: ICAF / ICCP
Double D marine equipment, Waalwijk	: *Heila* deck crane
Econosto, Rotterdam	: valves and fittings
EMCE, Machinefabriek, Voorhout	: capstans; aux winches; fish net drum; winch
Facet Industrial, Almere	: bilge water separator;
Fast RSQ, Barneveld	: work/rescue boat (MOB)
GEA Westfalia Separator Nederland, Cuijk	: fuel and luboil separators
Helmers Accommodatie en Interieur, Sappemeer	: insulation; floors; carpentry
Hycos, Raamsdonkveer	: hydraulics
IJtama Scheepstimmerbedrijf, Stellendam	: insulation; floors; carpentry
International Paint (Nederland), Rhoon	: paint; coating system
Jac. De Vries Gesta, Middenbeemster	: *Nibe* hot water calorifiers
Johnson Controls System & Service, Dordrecht	: cool and freeze installation; HVAC system
Luitec, Zoeterwoude Rijndijk	: *Quincy* compressor
Maaskant Shipyards, Stellendam	: main winches; anchor winch; winch side A-frame
MARIN, Wageningen	: model tests
MX Brandbeveiliging, Almere	: fixed installation for internal fire fighting
Ned-Deck Marine, Barneveld	: davit
Reikon, Spijkenisse	: *Azcue* pumps
RFD, Sydney, Australia	: life rafts
Rolls-Royce Marine Benelux, Pernis Rotterdam	: rudders; steering gear
Rubber Design, Heerjansdam	: propeller shafts
Sandfirden Technics, Den Oever	: *Scania* main engine; *Stamford* generator set
Sterling Fluid Systems, Beverwijk	: *Sihi* pumps & hydrophores; *Sihi* freshwater pressure set
Theunissen Technical Trading, Malden	: *Eltek* fire detection system; *MCT Brattberg* transit systems
TOS Transport & Offshore Service, Rotterdam	: compass adjustment
Wärtsilä Netherlands, Zwolle	: FP propellers
Winet, Assen	: water and weatertight musketeer doors in steel and GRP
Wingerden & Zonen, H.K. van, Vuren	: *Wigo* windows
Winteb, Windschoten	: seawater resistant aluminium air pipe heads
ZF Marine Krimpen, Krimpen a/d IJssel	: bow thruster installation