



Photo by Flying Focus-Bussum, The Netherlands

# VEERHAVEN X - ORKA

SCHEEPSWERF GEBROEDERS KOOIMAN DELIVERS POWERFUL NEW PUSHER TUG

*Builders: Shipyard Gebr. Kooiman BV, Zwijndrecht, The Netherlands*

*Owners: ThyssenKrupp Veerhaven B.V., Brielle, The Netherlands*

The push boat Veerhaven X 'Orka' was named by Mrs Ursula Göbel, spouse of Dr. Göbel, chairman of the board of commissioners of ThyssenKrupp Veerhaven B.V. The boat was delivered twelve months after keel laying. The Veerhaven X 'Orka' is the first push boat built by Scheepswerf Gebr. Kooiman BV and number nine for ThyssenKrupp Veerhaven BV. Trials on the 24th of May 2007 proved the push boat to be a quality vessel, sailing the Rhine in power, speed, manoeuvrability, silence and smooth operation.

## Design

The 'Veerhaven X' is designed to navigate with a total of six push barges on the inland

waterway route Rotterdam Europoort to and from Duisburg. The busy, shallow and winding river, in combination with the tight voyage schedule demand a vessel with good manoeuvrability and considerable propulsion power. This resulted for the 'Veerhaven X' in a triple-screw propulsion installation with three nozzles and three fishtail rudders. In order to keep optimum manoeuvrability when navigating astern with six barges attached, the vessel is equipped with two bow thruster units.

## General Characteristics

The main characteristics of the pushboat 'Veerhaven X' built under yard number 172 are:

## Principal particulars

Length o.a. ....	40.00 m
Breadth o.a. ....	15.00 m
Depth mld. ....	2.75 m
Draught ....	1.74 m (half load)
Propulsion power ....	3 x 1,360 kW
Bowthrusters ....	2 x 400 kW

## Accommodation

The accommodation is situated in the two-tier superstructure and comprises nine cabins for the crew, including an owner's cabin, each with separate sanitary facilities. Furthermore, a fitness room, a messroom with lounge facilities, the galley, stores and a change room have been provided. The living quarters, the engine control room and the wheelhouse are fully



To improve the view forward, the bridge windows are without mullions

airconditioned. In order to obtain the strict noise levels required by ThyssenKrupp Veerhaven BV, the accommodation has been resiliently mounted on pneumatic shock absorbers. Furthermore, acoustic insulation, sound insulated glass panels and floating floors have been installed to prevent machinery noise from penetrating the accommodation area, where the noise level in the cabins is about 54dBA at maximum.

### Wheelhouse

A lot of effort has been made to realise a clear view over 360 degrees from the wheelhouse. In order to obtain this, there is no steel construction at all in the wheelhouse front and rear, and only a minimum of steel construction in the sides. The frameless windows are made of double glass which is glued directly to the construction and to each other.

The spacious wheelhouse contains a central command console which has been arranged for one-man watch operation of the vessel. In order to have an unobstructed view to the foredeck during manoeuvring and coupling of the barges, the two radar monitors are fitted on a separate swing arms, which can be shifted from the position in front of the central command console to the side on a rail system integrated in the command consoles.

The vessel's navigation and communication equipment is fitted in the central command console and in overhead displays. The com-

munication and navigational aids include: two raster scan radars, radar chart overlay system, two rate-of-turn indicators, one echo sounder, two VHF sets, one integrated auto pilot system, GPS, CCTV camera system around the engine room, rudder indicators for own system and barges, and an anemometer.

### "Economic cruise control"

For a highly powered push boat on the coal and ore trade, fuel costs are a substantial part

*Three MaK engines provide a total of 4.080 kW of propulsion power*



of the overall operational costs. Therefore the performances of the push boats of ThyssenKrupp Veerhaven BV are monitored and tracked, using a sophisticated system "Tempomaat" installed by Techno Fysica. The resistance characteristics of the river from Rotterdam to Duisburg have been processed in a data base as well as the engine characteristics. Position and speed over ground input is carried out by a GPS. During the voyage the measured engine data are checked with the engine characteristics and the river characteristic. After departure the system is switched on, the computer now continuously calculates the optimum speed for a pre-set time of arrival and adjusts the throttles accordingly in order to optimise fuel consumption. This permits the officer of the watch to fully concentrate on navigation. If necessary for nautical reasons the system can manually be overruled. The system can be compared with a cruise control on cars, except that in this case the target speed is not set by the driver but calculated on arrival time and minimum fuel consumption.

A visual display unit (VDU) provides the officer of the watch with up-to-date information on speed, main engine revolutions and fuel consumption. Data are also stored on floppy disks and sent to the head office where they are stored in the owner's database after having been checked. This way savings of 2 to 5% have been achieved in the field of operational costs.

### Propulsion Plant

The propulsion installation is situated in the midship section of the vessel. The installation consists of three MaK 8M20 marine diesel engines, rated 1,360KW at 900rpm. The

engines are each fitted with a Vulkan highly flexible coupling of the type RATO-R G2120R-2200 and a Reintjes WAF 1943 marine reduction gearbox giving the three propellers a speed of 256 rpm.

The main engines are flexibly mounted to the motor girders, again an improvement to the noise and vibration levels of the vessel. The five-blade Wärtsilä propellers have a diameter of 2,050mm and are fitted in propeller nozzles from Lips/Wärtsilä HR. A lot of attention has been given to the design of the propellers and nozzles made by Wärtsilä. In order to improve the propeller and nozzle design Wärtsilä has in close cooperation with ThyssenKrupp Veerhaven BV and DST carried out extensive analysis studies. These studies have led to the application of the HR nozzles featuring an inner stainless steel covering over the complete length.

In theory the new propeller-nozzle combination would give:

- more propulsion power ahead;
- more thrust power astern (stopping manoeuvre);
- a reduction of sound and vibration emissions.

During the technical trials of the push boat, the propeller nozzle characteristics matched the expectations. The boat attained a speed of 18.5 km/h while pushing six loaded pushbarges.

### Exhaust silencers

For fuel oil and lubricating oil treatment, two Westfalia separator modules are installed. Heating is incorporated in the lubricating oil module. Two bow thrusters are fitted in a thruster nacelle. Each thruster is powered by a 400kW reversible electric motor and is stepless frequency controlled. The tunnel thrusters are equipped with four-blade fixed pitch propellers. Special care is taken for the design and construction of the exhaust system. Under the silencers of the main engines a special bridge construction is constructed to support the weight of the exhaust installation directly to the bottom structure of the vessel. The silencers are fitted onto the bridge construction with flexible mounts.

This resulted in a significant reduction of vibrations around the engineroom.

### Electric Power

Auxiliary power is derived from four 315kW diesel alternator sets. Each alternator set is driven by a Scania DS-12-62M diesel engine developing 380 kVA/50Hz at 1,500rpm.

Furthermore a 80kW John Deere harbour generator set is installed. During normal service electric power is supplied by one auxiliary generator. However, when the bowthrusters are to be used, the other generator sets can be remotely started from the wheelhouse. A PLC controlled system automatically synchronises the generators to the bus bars. After use of the bow thrusters, the alternator sets can be stopped from the wheelhouse. A black-out prevention is incorporated in the PLC system. The complete electrical installation has been designed, delivered, installed and commissioned by GTI Marine & Offshore (GTI Suez). The scope of supply includes the main switchboard, the motor control centres and distribution and lighting panels, the control boards in the switchboard room and the electrical outfit of the mahogany wooden wheelhouse consoles. The SAM engine room alarm system consisting of 220 channels, and the frequency control of the bow thrusters was also included in the scope of supply of GTI.

The shipboard electrical installation consists of the following voltage circuits:

- a 220/380V, 50Hz, three-phase circuit for power and lighting;
- a 24VDC circuit for control and signal appliances;
- a 24VDC circuit for starting purposes of the auxiliary generators;
- a 24VDC circuit for emergency steering.

Each 24VDC circuit is provided with separate batteries and chargers which however, for emergency purposes can be interchanged by means of switches. The chargers are of the automatic type with boosting facility. A shore supply



The gearboxes were delivered by Reintjes



Four gensets are located in the spacious engine room



Caldic supplied the alternators for the gensets

Steering is with three independent rudders





The electrical installation was done by GTI Suez



The alarm and monitoring system is accessible through TFT screens

socket of 63A is fitted near the starboard entrance of the engine room.

### Alarm & Monitoring

The 'Veerhaven X' is equipped with the MOS 2200 system supplied by SAM Electronics from Rotterdam. The system includes a cabinet in the switchboard room, in which in- and output modules are mounted, as well as the central processor. All sensors are connected directly. Through 2 redundant networks the information is shown in the switchboard room on a PC with 17" TFT screen and LCD panels in the mess room, in the Chief Engineer's office and on the bridge. Through "mimics" the crew has elaborate information available about the systems onboard like the main diesels, ballast tanks, bilge alarms, etc. Also the "deadman" alarm in the engine room is integrated. It's the first time Veerhaven has such an advanced system installed on one of their vessels. The system is commonly found on oceangoing ships.

### Life-Saving Equipment

Aft of the superstructure, a workboat is placed which can be used for maintenance works, in case of emergencies or man-over-board situations. It is fitted with a Mercury outboard engine of 55 kW. The boat is handled by a crane designed and manufactured by the yard.

Two stern anchors on the aft deck can be dropped with a pushbutton on the wheelhouse control panel in case of an emergency.

A workboat/rescue boat is placed on the aft deck



### Subcontractors and suppliers of equipment fitted on board the 'Veerhaven X - Orka' (partial list)

ACV Nederland, Ridderkerk	: central heating unit
Alphatron Marine, Rotterdam	: JRC radar; the complete Multicolorline "blackversion"; VHF's in Alphatron layout; Alphatron radar overlay system; stainless steel camera system
Alubouw de Mooy, H.I.Ambacht	: mast
Andeweg Benelux, Numansdorp	: fire-fighting equipment
Autena Marine, Nijmegen	: communication; ICT
Boeg Maritiem, De, Scheveningen	: foldable radar masts; radarsupports; waste water tanks
Buijs Scheepsbouw, Gebr, Krimpen a/d IJssel	: hull
Caldic Techniek, Rotterdam	: Stamford generators
Deno Compressors, Krimpen a/d IJssel	: compressed air systems
DESMI K&R Pompen, Utrecht	: pumps
Dilago Hijs en Heftechniek, H.I.Ambacht	: hoisting pullies
Discom, Alblasterdam	: exhaustsilencers
Dolderman, Dordrecht	: generatorset
E.B.R., Lage Zwaluwe	: windows steeringhut
Econosto, Rotterdam	: valves
Euro Marine Controls, Molenaarsgraaf	: Kobelt shaft breakes
Flender Bruinhof Marine, Rotterdam	: propeller-shaft bearings
Gova scheepselectronica Services, Ridderkerk	: nautical equipment
GTI Marine & Offshore, Rotterdam	: electrical installations
Homa Pompen, Gorinchem	: pumps
Hydromarine, Papendrecht	: hydraulic systems
Intersona, Heerde	: noise & vibration calculations and measurements
Keruma, Werkendam	: painting work
Kooiman Scheepswerf & Machinefabriek, Gebr., Zwijndrecht	: hull; carpentry; shafts; piping; hydr. coupling winches; electr. anchorwinch

Kooiman, Scheepsbouwkundig Ontwerp & adviesbureau, Zwijndrecht	: engineering; drawings
Leeuwen Buizen, Van, Zwijndrecht	: pipes and components
Loggers Rubbertechniek, Dordrecht	: airspringset accommodation; elastic suspension system exhaustlines; rubber expansion joints
MaK (Nederland), Dordrecht	: main engines & reversing-clutch (gear coupling)
Mapron Engineering, Dordrecht	: propeller-shaft bearings
Mennens Schiedam, Schiedam	: davitwinch
Observer Instruments, Ridderkerk	: tank level measurement instrument
Os, Scheepswerf van, Yerseke	: hull
Poley Installatie bureau, Zwijndrecht	: sanitary systems
Polmai Brandbeveiliging, Barendrecht	: fire-fighting equipment
Reinplus Van Woerden Bunker, Zwijndrecht	: nautical equipment
Reintjes Benelux, Antwerpen (B)	: main engines & reversing-clutch (gear coupling)
Rhigo, Bergen op Zoom	: windows
Rotor, Eibergen	: electric motors
Sandfirden Technics, Den Oever	: generators
SARC, Bussum	: fairing of lines plan, plate expansions; shape database for construction software.
ScheGro, Zwijndrecht	: chairs; decktracks
Smits Neuchâtel, Utrecht	: deck covering
Snel Technische Handelssond., Sliedrecht	: hatches and doors
Snijtech Joure, Joure	: steel- cuttings- and composition
Snijtechniek Brabant, Raamsdonkveer	: plasmacutting
Swartsenborgh, Dordrecht	: furnishing & upholstery
Techno Fysica, Barendrecht	: tempomaat automatic propulsion control system
Thermatras, Oud-Beijerland	: isolation
Thielco Staalindustrie, Reuver	: gratings
Trelleborg Bakker, Ridderkerk	: rubber fenders
Tresco Navigation Systems, Wuustwezel (B)	: Tresco inland ECDIS viewer integrated with tempomaat fuel reduction

The 'Veerhaven X - Orka' pushing 6 loaded barges at 18.5 km/h



TSD Engineering, Rotterdam . . . section drawings and production information

Velden Marine Systems, Van der, Krimpen aan de Lek . . . fish tail rudders; steering gear; electronic panel

Veth Motoren, Papendrecht . . . Veth tunnel thrusters with horizontal E- motor

Wärtsilä Nederland, Zwolle . . . Lips HR nozzle with inner part made from stainless steel; Lips Coneal TipRake fixed Pitch Propellers; spare propellers

Wärtsilä Propulsion, Drunen . . . propellers jetpipes:

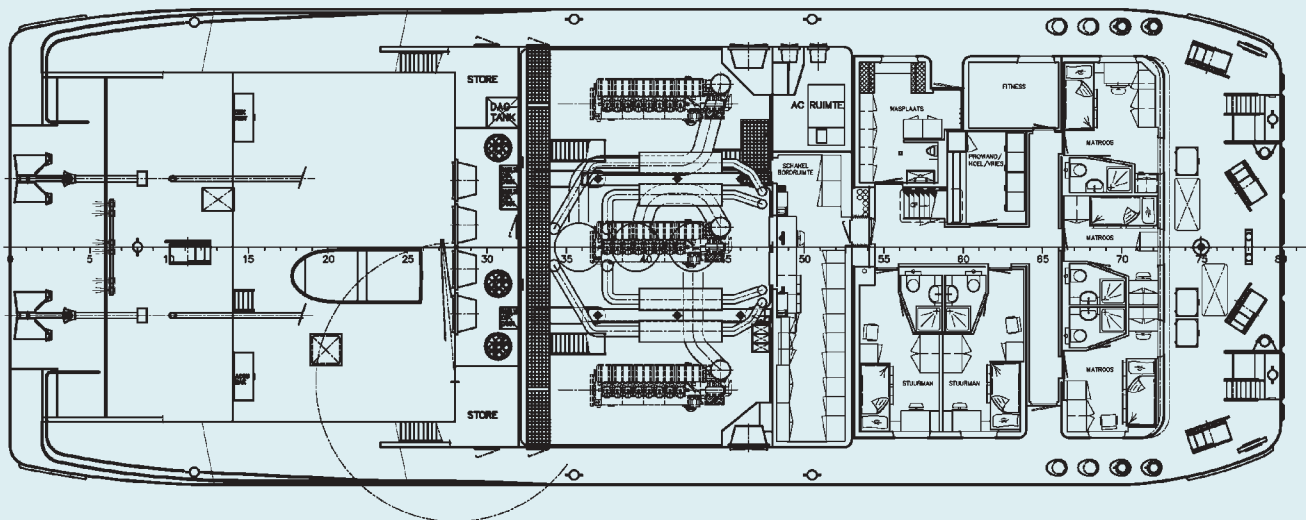
Westfalia Separator Nederland, Cuijk . . . lube oil; fuel separators  
 Wijk en Boerma Pompen, Groningen . . . pumps  
 Windex, Hardinxveld-Giessendam . . . AC installation; gratings; filters  
 Winteb, Winschoten . . . air vents

**GENERAL ARRANGEMENT**

**PROFIEL**



**HOOFDEK**



**MACHINEKAMER**

