VOLVOX IBERIA
Trailing Suction Hopper Dredger

Dimensions:
Length overall 97.10m
Hull length 92.70m
Beam 19.20m
Moulded depth 9.60m
Draught (max.) 8.00m
Capacity 6,000m³

Suction pipe:
Ø 1.10m
Discharge pump:
Ø 0.75m
Dredging depth:
55.00m
Suction pump:
2,350kW electric
Underwater pump:
6,175kW diesel
Discharge pump:

Propulsion:
2 x 3,530 kW
1 x Bow thruster
660 kW
1 x Stern thruster
840 kW
Maximum speed 14.5 knots

Power during transport:

Power during dredging:
2 x 3,530 kW

Positioning:
2 x 3,530 kW

Equipped for dynamic tracking and

dynamic positioning

Classification:
Bureau Veritas, I 3/3 *
Hopper Dredger/Deep Sea, AUT-MS
In February 1992 the English subsidiary of International Marine and Dredging Contractors Van Oord ACZ, ordered the design and construction of a trailing-suction hopper dredger with a hopper capacity of 5700 m³. After successful tests the suction dredger, christened “Volvox Iberia”, was transferred to the client on 4 June 1993.

Unloading can be done in two ways:

- by opening two rows of nine single bottom doors.

- using a self discharge system, for which a separate IHC dredging pump, type 220-40-80, has been installed aft. This pump is driven via a twin input/single output reduction gearbox by the SB propulsion diesel engine and a separate diesel engine which operates the pump generator during dredging. The delivery connection is in front of the bow where a (floating) shore-linked pipe can be hooked up.

Accommodations for 24 people and the bridge are located forward. A mobile deck crane with a hoisting capacity of 25 tons can serve the entire ship.

The Volvox Iberia is a twin-screw trailing-suction hopper dredger, equipped with a single suction pipe on the starboard side with a special submersible pump. In the forward part of the ship a standard single-walled IHC pump, type 220-65-110, has been installed which is driven by an electric motor. The dredging depth is 25 metres; with extension pipe 35 metres; and provisions are made for a maximum dredging depth of 55 metres.

Loading can be done in different ways. Two adjustable overflow ducts have been mounted in the hopper, one forward and one astern. This allows the maximum hopper capacity to be adjusted from 2250 up to 6000 m³, depending on the type of load and the desired draught. The two overflow ducts in the hopper allow the trim of the ship to be optimally controlled under varying circumstances.
SUCTION PIPE WITH SUBMERSIBLE PUMP

The suction pipe of the Volvox Iberia is equipped with the recently developed IHC semi-axial submersible pump, which is driven by an electric motor that is directly connected to the impeller shaft. For a description of this type pump refer to Ports and Dredging no. 139. This suction pipe has an internal diameter of 1100 mm. The suction pipe has the modern IHC design and is equipped with a jet water pipe for the waterjets in the draghead and a long type of turning gland to ensure the suction mouth always touches the ground in correct position. The suction pipe also has an extremely strong construction to convey the large forces of the trailing head.

POSITION FIXING

For releasing loads at sea via a floating pipe or other method, as previously mentioned, a powerful self-discharge system has been installed which can also process gravel and stone. There are also special facilities to keep the ship in correct position during these activities. The Volvox Iberia has therefore been equipped with a bow thruster and a stern thruster; and the PS propulsion engine can then be used at full for forward and backward thrust.

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<td>Propulsion drive</td>
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<td>power</td>
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<td>Bow thruster output</td>
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The Volvox Iberia has been built to the rules and under supervision of BUREAU VERITAS for the class 1 3/3 Hopper Dredger (Deep Sea) AUT-MS.
Van Oord ACZ’s newly built 5,700m³ Trailing Suction Hopper Dredger Volvox Iberia
VOLVOX IBERIA
DREDGING CONTRACTOR VAN OORD ACZ EXPANDS ITS FLEET WITH A 5,700 m³ TRAILING-SUCTION HOPPER DREDGER

Introduction
In February 1992 the English subsidiary of International Marine and Dredging Contractors Van Oord ACZ, ordered the design and construction of a trailing-suction hopper dredger with a hopper capacity of 5,700 m³. After successful tests the suction dredger, christened 'Volvox Iberia', was handed over to her owner on 4 June 1993.

General
The 'Volvox Iberia' is a twin-screw trailing-suction hopper dredger, equipped with a single suction pipe on the starboard side with a special submersible pump. In the forward part of the ship a standard single-walled IHC pump, type 220-DS-110, has been installed which is driven by an electric motor. The dredging depth is 25 metres and with extension pipe 35 metres. Provisions have been made for a maximum dredging depth of 65 metres.

The principal particulars of the 'Volvox Iberia' are:

<table>
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<tr>
<th>Specification</th>
<th>Value</th>
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<tr>
<td>Length o.a.</td>
<td>97.1 m</td>
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<td>Length b.p.</td>
<td>92.7 m</td>
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<tr>
<td>Beam</td>
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<tr>
<td>Depth</td>
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<td>Draught at dredging mark</td>
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<tr>
<td>Hopper capacity</td>
<td>5,700 m³</td>
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<tr>
<td>Suction pipe diameter</td>
<td>1.100 m</td>
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<tr>
<td>Dredging depth</td>
<td>25/35/55 m</td>
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Propulsion power: 2 x 3,530 kW
Bow thruster output: 840 kW
Stern thruster output: 160 kW
Service speed (max): 13.5 knots

The 'Volvox Iberia', built under yard number CO 1200, has its accommodation and wheelhouse located forward. The accommodation is designed for a complement of 24 people. A mobile deck crane with a hoisting capacity of 25 tons has been fitted to serve the ship's full length.

Loading/Discharging
Loading can be executed in different ways. Two adjustable overflow ducts have been mounted in the hopper, one forward and one aft. This allows the maximum hopper capacity to be adjusted from 2,250 up to 5,000 m³, depending on the type of load and the desired draught. The two overflow ducts in the hopper allow the trim of the ship to be optimally controlled under varying circumstances.
The ‘Volvox Iberia’ can be unloaded in two different ways:
- by opening two rows of nine single bottom doors or
- by using a self-discharge system, for which a separate IHU dredging pump type 220/40/80 has been installed. This pump is driven via a twin input single output reduction gear box by the starboard propulsion diesel engine and a separate diesel engine which operates the pump generator during cleaning operations. The ballen, consisting of a large suction pipe from the wheelhouse, can be hoisted up.

For discharging loads at sea via a floating pipe or other method, a powerful self-discharge system has been installed which can also process gravel and stone.

In order to keep the ‘Volvox Iberia’ in correct position during these activities special facilities have been fitted such as a 840 kW jackstay bow thruster and a 660 kW stern thruster. In addition at the same time the port propulsion engine can be used for full forward and backward thrusts.

Semi-Axial Submersible Pump

The suction pipe of the ‘Volvox Iberia’ is equipped with the recently developed IHU semi-axial mixed flow submersible pump, which is driven by an electric motor that is directly connected to the impeller shaft. This suction pipe has an internal diameter of 1,100 mm. The suction pipe has the modern IHU design and is equipped with a jet water pipe for the waterjets in the propeller and a long type of turning gland ensuring that the suction mouth always touches the ground in correct position. In order to convey the large forces of the rotating head the suction pipes is of extremely strong construction.

The semi-axial submersible pump significantly improves the dredger’s production retaining the existing pump installations on board. The integrated suction pump consists of a dredge pump with an electric motor flanged onto it by which the speed of the electric motor is the same as the required pump speed. The extended motor axle is also the pump axle and the pump axle bearing is integrated with the motor axle bearing. The pump housing and motor housing are attached to each other with an open lathe place spacer and fitted with their own shaft seal. The oil-lubricated squirrel cage electrical motors were specially developed for submersible dredge pump drive systems. By integrating electrical motor and dredge pump a highly reliable unit is produced with a compact structure, ideal for installation in ladder constructions and building into suction pipes of stationary or trailing dredges. The development of the semi-axial or so called mixed flow pump was undertaken by IHU Holland in close cooperation with Stark Pumps, a company with considerable expertise and great reputation in the area of semi-axial pumps.

Engine Room

The propulsion plant of the twin-screw ‘Volvox Iberia’ consists of two Stork-Williams Diesel marine diesel engines type 12SW28C each developing 3,630 kW. Power transmission is through a Lohmann + Stoltfort Navius single input/single output marine reduction gear box, type 710 with a horizontal distance of 7.10 m and a reduction ratio of 5.23:1. The input shaft of each gear box is fitted with a Lohmann + Stoltfort high speed friction clutch, type Pneumaflex KAP 280, design 2000. The propulsion plant provides the vessel a service speed of 12.8 knots. Gear boxes and clutches have been delivered by Hydraulique Brunel who also delivered the drive systems for the sandpump, discharge pump, jet pumps and generators.

Sandpump Drive

The sandpump is driven by an electric motor. Mounted between electric motor and sandpumps is a Lohmann + Stoltfort gear box, type GJ2730, with a horizontal offset at 700 mm and a reduction ratio of 5.24:1. The gear box is provided with a PTT for 600 kW at 500 rev/min with a reduction ratio of 9:1, which gives the pump a speed of 100 rev/min. The input shaft has been fitted with a Lohmann + Stoltfort highly elastic friction clutch, type Pneumaflex KAC 240, design 1500. The PTT shaft is connected to a Lohmann + Stoltfort high speed friction clutch, type Pneumaflex KAC 240, design 1500.
A standard single-wall IHC pump, type 220-65-110 has been installed in the forward part of the ship.

An clutch, type Pneumatrex KAO, 140, design 1300. The output shaft is fitted to a Lohmann + Stollefort flexible gear coupling, type VZ2/29, with an intermediate tube of 1,500 mm.

Separate pump?

Discharge Pump Drive
The discharge pump is driven by the starboard main engine and a separate Stork-Wärtsilä Diesel 5SW280 main generator diesel engine which are located between the two main engines. The separate diesel engine operates the pump generator during dredging operations.

The discharge pump drive has been fitted with a Lohmann + Stollefort twin input/single output gearbox, type GUZ 2700 with a reduction ratio of 3.061. Horizontal distance between both input shafts is 2,700 mm. The impeller of the pump is directly mounted on the output shaft of the gear box. Pump housing and gear box are assembled into one unit.

One of the input shafts is fitted with a Lohmann + Stollefort clutch coupling combination, type Spiroflex KJF 220/Pneumatrex KUN 220, design 1500. The other shaft is fitted with a Spiroflex KJF 200/Pneumatrex KUN 200 clutch coupling combination.

Jet Pump Drive
The jet pumps are driven by a single Stork-Wärtsilä Diesel 6SW280 marine diesel engine. A Lohmann + Stollefort gearbox type GUZ 2700 with a reduction ratio of 2.47:1 and a horizontal distance between both output shafts of 1,213 mm is fitted between diesel engine and jet pumps. The input shaft is situated 500 mm above these output shafts and is fitted with a Lohmann + Stollefort highly elastic shaft coupling, type Spiroflex KJO, 180 Sc. Both output shafts are fitted with a Lohmann + Stollefort flexibility coupling, type VZ 2.5 of which one has an intermediate tube of 2,340 mm.

Generator Drive
The main generator is fitted with a Lohmann + Stollefort highly elastic shaft coupling, type Spiroflex KJO 220, design 1300 and the sandpump generator with a Lohmann + Stollefort highly elastic shaft coupling, type Spiroflex KJO 200, design 1200. Both shaft couplings have been delivered by Hydraulique Brunehout B.V.

Fuel Oil and Lube Oil Treatment Plant
The fuel oil and lubricating oil treatment plant on board the Vooyx laser consists of a fully automatic separator module with sludge tanks. The complete separator module, delivered by Alfa Laval, consists of six separators:
- two Alfa Laval heavy fuel oil separators, type Alcoa MFPX 307 TPD-21, with a capacity of 2,130 l/h and suitable for heavy fuel oil up to 390 cSt/50°C. One of the two FO separators can also be used for the treatment of marine diesel oil. The Alfa Laval MFPX separator is a new type which is driven by a belt instead of mechanically;
- four Alfa Laval MOPX 205 TGC-20 lub oil separators.

All separators have been fitted with Alfa Laval Heatpac THS preheaters. Separators and preheaters are controlled by Alfa Laval EPC 400/41 automatic control systems. Fuel and lubricating oil supplies via separate Kral 3 spindle screw pumps. Internal cleaning of the separators is with a portable Alfa Laval DP unit.

Electronics
The wheelhouse has been fitted with highly advanced steering, propulsion and communication systems. Alphatron Observation and Communication B.V. of Rotterdam delivered a complete communication and navigation package in compliance with the latest GMDSS rules A3. The full range of equipment includes:
- two Raytheon/JRC displays 14 in ST series true motion radars, incl slave monitor;
- one Raytheon Yotogawa gyro compass and autopilot, type CMZ 3500/PT 100;
- the main steering control system;
- one Shipper echo sounder, type ED 162;
- one JRC JLS200 Doppler Speedlog video display (bottom track up to 500 metres);
- one Raytheon electronic chart display, type BIC;
- one JRC radar, type NCR 300;
- one CCTV system;
- three SP Radio Husum RT 2048 KH VHF units with two DSC controllers;
- one SP Radio Husun Compact 2000 MF/FM radio installation, incl. tele and DSC;
- one SP Radio Husun RM 2100 watchkeeping receiver;
- one JRC JET 755A STD C terminal;
- one Remantron OBS 360 direction finder;
- two Grassby Nova RT 400LN ports;
- one Jotron 305 Epirb;
- three Alphatron standard handheld radios;
- one Raytheon JRC GPS 350.

The communication equipment has been fitted into a custom made console in close cooperation with HIC Holland. In addition to this, in the wheelhouse the following instruments have been installed for the operation, monitoring and registration of dredging processes:
- suction pipe measuring system;
- vacuum and pressure measuring systems;
- integrated density and velocity measuring systems;
- load, draught and displacement measuring system;
- automatic draught recorder;
- hopper volume and loaded mass meter system.
- data acquisition systems.
Class Notation
The "Vovox Iberia" has been built to the rules and under supervision of Bureau Veritas class V 3/3 • Hopper Dredger (Deep Sea) AUT-MS.

Equipment on board the "Vovox Iberia", yard number GO1200
(partial list)

A.M.W. Marine, H.I. Ambacht, Alex de Boer, Amsterdam, firefighting installation & generators. Borkum, Zwijndrecht, marking & measurement systems.

Brussel, Nauwpoort (R), anchor winches and steering gear.

Coostra, Rotterdam, steel plates/profiles and rollers.

Dera, Deltaz, debris, material & safety plan equipment.

Drunkman, Wekendam, sparse main board.

Duivelkaj v. Rotterdam, starting air compressors.

Eenrode, Tyne, elevators, fittings & awl.

Endenburg, Souda, electrical installation & generators.

Erdi, Almara, drives & propel propellers.

Geke, Papendrecht, harbour & emergency generator sets.

Giesse, d.v., Harderwijk-Giesse, rudders & propeller nozzles.

Gort J.G., Alderss, furnishing.

Gran, Amstela, engines.

Gripl, Papendrecht, driving pipes.

Groenendal, Hilversum, galley equipment.

Groenwegen, Rotterdam, drills & drilling machine.

Hoeve & Hopman, Spakenburg, ventilation installation.

Heider & May, Rotterdam, floors.

Hempel, Veerlingen, pumps.

Hydraulische Bruinhof, gear boxes, couplings & elevators.

Hydraulische Pneumatiek, Rotterdam, pneumatic components.

Hydromet, Uitgeest, pipe fittings.

ICM Loggersmit, Kinesis, Supreme shaft seals.

ICM Parts & Service, Siedrecht, dredging equipment.

ICM Systems, Siedrecht, panels & measurement equipment.

Intersena, Epe, rail measurements.

Jong Th. A. de, Rotterdam, oil fuel pumps.

JVS, Papendrecht, Janssen side hower.

Kampbrt, H.I. Ambacht, crane rails & beams.

Kret, H.I. Ambacht, masts & masts.

Koon, Hoogezand: cabin doors & door fittings.

Leeuwen, Zwijndrecht, steels & pipes fittings.

Leeuwen Precise, Dewater, hydraulic steel pipes.

Lemmer, Bergen op Zoom, Brussel, steering gear & steering room.

Leusden, Elten, travelling crane & travelling system.

Lips, Drunen, CP propeller installation & Lips' stick system.

Loggers Rubbertechniek, Dordrecht, compensators & flexible suspension.

 Marine Controls, Rotterdam, fuel supply module.

Marktechniek, Saeftingen, Raffat transmission.

Material Metingen, Barneveld, anti-sinking system.

Michielsen, Souda, stainless steel pipe & quality pipes.

Midden Nederland, Tilburg, painting.

Mudcr & Rijke, Uuden, lifeboats.

Nijhuis, Wilting, De Laiggen, deck loading system.

Nieuw, Krampen a/d Usque, rubber gaskets.

Nijhuis, Wilting, OOS, Barendrecht, steel pipes & fittings.

Van Oord ACZ, Groningen, deck crane.

Welders, Assen, steelworks (steel, rails, platforms etc.)

Wolters, Rotterdam, anchors & chain cable.

Zwirnburg, Krampen a/d Usque, sized works (furniture, platforms etc.)
And It’s Bubba-Proof!

When Van Oord ACZ’s TSHD Volvox Iberia arrived home in Holland suffering from vibration after a campaign in the Middle East, Machine Support were called in...

“...She worked hard on the Elles Island job,” said Van Oord’s project manager Iwan de Vos, gazing fondly as his ship glinted in the drizzle at Rotterdam’s United Shipyard – a sharp contrast to the weather off Dubai.

“Temperatures out there could sometimes be so high we had to use portable air conditioners to keep the electronic relays cool and working properly,” said Iwan.

Back home and with the vibration almost certainly caused by alignment/mounting problems, Volvox Iberia was to be rewarded with an innovative solution that’s now finding favour across the dredging world.

Precision Engineering

“...Around 15% of our revenue’s now coming from the dredging industry,” said Frans Akkermans of Machine Support (MS), a firm that specialises in laser alignment and mounting services and whose reference clients not only include Van Oord ACZ, but also Jan De Nul, Ballast Harp, Boskalis and US contractors Bean and Great Lakes Dredge and Dock.

Dredgers are special ships, not simply because of their advanced technology, but also because of the stresses and strains they have to put up with as part of their everyday working lives. After a job involving the excavation of hard rock, for example, many cutter dredgers head straight for the nearest shipyard for repairs.

A TSHD’s life is easier, but she’s a workhorse nonetheless and to keep working smoothly she requires the major moving parts – engines, pumps, gearboxes, propshafts and more – to be in perfect harmony. Which also means perfect alignment.
When you build a ship, inevitably there'll be gaps under both the gearbox and the engine,” said Frans. “In the past, skilled workmen engineered steel blocks or shims to take up the slack - in fact, they still do just that in many countries. More recently, epoxy resin has been used, but now we’ve come up with Vibracon SM, low-profile, adjustable steel chocks that have numerous advantages.

**FORM & FUNCTION**

As Frans pointed out, when ships are launched, the stresses take their toll on even the most careful alignment. Once at work, the thermal expansion of ship’s engines and the changes caused by cargo loading/unloading - particularly on dredgers - almost inevitably result in misalignment. "The distance between a dredger’s pump, engine and prop can be as much as 50m,” Frans continued. "Get the alignment wrong and you’re looking at shorter component life through unnecessary wear... and vibration. It’s our claim that Vibracon, installed on a newbuilding, will cope with both the launch and working stresses. In addition, about 80% of the realignment jobs we get can now be solved with Vibracon; for the rest, we use epoxy resin, though of course that takes up to 24-hours to harden.”

The latest low-profile Vibracons are a mere 20mm, yet can be adjusted by spanner in the same way as their 30mm brothers. And even that spanner had to be approved by the classification societies.

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The original alignment targets were checked with shipbuilders IHC, and, with backing from IHC as well as Fender and Wärtsilä, new targets were agreed and the team went to work. "We used the propulsion gearbox as our fixed point," said René, "machining the top plate of the engine and using 20 Vibracons to align them. We continued by aligning the dredge pump and pump gearbox with the nine-cylinder engine that runs the genset and pump and also realigned the ship's port side engine and pumps."

**FINALLY...**

The entire job took just three weeks - and that included giving the Olympia a new coat of paint. The alignment itself took just four days.

"The major advantage is that you can prepare the Vibracons in advance," said René. "And of course, should any event cause misalignment in the future - always a risk with working dredgers - realignment's a simple job thanks to the Vibracons."

Bubba-proof?

"Every shipyard has a Bubba," said Frans, "he's the big dumb guy who wanders around with a hammer hitting things to see if they work - or break. But Vibracons are so tough, not even Bubba can upset them!"

More info at www.machinesupport.com and at www.voscz.com

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Clients in today's economy demand clever and original solutions for best dredging results something that is a daily challenge for the designers and project engineers in our dredging technology think-tank. With skills from drawing board to shipyard selection, VOSTA LMG is an architect of tailored solutions. On our range of dredge components developed in day-to-day practice, the worldwide alliance with specialists, the work methodology not bound to a product, long experience with standard and custom-built dredges and much more, make us different. Pre-order consulting, complete dredge design, engineering and contracting services for CSOs and TSHDs or single supply of key components such as cutters, pumps, couplings and computer control systems...the choice is yours... Make room for a new approach...

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- Years of experience and practice
- Worldwide supply & service

VOSTA LMG B.V.
Kloveniersweg 25 • FO Bok 2114
1030 AC Amsterdam
The Netherlands
Phone: +31 (0)20 4020000 • Fax: +31 (0)20 4020070
E-mail: info@vostaling.com • www.vostaling.com

VOSTA LMG GmbH
Einhofboulevard 8
33335 Lübeck
Germany
Phone: +49 (0) 451 85010 • Fax: +49 (0) 451 850117
E-mail: info@vostaling.com • www.vostaling.com

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**OCTOBER 2003 DRIVING AND PORT CONSTRUCTION**