

© REPRINTED FROM HSB INTERNATIONAL



Photo by Flying Focus-Castricum

# BORDER HEATHER & BORDER THISTLE

FIRST UNITS IN A SERIES OF THREE DOUBLE HULL OIL TANKERS  
DELIVERED BY DAMEN SHIPYARDS BERGUM FOR UK ACCOUNT

---

Builders	: Damen Shipyards Bergum, Bergum, The Netherlands
Owners	: Darwin Shipping Ltd, Jersey, UK
Managers	: Jubilee Shipping, London, UK

---

The 3,100 tons newbuildings 'Border Heather' and 'Border Thistle' are the first vessels completed in a series of three units of double hull/clean products oil tankers ordered in 2002. The 'Border Heather' was delivered in October 2004. The 4,500 tons sister vessels 'Border Thistle'

and 'Border Tartan' were due for delivery to their owners in January and February 2005. The vessels were designed by Damen Shipyards Bergum as a modern tanker built for the transportation of clean products in reply for a worldwide demand of environmental friendly and safe vessels. With the demand for modern and safe

tonnage the vessels are capable to service the smaller ports for in/export and distribution of clean oil products in the UK and on the continent. The cargo tanks are laid out for four segregations and are coated with an Interline epoxy system.

The owners ordered the vessels to charter the tonnage to the major oil companies around the UK, replacing older single hull tonnage in service for over 30 years. With the intention of all oil mayors to use only tonnage under 20 years of service age and double hull configuration, these vessels are in demand.

Although different in size, the vessels are identi-

cal as far as equipment and lay-out. The same machinery and systems can be found on both vessels.

#### Design Criteria

The basic criteria to fulfill are as follows:

- A restricted length/beam of 75.00 x 14.00 m for the 3,100 tons vessel and 80.00 x 17.00 m for the larger design.
- A restricted draft in loaded condition not exceeding 6.30 m.
- Minimum speed in loaded condition of 12.0 knots on main propulsion rated at 90% MCR and 6.0 knots on auxiliary propulsion mode.
- Good deadweight related to light draft in case of low water situations on the river.
- Compliance with the OCIMF requirements for mooring equipment and cargo manifold.
- Ballast capacity to enable return voyages at sea in ballast.
- Good manoeuvring capability in both ballast and loaded conditions both at sea and in river navigation.
- Modern layout in crew accommodation to attract seafarers to join the coastal fleet.
- Double hull position for all tanks containing oil products throughout the vessel.

#### Class Notation

The Damen type DHOT 3100 viz. 4500 has been designed and built to the Rules and Regulations of Lloyd's Register of Shipping for the notation  $\star$  100 A1, Double Hull Oil Tanker, ESP,  $\star$  LMC, UMS IP, SCM, NAV1 Unrestricted International Service. Furthermore the vessel meets the requirements of the Isle of Man Inspectorate of Shipping for flying the Isle of Man flag. The vessel is equipped according to the latest IMO and MARPOL Regulations for carriage of Dangerous cargoes.

The cargo tanks were designed to meet a setting pressure valve of 14 kPa and vacuum valve setting of 3,5 kPa. The specific gravity of the cargo is set at 1,025 ton/cu.m.

#### Main Characteristics

Built under the yard numbers 9355 and 9357 the vessels feature the following main characteristics:

*The control console in the cargo control room*



*Radio Holland Netherlands supplied a complete package of navigational aids and communications systems*

#### Principal dimensions

	Border Heather	Border Thistle
Length o.a. ....	75.10 m. ....	85.32 m
Length b.p. ....	70.40 m. ....	81.12 m
Beam mld. ....	14.00 m. ....	17.00 m
Beam o.a. ....	14.16 m. ....	17.16 m
Depth ....	7.60 m. ....	8.95 m
Ballast draft. ....	4.20 m. ....	4.30 m
Summer draft ....	5.75 m. ....	6.30 m
Deadweight all Told ...	3,185 tons. ....	4,988 tons
Gross Tonnage. ....	2,159 t. ....	3,187 t

#### Tank volume at 100%

Cargo tank capacity ...	3.340 cu.m. ....	5.211 cu.m
		incl. slop tank

#### Tank capacities

Gas oil. ....	90 cu.m. ....	194 cu.m
Ballast water. ....	1,130 cu.m. ....	2,477 cu.m
Freshwater. ....	28 cu.m. ....	30 cu.m
Lub Oil. ....	7.2 cu.m. ....	8.0 cu.m
Sludge. ....	2.3 cu.m. ....	12.0 cu.m

#### Propulsion

Main engine. ....	2,400 kW at 750 rpm
Speed trials. ....	12.3 knots (main engine) at 90% MCR 6.5 knots (on PTI mode)

#### Accommodation

The accommodation is distributed over three decks land situated above the engine room. Modern spacious cabins furnished with light coloured carpentry and walls are provided for nine crew members and one guest. The material of the carpentry consists of fire retardant metal sheeted rockwool installed on a flexible mounted floor construction.

The cabins included a large master's cabin with settee, office desk and separate bedroom. The cupboards include a fridge and locker for personal belongings. The shower-toilet space of the captain is located in an adjacent space. The chief engineers cabins located at opposite part of the accommodation are similarly furnished.

For five crew members and a guest, cabins with adequate furnishings are provided aft of the officers cabins.

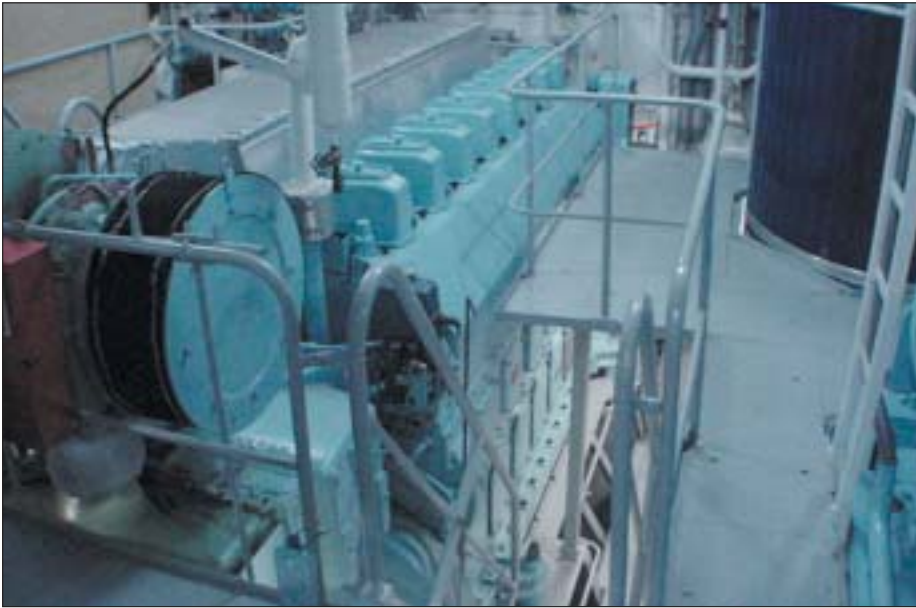
In the accommodation a messroom is situated with diner table. A separate recreation room for smokers and non-smokers is arranged with TV and radio equipment. The galley is provided next to the messroom and arranged with the extensive cooking and preparation equipment. At opposite end of the accommodation a storage area is provided with freezers, fridge and dry stores. Toilet and showers are provided for the officers and crew next to the cabins. A washer and dryer room is arranged aft of the accommodation on poop deck.

Carpentry work was skilfully done by Helmers BV of Hoogezand.

The crew cabins and messroom are air-conditioned and heated through a ducted ventilation and heating system installed on the vessel. The HVAC system was delivered and installed by De Graaf of Hoogezand.

The floor of the vessel is made of soundproof and fire retardant insulation. This insulation gives goods results in reducing the noise levels on board during maximum propulsion use as is required by the Shipping authorities. During trials the Research department of the Damen Shipyards Group measured the results and compared these to previous vessels to ensure proper insulation and the vessel and continued improvement of the noise level reduction on board seagoing vessels of this size.

The hot and coldwater outlets are connected to



The main engine of the vessel is a MaK diesel engine type 8M25

the ships sewage system and collected in a sewage tank with overboard and shore discharge connection.

#### Navigation & Communications Systems

Radio Holland Netherlands supplied a complete package of navigational aids and communication systems.

The vessel has been equipped to meet the requirements of GMDSS A1 sailing area and includes the following main components:

- one Cassens & Plath, Fiberline Magnetic Compass;
- one Furuno, DS-80 Log;
- one Furuno, FA-100 UAIS;
- one Furuno, FAR-2815 marine radar system;
- one Furuno, FE-700 echosounder;
- one Furuno, FELCOM-15 Inmarsat-C Terminal;
- two Furuno, FM-8500 VHF Transceiver with DSC;
- one Furuno, FR-2115 marine radar system;
- one Furuno, FR-2115 marine radar system;
- two Furuno, GP-90 GPS receiver;
- one Furuno, NX-500 Navtex receiver;
- three Jotron, TR-20 VHF portables;
- one Jotron, TRON-40S Satellite EPIRB;
- two Jotron, TRONSART radar transponders;
- one Nera, worldphone Mini-M Inmarsat terminal;
- one Obsermet, OMC-139 combination wind display;
- one Obsermet, OMC-160 wind sensor;
- one Radio Zeeland, DELTA-345 electronic compass;
- one Radio Zeeland, ECO-300 rate-of-turn indicator;
- one Radio Zeeland, SEAPILOT-75 autopilot;
- one Ricoh, 1120L fax;
- one Siemens, Euroset 2005G telephone;
- one Telular, SX5E Cellular fixed voice/data/fax;
- one Tokimec, ES-160 gyrocompass.

#### Engine Room

The main engine of the vessel is a MaK diesel engine type 8M25. The engine is resiliently mounted on its foundation and coupled via a flexible coupling to a fixed mounted reduction gearbox, design Reintjes LAF 2355, with a

reduction ratio of 5.06:1. The 3,850 mm diameter controllable pitch propeller, make Scana Volda, has been delivered by Van Voorden.

The engine is in NOx compliance with the requirements of IMO. On the gearbox a shaft generator of 348 kW(E) is installed capable of delivering power to the main system and in return driving the propeller in PTI-mode.

For extended redundancy the propulsion system is equipped with a PTI/ PTO mode. In case the main engine has a breakdown, the vessel can operate on a PTI-mode whereby the propeller is driven by an electric motor on the gearbox powered by the generator sets.

In the PTI mode the coupling between main engine and gearbox has to be disconnected.

The propeller shaft is mounted in an oil filled stern shaft with oil lubricated white metal bearings and seals delivered by the CP propeller manufacturer.

The main as well as the auxiliary engines mounted in the engine room are cooled through sea-chest mounted box coolers. The coolers are designed to meet 32 ° C seawater tempera-

tures. The exhaust gasses are led through a funnel to the aft of the deckhouse.

Electric power is generated by means of two engine rooms mounted generator sets of 525, kVA each developing 230/400 V AC current at 50 Hz. A shaft mounted generator of 435 kVA (348 kW) is installed to support the electric consumption in the sailing mode.

The sets consist of a Daihatsu diesel engine of 420 kW and a brushless alternator of 525 kVA, running at 1,500 rpm. The diesel engines are IMO NOx compliant to the latest requirements for international regulations of exhaust gas emissions.

An emergency harbour generator of 80 kVA is mounted in a space in the deckhouse aft. The aircooled 64 kW Sisu diesel engine, fitted with 80 kVA alternator and electric starting engine and battery set in the same space, is able to supply the power in case of emergency, in port or when aground or in dry dock.

#### Power Distribution

The main electrical distribution, (3x400 / 230V 50c/s) consists of an eleven field Eekels made main switchboard with connected an emergency/harbour switchboard, three power distribution boards and four lighting distribution boards. The main switchboard can be supplied by two 525 kVA auxiliary generators or a 443 kVA shaft generator which also can be used as PTI machine for emergency propulsion. The emergency/harbour switchboard is supplied by an 80 kVA generator. Integrated in the Eekels made bridge desk are the main 24 V distribution board and a main and emergency 3 x 230 VAC distribution facility.

Two (400/230V 50 c/s) 35 kVA main lighting transformers are used for the main 230 VAC supply and two 10 kVA lighting transformers for the emergency 230 VAC supply. For the several motor starters three MCC cabinets are placed in the engine room.

#### Auxiliary Equipment

The bowthruster mounted in the forepart consist of a two-duct thrust outlet and a centrally bottom mounted suction unit, type Veth 2-K-1200. The 1,180 mm diameter propeller is driven via a

The generator sets consist of 420 kW Daihatsu diesel engines driving a brushless alternator



gearbox by a 300 kW electric motor. The bowthruster is controlled and started from the wheelhouse control position. The direction of thrust is controlled by means of a hydraulically operated deflection plate.

The ducted bowthruster enables the vessel to control its bow even under low draft at the bow. The ducts in the sides can be above water level without reduction of thrust. In the engine room the following pump systems are installed and connected to the ships systems:

- one fuel trim pump of make Azcue with a capacity of 3.6 cu.m/h;
- one fuel oil standby pump for the main engine with a capacity of 1.5 cu.m/h;
- two bilge/ ballast pumps of make Azcue, each with a capacity of 150/ 40 cu.m/h at 1.5/ 4.0 bar;
- one fire-fighting emergency pump Azcue with a capacity of 50 cu.m.h at 4 bar;
- two submerged ballast pumps, each with a capacity of 400 cu.m/h at 2.5 bar;
- one bilge water separator make Coffin Wold Heli-Sep 1000 to MARPOL requirements;
- one freshwater pressure set make Speck 200 litres with boiler;
- one cooling water emergency pump main engine with a capacity of 82 cu.m/h;
- one stand-by lube oil pump for the main engine with a capacity of 21 cu.m/h;
- one dirty oil trim pump, make Wilden, with a capacity of 8 cu.m/h;
- one starting air compressor, make Atlas Copco, with a capacity of 3.5 litres/sec.;
- one waste oil incinerator of 210 kW capacity.

The ballast system is remote controlled from the cargo control room and the engine room by means of hydraulic controlled valves in the ballast tanks. All the piping installed in the tanks and in the engine room was hot dip galvanised after fabrication and before installation.

The engine sumps are connected via a trim pump to the dirty oil sump tank. This tank can be emptied via a shore connection to the shore disposal facility.

The engine room features a spacious work area with all equipment installed logically and with space to work and to service.

*The Scana Volda controllable pitch propeller and the Van der Giessen large size rudder*



*The Promac-Stuwa steering gear*

#### Steering Gear

The fishtail type rudder is mounted behind the propeller and driven by a Promac Stuwa hydraulic steering gear. The unit is mounted in the steering gear room and is driven by two electrical driven hydraulic pumps, type Danfoss. A 24V DC emergency electro-hydraulic pump is installed in case of emergency failure of the 400V system. The large size rudder has an operating angle of 2 x 60° to either side.

#### Cargo System

The cargo system is designed for loading of three different cargo grades simultaneously and provided with three manifolds for ship-shore connections. Five different grades can be loaded or discharged consecutively into five pairs of tanks through one manifold. Any of the three manifolds can be connected to any pair of tanks. The discharge rate per segregation is 400 cu.m/h. (two pumps of 200 cu.m/h connected). The loading rate is 800 cu.m/h through any manifold into any pair of tanks.

The pipelines are self-draining back into the

cargo tank or slop tank, from even keel up to 2 m trim by stern. The main valves (loading drop valves and discharge valves) are hydraulically/remote controlled from the cargo control room, with connection to a manually operated pump. The cargo piping is made of stainless steel. The cargo pumps of deep well type were supplied by Marflex and consist of ten units of 200 cu.m/h. The system is designed to run with six pumps simultaneously via six frequency converters. A portable emergency submerged cargo pump of 70 cu.m/h is also supplied. The slop tank uses a 100 cu.m/h deep well pump for discharging purposes. Around the deck four scupper drain tanks are constructed, which can be emptied using diaphragm pumps, air driven. Tank heating is provided using deck mounted heaters (one heater per cargo tank) and thermal fluid. The cargo is circulated in the tank by the deep well cargo pump, through the heat exchanger and returned into the cargo tank via the drop line. For tank cleaning a hot water line with eleven connections on the main deck is provided. In each of the cargo tanks a tank cleaning machine with two nozzles at two different levels are foreseen. Alarm and monitoring of the cargo tank levels is with a Bergan cargo tank monitoring and loading computer. The radar level instruments can be monitored from the CCR.

#### Frequency Converters

Ten cargo pumps (90 kW) and one slop pump (45kW) are installed. The speed of each pump can be adjusted by means of six Eekels frequency converters (EVE-FC). Each EVE-FC can control two pumps. The EVE-FC's take care of a smooth start-up and adjustment of the pump speed. The system is provided with two operational modes, the "load/unload" and the "circulation" mode. In "load/unload" mode the pumps are used for control of the cargo and slop tanks. The power of the EVE-FC is harmonized with the power of one motor/pump. In this mode one pump on each Frequency Converter can be used simultaneously. The EVE-FC protects the pump against dry running and no-flow by monitoring the motor torque. This function is designed for pumps with a square torque feature and detects an under load. When the

torque drops below the no flow limit the pump will stop after 10 seconds. If the torque drops below the dry running limit the pumps stops at once. The "circulation" mode is used for circulation of the cargo during the trip. During "circulation" the pumps operate at a fixed low speed, in this case the power of the motor is limited. During "circulation" two motor/pumps operate at one EVE-FC to limit the total harmonic distortion (THD) of the main supply the EVE-FC's are connected in a semi 12-pulse configuration.

#### Alarm & Monitoring System

The Eekels Alarm system (type: EAS200/05) is placed in the control desk of the switchboard room. The system is built up with the use of standard well-proven certified industrial components and is based on a normal PLC. This ensures an easy commissioning and a long-term support for service and spare parts. Each alarm input is separately protected, in case of a malfunction from the outside, the damages on the inside are limited and the troubleshooting is very fast and easy. The touch panel on the ECR-desk displays the actual alarms and the alarm history. The touch panel also can be used for read-out and changing the settings of the alarm inputs. In the bridge desk is a panel with LED-indicators for indicating the alarm groups is mounted. On the foredeck an anchor/mooring winch is provided. The bow anchors of each 1,125 kg are installed according the requirements for seagoing and inland waterways rules. The winch provided by SEC, Groningen is electro-hydraulically driven. The power pack supplying the anchor and the navigation mast is situated in the forward store. The foremast can be lowered to facilitate entering into warehouses. The MOB boat is handled by a MOB crane of 10 kN SWL, positioned on the starboard side of the aft deck. A hose handling crane, electro-hydraulically operated is installed in centre of the cargo deck area. The crane is capable of lifting 1,500 kg at a maximum working radius of 16 m.

#### Subcontractors and suppliers of equipment fitted on board the 'Border Heather' (partial list)

- Aalborg Industries NL,**  
Spijkenisse . . . . . : *Wiesloch* thermal fluid heating unit
- Ajax Fire Protection Systems,**  
Amsterdam . . . . . : fire fighting
- Alfa laval,** Utrecht . . . . . : separators, fresh water generator
- Atlas Copco,**  
Zwijndrecht . . . . . : air compressors
- Besi Armaturen,**  
Bremen (G) . . . . . : cargo valves
- Caldic Techniek,**  
Rotterdam . . . . . : *Stamford* generators
- Daihatsu,** London (UK) . . . . . : main generator diesel engine
- Econosto,** Rotterdam . . . . . : valves and fittings
- Eefting Engineering,**  
Hoogezaand . . . . . : bilge water separator, sewage treatment
- Eekels Elektrotechniek,**  
Hoogezaand . . . . . : electrical installation; main switchboard; alarm system; fire detection system; frequency drives; lighting installation; consoles
- Giessen Straalbuizen, Van de,**  
Hardinxveld-Giessendam . . . . . : rudder
- Haan, v/h Gebr. De,**  
Hoogezaand . . . . . : air conditioning; fixed gas freeing fans
- Hatecke, Ernst,**  
Drochtersen (G) . . . . . : free-fall lifeboat; MOB boat
- Ian-Conrad Bergen,**  
Penscola (USA) . . . . . : cargo tank gauging; loading computer
- Imtech Marine & Offshore,**  
Rotterdam . . . . . : *Mitsubishi Electric* circuit-breakers

- International Paint,** Rhoon . . : *Internationa<sup>®</sup>* marine coatings
- Ketting,** IJmuiden . . . . . : starting air compressor
- Liebherr Maritime Benelux,**  
Utrecht . . . . . : hose handling crane
- Maas Marine & Industrial Equipment,** Alblasserdam . . : *Scanjet* tank cleaning equipment
- MaK (Nederland),** Dordrecht : main engine
- MarFlex,** Oud-Beijerland . . . : deepwell cargo pumps
- Pres-Vac Engineering,**  
Allerod (DK) . . . . . : pressure/vacuum relief valves
- Promac,** Zaltbommel . . . . . : *Promac-Stuwa* steering gears; freefall lifeboat; rescueboat with davit; CP propeller
- Radio Holland Marine,**  
Delfzijl . . . . . : navaid's & communications systems
- Reikon,** Spijkenisse . . . . . : *Azcue* pumps
- Rotor,** Eibergen . . . . . : electric winch motors
- Sandfirden Technics,**  
Den Oever . . . . . : *SisuDiesel* engines & generator sets
- Scana Volda,** Volda (N) . . . . : reduction gears; propeller shaft seals; cp-propellers
- Ship's Equipment Centre,**  
Groningen . . . . . : winches
- Theunissen,** Malden . . . . . : *SeaTeleCom* communication equipment
- Veth Motoren,** Papendrecht . : *Veth-Jet* bowthrusters
- Wärtsilä Propulsion Netherlands,** Drunen . . . . . : *SternGuard* propeller shaft seal; *UNNET* fishline protection system
- Weka Boxcoolers,**  
Krimpen a/d IJssel . . . . . : box coolers
- Wortelboer,** Rotterdam . . . . : anchors & anchor chains

