



REPORT: ROYAL BOSKALIS





Summary

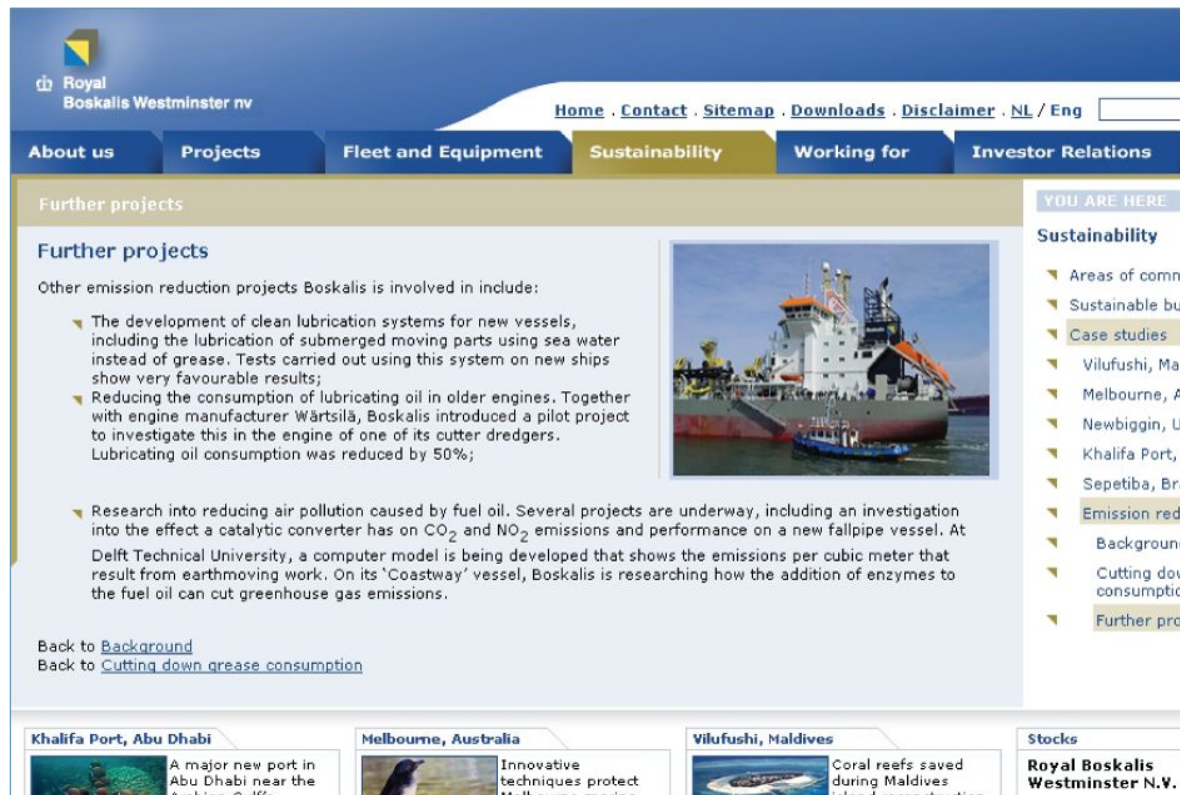
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Better fuel,
better performance.
Better combustion,
better emissions.
XBEE: naturally better.

Context

In 2008, the Dutch dredging company Royal Boskalis Westminster B.V. looked actively for solutions to reduce greenhouse gas emissions: **XBEE Enzyme Fuel Technology** was one of the leading projects.

The company selected the *M/V Coastway*, a dredger then located in Bahrain, to check the capacity of **XBEE** to reduce the polluting gas emissions. The reference test was carried out on July 19, 2008, and the comparative measurement on December 15, after almost four months of treatment with **XBEE**.



The screenshot shows the website of Royal Boskalis Westminster B.V. The navigation menu includes: Home, Contact, Sitemap, Downloads, Disclaimer, NL / Eng. The main menu categories are: About us, Projects, Fleet and Equipment, Sustainability (highlighted), Working for, and Investor Relations.

The 'Further projects' section is displayed under the 'Sustainability' tab. It lists several projects:

- Other emission reduction projects Boskalis is involved in include:
 - The development of clean lubrication systems for new vessels, including the lubrication of submerged moving parts using sea water instead of grease. Tests carried out using this system on new ships show very favourable results;
 - Reducing the consumption of lubricating oil in older engines. Together with engine manufacturer Wärtsilä, Boskalis introduced a pilot project to investigate this in the engine of one of its cutter dredgers. Lubricating oil consumption was reduced by 50%;
 - Research into reducing air pollution caused by fuel oil. Several projects are underway, including an investigation into the effect a catalytic converter has on CO₂ and NO₂ emissions and performance on a new fallpipe vessel. At Delft Technical University, a computer model is being developed that shows the emissions per cubic meter that result from earthmoving work. On its 'Coastway' vessel, Boskalis is researching how the addition of enzymes to the fuel oil can cut greenhouse gas emissions.

Navigation links: Back to [Background](#), Back to [Cutting down grease consumption](#).

Other project highlights shown in a carousel below:

- Khalifa Port, Abu Dhabi**: A major new port in Abu Dhabi near the Arabian Gulf.
- Melbourne, Australia**: Innovative techniques protect Melbourne marine.
- Vilufushi, Maldives**: Coral reefs saved during Maldives island reconstruction.

Right sidebar: YOU ARE HERE > Sustainability > Further projects.

The trailing suction hopper dredger is equipped with two Wärtsilä engines, model W6L32B, and the test has been made on the starboard engine developing a power of 2,760 kW.

Data

1 | IMO E2 test cycle

The International Maritime Organization has developed several test cycles to compare technologies. In the case of the *M/V Coastway*, Boskalis selected the E2 test cycle. Gas emissions have been measured by the accredited laboratory Envirotech Consultancy W.L.L.

This test cycle applies to propeller-law-operated main and auxiliary engines, and details a measurement program and weighing factor when analyzing the final results:

Test cycle E2				
Power	100%	75%	50%	25%
Weighing factor	0.2	0.5	0.15	0.15

2 | Measured parameters

Envirotech Consultancy have measured the main green house gases. Boskalis engineers monitored and collected all data related to fuel consumption:

- Power (% and kW)
- Specific fuel consumption (g/kWh)
- O₂ (%)
- CO (g/kWh)
- CO₂ (g/kWh)
- NO_x (g/kWh)
- SO₂ (g/kWh)

Results analysis

The results analyzed by Boskalis personnel demonstrate how significant is the impact of **XBEE Enzyme Fuel Technology** on gas emissions and specific fuel consumption in ships working regularly on low loads such as dredgers, tugs, and cable layers.

	Without XBEE	With XBEE	% reduction according to E2 test cycle
Fuel consumption	254.10	229.10	-9.84%
CO	1.81	0.58	-67.95%
CO ₂	788.0	716.0	-9.14%
NO _x	10.20	7.60	-25.49%
SO ₂	1.40	1.21	-13.57%

It is interesting to observe that although the **fuel consumption of this dredger has been reduced by 9.84%** according to the E2 test cycle, such ships mostly work on loads ranging from 25 to 50%.

Taking this into account, the specific fuel consumption is reduced by an average of 13.81%.

Conclusions

According to MM. Smits and Meijer at Boskalis:

- *"Although the accuracy and repeatability of the performed tests is not fully satisfactory, the measurements indicate that the fuel additive XBEE affects the engine performance in a positive manner.*
- *The measured reduction of NO_x is significant [...]*
- *The observed reduction in specific fuel consumption is questionable due to the accuracy of the measured power, fuel rack and fuel pump characteristics. However, the measurements also show that more CO₂ per MT fuel and less CO is produced, which can indicate that the fuel combusts more efficiently."*

Interestingly, the authors of the report chose to minimize the results by basing their calculation of the break-even point fuel price on the lowest reduction of fuel consumption, i.e. 1.4% at 75% load. Even so, such break-even point is set to about \$665 per ton of fuel considering prices in 2023.

If we take into account the actual reduction of fuel consumption by -9.84%, **XBEE Enzyme Fuel Technology** is completely paid when you treat fuel that cost more than \$91.4 per ton!

CO₂

-9.1%

E3 SFOC

-9.8%

NO_x

-25.5%

XBEE Enzyme Fuel Technology is global partner with Green Marine environmental program and allows shipowners to improve the performance of their ships on at least three key indicators!



Annex

M/V Coastway
equipment sheet

EQUIPMENT SHEET

COASTWAY
TRAILING SUCTION HOPPER DREDGER



CONSTRUCTION/CLASSIFICATION

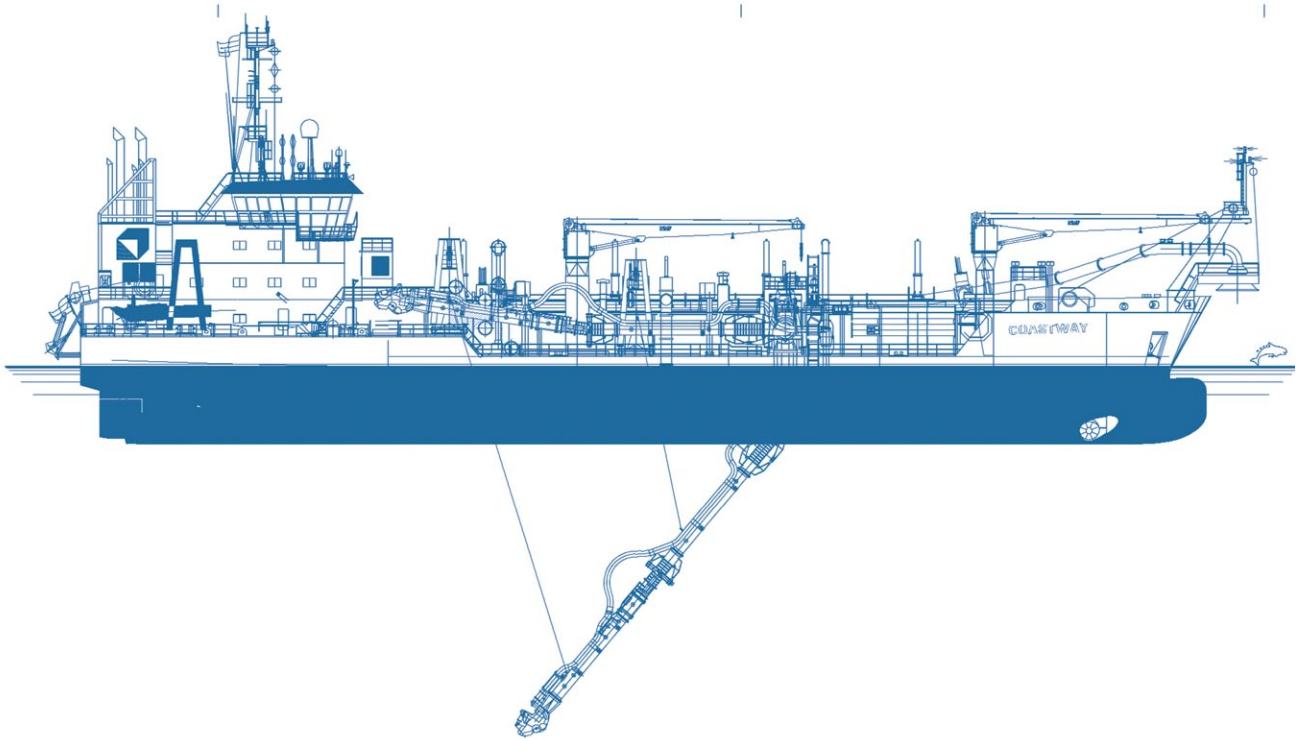
Built by	Merwede Shipyard
Year of construction	2002
Classification	B.V. I ✕ HULL ✕ MACH ✕ AUT-UMS Hopper Dredger Dredging within 15 miles from shore or within 20 miles from port Dredging over 15 miles from shore with H.S. <= 2.5 m Unrestricted Navigation

FEATURES

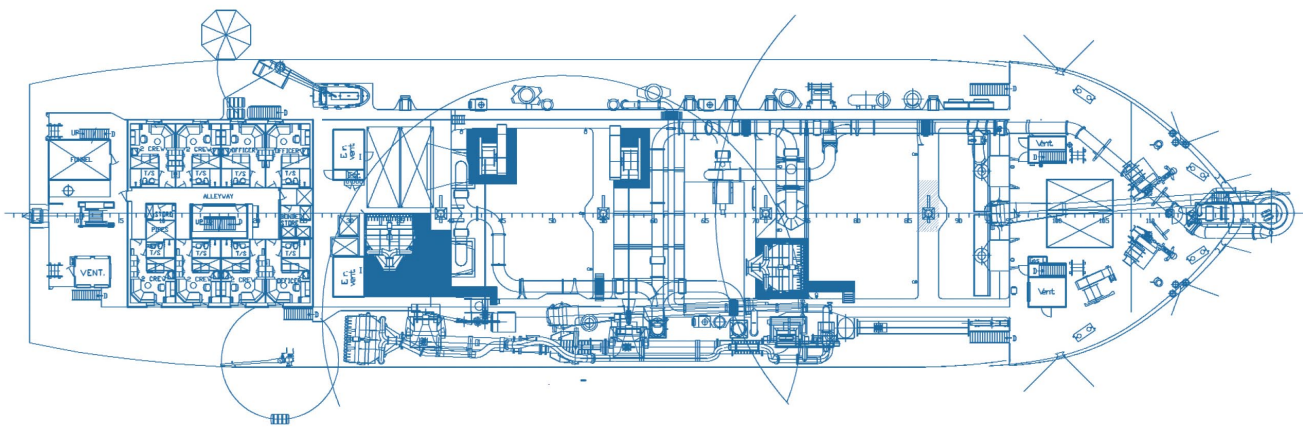
Shallow draught and large loading capacity.
Desalination installation.

MAIN DATA

Gross tonnage	5,393
Length overall	97.70 m
Breadth	23.00 m
Moulded depth	7.00 m
Max. draught empty	4.04 m
Max. draught Int. load line	5.72 m
Max. draught dredging load line	6.58 m
Carrying capacity (D.W.)	7,144 t
Hopper capacity	4,906 m ³
Suction pipe diameter	1 x 0.90 m
Max. dredging depth	28.00 m
Discharge systems	4 bottom doors/pump-ashore/ rainbow installation
Sailing speed loaded	12.5 kn
Total installed power	6,365 kW
Sand pump output	1,500 kW
Jet pump output	1,500 kW
Pump ashore output	2,760 kW
Propulsion power sailing	4,000 kW
Bow thruster	500 kW



SIDE VIEW



TOP VIEW DECK LEVEL



8, am Wapp
3841 Schiffflange
Luxembourg

customerservice@xbec.com
+352 691 668900

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