Wilh. Wilhelmsen

ENVIRONMENTAL REPORT 2006

DRIVING FORCE FOR ENVIRONMENTALLY-ADAPTED INTERNATIONAL SHIPPING

WILH. WILHELMSEN IS IMPLEMENTING A NUMBER OF MEASURES FROM DESIGN TO INCREASING MACHINERY EFFICENCY, MAINTENANCE AND ROUTE PLANNING IN THE HOPE OF CREATING AN OPTIMUM FLEET IN ENERGY TERMS.

A CLEANER SHIPPING BUSINESS

Ingar Skaug
Group CEO
Wilh. Wilhelmsen

We must dare to think along completely new lines about energy sources on board. So we in Wilh. Wilhelmsen have launched an innovation initiative where one aim is to come up with technological solutions which ensure that our future vessels have an even better environmental image than today's ships.

Climate change represents one of the biggest challenges facing the world community. The shipping industry must contribute to overcoming it.

Shipping is the most environment-friendly way to transport commodities when measured in energy consumption per unit of cargo carried. Nevertheless, this industry is also a polluter of the environment by releasing fumes from engines and refrigeration systems, for instance. Cutting emissions from maritime transport will therefore make an important contribution to reducing overall environmental pollution, particularly of the air. Calculations show that about 2% of overall human emissions of carbon dioxide derive from shipping, of which our vessels account for roughly 0.025%. Neither the industry in general nor our company in particular can rest content with these figures. Innovative thinking is needed to reduce fuel consumption and greenhouse gas emissions by the world fleet. That also applies to our ships.

The sulphur content of bunkers represents a substantial environmental problem for world shipping. By making greater use of low-sulphur oil, we take an important step towards a cleaner environment. Low-sulphur bunkers is available on the market, but in limited quantities and at a relatively high price. As a company, we are willing to pay that price since reduced sulphur emissions will make a significant contribution to improving air quality. Together with such partners as Det Norske Veritas (DNV), Shell and Pacific Gas & Electric, we have therefore taken an initiative to improve the availability of good-quality bunkers with a low sulphur content in the world's most important ports.

Ships under construction today will determine fuel consumption and other environmental impacts for at least 30 years to come. So we at Wilh. Wilhelmsen (WW) are working both on our own account and with others to identify new and more environmentally-efficient designs and modes of operation for tomorrow's ships.

We must dare to think along completely new lines about energy sources on board. Through the development of the e/s *Orcelle* concept vessel, we have demonstrated what is possible. This ship of the future embodies a vision of deriving propulsion from sun, sea and wind. It results from a close, committed and active collaboration with our Swedish partner Wallenius Lines, which also covers other environmental issues. In the short term, we are assessing improvements to existing technology and energy sources. We are also looking at changes which look likely to be attainable in the medium term. Last, but not least, we are seeking solutions in a longer perspective which utilise entirely new technologies and forms of energy.

Today's propulsion engines are based on an old technology which offers relatively few improvement opportunities in environmental terms. To solve the basic problems of the environment, tomorrow's vessels must apply a quite different technological concept.

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ENVIRON-MENT 2006 IN BRIEF

THE SULPHUR CONTENT IN BUNKERS used on WW ships sailing in the WWL fleet was 1.61% in 2006, corresponding to a reduction of 2.2% from 2005. Sulphur emissions were reduced by 43% compared with 2000.

WW LAUNCHED AN INNOVATION INITIATIVE which will ultimately contribute to the further development of environmentally-adapted vessel design and operation. The main focus in on measures to reduce bunkers.

IN COOPERATION WITH NORWAY'S BELLONA environmental foundation, WW prepared an improved list of health- and environmentally-adapted chemicals for use on ships. A project was also launched to improve shipboard waste handling.

PRINCIPAL GOALS FOR 2007

IMPLEMENT BUNKERS-REDUCING MEASURES, including raising crew awareness, voyage optimisation and implementation of data measurements.

CUT BUNKERS consumption by 2% from 2006.

CLARIFY HOW FAR ONE OR MORE OIL COMPANIES are willing to develop sustainable technology for separating sulphur from bunkers on land.

ESTABLISH A STANDARD FORMAT for voyage reporting in cooperation with EUKOR Car Carriers and Wallenius Lines.

IMPLEMENT washing of the hull below the waterline with improved technology.

ASSESS OPPORTUNITIES for ballast water treatment on newbuildings.

WILH. WILHELMSEN IN BRIEF

Wilh. Wilhelmsen (WW) is a leading global provider of maritime services. It has some 13 000 employees in wholly-owned companies or about 23 000 if joint ventures are included. Just over 350 offices in 71 countries collaborate in an extensive global network.

The group's ambition is to be a leader in environmentally-adapted shipping. WW's goal is to do more than simply comply with all requirements and standards, and to ensure that our business pollutes less than international rules require.

WW controls 39 ships but exerts influence via its partnership with Wallenius Lines on just under 150 vessels through interests in operational companies Wallenius Wilhelmsen Logistics (WWL), EUKOR Car Carriers and American Roll-on Roll-off Carrier. These ships carry cars, high and heavy and non-containerised cargoes. Together with its partners, WW has a total of 44 newbuildings on order for delivery from February 2007 to 2011.

In addition to maritime transport and associated logistical services, WW offers a number of services and products through Wilhelmsen Maritime Services. Both operation and maintenance of vessels are very significant for ensuring an environment-friendly fleet. So is the supply of environmentally-adapted maritime products.

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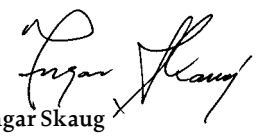
We launched an innovation initiative in 2006 as our contribution to creating such technology. Our best research and development resources will scrutinise all conceivable possibilities for coming up with new technological solutions which will ensure that tomorrow's shipping business has a significantly better environmental image than today. We are again cooperating closely with Wallenius Lines, and have jointly recruited a network of prominent companies such as Mitsubishi Heavy Industries, General Electric, DNV, Pacific Gas & Electric, Shell and others.

Shipping is a global business. So it is important to ensure that rules and standards for this sector are also framed in a global context. Regulations for the industry are established by the UN's International Maritime Organisation (IMO), whose work for the environment is influenced by active contact with international bodies, national governments and interest organisations. Efforts to promote international regulation rather than the imposition of different regional and national rules have our full backing.

This support is given from a recognition that all participants in the shipping market must contribute and accept their responsibility. As a leading player in the maritime industry, our goal at WW is to do more than simply comply with all requirements and standards. Our clear ambition is to lie ahead of legislative and regulatory developments, and to ensure that our business pollutes less than international rules require. This is because we want to accept responsibility for our common environment while also recognising that environment-friendly operation actually confers a competitive advantage. Our customers must be confident that their goods and products are transported in the most environmentally-considerate way possible.

We cannot promise any environmental revolution in 2007. What we can promise, however, is that we will do our utmost to contribute to new and more environment-friendly technology and to products and services which are better adapted to environmental needs. Taken together, these measures will represent an important contribution by us to the world community's collective effort to take climate challenges seriously and ensure a cleaner shipping industry.



Ingar Skaug
Group CEO
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ENVIRONMENTAL WORK AT WW IN 2006

Compared with other forms of transport, shipping represents one of the most environmentally-adapted means of moving goods around the world. At the same time, vessel operation involves a number of processes which affect the environment.

Wilh. Wilhelmsen (WW) takes environmental challenges seriously, and implemented a number of measures in 2006 to ensure environmentally-adapted operation of its fleet.

This work will continue with undiminished vigour in 2007. Measures which can reduce fuel consumption by the fleet have the highest priority.

WW is a leading global provider of maritime services, and wants to be a driving force in ensuring that international shipping is as environmentally-adapted as possible. Its ambition is accordingly to lie ahead of regulatory development. WW will contribute to developing ships which pollute far less than international rules require, and is therefore committing substantial resources to creating new ship designs, technology and environmentally-adapted products.


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ENVIRONMENTAL PROGRAMME 2006

	Aspect	Air	Sea	Other	Objective	Target	Measures	Status
1	NO_x, main engine operation	x			Reduce NO_x emissions.	Reduce NO_x emissions by 25% per unit transported by 2008.	Install new slide valve on Mark IV ships during 2006.	Completed on all four Mark IV ships. Emissions after final completion will be measured in 2007.
2	SO_x, main and auxiliary engine operation	x			Reduce sulphur emissions.	Reduce SO_x emissions by using low-sulphur fuel in main and auxiliary engines. Observe WWL bunkers instruction (average sulphur content 1.5%).	Record bunker data.	Recording continues. Registered sulphur emissions from WWL tonnage were 1.61% in 2006.
3	Antifouling		x		Find coating which can give predictable docking intervals.	Actively evaluate new coating systems.	Obtain references from other shipping companies. Discuss issue at environmental meetings in-house and with WWL partners. Present results and recommendations to WLS.	Test area on some ships: Taiko – silicon-based coating. Texas – silicon-based coating. Propeller also coated. Tampa –glass flake coating. Tourcoing – propeller coated with silicon-based paint in October 2005, to be inspected in March 2007. Antifouling project established with Wilhelmsen Marine Consultants (WMC).
4	HCFC and HFC	x			Reduce consumption of HCFC and HFC.	Record refrigerants used in 2005. Reduce consumption by 5% from 2004 to 2006.	Follow up consumption in 2006. Record refrigerant stock at 1 Jan and 31 Dec.	Consumption and stock recorded for each quarter and at 31 Dec.
						Change to environmentally-adapted refrigerants in refrigeration plants.	Change refrigerant on Taiko and a car carrier managed by BSM in UK. Inspect refrigeration plant(s) on a Mark 1 vessel.	Mark II vessel Taiko changed to R134A for shipboard air conditioning unit. Reports that R134A is less efficient than A22. Two compressors often required rather than one earlier.
						MHI newbuildings to use environmentally-adapted refrigerants.	Evaluate whether R404 refrigerant can be replaced by more environment-friendly type. WLS list to be sent to all vessels by 1Q 2006.	Toba to be inspected in dry dock, October 2006. Awaiting construction yard.
5	Chemicals and detergents		x	x	Reduce use of environmentally-hazardous chemicals.	Formalise a list of environment-friendly chemicals and detergents to be used on Wilhelmsen Lines Shipowning (WLS) vessels.	Vessels to report quarterly on quantity of chemicals/ detergents used with reference to WLS list. Oily water separators certified for 5 ppm installed on a minimum of two WLS vessels in 2006 (Tasco and Tagus).	New list of environmentally-adapted chemicals developed in cooperation with Bellona and sent to the ships. Quarterly recording from 2007.
6	Bilge water		x		Reduce pollution of the sea by oily water.	Install 5 ppm oily water separator on existing vessels. White box for recording ppm content of bilge water to be installed on all WLS vessels in 2006.	Start planning and executing installation.	Tagus – delivered. Tasco – delivered. Installation initiated.
7	Painting		x	x	Use more environment-friendly paints on board.	Evaluate environment-friendly paints. Be updated on new products Return empty paint tins to supplier.	Ask paint suppliers for advice. Follow up new products. Cooperate with suppliers to find solutions.	Paint suppliers will be invited to present environmentally-adapted paint systems and opportunities for organising a system to return empty tins. Continues in 2007.
8	Ballast water		x		Eliminate micro-organisms in ballast water.	Monitor development of ballast water treatment and IMO regulations.	Discuss ballast water issues at environmental committee meetings and follow up decisions.	Ballast water management plan updated to meet new requirements.

> ENVIRONMENTAL WORK AT WW IN 2006

Work on protecting the environment focuses on such areas as emissions to the air, discharges to water and waste handling.

Group CEO

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REGISTRATION

The Barber Ship Management (BSM) business unit of Wilhelmsen Maritime Services (WMS) is responsible for ensuring that the ships under its management operate safely, environmentally and efficiently. A special computer system has been developed to register and analyse operational data as well as undesirable incidents and non-conformances. This information is compared quarterly with pre-defined quality parameters to ensure that the vessels do not have unacceptably high emissions/discharges.

EMISSIONS TO THE AIR

Carbon dioxide (CO_2) and nitrogen oxides (NO_x) are produced from the combustion of fossil fuels, such as bunkers. According to scientific studies, human activities generate larger emissions than the Earth's carbon cycle can absorb. These volumes influence the greenhouse effect, which could result in rising temperatures and sea levels as well as more extreme weather.

Any reduction in fuel consumption by WW's fleet represents an improvement in the global environment.

Emissions of sulphur oxides (SO_x) partly reflect the percentage of sulphur contained in the heavy oil used on ships.

Carbon dioxide

No international agreements currently restrict the release of carbon dioxide from international shipping. However, the IMO encourages voluntary reporting of such emissions.

The volume of carbon dioxide produced by ship's engines is directly proportional to bunkers consumption. Energy optimisation measures and well-motivated crews can help to reduce this output. WW aims for a high level of engine efficiency in its fleet. This keeps fuel consumption low and thereby reduces carbon emissions. An efficient vessel design yields good energy utilisation, while operational measures to save energy also cut the amount of greenhouse gas released.

No satisfactory technology is available today for reducing carbon emissions from ship's engines.

WW established a collaboration in 2006 with leading industry companies to promote research into the use of alternative fuels and new propulsion technology.

Nitrogen oxides

These environmentally-harmfully gases are also a product of the combustion process in ship's engines.

Emissions at sea are limited by the IMO through Marpol Annex VI to 17 grams per kilowatt-hour for the type of slow-speed main engines used on WW's ships. These regulations apply only to tonnage built after 2000. In addition, taxes are increasingly being introduced for specific geographical areas.

In 2000, WW resolved to achieve a 25% reduction in nitrogen oxide emissions from its own fleet operated by Wallenius Wilhelmsen Logistics (WWL) by 2008.

Cutting fuel consumption makes an important contribution to releasing less nitrogen oxides. Such emissions can also reduced to some extent by engine technology solutions

IN 2000, WW SET A TARGET OF A **25% REDUCTION** IN NITROGEN OXIDE EMISSIONS FROM ITS OWN FLEET OPERATED BY WWL BY 2008.

which improve the combustion process. Older and less efficient engines release larger volumes than newer and more environmentally-adapted installations. Since the market for carrying cars and rolling cargo is tight, it has not been possible to phase out older tonnage. Reductions have so far been achieved through fleet renewal and modifications to existing machinery.

Technical improvements on existing engines are not sufficient for achieving any significant reduction in emissions, so supplementary equipment is required.

A Norwegian manufacturer has developed and introduced a successful solution for removing nitrogen gases from exhaust fumes in the transport industry on land. The same technology is used by a limited number of small ships in Norway and Sweden, mainly local ferries.

In cooperation with the manufacturer concerned, WW's wholly-owned WMS subsidiary has established a project team to assess opportunities for adapting this solution to the needs of the global merchant fleet. The work is showing promising results, and expectations are high that this collaboration will be able to offer the maritime industry an efficient solution for removing nitrogen oxides from exhaust fumes.

Sulphur oxides

Burning bunkers containing sulphur creates gases which contain harmful sulphur oxides.

Emissions of these substances are regulated by the IMO through Marpol and the introduction of geographical areas where the release of sulphur is restricted. Bunkers containing more than 1,5% sulphur has been banned, for example, in the Baltic and North Sea areas. The general IMO requirement is that sulphur emissions do not exceed 4.5%.

These emissions can be reduced through the use of low-sulphur bunkers or by scrubbing exhaust gases when this yields a corresponding effect on emissions.

WW's fleet makes considerable use of low-sulphur bunkers. The average sulphur content in bunkers burnt on the WW vessels operated by WWL in 2006 was 1.61%. This represented a reduction of 2.2% from 2005. Work is under way on further measures to cut sulphur emissions. The goal is to reduce the sulphur content in bunkers to 1.5%.

However, the supply of low-sulphur bunkers is limited and its quality varies. Its price is also significantly higher than other bunkers, because of bigger production costs. Using such oil also presents certain technical challenges.

With a somewhat limited supply of low-sulphur bunkers, and correspondingly high prices, demand for treatment technology is set to rise in company years.

WW and its partners will seek a collaboration with the oil industry to assess opportunities for removing sulphur from bunkers on land. Since no such collaboration has been established at the moment, WMS is engaged in developing scrubber technology to treat exhaust fumes with the aid of seawater. Test installations show very promising results, removing more than 95% of the sulphur content in the exhaust fumes. In addition, harmful particulates are washed out. Seawater used in this process is itself treated before being pumped back overboard to remove harmful substances. These are collected and deposited on land for secure destruction. WMS expects to be able to introduce this solution to the market during 2007.

Leaks from refrigeration and fire systems

Leaks from refrigerating and firefighting equipment can release hazardous gases. Older refrigeration systems use refrigerants which contain hydrochlorofluorocarbons (HCFCs), while older firefighting systems often contain halon. Both these gases help to deplete the ozone layer.

In addition to the Montreal protocol, IMO regulations cover the use of environmentally-harmful greenhouse gases on ships. The European Union has additional regulations.

WW has no halon in the systems on its ships.

Refrigerating systems on WW's ships are used to keep provisions cold and for air conditioning in the crew quarters. None of its vessels have refrigerating systems on their cargo decks. The environmental impact of its fleet is accordingly limited. At the same time, accidental emissions of refrigerant are continuously monitored on the basis of quantities purchased and stocks on each vessel. WW is also replacing older refrigerants with more environmentally-adapted products.

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06: ACHIEVED IN 2006

- Used 150.4 grams of fuel per kilowatt-hour, reduced from 150.8 in 2005.
- Sulphur emissions corresponded to 1.61% of fuel consumption.
- More ships were adapted to use low-sulphur bunkers, and adaptations have been made to permit them to sail in areas with restrictions on sulphur emissions.
- Another two ships were fitted with slide valves on the main engine to reduce NO_x-emission, bringing the number of vessels with such installations to four.
- Continued registration of bunkers quality, its effect on fuel consumption and resulting CO_2 emissions.
- Stepped up efforts to raise awareness among seagoing personnel about how they can help to make vessel operation more environmentally acceptable.
- Changed refrigerant on one ship to R134A.

07: TARGETS FOR 2007

- Establish the basis for a 10% reduction in fuel by 2010. Target for 2007 is a 2% cut. The 2008 target is 4%. Same for 2009. Measurement unit is consumption in grams per tonne transported per nautical mile.
- The target of maximum sulphur emissions corresponding to 1.5% of fuel consumption is being maintained.
- Seek to combat operational damage from poor-quality bunkers with a low sulphur content. Consider exhaust fume scrubbing if this technology becomes commercially available.
- Require modern engine technology from newbuilders. Assess opportunities for conversion and NO_x-reducing technology if this comes on the market.
- Continue innovation projects aimed at new combustion technology in existing engines, and projects to develop new fuel types.
- Continue to raise awareness among seagoing personnel through conferences, courses and seminars.
- Change refrigerant from R22 to R134/ R417A or more environmentally-adapted alternatives on three vessels.

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Environmental figures for 2006

	2005: 24 ships		2006: 25 ships	
EMISSIONS TO THE AIR	Total		Total	
Full consumption in tonnes	392 780		395 703	
Power generation in GWh	2 604		2 631	
Fuel consumption in g/kWh	150.83		150.4	
EMISSIONS TO AIR (INCL AUXILIARY ENGINES)				
	Total	G/kWh	Total	G/kWh
SO_x emissions in tonnes	6 587	2.53	6 283	2.39
CO_2 emissions in tonnes (based on IMO voluntary registration index)	1 206 409	463.26	1 232 990	468.65
NO_x emissions in tonnes	47 376	18.19	47 979	18.24

This table presents the most important environmental data for vessels controlled by WW and operated by WWL.

ALL WW'S SHIPS WILL HAVE A GREEN PASSPORT BY 2010. THIS CERTIFICATE CONFIRMS THE MATERIALS USED TO BUILD A VESSEL.

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06: ACHIEVED IN 2006

- Resolved that newbuildings will incorporate space to retrofit treatment systems for ballast water.
- Replaced two bilge water separators to achieve a capacity of five ppm. Test installation of supplementary filter initiated.
- Coated test areas with antifoulings and paints, mainly silicon-based, above and below the waterline. Follow-up of test results specified.

07: TARGETS FOR 2007

- Implement plans to install a ballast water treatment system when placing possible orders for new vessels. Assess and select suppliers and system types for ballast treatment.
- Plans to replace bilge water separators on five vessels. Launch work to identify a solution which eliminates discharges of oily water.
- Complete antifouling tests and decide on alternative coating types for forthcoming newbuildings.

DISCHARGES TO WATER

Ballast water

To avoid uncontrolled transfer of marine organisms from one region to another, the IMO as well as certain national and regional authorities have adopted regulations on treating ballast water. In the longer term, this will mean that both new and existing vessels must install systems which neutralise such organisms before ballast water is pumped overboard. Ballast water is often needed when ships are not filled with cargo to keep the propeller submerged and provide sufficient stability.

WW's fleet satisfies the applicable regulations for ballast water. Should it be necessary to take on or discharge such ballast for stability reasons, this is done in the open sea far from land as specified in current regulations. In addition to minor adjustments, this could also apply to internal transfers between ballast tanks.

A treatment plant developed by WW partner Wallenius Lines has demonstrated promising test results. WMS has also communicated closely for a number of years with several of the teams developing systems for ballast water treatment, and has observed that some of these have made great strides in developing simple and efficient solutions. A collaboration is likely to be concluded in 2007 with a company which has the best available technology for ballast water treatment, so that this system can be introduced to the maritime industry in good time before the international regulations come into force.

Ballast water treatment will be installed in WW's fleet once it is commercially available and the regulations are clear.

Bilge water

Polluted oily water will always occur on a ship as a result of cleaning engine rooms and machinery components, exhaust boilers and the like. A bilge water separator ensures that oily waste from the engines is separated from other water in the ship's bilge system, so that the oil content in the bilge does not exceed the 15 parts per million (ppm) specified as the maximum permissible level in the IMO regulations.

The goal is that bilge water from WW's fleet should not exeed five ppm, and systems are therefor gradually being upgraded. The group has installed measuring equipment to ensure better registration and improved safety if bilge water must be discharged. On newbuildings and when replacing existing systems, WW assesses separators and other equipment which can reduce emissions beyond applicable regulatory requirements. Discharging oil water is an important issue at the officer conferences held regularly by WW.

Antifoulings

Antifouling coatings are applied to the hull below water to prevent marine growth. Keeping a hull as smooth as possible reduces fuel consumption and thereby exhaust fumes. The drawback with traditional antifoulings is that they not only kill weeds and other foulings but also add toxins to the sea. The IMO has banned the application of tin-based antifoulings, but it is still permissible to operate vessels which have been coated in this way. From 2008, however, all ships must be coated with a tin-free product.

All WW's ships are coated with tin-free antifouling. Good contacts are maintained with coating suppliers, and the group is involved in a Norwegian research project engaged in evaluating other types of antifouling. WW is currently testing silicon-based products – which are wholly non-toxic – on propellers and rudders. During 2007, the group will carry out tests on cleaning underwater hulls with high-pressure waterjetting.

OTHER DISCHARGES

Waste from operations

All WW's ships comply with international regulations and local restrictions for handling both solid and liquid waste. Refuse and oil residues not burnt in shipboard waste incinerators are delivered to land. The incinerators comply with international technical requirements.

A project was launched in 2006 to prepare a waste management programme. In cooperation with the Bellona foundation, WW will consider whether a further potential exists for improved recycling after waste has left the ship.

Life-cycle analyses

A ship has a normal life of 25-35 years depending on the quality of its materials and construction solutions and the extent of its maintenance. Steel corrosion, particularly in the ballast tanks, is frequently crucial for the lifetime of the vessel.

Depending on such factors as its age, a vessel could contain toxic and environmentally-harmful materials which need to be handled in an acceptable manner.

No international regulations govern the scrapping of ships. However, this challenge is on the agenda for the IMO, the Basel Convention and the International Labour Organisation (ILO). The IMO has drawn up guidelines for scrapping, but these are not mandatory. Norway will contribute to the adoption of binding standards which help to protect health, safety and the environment during scrapping.

Two of WW's vessels were awarded a Green Passport in 2006, which confirms the materials used in their construction. All the group's ships are due to have such certification by 2010.

WW's ships have an economic life of roughly 30 years. The group is concerned to see that vessels are recycled in an acceptable manner for health and the environment. When ordering new tonnage, careful consideration is given to the materials used in order to ensure the most acceptable possible process when the vessels are later recycled.

A life-cycle analysis of WW's ships was initiated in 2006. This aims to identify what environmental burdens these vessels represent and where in their life cycle such impacts occur. In addition to energy consumption, this analysis will cover construction and maintenance materials as well as waste. Weight will also be given to the emission/discharge gains offered by alternative energy sources, and what other measures could be implemented to reduce environmentally-harmful emissions/discharges. The analysis will be used when designing new generations of vessels with the aim of developing a fleet which takes the greatest possible account of the environment.

Chemicals

Various types of chemicals are used on ships, including substances required for special cleaning of machinery components or as additives to boiler water. WW is concerned to use the least harmful product where such an option exists, and cooperates closely with Bellona in this area.

WW wants to reduce the quantities of chemicals used, and keeps statistics of its purchases.

The group works continuously on developing environmentally-adapted chemicals. See page 24.

06: ACHIEVED IN 2006

- Began analysing waste volumes from the fleet.
- Completed new list of recommended chemicals for the fleet.
- Initiated life-cycle analysis.
- Implemented Green Passport documentation for two ships.

07: TARGETS FOR 2007

- Implement improvements in waste volumes accordance with the analysis results.
- Initiate project for further improvements where environmentally-adapted chemicals are not commercially available.
- Complete life-cycle analysis and apply the results to improving knowledge for the future design of new ships and for phasing out older vessels.
- Complete Green Passport for five ships. Target is to have such certification for the whole fleet by 2010.


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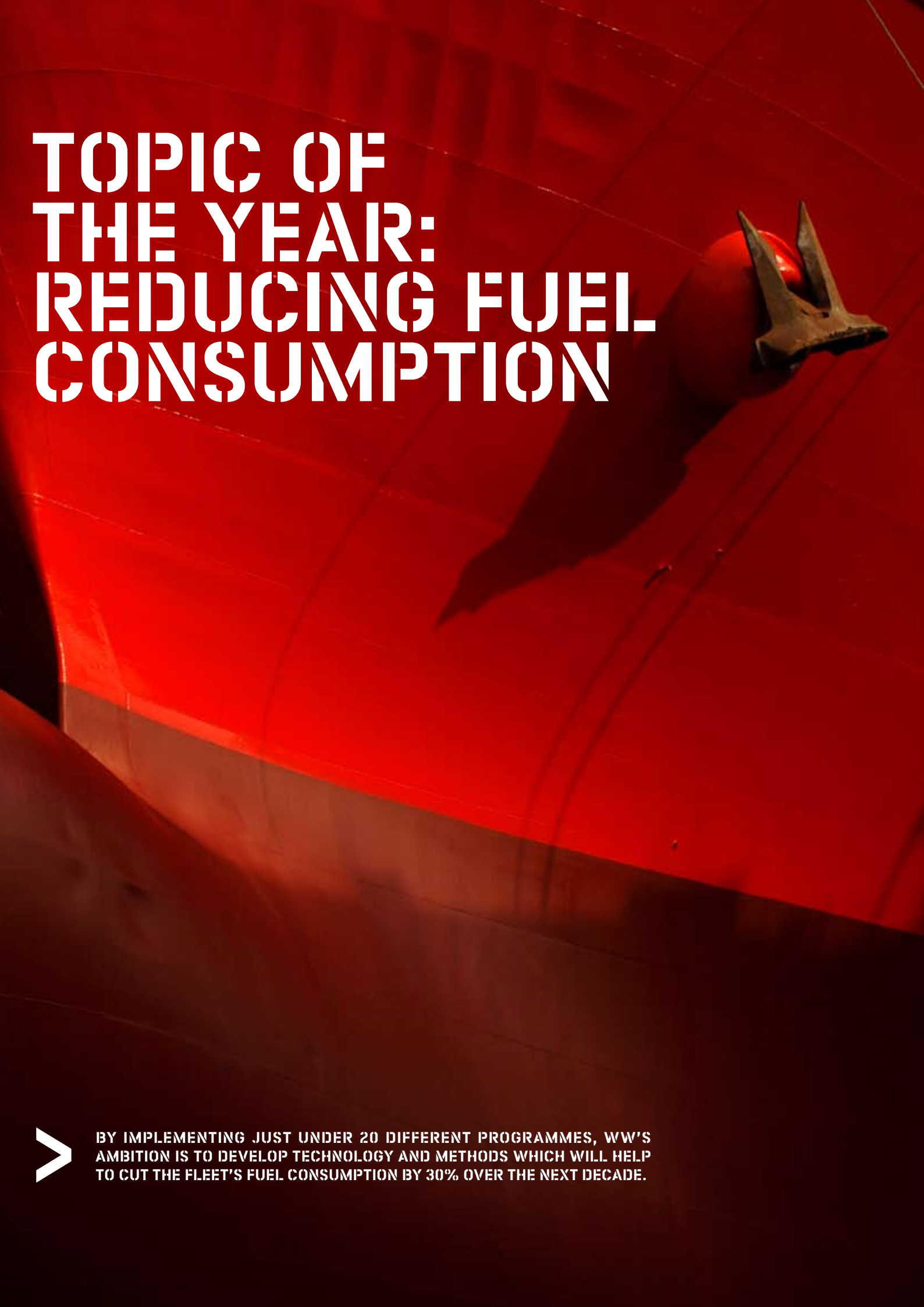
TOPIC OF THE YEAR: REDUCING FUEL CONSUMPTION



BY IMPLEMENTING JUST UNDER 20 DIFFERENT PROGRAMMES, WW'S AMBITION IS TO DEVELOP TECHNOLOGY AND METHODS WHICH WILL HELP TO CUT THE FLEET'S FUEL CONSUMPTION BY 30% OVER THE NEXT DECADE.

> TOPIC OF THE YEAR: REDUCING FUEL CONSUMPTION

Intervju with
Carl-Petter Kaltenborn
General manager
marine operations
and environment at
Wilh. Wilhelmsen ASA

Cutting the amount of fuel it consumes allows WW to create both ecological and economic value.

WW has taken delivery of six new car carriers from Mitsubishi Heavy Industries (MHI) over the past three years. These vessels are the best equipped in the world to sail in an environment-friendly and economically-efficient way around the world for several decades to come.

REDUCTIONS NEEDED

The vessels being built by WW at MHI are fitted with the most modern technology which was available when they were ordered, and their bunkers consumption has been reduced by 10% compared with similar ships delivered earlier.

"Although these carriers are far more efficient than ones delivered only a few decades ago, further reductions in bunkers consumption are possible," affirms Kaltenborn.

Asked why cutting the use of bunkers is important, he notes that two key factors are involved. "First comes concern for the environment. Burning fossil fuels produces environmentally-harmful gases. Reducing consumption also cuts the emission of such fumes. The other factor is the price of oil."

A modern car carrier consumes about 50 tonnes of bunkers per day, or 15 000 tonnes per year. A 3% reduction would cut the annual figure by almost 500 tonnes. Given an oil price of USD 300 per tonne, that corresponds to a saving of USD 150 000. At the same time, emissions would be substantially reduced. It is estimated that they would fall by 1 400 tonnes of carbon dioxide, seven tonnes of sulphur oxides and 38 tonnes of nitrogen oxides.

"In other words, cutting fuel consumption has both ecological and economic value and accordingly represents an ideal combination," says Kaltenborn.

ENERGY OPTIMISATION

Alternative sources of propulsion, such as wind power, are likely to emerge in the future. Today's vessels remain dependent on a type of bunkers which is among the heaviest oil products created by the refining process, and which contains a number of pollutants. Minimising consumption is accordingly important, and the question then is how to achieve this.

WW is implementing a number of measures from design to route planning in the hope of creating an optimum fleet in energy terms.

ALTHOUGH THESE VESSELS ARE FAR MORE EFFICIENT THAN ONES DELIVERED ONLY A FEW DECADES AGO, FURTHER REDUCTIONS IN BUNKERS CONSUMPTION ARE POSSIBLE.

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OPTIMUM DESIGN

Wilhelmsen Marine Consultants, WW's own design department, develops tomorrow's vessel types and is responsible for supervising newbuildings. It works continuously on measures to improve environmental protection for new and existing vessels.

"A working party was established in 2006 to look at the development of the ro-ro carrier of the future," Kaltenborn reports. "Since vessels have a life span of 25-35 years, a long-term approach is important when we build new ones. Ships must incorporate tomorrow's technology and be adapted to future environmental standards."

AUTOPILOTS

Efficient use of autopilots could probably help to reduce bunkers consumption by 1% through replacements, adjustments and training in correct operation.

A study of the potential offered by such upgrading is currently being conducted on WW's ships. Substantial work is also being devoted to defining requirements for crew training to ensure that the technology can be used as efficiently as possible. The results of this study are expected during the first half of 2007.

TESTING ALTERNATIVE ANTIFOULINGS

A hull fouled below the waterline can increase the vessel's water resistance by up to 20%. Greater resistance means higher fuel consumption. Ships are accordingly coated with antifouling to prevent the growth of undesirable organisms.

The degree of fouling depends of the type of antifouling applied and in what quantity. How frequently the coating is renewed and the waters trafficked are also significant.

"All our ships are coated with tin-free antifoulings in accordance with international regulations," reports Kaltenborn. "However, we're also considering other substances on the market, such as silicon-based variants. Test areas have been coated on several of our ships, and the goal is to arrive at new and better variants which can be utilised in our newbuildings – hopefully as early as 2008.

"We're also considering alternative methods of keeping the underwater hull clean, including the use of robots to remove growth without harming the antifouling. Bunkers consumption on ships with clean hulls will be 2-3% lower than on those which are fouled."

WEATHER DATA

"Fuel consumption can be increased by up to 15% as a result of weather conditions and sea states," Kaltenborn points out. "Exploiting available weather data to optimise the voyage route accordingly offers substantial fuel savings. Nor must we forget the fact that extremely bad weather increases the risk of accidents at sea. So finding optimum sailing routes is an important element in reducing the threat of harm to crew or vessel."

cont on next page ›

WW's fleet consumed just under 400 000 tonnes of bunkers in 2006. The goal is to reduce that figure by 30% over the next decade.

OUR CREWS TAKE MANY IMPORTANT DECISIONS WHICH HAVE A DIRECT INFLUENCE ON THEIR VESSEL'S FUEL CONSUMPTION.

› *Cont from previous page*

WW's ships are in continuous touch with meteorological services to assist route planning. The goal is to choose the optimum journey. Vessel resistance, and thereby bunkers consumption, rises with bad weather and/or opposing currents.

Various suppliers offer technology for assessing weather, wind and waves, and for analysing such data. As operator of the vessels, WWL chooses which systems to utilise, but it is up to the crew to make effective use of them.

WWL launched a programme in 2006 to upgrade systems for delivering weather data. Attention in WW was focused on electronic methods for processing the information. Combined with thorough crew training, such methods will give ship's masters an effective decision-making base when selecting which route offers the best solution in energy terms.

Trim and ballast water

A ship's trim is an expression of its fore-and-aft angle to the water. Correct trim can reduce fuel consumption by 2-3%.

"We launched a project in 2006 to assess the trim tables for our ships in detail, and to look at what effect trim had on speed and fuel use," says Kaltenborn. He emphasises that calculating trim and ballasting needs is very complicated, since cargo composition and distribution as well as bunkers intake can vary right up to the point when the cargo physically comes board. Once it has been loaded, the master can only adjust trim with the aid of ballast water.

Technological innovations

The two latest additions to the WW fleet, m/v *Tombarra* and m/v *Tortugas*, are equipped with technology for analysing the main engine's working parameters. "We're also testing software to identity and permit cuts in fuel consumption," says Kaltenborn.

Broadband on-line communication was installed on m/v *Tampa* in the autumn of 2006.

"Timely communication is central to fuel saving," Kaltenborn emphasises. "A close dialogue between ship and land can adapt the vessel's speed to weather conditions and the possible timing of loading and discharging, for instance. We expect to make installations on a continuous basis after the test is completed, both for existing tonnage and newbuildings."

Human factors

Putting everyone who can influence fuel savings in a position to take the right decisions represents an important part of WW's environmental responsibility.

Kaltenborn regards this as perhaps the most important dimension for reducing bunkers. "Our crews take many important decisions which have a direct influence on their vessel's fuel consumption. We devote much work to increasing crew expertise on and awareness of energy-optimal vessel operation."

WW regularly stages officer conferences where environment-friendly operation of ships is high on the agenda.

The master of each vessel is responsible for

day-to-day supervision, and for taking the measures needed to protect the maritime environment. Ship inspectors are responsible for technical monitoring, and propose specific environmental measures on board. Priority areas for inspections are health, safety and the environment. In addition to assessing vessel condition, crew are interviewed and emergency response exercises staged. Courses are also provided on board, along with discussions of how the crew can contribute, on its own or together with the land organisation, to improving both safety and environmental protection even further.

Ambitious target

WW launched an innovation initiative in 2006 with the aim of adopting measures which can partly contribute to creating a more environmentally-adapted fleet. One target is to develop solutions to help reduce bunkers consumption.

"A lot of people in the industry see a need for a revolution on the fuel side which matches the transition from sail to steam," says Kaltenborn. "Such changes aren't possible at present, but work on reducing consumption will continue with undiminished vigour in 2007. By implementing just under 20 different programmes, our ambition is to develop technology and methods which will help to cut our fleet's fuel consumption by 30% over the next decade."

On long intercontinental voyages, WW's ships are in contact with meteorological services which provide information about expected weather conditions. On the basis of this information, the energy-optimum route can be chosen. Weather forecasts are continuously updated during the voyage so that plans can be adjusted.

REGISTRATION AND ANALYSIS

WW uses quarterly measurements to check that its vessels are operated within acceptable environmental parameters.

1:

SULPHUR CONTENT IN BUNKERS

About 395 000 tonnes of bunkers was consumed on ships controlled by WW and operated in WWL, with an average sulphur content of 1.61% in 2006. This represented a decline of 2.2% since 2005 or 43% since 2000.

WW's goal is to reduce the sulphur content in bunkers to 1.5%.

Since low-sulphur bunkers is more expensive to produce than other grades, WW is willing to pay a higher price for fuel which causes lower emissions. The additional cost of using low-sulphur bunkers in 2006 amounted to roughly USD 12 million for WW's total business.

Table 1 shows the average percentage sulphur content in bunker oil in 2006 for that part of WW's fleet which operates in WWL. The sulphur figures are directly related to bunkers purchases and based on laboratory measurements of samples taken every time the vessels load bunkers. The bunkers quality of low-sulphur products varies in different geographical areas, and bunkers with a higher sulphur content has to be used in some cases to ensure acceptable operation of the ships.

The IMO requires that the sulphur content in bunkers must be lower than 4.5%. A maximum limit of 1.5% was set in 2006 for vessels sailing in the Baltic, and is due to be extended to the North Sea in 2007. Similar restrictions will also be introduced elsewhere in the world in the time to come, helping to boost demand for low-sulphur bunkers.

2:

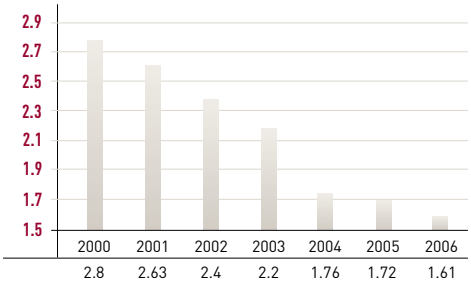
OIL SPILLS BY THE FLEET

Only one accidental oil spill was registered in 2006, involving a total of 10 litres of hydraulic oil. See table 2. Although this spill is regarded as very small, and the oil in this instance had a high viscosity and vaporised easily, the WW group takes such incidents seriously.

Good seamanship and routines help to yield positive results. The group seeks to prevent accidents through training and motivational efforts. Accidents or incidents are analysed to identify the underlying causes so that similar episodes can be avoided.

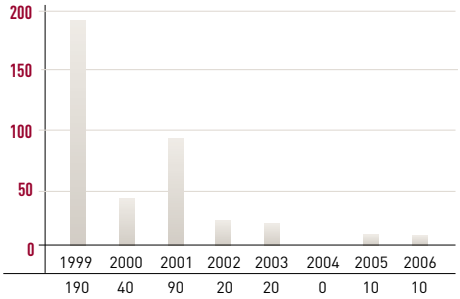
BSM launched a safety campaign on its vessels in 2006 under the slogan Aim for Number 1. This focuses on risk analysis and preventive working methods.

1: > AVERAGE PERCENTAGE SULPHUR CONTENT IN MAIN ENGINE BUNKERS ON WW VESSELS OPERATED BY WWL



Average percentage sulphur content

2: > OIL SPILLS BY THE FLEET (LITRES)



Oil spills (litres)

3:

FLEET'S TOTAL NITROGEN OXIDE EMISSIONS

Table 3 shows average emissions for all WW-owned ships in 2006 by vessel type (see definitions on page 28). Registered emissions are calculated on the basis of the ship's service speed and cargo volume, and say something about emissions measured in grams per tonne cargo capacity per transported kilometre. Emissions of nitrogen oxides are based on theoretical calculations from the ship's engines.

Engine efficiencies between the ships, cargo hold volumes and sailing speeds yield variations in emissions. Newer vessels have lower nitrogen oxide values, in part because of more environment-friendly engines.

Average nitrogen oxide emissions are declining as WW builds new ships with an improved emission profile. WW is constantly evaluating opportunities for better registration and alternative methods for achieving further reductions.

Table 4 shows an improvement to 0.274 grams/tonne/kilometre in 2006 for wholly-owned and time chartred tonnage. This reflects the delivery of more modern tonnage. The reduction since 2000 is 19.4%, so the target of 25% by the end of 2007 appears to be within reach with the present newbuilding programme.

4:

FLEET'S CARBON DIOXIDE EMISSIONS

The IMO introduced guidelines in 2006 on voluntary registration of carbon dioxide emissions. Such registration is directly related to bunkers consumption and is based on one tonne of bunkers emitting about 3.1 tonnes of carbon dioxide.

Emissions from the WW fleet operated by WWL rose by 2.2% from 2005 because of higher bunkers consumption. That in turn reflects an increase in the number of WW-controlled vessels operated by WWL, corresponding to a fleet expansion of 4%. In relative terms, therefore, emissions were reduced.

Table 5 shows average carbon emissions per gram per cargo capacity per transported kilometre, based on the supplier's values for the main engines on WW's ships.

Vessel operation is dependent on fossil fuel, and consumption of fuel depends in turn on a number of factors. WW is working systematically to study a range of factors which will help to reduce bunkers consumption even further – and thereby also carbon emissions.

5:

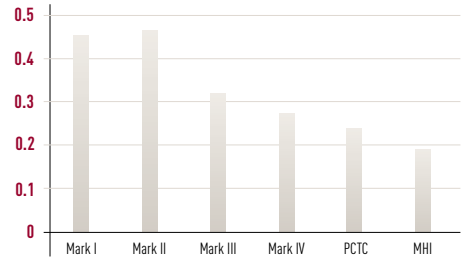
FLEET'S CONSUMPTION OF CHEMICALS

Table 6 shows consumption of refrigerants from 1999-2006. These substances are used in air conditioning plants and for keeping provisions cold on the ships.

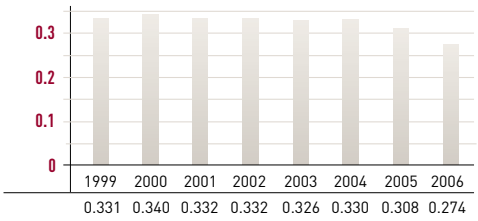
WW's goal is to reduce the use of HCFCs and hydrofluorocarbons (HFCs) and to replace older refrigerants with more environmentally-adapted products.

The volume of purchased coolants and the registration of stocks on each ship help the group to measure consumption and take action to achieve further improvements. The target for 2006 was a reduction of 10% in consumption. This was not reached, primarily because of breakdowns in older air conditioning plants. A repair programme has accordingly been launched. Routines have also been instituted for checking systems and replacing refrigerants to prevent further breakdowns and pollution.

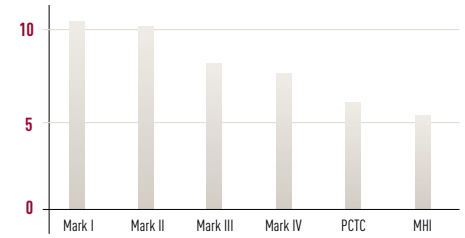
3: > AVERAGE NO_x EMISSIONS (g/t – km) BY VESSEL TYPE



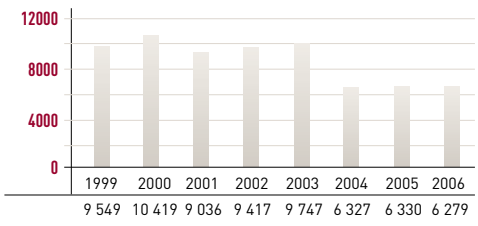
4: > AVERAGE NO_x EMISSIONS (g/t – km) BY 31 DECEMBER



5: > TABLE 5 AVERAGE CO_2 EMISSIONS (g/t – km) BY SHIP TYPE



6: > TABLE 6 HCFCS/HFCS (KG)



ENVIRONMENTALLY-ADAPTED PRODUCTS FOR THE WHOLE SHIPPING INDUSTRY

UNITOR CHEMICALS IS COMMITTED TO RESEARCH AND DEVELOPMENT, AND NEW AND MORE ENVIRONMENTALLY-ADAPTED PRODUCTS ARE CONSTANTLY SEEING THE LIGHT OF DAY.

> ENVIRONMENTALLY-ADAPTED PRODUCT DEVELOPMENT

Through the world's largest maritime network, WW can contribute to developing environmentally-adapted products for the whole shipping industry.

Unitor Chemicals at Kjøpmannskjær south of Oslo, Norway delivers chemicals for shipboard use. Research is highly prioritised to continously develop new and more environmentally-adapted products.

Environmental work in WW has previously focused first and foremost on environmentally-adapted operation of its own vessels. With the acquisition of Unitor in the summer of 2005, the group can now contribute actively to the development of environmentally-tailored products for the maritime sector.

The Barwil Unitor Ships Service business unit, established by WW's wholly-owned Wilhelmsen Maritime Services subsidiary in 2006, ranks as the largest and most extensive maritime network in the world. It combines the strength of Barwil's port services with Unitor's market-leading products for shipboard use.

Unitor Chemicals at Kjøpmannskjær south of Oslo delivers chemicals for shipboard use. Research and product development have a high priority in the hunt for ever better and more environmentally-adapted products.

CHEMICALS

ISO 14001 certification

The use of chemical products can account for a substantial proportion of the total burden imposed by a ship on the natural environment.

In the Barwil Unitor system, responsibility for delivering chemicals to be used on ships rests with Unitor Chemicals at Kjøpmannskjær south of Oslo.

As a consequence of its long-standing and purposeful commitment to developing environmentally-adapted chemicals, Unitor Chemicals became the first company of its kind in Norway to secure ISO 14001 certification in 2000. Recertified in 2006 by Det Norske Veritas, its environmental management system covers product development, production, warehousing, distribution and marketing of marine chemicals.

Certification also requires sub-suppliers of product components, knowledge and services to have a satisfactory environmental management system. Unitor Chemicals consistently uses chemical companies with substantial resources as suppliers and partners for research and development. These include Shell, Exxon, Akzo Nobel, BASF, Total and Ceca. This gives Unitor Chemicals' marine customers an assurance that every link in the supplier chain which could have a potential impact on the natural environment is under control and accords both with the ISO 14001 standard and with applicable environmental regulations.

Use of environmentally-adapted products

Researching, developing and marketing environmentally-adapted products are not enough in themselves. These products must be brought

RESEARCHING, DEVELOPING AND MARKETING ENVIRONMENTALLY-ADAPTED PRODUCTS ARE NOT ENOUGH IN THEMSELVES.

to market and actually adopted in practice. To have a genuine impact on the environment, it is crucial that environmentally-harmful products are actually removed from the market and replaced by less damaging alternatives.

According to the Norwegian Product Control Act, the end user of chemical products which could have a negative impact on health or the environment must assess whether alternatives are available which reduce the risk of such effects. If so, the alternative must be preferred providing this is possible without unreasonable expense or inconvenience (duty of substitution).

A chemical developed in accordance with the ISO 14001 standard must not only have an environmentally-adapted formulation. The market and the individual user must consider its performance to be just as effective as, and its price to be competitive with, the product to be replaced. Unitor Chemicals has accepted this requirement. The goal is that all new environmentally-adapted products must be at least as cost-effective as existing chemicals on the market. This is the only way to ensure that the new products are taken up and thereby have a genuinely positive impact on the environment.

The company's ability to meet these special demands is demonstrated by the steady increase in the number of ships using such environmentally-adapted products as Enviroclean, Aquabreak PX and Aquatuff. The graph on the right shows that the number of vessels using these products rose significantly during 2006, in line with the Unitor Chemicals target for the year.

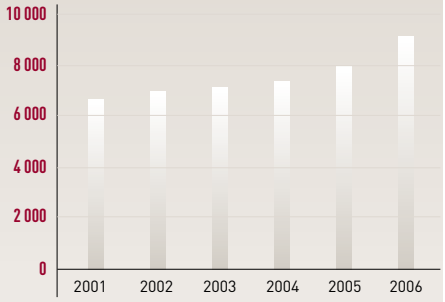
Another method used by Unitor Chemicals to measure how far new environmentally-adapted products are taking market share from more conventional solvent-based substances is to measure the percentage distribution of sales. As the graph below shows, the trend is very clear and in line with the company's targets.

To be classified as environmentally-adapted, a chemical product must present a low risk during transport, storage and use. Converting to such a product must also have a positive effect on general shipboard safety and health conditions.

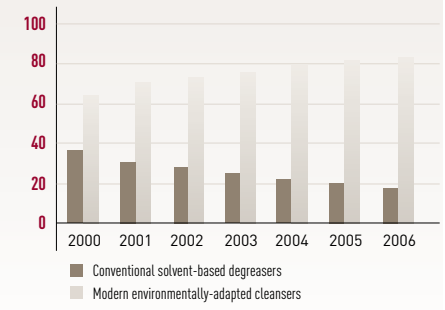
Safe use of chemicals embraces more than their properties. The way they are applied is just as important. Each product is accordingly supplemented with a label which provides full user guidance, a health and safety datasheet and a large range of dosing systems and equipment needed to apply the chemical in the safest, most economic and most efficient way.

Unitor Chemicals developed and introduced three new environmentally-tailored marine chemicals in 2006. Slip Coat, Unipol and

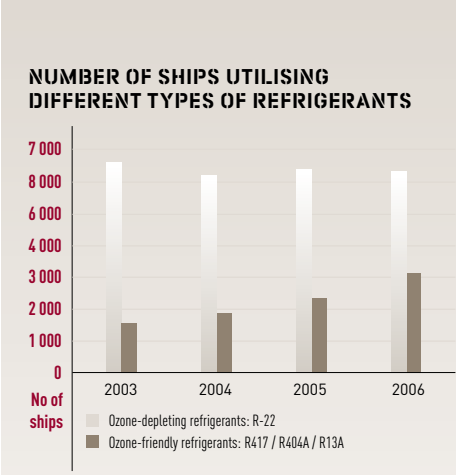
VESSELS USING AQUABREAK PX, AQUATUFF AND/OR ENVIROCLEAN



PERCENTAGE SHARE OF SALES OF ENVIRONMENTALLY-ADAPTED PRODUCTS



BARWIL UNITOR SUPPORTS INTERNATIONAL INITIATIVES TO BAN THE SUPPLY OF REFRIGERANTS IN DISPOSABLE CYLINDERS WHICH INVOLVE UNNECESSARY EMISSIONS OF RESIDUAL GASES.



Aquatuff High Foam are all specially tailored for cleaning chemical tanks and cargo spaces. The first of these represents a completely new technology. By forming a thin film between cargo and bulkhead which can be washed away with water after discharging, it provides cleaner surfaces in the cargo hold with lower use of chemicals in a shorter time. This concept has proved extremely successful for dry cargoes. Over time, it will be expanded with more products specially adapted for "wet" cargoes.

New detergent directive

The EU implemented regulation EC no 648/2004 (the detergent directive) in 2006, with a final deadline for compliance on 1 January 2007. This directive sets new and stricter environmental standards for the composition and labelling of washing and cleaning products produced by, imported to or sold in the EU.

All Unitor Chemicals detergents meet the new standard in terms of both content and labelling. Nonylphenols, for instance, are a group of substances which have now been forbidden because of documented hormone-disrupting properties. They were replaced in all Unitor Chemicals products with more environment-friendly alternatives as far back as 1996.

Another requirement in the directive is that continuously-updated health, safety and environmental datasheets must be available on the internet. This was implemented for all Unitor Chemicals products produced from the 1990s to the present day. These datasheets are also included in every label, so that users have easy access to the necessary information – a feature which remains unique in the maritime market.

REFRIGERANTS

Refrigerants are also part of the Barwil Unitor product portfolio. The use of such substances has attracted much attention in recent years as environmental regulations become progressively more stringent. The Montreal and Kyoto protocols, as well as new EU regulations, aim at phasing out ozone-depleting substances such as the R-22 HCFC refrigerant. Strict curbs are also placed on the emission of all types of synthetic refrigerants.

The IMO, through Marpol's Annex VI, and the major classification societies have adopted these regulations and introduced appropriate measures for shipping. In parallel, Barwil Unitor has worked on innovative solutions which can ensure that customers operate efficiently within applicable regulations.

Ozone-friendly refrigerants

In line with the Montreal Protocol, Barwil Unitor has worked actively to promote a shift from ozone-depleting refrigerants to ozone-friendly alternatives. Although some 70-80% of the world's merchant fleet still operates with R-22 in its systems, the trend towards ozone-

friendly HFC refrigerants in the marine industry is obvious. About 30% of Barwil Unitor's customers are now using such alternatives. The graph on the left shows the number of ships buying Unicool R-22 versus the number of ships buying ozone-friendly refrigerants such as Unicool R-404A, R-417A and R-134a.
As the world's largest supplier of refrigerants to the marine industry, Barwil Unitor owns the world's largest fleet of refillable refrigerant cylinders in 56 and 12.3 litre sizes. This supports international initiatives to ban the supply of refrigerants in disposable cylinders which involve unnecessary emissions of residual gases.

Refrigeration products and services

Barwil Unitor offers a wide range of products and services which satisfy the industry's stringent requirements for quality and efficiency. In addition to all types of system components and compressors, it offers refrigerant recovery packages and a fixed system which can detect leaks of all types of refrigerants.

The Catch R-22 initiative was launched by Barwil Unitor in 2005 to promote the shift from ozone-depleting products such as R-22 to an ozone-friendly alternative. So far, several hundred systems have successfully changed over. Since Barwil Unitor ranks as the world's largest maritime network, customers are assured of refrigerant supplies and follow-up worldwide.

A steadily growing number of users are taking advantage of the environmental systems inspection (ESI) programme. This annual survey can identify possible leaks, supply a status report on the refrigeration system and provide advice when planning future maintenance.

Refrigerant handling

The process of phasing out of ozone-depleting substances, such as chlorofluorocarbon (CFC) and HCFC refrigerants, calls for international waste management systems to ensure that such products are removed and destroyed in a legal and environmentally sound manner.

As the largest supplier of refrigerants to the marine industry, Barwil Unitor has addressed this requirement by introducing its Enviro Return Management (ERM) programme. This unique waste management system permits lawful import and disposal of a variety of ozone-depleting substances. It has been implemented in major European ports and in Singapore, and efforts are under way to extend the system to selected ports in the rest of the world.

Almost 4.3 tonnes of different ozone-depleting substances were disposed of through the ERM system during 2006.

Recovery cylinders are required to hold and transport refrigerants for disposal. In addition to outright sales, Barwil Unitor has introduced a rental system to enhance its availability for the shipping sector.

Barwil Unitor offers complete packages for recovery of refrigerant from systems on board. The picture shows one of Barwil Unitor's service engineers in action recovering refrigerant.

GLOSSARY

Bunkers: Collective term for fuel oil used on ships. Its origin is uncertain, but could derive from the English word "bunk" – a storage space on vessels for sails and in times past for coal (or for people – bunk = bed). Steamers stored their coal in a coal bunker.

Heavy oil: A collective term for residues from oil refining. It comprises a blend of substances left over from processing and necessary components which make it useable as fuel.

Antifouling	Normally contains toxic compounds to prevent marine growth. Non-toxic products are gradually being introduced to the market.
Aquabreak PX	Product name for an environmentally-adapted cleaning agent which can be used throughout the ship.
Aquatuff	Product name for an environmentally-adapted cleaning agent used in cargo holds.
Ballast water	Contains micro-organisms which can cause harm outside their home environment. Ballast water is taken on board during the discharge of a cargo to improve a vessel's stability, changed while at sea and pumped out when the next cargo is loaded.
Barnacles	Organisms which grow on the underwater hull and increase its resistance to the water.
Bilge water	Dirty water which collects in a ship's bilges and may be contaminated with small quantities of oil from engine room drains, etc.
Bilge water flocculant	Chemical used to separate oil from waste water.
BSM	Barber Ship Management.
CFC	Chlorofluorocarbon compounds. See HCFC.
CO_2	Carbon dioxide – a combustion product from burning all types of fuel. The amount of carbon dioxide in the atmosphere may increase the temperature at the Earth's surface – known as the greenhouse effect.
Enviro Return Management	System for legal and environment-friendly management of used ozone-depleting refrigerants
Enviroclean	Product name for an environmentally-adapted degreasing agent for engine rooms and tank cleaning
Environmental system inspections	Inspection of refrigeration systems to ensure optimum operating conditions and prevent leaks
EPA	Environmental Protection Agency
Gamazymes	Bioactive cleaning agents used in galleys, crew quarters and passenger sections on cruise liners.
g/t-km	Denotes emissions in grams per tonne of cargo shipped over a kilometre.
Green Passport	A certificate which confirms which materials have been used in a vessel's construction
Halon	Previously used on ships as an effective fire-extinguishing medium, harmful to the ozone layer in the atmosphere.
HCFC	Hydro-chlorofluorocarbon compounds, such as freon 22 (R22).
HFC	Hydrofluorocarbon.
HFO	Heavy fuel oil. Used in ship's engines and boiler systems.
IMO	International Maritime Organisation. Body created to regulate international maritime trade.
Incinerator	Used to burn waste and sludge.
ISO 14000	ISO standard for environmental management.
Kyoto protocol	International agreement, adopted under the UN Framework Convention on Climate Change (UNFCCC), which aims to reduce greenhouse gas emissions.
Low NO_x nozzles	Fuel valves specially developed to reduce formation of nitrogen oxides (NO_x) from combustion.
LSFO	Low-sulphur fuel oil (bunkers)
Mark I	WW designation for ro-ro carriers built in 1978-79.
Mark II	WW designation for ro-ro carriers built in 1984.
Mark III	WW designation for ro-ro carriers built in 1996.
Mark IV	WW designation for ro-ro carriers built in 2000-01.
Marpol	IMO convention on the prevention of marine pollution. Regulates environmental pollution by ships.
MDO/MGO	Marine diesel oil/marine gas oil.
MHI	Car carriers built at Mitsubishi Heavy Industries in 2004-06.
Montreal protocol	International agreement which aims to protect the ozone layer. Forms part of the UN Environmental Programme (UNEP).
Nitrogen oxides (NO_x)	Environmentally-harmful gases formed by the engine's combustion process.
OWS	Oily water separator.
PCC	Pure car carrier.
PCTC	Pure car and truck carrier.
ppm	Parts per million (1 ppm = 0.000001 or 1 mg/kg).
Recovery package	Advanced equipment package for secure recovery of refrigerants. Satisfies all relevant marine regulations.
Refrigerants	Used in refrigeration and freezing plants.
Reg (EC) 2037/2000	EU regulation covering ozone-depleting substances which seeks to protect the ozone layer.
Ro-ro	Roll-on, roll-off carrier tailored to transport heavy rolling cargo and static cargoes.
Seca	Sulphur oxide emission control area – a sea area defined by the IMO where the sulphur content of bunkers must not exceed 1.5% or emissions of sulphur oxides to the air must be below 6 g/kWh.
Slide valve	Fuel valves which are fully emptied on each stroke, and thereby counteract afterburning.
Sludge	Mixture of water and oil formed during treatment of heavy fuel oil.
Sulphur oxides (SO_x)	Sulphur in the bunkers oil combines with oxygen in the combustion process to form sulphur oxides. These react with moisture in the air to produce sulphurous and sulphuric acid.
Swedac	Swedish Board for Accreditation and Conformity Assessment.
TBT	Tributyltin, used in tin-based antifouling.
Unicool	Barwil Unitor's maritime refrigerants.
Viscosity	A liquid's resistance to flow.
WLS	Wilhelmsen Lines Shipowning.
WMC	Wilhelmsen Marine Consultants.
WMS	Wilhelmsen Maritime Services.

OUR CUSTOMERS MUST BE CONFIDENT THAT THEIR GOODS AND PRODUCTS ARE TRANSPORTED IN THE MOST ENVIRONMENTALLY-CONSIDERATE WAY POSSIBLE. OUR AMBITION IS TO BE A LEADER IN ENVIRONMENTALLY-ADAPTED SHIPPING.

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