



ENVIRONMENTAL CHALLENGES AND SOLUTIONS

The modern world has a growing demand for ocean transport. However, shipping is considered the most environment-friendly way of moving goods around the world, considerable challenges must be overcome to ensure that this form of transport takes even better account of environmental considerations.

As a company dedicated to ocean transport and logistics, WW's aim is to reduce the impact of its cargo-carrying operations. Its vision is to improve operations continuously in seeking to achieve zero emissions, and thereby contribute to a cleaner global environment.

Emissions to the air

WW aims to cut fuel consumption by its fleet in order to reduce the group's impact on the global environment. The long-term ambition is a zero-emission operation, as symbolised by the Orcele concept vessel, which utilises wind, solar and wave power.

Carbon dioxide (CO₂) and nitrogen oxides (NO_x) are produced from the combustion of fossil fuels such as bunkers. Burning bunkers containing sulphur also generates gases which contain harmful sulphur oxides (SO_x). Emissions of sulphur oxides partly reflect the percentage of sulphur contained in the heavy oil used on ships.

While carbon dioxide is to be regarded as a greenhouse gas on a global basis, nitrogen and sulphur oxide emissions will be more local in character and primarily affect the immediate environment – particularly in coastal districts. These gases lead to eutrophication and acidification of soil and water, and could be harmful to human beings. This effect will obviously be strongest in ports, even though acid precipitation is also

known from more distant areas to which sulphur oxides and nitrogen oxides are carried by the wind.

FUEL SAVING REDUCES CARBON EMISSIONS

Carbon emissions from vessels controlled by WW and operated by WWL were reduced by 1.6% from 2005/2006 to 2007, measured per tonne of cargo shipped per nautical mile sailed during the time spent at sea. This was achieved despite an extremely tight market position, which prevented implementation of several measures available to control speed and consumption performance.

These vessels also managed to cut fuel consumption in general. Using 2.6% less bunkers in 2007 compared with 2006 reduced carbon emission by 32 000 tonnes. The vessels carried 8% more cargo in 2007. Efforts made to deploy the tonnage efficiently, including coastal movements and time in port, have helped to cut bunkers consumption by 10% per tonne of cargo.

Predictions indicate that ocean transport will remain dependent on hydrocarbon fuels in the foreseeable future. Since no satisfactory technology is currently available for cutting carbon

Key figures

- 31.7% reduction in nitrogen oxides in 1999-2007, and 10.9% in 2006-07.
- 53.5% reduction in sulphur oxides in 2000-07, and 19.25% in 2006-07.
- 2.6% reduction in bunkers consumption from 2006-07.



dioxide released from ship's engines, WW sees fuel reduction as the essential means for curbing these emissions.

Fuel-related measures will again focus in 2008 on obtaining both lower consumption and reduced emissions. To reach its zero emission vision, WW will also continue to collaborate both with universities and with other companies to develop alternative fuels and new propulsion technology.

WW is implementing five specific fuel and emission reducing projects:

■ Ambitious newbuildings: reduced fuel consumption combined with higher cargo capacity cuts emissions per cargo unit by 10-15% on the new ro-ro vessels on order compared with the former generation of such carriers. A turbo generator will turn exhaust heat into electricity.

■ Innovative partnership: together with Shell Marine Fuel and Det Norske Veritas, WW has taken the lead in a joint industry project for sustainable propulsion. The project targets are ambitious: reductions of 30% in carbon dioxide, 50% in nitrogen oxides and 90% in sulphur oxides

for existing pure car and truck carriers (PCTCs). WW's 10 newest PCTCs from Mitsubishi will serve as a test laboratory.

■ Energy management system to save fuel: WW is testing a decision-making tool, which will help crew to find optimum realtime sailing conditions. A pilot installation has been tested on one vessel, with an estimated 3-5% fuel reduction. Four new installations are expected in 2008.

■ Fuel-saving campaign: in 2008, WW will launch a campaign on its vessels for reducing fuel consumption at sea.

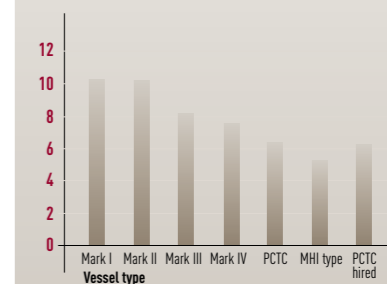
■ Keeping a smooth hull: a completely non-toxic silicon-based anti-fouling expected to provide a 5% reduction in fuel consumption, is under extensive testing.

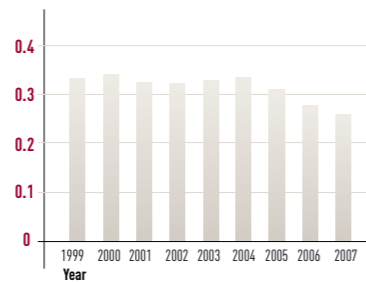
Did you know that...

- WW reduced its bunkers consumption by 2.6% in 2007, cutting 32 000 tonnes in carbon emissions.
- For every tonne of bunkers saved, carbon emissions are reduced by three tonnes
- WW transported 8% more cargo in 2007, but used 10% less bunkers per tonne of cargo.

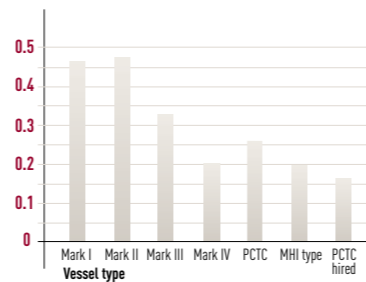
Regulations:
No international agreements currently restrict the release of carbon dioxide from international shipping. However, the IMO encourages voluntary reporting of such emissions.

Average carbon emissions (g/t-km) per vessel type based on main engine kW at 85% load at cargo capacity.

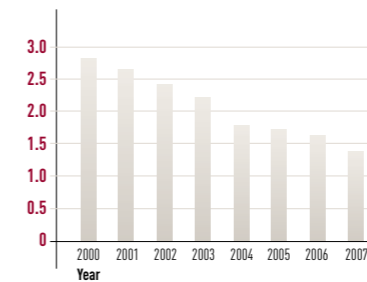




Average nitrogen oxide emissions (g/t-km) by 31 Dec.



Average nitrogen oxide emissions (g/t-km) by vessel type



Average per cent sulphur in bunkers for WW vessels operated by WWL

Fleet renewal and machinery optimisation cut nitrogen oxide emissions

WW established a goal in 1999 of a 25% reduction in nitrogen oxide emissions by 2008. This target was met in 2007, when WW-controlled vessels operated by WWL recorded a reduction of 31.7% in emissions from 1999. If vessels operated by Mark 1 Shipping (owned 50% by WW) are included, the target for 2007 was a 22.3% reduction.

Cutting fuel consumption makes an important contribution to releasing fewer nitrogen oxides to the air. Newer vessels use significantly less bunkers than older ships, since various measures such as hull and propulsion design reduce consumption considerably. Emissions can also be cut to some extent with the aid of engine technology solutions which improve the combustion process.

The market for carrying cars and rolling cargo is tight, and phasing out older tonnage has not been possible. However, WW has introduced

several newbuildings to its fleets with reduced nitrogen oxide emissions.

On older tonnage, WW is striving to make technical improvements to existing engines which also help to cut emissions. One example is the modification of slide valves on ro-ro vessels delivered in 2000-01 (Mark IV).

WW is also developing a technology through the Yarwil joint venture which will reduce nitrogen oxide emission by up to 95%. This technology is primarily intended for smaller engines rather than the slow-speed main engines used on WW's vessels. It will be developed further to be applicable on these engines. For more information, see page 84.

WW expects nitrogen oxide emissions to decline gradually towards zero as new vessels are introduced to the fleets and innovative technology is developed.

Did you know that...

A 31.7% reduction in nitrogen oxide emissions was achieved on WW-controlled vessels operated by WWL between 1999 and 2007.

Three important initiatives to cut nitrogen oxide emissions:

- 1) Fleet renewal
- 2) Machinery optimisation
- 3) Introducing a new technology through Yarwil which can reduce nitrogen oxide emissions by as much as 95%

Regulations:

Emissions of nitrogen oxides 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 vessels. These regulations apply only to tonnage built after 2000. In addition, taxes are increasingly being introduced for specific geographical areas to limit emissions further.

Reducing sulphur content cuts sulphur oxide emissions

WW-controlled vessels in WWL consumed some 386 000 tonnes of bunkers in 2007. The average sulphur content of this fuel was 1.37%, which is considerably better than the group's 1.5% goal and 15% down from 1.61% in 2006.

WW's fleet makes considerable use of low-sulphur bunkers. The group accepted an additional cost of about USD 10.5 million in 2007 from buying such fuel.

The goal for 2008 is still to use bunkers with a sulphur content of less than 1.5% worldwide.

Emissions of sulphur oxides can be cut by using low-sulphur bunkers or by scrubbing exhaust gases when this yields a corresponding effect on emissions. WW distributes Krystallon's scrubber system for sulphur oxides and particulate matter, which can cut emissions by up to 98%. For more information, see page 84.

Did you know that...

- The average sulphur content was a low 1.37% in bunkers used by WW-controlled vessels operated by WWL in 2007, down by 15% since 2006
- Using low-sulphur fuel incurred an additional cost of USD 10.5 million for WW in 2007.

Regulations:

Emissions of sulphur oxides are regulated by the IMO through Marpol to 4.5% and by the introduction of geographical areas where the release of sulphur is restricted to 1.5%.

The average sulphur content was a low **1.37%** in 2007.

Leaks from refrigeration and fire systems

Reducing refrigerant leaks has a high priority, since such escapes can release hazardous gases. A cut of 27.16% was achieved from 2004-2007.

WW continuously monitors refrigerant emissions on the basis of quantities purchased and stocks on each vessel. Old refrigerants on ships are being replaced with a more environment-friendly medium.

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. Systems are subject to systematic maintenance to prevent leaks. WW is replacing old refrigerants to more environmentally friendly solutions on board the vessels.

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. For more information, see page 86.