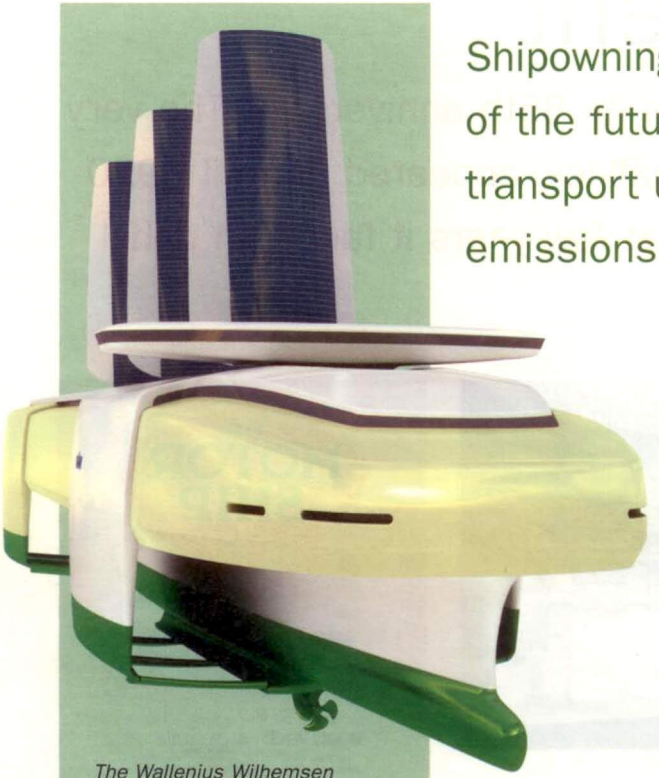
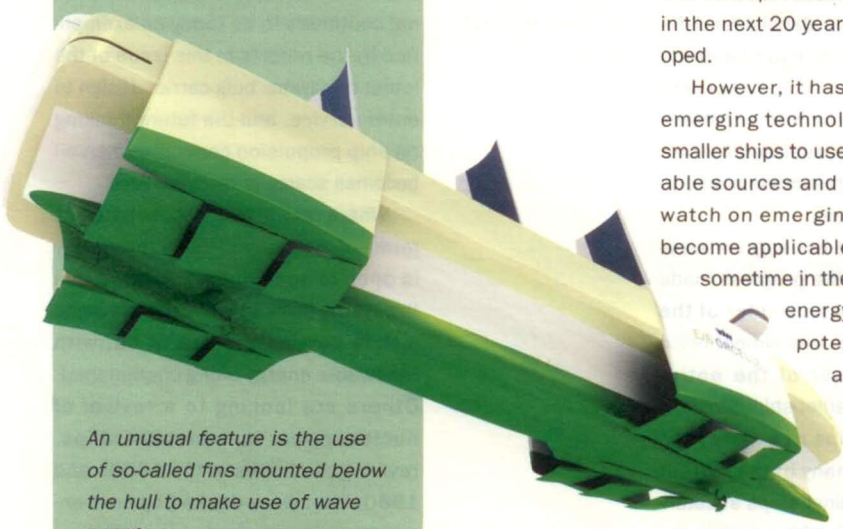
E/S Orcelle – a concept

Shipowning group Wallenius Wilhelmsen has a vision of the future – an environmentally friendly ocean transport unit for 2025 that does not release any emissions into the atmosphere or the oceans



The Wallenius Wilhemsen design is futuristic in appearance but based on sound, if advanced, thinking



An unusual feature is the use of so-called fins mounted below the hull to make use of wave energy

The *E/S Orcelle* uses renewable energy sources and fuel cells to generate the energy required to power the vessel. Its highly advanced design provides optimum cargo capacity to transport cars and other goods around the world more efficiently.

Sustainable shipping depends on the use of new technologies and on the utilisation of energy from renewable sources. Wallenius Wilhelmsen believes that the future of the shipping industry lies in using the energy sources already available at sea – solar, wind and wave energy.

Even so, the company is well aware that the technologies required to enable this concept vessel to become a reality in the next 20 years need to be developed.

However, it has observed various emerging technologies that enable smaller ships to use energy from renewable sources and is keeping a close watch on emerging trends that may become applicable to larger vessels sometime in the future. Renewable energy sources have the potential to provide an abundant supply of energy with minimal environmental impact and at relatively low cost.

A more versatile vessel

The *E/S Orcelle* will have an optimum cargo capacity of 85,000 m² of cargo deck area, which is up to 50% more than today's modern car carriers that can transport 6,500 vehicles. Hence it will be capable of transporting up to 10,000 cars on eight cargo decks, three of which will be adjustable to accommodate cargo of different heights and weights.

Compared to today's vessels, the use of a pentamaran hull and renewable energy will help optimise the vessel's cargo capacity and give it a maximum deadweight of 13,000 tonnes . This is said to be around 3,000 tonnes more than the equivalent conventional vessel thanks to the use of aluminium and thermoplastic composites in its construction and the elimination of ballast water.

Conceptual work on the design began in 2004 and is ongoing and Wallenius Wilhelmsen envisages a service date of 2025 for the design.

No ballast water

According to IMO, ballast water is one of the four major threats to the world's oceans. The *E/S Orcelle* will remove this threat by eliminating the need for ballast water thanks to its pentamaran hull design and the elimination of a traditional stern propeller and rudder requiring immersion.

No emissions

The *E/S Orcelle* will sail with zero emissions. It is to be powered by renewable energy sources including solar, wind and wave energy, to be used in combination with a fuel cell system powered by hydrogen. Some of the hydrogen for the fuel cells will be generated on board by the solar, wind and wave energy. The

for two decades hence

only by-products of the production of electricity from fuel cells will be water and heat.

Solar energy

Solar energy will be acquired by photovoltaic panels located in the vessel's sails. When not in use for wind propulsion, the sails may be tilted, laid down or in other ways directed for maximum solar energy collection. This energy will then be transformed into electricity for immediate use, or for storage.

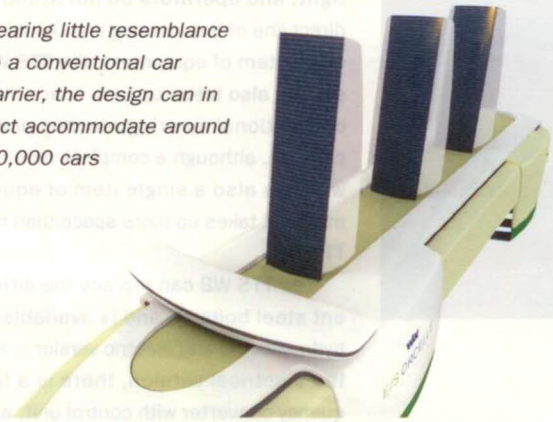
Wind energy

Wind energy will mainly be utilised for propulsion directly through three sails constructed of lightweight composite material. Capable of folding upward and outward, the rigid sails can rotate about the masthead to find the best position to extract wind energy through the creation of drag or lift , or a combination of the two.

Wave energy

Wave energy may be transformed into various types of energy by combining the relative movements of the waves, the fins and the vessel. The *E/S Orcelle* is designed to have a total of 12 fins in all, enabling the vessel to harness and transform wave energy into hydrogen, electricity or mechanical energy. The fins are also propulsion units that are driven by wave energy or the electricity or mechanical energy available on board.

Bearing little resemblance to a conventional car carrier, the design can in fact accommodate around 10,000 cars



Sails and solar panels, here seen deployed, are a key element

The wave energy generated by the vertical movement of the fins may be transformed into mechanical energy for immediate use in the mechanical propulsion of the fins. In addition, energy from the movement of the fins could be harnessed to generate hydraulic energy that might be used either immediately or stored. Other promising systems for mechanical energy storage, such as flywheels, are also under development.

Energy carriers

Approximately 50% of the energy used for propulsion of the *E/S Orcelle* will be generated by fuel cells which combine two common chemical elements, hydrogen and oxygen, to generate electricity. This is then used by the electric motors in the pod and fin propulsion systems. The fuel cells will also generate electricity for other energy consumers on board.

The vessel will have a hydrogen-driven fuel cell system on board to generate electricity. The production and storage (at high pressure or low temperature) of the hydrogen itself are currently obstacles that need to be overcome to develop viable fuel cell technology for ships.

Wallenius Wilhelmsen believes that future technologies will be able to transform solar, wind and wave energy into hydrogen for immediate use or storage on board. By developing technologies that will enable the production of hydrogen at sea, there will be a significant reduction in the handling and storage of this energy source on board. In addition, new technologies may well solve the hydrogen storage problem, enabling solid materials to replace the fluid.

Electric propulsion system

The *E/S Orcelle* will have two variable speed 360° electric propulsion pods – one at each end of the main hull – to complement the vessel's sail and fin propulsion systems.

Electric and hydraulic power supply will be required to erect, unfurl and rotate the sails and to operate the two aft rudders. These will provide steering capabilities when the electric propulsion system is not in use, for example, when the vessel is under sail. ■

PRINCIPAL PARTICULARS

Length o.a.	250m
Beam moulded	50m
Draught design	9m
Height	40m
Height with sails erected	95m
Deadweight (max)	13,000 tonnes
Lightship	21,000 tonnes
Solar panels	3 x 800 m²
Sails	3 x 1,400 m²
Fins	12 x 210 m²
Solar panel output	2,500 kW
Fuel cell output	10,000 kW
Pod propulsion	2 x 4,000 kW
Design speed (max)	20 knots
Design speed (service)	15 knots