

Green energy sets sail

Big ships are looking to the past as well as the future to clean up their act

Jesse Emspak

LIKE the clippers of old, the cargo ships of tomorrow may one day raise sails, though with a modern twist. They might also sport solar panels, and even glide through the ocean on cushions of air.

Typical cargo ships today are little different from their forbears a century ago: dirty, oil-burning behemoths. Because

of their huge size, they're an efficient way to move goods, but the industry is so vast that the amount of carbon they emit exceeds that of all the world's aircraft. If the global fleet were a single country, its emissions would rank seventh in the world.

Now the realities of volatile oil prices, climate change and pollution are setting in, and ship-builders are changing their tune.

"Mining companies are telling us that to ship a tonne of iron ore, something like 90 per cent of the cost is fuel," says Robert Dane, CEO of Solar Sailor in Sydney, Australia, which makes ships that are powered by a combination of combustion engines and solar power. What's more, under mounting public pressure, the International Maritime Organization adopted

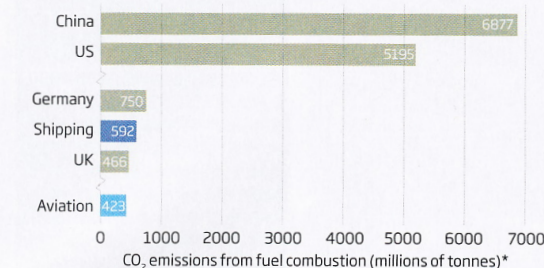
rules in July mandating that ships increase their fuel efficiency and reduce emissions of carbon and other pollutants by 25 to 30 per cent by 2030.

Dane thinks an ore carrier could achieve up to 20 per cent savings in fuel costs using large solar panel-covered masts that both charge a battery and catch the breeze. Eco Marine, based Fukuoka, Japan, is using a similar approach, and expects to test its first prototypes in 2012.

Such solutions are meant for the largest bulk carriers, such as Panamax and Capesize-class vessels, which can carry tens of

Ships as a country

If large ships were a single country, their carbon dioxide emissions from fuel consumption would be the seventh highest in the world



*any fossil fuels burned for energy generation, transportation, heating or other uses. Does not include emissions due to agriculture, deforestation, or other non-combustion sources

SOURCE: INTERNATIONAL ENERGY AGENCY

Smoother sailing

A number of innovations could see the ships of the future producing far fewer greenhouse gas emissions

NATURAL GAS-FUELLED ENGINE PLUS CANVAS SAILS
Smaller ships may soon be propelled this way

20%
fuel decrease

SOLAR PANEL SAILS
Retrofitting tankers with solar panels will allow ships to charge a battery for propulsion. The panels will also act as rigid sails

40%
fuel decrease

HULL COATING
A polymer coating on the hull will prevent barnacles and other sea creatures from attaching, reducing drag

10%
fuel decrease

AIR CAVITY SYSTEM
Pumping a stream of bubbles along the hull of container ships will reduce friction

PROPELLER DESIGN
Rim-driven thrusters push water more efficiently than conventional propellers

"A more impressive way to glide through the water is to inject air around the submerged hull"

thousands of tonnes of cargo. But to green up the legions of smaller ships that move goods along coastal shipping lanes, UK firm B9 Energy Group has brought back the old days of three-masted sailing ships – with a difference.

The company's design employs a Rolls-Royce engine that it can refit to run on natural gas or biofuel. The majority of their ships' propulsion, though, will come from giant sails. These will be able to unfurl or fold up at the push of a button, avoiding the need for the large crews that manned the rigging of large sailing ships in years gone by.

Meanwhile, some firms are saving fuel in a decidedly low-tech fashion – they are slowing down. In 2008 as oil prices shot up to \$145 per barrel, shipping giant Maersk cut fuel use by as much as 30 per cent by slowing down to just 12 knots instead of a full-

throttle 25 knots (46 kilometres per hour). Other companies have followed suit; slow steaming reduces friction and increases energy efficiency much as driving a car at 90 km/h can use less fuel than driving at higher speeds.

A more impressive way to glide through the water is to inject air around the submerged part of the ship's hull. DK Group in the Netherlands has tested what it calls the "air cavity system", which pumps air out of a hole in the hull that then travels as a carpet of bubbles under the vessel (see diagram, left, and *New Scientist*, 18 February 2006, p 46).

Sea creatures such as barnacles and mussels that attach to ship hulls can push up fuel use by as

much as 40 per cent. To combat this, paint and coatings firm AkzoNobel, also in the Netherlands, has developed a polymer that forms a microscopic "chequerboard" of water-repelling and water-attracting molecules. This makes it much harder for anything to stick, and the company is working on commercialising the technology.

This kind of innovation comes along whenever there is major pressure on an industry, says David Surplus of B9. "Shippers weren't concerned about energy efficiency until now," he says, as oil prices continue to hover around \$100 a barrel, and carbon emissions continue to increase global warming. ■

Voyage of the Eiksund

The M/F Eiksund looks like an ordinary car and passenger ferry as it navigates the fjords of western Norway. But underwater it is a ship like no other.

The Eiksund's propellers have been replaced with rim driven thrusters (RDTs), enclosed fans with the blades attached to the inside of a rotating ring (see diagram, left). Made by Brunvoll A/S of Molde, Norway, the RDT is an electric motor, with wound electromagnets in the outer section and permanent magnets in the rotating inner section. Each RDT is

linked to a diesel generator, the speed varying with the engine's output. Water flows more smoothly through an RDT than a propeller, improving efficiency and reducing noise levels.

According to Knut Andresen of Brunvoll, the conversion has resulted in a fuel saving of about 30 per cent. This is the first time RDTs have been used as a ship's main propulsion. At 40 metres long the Eiksund is a relatively small ship, but Brunvoll plans to scale up the technology for larger vessels. David Hambling