EMISSIONS

Steaming towards decarbonisation

Tanker owners are already making headway to meet IMO's targets for a carbon-neutral shipping industry, writes *Peter Mackay*, Principal Consultant, Meredith & Company.

A year ago, the global shipping community was struggling to come to terms with the new restrictions on sulphur oxide emissions in ships' exhausts imposed by the International Maritime Organisation (IMO) that took effect on 1 January 2020 – the so-called 'IMO 2020' rule. In the event, enough ultra-low sulphur fuel oil was available, and enough exhaust gas scrubbers fitted to allow trade to continue virtually uninterrupted.

Thoughts are now turning to the next IMO moves as part of its implementation of the UN Sustainable Development Goals (SDGs), which call for a significant reduction and eventual elimination of carbon dioxide (CO_2) emissions, with looming deadlines in 2030 and 2050. For an industry that has been wedded to fossil fuels since sail gave way to steam in the mid-1800s, this will be a major transition.

It will also be a great technical challenge and there are many different ideas as to how decarbonisation can be achieved. The most obvious is to use fuels that are not based on hydrocarbons – hydrogen, ammonia and electricity, either sustainably sourced or generated via an onboard fuel cell. There is an alternative – to use carbon-neutral liquid fuels that are manufactured by using biomass or other non-fossil sources and renewable electricity. These 'e-fuels' would have the advantage of being able to use the existing supply and delivery network.

Whichever route is chosen – and it is likely that individual shipowners will make their own choice – getting to the point where such alternative fuels can be used to power oceangoing ships will take innovation and collaboration. In the keynote address to the Shipping Insight 20/20 conference in October 2020, Christopher J Wiernicki, Chairman, President and CEO of classification society ABS, said: 'In our industry, the more all stakeholders in the supply chain cooperate on meeting the challenges of getting to 2030 and 2050, the sooner we will reach those goals and the better we all will be.'

Wiernicki also said that the real challenge to get to 2050 will involve a hybrid solution, including not just the development of alternative fuels and improved technologies, but also operational efficiencies.

Pathway to compliance

Another major classification society, DNV GL, has also been looking at the pathways to decarbonisation and, in its recently published Maritime Forecast to 2050, laid out some options. IMO's current ambitions envisage a world fleet still running largely on fossil fuels (including LNG) in 2030, with some moderate carbon pricing to encourage alternatives. By 2040, vessel design and operational requirements will become stricter, the price of carbon will rise and newbuilds will be using new fuels. By 2050, there will be a 50% reduction in greenhouse gas (GHG) emissions compared to the 2008 level and a 70% improvement in carbon intensity.

In the DNV GL model, fossil LNG initially gains a significant share of the marine fuels market, being replaced from 2030 or 2040 by bio-gasoil, e-gasoil, bio-LNG and e-LNG on existing ships; newbuilds will be designed to run on bio-methanol, 'blue' ammonia or e-ammonia. DNV GL also believes there is the option to accelerate IMO's ambitions by removing the transition via LNG and going straight to bio- and e-gasoil.

'It is difficult to identify clear winners among many different fuel options across all scenarios,' said Tore Longva, Principal Consultant at DNV GL, in the report. 'However, e-ammonia, blue ammonia and bio-methanol frequently model with a high market share in the decarbonisation scenarios and are the most promising carbon-neutral fuels in the long run.' That situation presents its own problem – without clarity, shipowners are confused and possibly reluctant to be a frontrunner. The increasingly diverse fuel environment means that, if they make the wrong choice – and bearing in mind

Terntank's LNG-powered tankers feature a more efficient hull design and are reported to have achieved CO_2 emission savings of some 40%

Photo: Bjarte Borlaug/ Terntank

the potential for later regulatory action or major changes in comparative costs – they risk being saddled with a stranded asset. IMO has promised some clarity on regulations in 2023, which may help clear the fog somewhat.

Getting together

However, as Knut Ørbeck-Nilssen, CEO of DNV GL – Maritime, says: 'Perfect is the enemy of good.' Owners cannot wait for an ideal solution to arrive and risk making no progress at all. Similar views were expressed by Shell in a report on the decarbonisation of shipping, produced in collaboration with Deloitte and involving interviews conducted during 1H2020 with 80 leaders across the maritime sector. In the report, Shell said that shipping leaders feel that the uncertainty about where to begin has created what one interviewee described as a 'deadlock'. Shell believes that collaboration within and outside the shipping industry will be needed to break that deadlock.

There is certainly plenty of talk going on. In 2019 the Global Maritime Forum, in partnership with the Friends of Ocean Action and the World Economic Forum, formed the 'Getting To Zero Coalition'. The alliance of more than 120 companies in the maritime, energy, infrastructure and finance sectors aims to provide transformational leadership during the move to zero emission vessels, which it expects to be delivered by 2030.

In October 2020, a group of the world's largest energy, agriculture, mining and commodity trading companies agreed the 'Sea Cargo Charter', through which they pledged to assess and disclose the climate alignment of their shipping activities. Jan Dieleman, Chair of the Charter's drafting group, said at the time: 'A standard greenhouse gas emissions reporting process will simplify some of the complexities often associated with reporting. It will encourage a more transparent and consistent approach to tracking emissions, which will be a critical part of making shipping more sustainable.' The 17 founding signatories included some major oil, energy and chemical companies, including Dow, Equinor, Occidental, Shell and Total, as well as major trading houses and dry bulk shippers.

Concrete action

There is no shortage of examples of the tanker shipping industry stepping up to the challenge of decarbonisation, and those examples illustrate the range of solutions available. Denmark-based operator Terntank, for example, has been working on greening its fleet for some time, often in cooperation with its charterer clients. In November 2019 it ordered two 15,000-dwt hybrid chemical/product tankers, with options on two more. These build on the LNG-powered tankers it ordered in 2013 and which, through the use of LNG and more efficient hull design, have achieved CO_2 emissions savings of some 40%.

The new ships, due to join the fleet in 2021, will run on LNG and liquefied biogas (LBG), an LNG-equivalent fuel derived from biomass. Charterer Preem is already using a 10% LBG blend in one vessel, but the new ships will also be fitted with a hybrid battery system that will eliminate the need for auxiliary engines on arrival and departure from ports and will also power the bow thruster. To achieve this solution, Terntank has had to work with the shipyard; the designer Kongsberg; and its charterers Preem and Finnish oil products distributor NEOT, which will charter the first two newbuildings; as well as the Port of Gothenburg, which is aiming to have shore power available by the time the ships are delivered.

Meanwhile, in Japan, Asahi Tanker has recently ordered two 'e5' tankers developed by the e5 Lab, a consortium in which Asahi is a partner. The new ships, which will operate as bunker vessels in Tokyo Bay, will be powered entirely by large-capacity lithium ion batteries and will be, Asahi Tanker says, the first zero emission tankers in the world on delivery in 2022 and 2023. Not only will they eliminate emissions of CO_2, NO_x, SO_x and particulate matter, they will also be quieter and have less vibration, making for a more comfortable work environment for the crew and reduced noise pollution in the bay.

These two examples seem to prove the idea that a move to alternative fuels will be concentrated – at least at first – in smaller vessel sectors and in shortsea and regular trades, where the necessary infrastructure for supplying novel bunkers can be established. However, there are also examples of innovation in deepsea shipping. Eastern Pacific Shipping, for instance, is trialling the use of biofuels in one of its 47,400-dwt medium range product tankers, *Pacific Beryl*. Dutch biofuel specialist GoodFuels is to supply a bio-fuel oil, equivalent to residual fuel oil, and Eastern Pacific will monitor and analyse performance before broadening its use.

In a more innovative project, leading chemical tanker operator Odfjell is taking part in a consortium developing new fuel cell technology. It plans to test a 1.2 MW prototype fuel cell at the Sustainable Energy 'catapult centre' in Norway prior to its installation on one of Odfjell's newest chemical tankers. The fuel cell is designed to run on a range of fuel types, including 'green' ammonia and LNG, and will be able to power a seagoing vessel.

Bernt Skeie, CEO of Prototech, the fuel cell specialist behind the concept, says: 'Our tests show a CO_2 reduction of as much as 40–45% when using LNG, compared to current solutions. Increased efficiency and reduced fuel consumption also provide significant cost savings, and the ship will be able to sail significantly longer on the same amount of energy. The system will also be ready to operate completely emission-free from the locations where, for instance, ammonia is available for bunkering.'

The technology also enables direct capture of CO_2, which will further enhance emissions reduction once the infrastructure for CO_2 management becomes available.

Illustrating the position that shipowners find themselves in right now, Erik Hjortland, Vice-President of Technology at Odfjell, says: 'Ships are to be operated for 20 to 30 years and we need flexible solutions that can meet future emission requirements. We do not have time to wait, we have to think about zero emissions already now. The fuel cell project is one of the paths we are pursuing. We focus on machinery rather than on one single type of fuel. Fuel cell technology gives us flexibility that ensures environmentally efficient operation regardless of fuel changes that may occur in the years ahead.' ●

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Photo: Asahi Tanker