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Shipping's energy transition is underway but the switch to new fuels will require a new commercial approach. **Steve Simms** of Simms Showers considers how bunker sales terms should be revised or written anew in the years ahead

LNG, methane, synthetic carbon-recycled fuels, biofuels, ammonia, hydrogen and others. New marine fuels are here, and more are coming. The international bunkering industry's contracts must be ready to sell them.

Commercial ships always have run on some sort of power, and on contracts. As commerce sailed around the ancient Mediterranean world, Plato wrote:

> If a man fails to fulfill an agreed contract – unless he had contracted to do something forbidden by law or decree, or gave his consent under some iniquitous pressure, or was involuntarily prevented from fulfilling his contract because of some unlooked-for accident – an action for such an unfulfilled agreement should be brought in the tribal courts, if the parties have not previously been able to reconcile their differences before arbitrators (their neighbors, that is).
>
> Plato, The Laws, Book 11, §23, Contracts.

Marine contracts have developed with the marine industry alongside longer and more expensive voyages, different cargoes, insurance, and eventually, with fuel replacing wind and oars. Petroleum-derived, carbon-based fuels have for over 70 years been nearly the sole offering of the marine bunkering industry. Since the 1970s' introduction of the bunker trader-supplier sale of bunkers, the international bunkering industry has relied on a more or less standard contracting model that starts with request for quotes, followed by confirmation incorporating sales terms and conditions, delivery, invoicing and then, hopefully, payment.

Some parts of this industry contracting relating to petroleum-based bunkers may be suitable for selling the coming new fuels. However, many of them may not be, and more will be needed. That need will come sooner than many in the bunker industry expect.

THE JOURNEY TO GHG REDUCTION AND NEW FUELS

In 2018, the International Maritime Organization (IMO) resolved[1] an initial strategy that by 2030 there is to be a 40% reduction in shipping carbon emissions per transport work (compared to a 2008 baseline) and a 50% reduction in shipping's total carbon dioxide (CO_2) emissions by 2050, and then by 2100 meeting the zero greenhouse gas (GHG) emissions goal of the 2015 Paris Climate Accord.

To achieve this, the IMO's initial 2018 strategy was to focus on technical and operational energy efficiency measures for existing and new-build vessels between 2018 and 2023. Then, from 2023 to 2030, the focus would turn to the introduction of low-carbon fuels and market-based measures (MBM) to incentivise GHG reduction. After 2030, the IMO envisioned from the standpoint of 2018, the focus would be on introduction of zero-carbon marine fuels.

The IMO also decided that in 2023 it would set a permanent strategy on GHG reduction targets. However, major marine companies, including Maersk, CMA-CGM and Hapag-Lloyd, now take the position that GHG reduction must, and can, occur more quickly than the timeline suggested by the IMO in 2018, and so it may be that the decision in 2023 may be to advance the IMO 2018 initial deadlines.

A major focus is on the more immediate uptake of GHG-reducing fuels. The announcement in June of the formation of the Mc-Kinney Møller Center for Zero Carbon Shipping announcement declares:

> The shipping sector accounts for around 3% of global carbon emissions. The industry has made a firm commitment to reduce this to zero within this century. Short-term measures related to increased energy efficiency is enabling a 40% relative reduction by 2030.
>
> Achieving the long-term target requires new fuel types and a systemic change within the industry. As shipping is a globally regulated industry, there is opportunity to secure broad-based industry adoption of new technology and fuels.

> To accelerate the development of viable technologies a coordinated effort within applied research is needed across the entire supply chain. Industry leaders play a critical role in ensuring that laboratory research is successfully matured to scalable solutions matching the needs of industry. At the same time, new legislation will be required to enable the transition towards decarbonisation.[2]

IT HAPPENED WITH 2020, AND HENRY FORD IN 1898

Some in the maritime industry are sceptical that the uptake of new fuels will be significant even after 2050 (just 30 years from now). They doubt that there will be any near-term significant movement away from petroleum-based fuels because of high cost, technology limitations and distribution channels. History shows this view (and the lack of preparation going with it), especially in the last 100 years or so of the maritime industry, is wrong.

One gauge for this view, however, is to recall the industry angst that began with the IMO's decision to impose a 0.10% sulphur content restriction for marine fuels in Emission Control Areas (ECAs) from January 2015 and a world-wide 0.50% sulphur cap beginning on 1 January 2020.

The bunker industry fretted that there would not be enough supply, that there would be cheating, that low sulphur fuels would cause engine damage, that that compliant fuel would be vastly expensive, that high sulphur fuel oil (HSFO) would be so cheap that refiners would pay to have it taken away. There was significant pressure to postpone the sulphur content restriction deadlines.

Came 2015, and with a few exceptions there was smooth uptake of 0.10% fuels for ECAs, and in 2020, the same for the 0.50% global cap The fear of impossibly high prices for low sulphur fuels did not materialise. The price for HSFO has stayed relatively high, apparently because of a combination of exhaust gas cleaning system (scrubber) use, and because fewer suppliers have chosen to maintain HSFO stocks. The COVID-19-affected world economy may have had some impact on the ease of the 2020 transition, but overall the industry has been able to adapt quickly and relatively easily to what in 2016 had been considered by some to be impossible change.

The 2020 0.50% restrictions also served to advance the use of 'new' fuels, such as LNG and methane, including accelerating the development of dual fuel engines to burn them and other fuels. 2017 also saw the introduction of ISO standard 8217:2017 (Petroleum Products – Fuels) which permits up to 7% fatty acid methyl ester(s) (FAME) content by volume of marine fuel, further increasing demand opportunity for bio-fuels.

The IMO's 2018 GHG resolution was not front of industry news; the frenzy was over petroleum-based product and the looming 2020 0.50% restrictions. Amidst that frenzy, at a 2017 bunkering conference, a year before the IMO's 2018 GHG reduction resolution, the International Chamber of Shipping's (ICS) then Policy Director, Simon Bennett, predicted that 'bunker suppliers must prepare for the death of fossil fuels in shipping'.

Addressing an audience of bunker fuel suppliers about the imminent transition to zero carbon fuels is perhaps like Henry Ford addressing suppliers to horses and carts, he said.

'Henry Ford remarked that if, in say 1890, you had asked someone in the street what they wanted, they would have asked for a faster horse.

'Governments need to recognise that many ships will remain dependent on fossil fuels probably at least until around 2050, just as some people in developed nations were still using horses in 1920. But the momentum created by the Paris Agreement on climate change means that the wholesale switch to alternative fuels and propulsion systems will be relentless and inevitable.'

He continued: 'This will happen as soon as the technology and bunkering infrastructure permits, which ICS is confident it eventually will, whether using fuel cells or batteries powered by renewable energy, technologies such as hydrogen or some other solution we can't yet anticipate.'[3]

Henry Ford is a great character to invoke. His history – and history of fossil fuels – is an example of the relentless, inevitable – and sooner than many may expect – replacement of petroleum-based fuels in shipping.

Henry Ford's company made the 'Model T'. Introduced in 1908, it was the world's first assembly-line, mass produced automobile. In 1908 a Model T cost $850 (at that time equivalent to about 18 months' salary for an average wage), but by its last model in 1925, a Model T cost less than $300 (equivalent to about four months' salary for an average wage). Although (contrary to legend) Henry Ford designed the Model T to run on gasoline, its new engine design ran well on other fuels, including ethanol.

Interviewed in 1925, the last year of Model T production, Ford commented:

> The fuel of the future is going to come from fruit like that sumach out by the road, or from apples, weeds, sawdust — almost anything. There is fuel in every bit of vegetable matter that can be fermented. There's enough alcohol in one year's yield of an acre of potatoes to drive the machinery necessary to cultivate the fields for a hundred years.[4]

Ethanol of course, with methanol, is a low-CO_2 emission fuel; ethanol produced from biomass.

In 1896, 14 years before the Model T, Ford had his first vehicle, the 'Quadracycle', to run on ethanol.[5] Perhaps the reason for that was that gasoline was scarce in 1896, and expensive internal combustion engine (ICE) use still relatively rare. Even by 1915, a gallon of gasoline cost the present-day dollar equivalent of $5.14 a gallon.[6] Demand to fuel the relatively new ICE, particularly for automobile engines, led petroleum exploration and refining to make gasoline (and other petroleum-based products) widely-available and inexpensive.

It still wouldn't be until years later, in the 1930s, when vessels could run on heavy, petroleum-based fuel, once the first four-stroke marine engine using heavy fuel became operational. However, it wasn't until 20 years on, in the 1950s, that there was significant demand for marine heavy fuel oil, made possible because of the technological advance of high alkaline cylinder lubrication, which neutralised the acids that the fuel's high sulphur content produced. Technological improvements made possible the greater use of heavy petroleum-based fuel so that it became plentiful, less expensive, and the dominant marine fuel.

What the Henry Ford story (and with it the marine fuel industry story) shows is that fuel supply and cost turns on technology development. When technology develops, fuel supply responds to that. Prices go down. Delivery methods appear. Methanol is a commonly-available commodity, as is ethanol and ammonia, none of which when burned, emit sulphur and result in reduced GHG emissions.

That all happened in a relatively short time period: by the time of marine engine developments in the 1930s, heavy, petroleum-based fuel was relatively more plentiful. This then led to the 1950s' advances and subsequently to the almost exclusive uptake of petroleum-based fuel by the shipping industry within a matter of about 30 years (that is, the time between now and 2050).

As a further example, IMO 2020, relatively higher fuel prices, technology developments including dual fuel engines, and the 2018 IMO GHG reduction goals also continue to encourage the marine fuel use of LNG. By 2030, an estimated 10% or more of the world fleet will be using, and demanding, LNG bunkers; by 2050, more than 20%.

The speculation about LNG was that not enough could be carried aboard ships, until technological innovation changed that. Then it was that there would not be sufficient means to bunker with LNG, but the market has had steady introduction of LNG bunker tankers and other bunkering methods.

The IMO's 2016 International Code for Safety of Ships Using Gases or Other Low-Flashpoint Fuels (IGF Code) also provided a standard for safe LNG bunkering. LNG use (including the issue of methane slip) still results in GHG emissions, so LNG is considered to be a transitional fuel on the way to GHG emission-free fuel. However, the experience from LNG fueling, including the IGF Code, provides a pathway for methanol (another low flashpoint fuel) and even hydrogen fuelling (hydrogen either transported cryogenically in its pure form, and also a very low flashpoint fuel, or transported in ammonia and extracted).

The IMO's Marine Safety Committee working with the International Organization for Standardization (ISO) has developed a draft standard for methanol as a marine fuel, based on the IGF Code, which should be adopted when the Committee can reconvene after Covid-19 postponements. A number of vessels have been operating on methanol, and with this standard, the number is expected to increase. The example is that one technology leads to the next, and often much more quickly than anticipated.

Two other developments may increase the uptake of 'new' fuels with lower GHG emissions.

The first is the Poseidon Principles[7], announced in June 2019 by major vessel financing interests and put forward for adoption thoroughout new-build vessel financing. The Poseidon Principles state that:

> The Principles are consistent with the policies and ambitions of the International Maritime Organization, including its ambition for greenhouse gas emissions to peak as soon as possible and to reduce shipping's total annual GHG emissions by at least 50% by 2050 compared to 2008.
>
> The Poseidon Principles are applicable to lenders, relevant lessors, and financial guarantors including export credit agencies. They apply globally, to all credit products secured by vessel mortgages or finance leases secured by title over vessel and where a vessel or vessels fall under the purview of the IMO.
>
> Currently, climate alignment is the only factor considered by the Poseidon Principles....

The Poseidon Principles commit those financing ships, and who join the Principles, to finance only vessels which employ GHG-reducing technology (including the use of new fuels). Essentially, the industry which makes new buildings possible is pushing the development and adoption of new, GHG-reducing fuels. Because much of the world's fleet is 21 or more years old, the vessels now being built (which will be operating past 2030), financed by Poseidon Principles-committed financers, will incorporate technologies soon requiring the use of new fuels.

Second, there is increasing consideration for a world-wide tax on carbon-emitting fuels, thus raising their price and subsidising new fuels. Whether such a world-wide tax, which would have to be accepted by national governments, would ever come into place is as yet a matter for speculation, but it would accelerate new fuel uptake and, just as the 2020 sulphur cap dramatically reduced HSFO use (and availability), could increase demand for new fuels and their availability.

MARINE FUEL CONTRACTS OF THE FUTURE

The renowned management consultant, Peter Druker, writes that: '[p]redicting the future can only get you into trouble. The task is to manage what is there and to work to create what could and should be.' (*Managing Turbulent Times*, 1980).

With the present common model for contracting to sell marine fuel, then what is already 'there' will be a basis for contracting for new fuels. The predominant LNG contract, and even the pre-1970s model for petroleum-based marine fuels (before the OPEC oil embargo brought in the trader-supplier model) is an example of what probably will be the first phase, for new fuels introduction.

LNG sold for marine bunker use initially was sold on long-term contracts. This was because the vessel owners needed to be assured that they would have LNG provision where and in the quantities they needed it, and LNG providers had to know that they would have the income stream to pay for the means of provision (trucks, storage and eventually LNG bunker tankers).

For the same reasons, long-term contracts were the ways that HSFO was sold, as its uptake increased from the 1950s to the 1970s. But, by the 1970s there were both ample investments in the means of providing HSFO and most of the world's vessels were using it. As providers cancelled long term contracts because the OPEC embargo kept them from meeting the contracts, bunker traders emerged to buy available HSFO and provide it on the spot market where and when needed.

> 'With the means of provision for LNG increasing and also more LNG providers recognising LNG bunkering as a market, the expectation is that LNG bunkering soon will be conducted through a trader- supplier model'

With the means of provision for LNG increasing and also more LNG providers recognising LNG bunkering as a market, the expectation is that LNG bunkering soon will be conducted through a trader-supplier model, particularly because traders (already familiar with industry needs through 'traditional' bunkering) can contribute maritime expertise that LNG providers, focused on land-based markets, do not have.

So, bunker providers first should consider entering long-term supply contracts for new fuels, which will encourage the development of technology and infrastructure to deliver them. That is, they should be prepared to engage both with vessel owners considering retrofits to their existing vessels or new builds to determine the markets the vessels will operate in, and then how to assure the vessel owners that they will have a long-term supply of the new fuel. The long-term contract should bring sufficient income to enable infrastructure development (and make it profitable) and also to incentivise the use of the new fuel by ensuring its availability.

What this means is that new fuels' uptake, will begin in specific markets, for specialised vessels. For example, hydrogen and ammonia require relatively larger shipboard storage

spaces, thus there would be more frequent bunkerings and the vessels utilising hydrogen or ammonia would be sailing short sea routes between a limited number of ports.

Biofuels are also a promising 'new fuel' response for GHG reduction. But, again, long-term contracts initially are needed for these, because of the need to capitalise sources of biofuel production, but also to assure supply because of the expected high future demand for biofuels across all sectors, including land transportation and industrial uses needing fuel. Long-term contracts for biomass must also be secured.

Many elements of long-term contracts will be the same as the contracting models that bunker traders and suppliers use now. There will still be terms for price and payment, handling, scheduling, measurement of quality and quantity, testing, sanctions avoidance, and dispute resolution, including maritime liens and arrest. But, depending on the fuel, some terms would need to be expanded, such as those for safety and planning (required for handling LNG and other low flash point fuels) and also testing and sampling (methanol, ethanol and ammonia, for example, rarely if ever having quality concerns) and retaining samples. For example, LNG samples must be stored cryogenically and can change after time, which is problematic, while fuels such as bio-diesel can also change biologically over time).

Fuel stability also is a concern with biodiesel, which tends to become unstable after long-term storage, so contracts to use it must make clear that the seller is not responsible for fuel change after a period of time (or for that matter, after loading).

A further consideration when using higher flashpoint fuels such as ammonia is that they require igniting mechanisms, using lower flashpoint fuels. Bunker suppliers selling ammonia would also want to sell the necessary lower flashpoint fuels, and so have contractual terms that would consider both ammonia and the igniting fuel.

Certification of the GHG-emitting (or not) properties of the new fuels, and their production (the total 'well to wake' GHG emissions) may also be required by authorities and customers. So, bunker providers of 'new fuels' also must focus on standards that they contract to meet, and the means of assuring (and proving) that the standards have been met, for example, that the fuel has been produced to achieve a result in overall GHG emissions reduction in a verifiable range. For biofuels, providers also should be prepared to certify that the fuels were produced from environmentally sustainable biomass.

For most 'new fuels' sales, it will be some time before a spot market will be used which will require the trader-supplier model of contracts now common in the bunker industry. However, two notable exceptions are for dual fuelled vessels, and, for fuel 'swap' arrangements.

Dual fuelled vessels may advance the use of spot-contracting, with 'standard' petroleum-based and new fuels. More LNG dual fuelled vessels are entering the market, and bunker traders have the opportunity to sell both fuels to their dual fuelled vessel-owning or chartering customers. Engines now are being developed to burn both 'standard' (now-LSFO) bunkers and methane. As the focus increases on GHG reduction and technology advances for dual-fuelled vessels, bunker suppliers will increasing have the opportunity to sell multiple fuels on a spot basis: both the traditional spot-sold fuel, and the new fuel (where, the dual-fuel customer may not be interested in a long-term, 'new fuel' contract).

Relatively new in the market (introduced recently by Stena Bulk) is the opportunity for customers to 'sponsor' the use of GHG-reducing fuels, which may not be available on the trade route on which the customers need to ship their cargo. Customers may choose to subsidise voyages of a vessel not carrying their cargo but operating on a trade lane which can utilise GHG-reducing fuel.

So, bunker providers can enter into these 'sponsoring' arrangements by offering 'new' fuels to customers operating on multiple routes which are suited for different fuel types, some less GHG-emitting. For that matter, bunker providers with multiple types of customers operating on short and long-sea routes could offer such 'sponsoring' between customers, so that a long-sea route customer operating a vessel consuming relatively high GHG-emission fuel can offer to its customers the opportunity to reduce GHG emissions by paying a higher fuel price (passed through) providing for a more affordable (essentially subsidised) low GHG-emission fuel to another customer.

There are increasing numbers of good studies of new fuels opportunities available in the market, recently in 2020, for example, by consultant Blue Insight with its *Low Carbon Energy Fuels & Energy Guide 2020*"[8], American Bureau of Shipping's (ABS), *Pathways to Sustainable Shipping*[9], and *Roadmap to Zero Emission from International Shipping*[10], a study led by the Japan Ministry of Land, Infrastructure, Transport and Tourism (MLIT). Bunker traders and suppliers should – in the words of Peter Drucker – use these studies now to 'manage what is there and to work to create what could and should be'.

Maritime commerce generally and the bunker industry specifically will continue to run on contracts. Bunker providers must start their thinking sooner rather than later about how their contracts will work successfully to sell the new fuels.

1. Resolution MEPC.304(72), Adopted on 13 April 2018, Initial IMO Strategy On Reduction of GHG Emissions from Ships, https://bit.ly/31jUePh
2. Press Release, Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping, 25 June, 2020, https://bit.ly/39UGSwV. Founding partners of the Center are American Bureau of Shipping, A.P. Moller - Maersk, Cargill, MAN Energy Solutions, Mitsubishi Heavy Industries, NYK Lines and Siemens Energy
3. https://www.ics-shipping.org/news/press-releases/2017/11/30/bunker-suppliers-must-prepare-for-the-death-of-fossil-fuels-in-shipping
4. https://www.nytimes.com/1925/09/20/archives/ford-predicts-fuel-from-vegetation-he-says-electricity-will-heat.html
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The opinions and recommendations of this article are his and not necessarily also those of SEA/LNG or IBIA, except if identified specifically as such.

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