

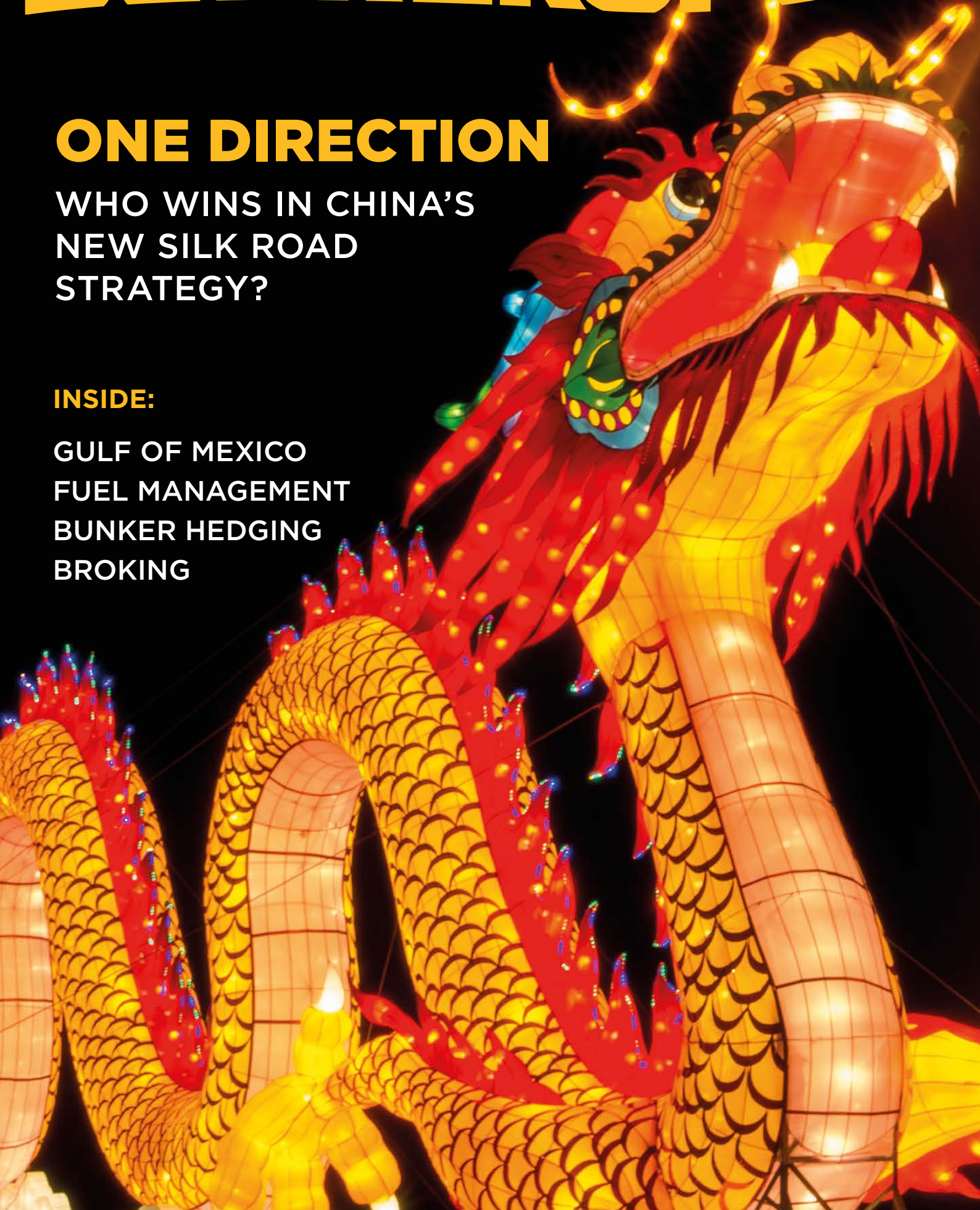
BUNKERSPOT

ONE DIRECTION

WHO WINS IN CHINA'S
NEW SILK ROAD
STRATEGY?

INSIDE:

GULF OF MEXICO
FUEL MANAGEMENT
BUNKER HEDGING
BROKING



The plus factor

Cutting the bunker fuel spend and lowering emissions are key drivers in today's cash-strapped and increasingly environmentally regulated shipping market. **Lesley Bankes-Hughes** talks to FUELSAVE, a company that has developed an innovative technology that it believes provides a win-win solution to both these challenges

It is a decade since the global economic crisis of 2007/2008 and shipping remains an industry under pressure. Freight rates have improved in some vessel sectors over the past year but margins across all areas of the maritime industry remain thin and vessel owners and operators are continually looking at ways of paring back OPEX and CAPEX. In addition to a tight commercial and financial climate, current and upcoming environmental regulations are also key obligations for shipping stakeholders, and compliance, of course, comes at a cost.

The 2020 0.5% global sulphur cap is only two years away and beyond there is huge uncertainty over the likely marine fuel demand/supply scenario, and, leading on from that, the effect of the new regulation on shipping's fuel bill.

Finding ways to cut a fleet's bunker spend and reduce its environmental footprint are key commercial imperatives, and a German company is working on an innovative technology solution which it claims can both reap significant fuel savings and reduce vessel emissions.

A relatively young company, FUELSAVE's initial focus was on developing solutions to improve fuel efficiency and reduce emissions for land-based transportation (trucks and utility vehicles). It has now branched out into the maritime sector and, after several years of bench testing and sea trials, it is ready to roll out its FS Marine+ technology on a commercial basis.

FS MARINE+, which has already secured a European patent and has received approval from class society DNV GL, is an onboard efficiency enhancement solution, based on the combination of different processes, including a hydrogen generator and synthgas injector which improves the engine's combustion process.

In simple terms, FUELSAVE's FS H2GEN+ electrolyser transforms deionised water into hydrogen and oxygen gas. These gases are then combined together with methanol which

has been converted from a liquid into a gas. The proprietary synthgas is injected into the engine, as well as a water/methanol mix that is injected into the hot section of the turbocharger.

In order to illustrate potential fuel savings, FUELSAVE uses the example of an auxiliary engine (on a vessel with no shaft generator) and a primary four-stroke engine on an inland vessel.

Assuming annual operation of 6,000 hours and a diesel price of \$450 per metric tonne (mt), FUELSAVE suggests that its technology could potentially achieve fuel savings of up to 12% which, in the case of engine power of 2,500 kW (and hourly fuel consumption of 460,63 litres) translates into annual cost savings of \$121,385.22.

To date, the company has undertaken tests on four-stroke engines alone, but has also modelled the potential fuel savings that could potentially be achieved on a primary two-stroke engine. Using the same diesel price indication and operating profile, FUELSAVE indicates that when using a 40 MW engine (with fuel consumption of 5,225,00 litres per hour), total savings of \$1,376,892 could be recouped.

Looking at the environmental benefits of FS MARINE+, the company says its technology could cut carbon dioxide (CO₂) emissions by between 10%-15%, depending on engine load, and nitrogen oxide (NOx) emissions by between 30%-80%, depending on configuration. Particulate matter (PM) emissions are also reduced, as well as Filter Smoke Number (FSN).

Attendant benefits of the technology solutions, says the company, are reduced engine wear and tear due to cleaner combustion and less soot, as verified by DNV GL, and potentially 30% maintenance savings and a 50% reduction in lube oil costs. Return on investment (ROI) is for most vessels within the first three years, depending on vessel, engine type and usage profile. The business model is customer ROI centric and guarantees ROI within the warranty period.

FUELSAVE's President Marc Sima explains that development work on FS MARINE+ began back in 2009. The company worked with the University of Bremen to test and validate the technology in a lab environment and in 2015 the equipment was then installed on one of Europe's largest heavy lift/heavy crane ships, the 151-metre-long *M/V Annette*, which was operated by SAL Heavy Lift GmbH (which has since become Harren & Partner). There then followed a two-year trial period (2015-2017) onboard the vessel.

Sima says that one of the main challenges in developing its innovative injection technology was 'achieving a very efficient mobile hydrogen generation.

'Crucial for the most efficient operation is the exact composition and injection timing and load specific quantities of the hydrogen synthgas with methanol along with other supporting processes.'

The size of the onboard equipment is relatively compact (Sima compares it to the size of a large refrigerator for auxiliary engines), and retrofitting is a relatively simple and time-efficient process. 'Installation, approval and commissioning is possible within a few days, without the need to take the vessel off hire or go into dry dock,' says Sima.

FUELSAVE's Technical Director Heino Eckerich says that the technology's performance in sea trials onboard the *M/V Annette* exceeded initial expectations, with no maintenance issues or stoppages. Furthermore, operation of the system does not require specific technical expertise.

'No additional skills are required,' he explains. 'Of course, you have to study and adopt the bunker instructions for methanol, but the crew don't need any special education for the system, and there is no need for any additional crew onboard – the unit is switched on and off electronically and operates automatically.'

During the test phase, a variety of bunker

fuel grades were used in conjunction with FS MARINE+. 'So far, we have tested heavy fuel oil (HFO), marine diesel oil (MDO) and marine gasoil (MGO), with excellent results for efficiency enhancements and emissions reduction,' comments Marc Sima.

'In general, we can say that the dirtier the fuel, the better the effect. If the fuel is cleaner, the emissions will be correspondingly less, however the fuel savings of 10% net (meaning the subtraction of all energy-related costs from the gross savings, such as water, electricity, methanol and pressurised air) and additional emissions reductions are still there.'

Sima also notes that the costs of the FS MARINE+ technology are around \$70-\$120 per kW, which, he says, is always significantly cheaper than using a scrubber.

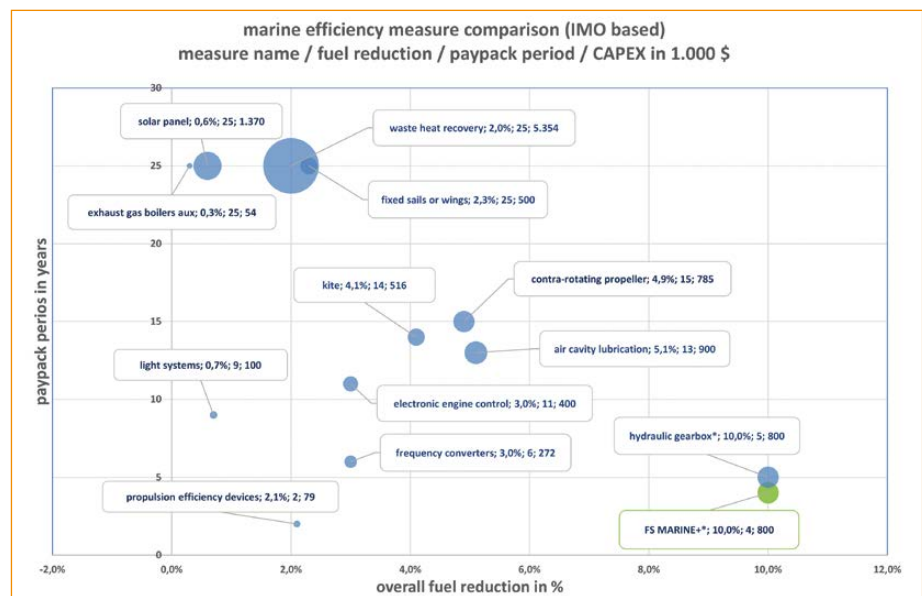
However, he cautions against making comparisons between FS MARINE+ and scrubber technology. 'The product is not in direct competition as FS MARINE+ is not reducing emissions as much as a scrubber in order to be in compliance with, for example, the 2020 global sulphur cap, but it is the only emissions reduction solution that also saves, additionally, significant amounts of fuel and provides a clear positive ROI; we are directly tackling the root of the problem, which is inefficient, incomplete and dirty combustion.'

Acknowledging that the emissions reductions achieved by FS MARINE+ are not as high as those achieved by scrubbers, he counters: 'A ship with a scrubber would still benefit from FS MARINE+ because we would still be able to cut fuel costs by 10% and make the combustion cleaner.'

To date, the development of the FS MARINE+ technology has been self-funded. FUELSAVE has made applications for EU funding under Horizon 2020, the European framework programme for research and innovation and has received in 2017 two seals of excellence after the evaluation phase. It has now been officially informed that it has been selected for funding by the EU Commission, having received the highest evaluation score in this current call for proposals.

However, with product trials successfully concluded, FUELSAVE is now preparing to take its technology to market, and it is already in late-stage negotiations over the first commercial sale of FS MARINE+. 'We are definitely the first mover [with this solution],' says Sima. 'DNV GL mentioned to us that it is the only system of its type that they have approved so far and currently we don't know of any other similar solutions in the market that operate like this and have achieved what FS MARINE+ has done.'

'We have had a tremendous feedback



from the market with a very high interest and willingness to try and buy, even before we have officially launched the product or made people aware of it, which shows that we are helping to address the current challenges of the market, and shipowners and operators understand this instantly.'

Of course, achieving good results in the testing phase of any technology is only part of a very long development time line, and achieving the transition from testbed to commercial production can be a 'make or break' step.

The common refrain in relation to the development of energy management or fuel/emissions reduction technologies is that it is the vessel owner which bears the upfront expenditure while the charterer may enjoy the cost benefits of, for example, fuel savings.

Sima fully understands this problem: 'The challenge is who is the one benefiting? Some customers, because they don't own the ship, then they don't have any interest in saving fuel, so there needs to be some parity within this value chain.'

Recognising that selling new technology into a cash-strapped market is a tough call, Fuelsave has created four purchase plans. There is an outright sale – which, as a new company looking to build and scale up its business is clearly the preferred route for Fuelsave – and also a leasing option. Additionally, the company has devised what it calls a 'build, operate transfer model'. This would require the participation of a bank or venture capital partner, and Sima explains how it would work in practice: 'We would provide the system at no cost and then offer a revenue split of the real savings that are achieved. If you achieved 10%, then we would split these 10% savings over three years – 70% for us and 30% for the customer in the first years and then a 50/50 split in the last two year.

'The benefit for the customer is that they will save from day one because there is no investment, and for us in the long run we will make a little bit more than we would have done with an outright sale.'

Sima also mentions another purchase option, based on an idea from Technical Director Heino Eckerich, which he believes could be an interesting model for large charterers and containerships. This would see the installation of the solution in a container which a charterer could move from one ship to another – and which is also a way of bringing the charterer into the OPEX/cost saving equation.

While FS Marine+ is ready for four-stroke engine application, development and testing has yet to begin for two-stroke engines, but Eckerich is confident that the solution can be successfully applied to this segment. The company is actively look for partners on two-stroke development, and Eckerich says that it could return to the University of Rostock (FVTR), which has a very good two-stroke engine testbed, or, with the right customer match, the technology could go straight to testing onboard a vessel, as any harm to the engine could be excluded due to experience gained through extensive testing.

The fuel efficiencies demonstrated by FS Marine+ will be more easily achievable on older ship engines with purely mechanical operation, says Eckerich. New engines are able to optimise operation by adjusting electronically to load variations, but, he notes, if new engines are able to achieve 3%-5% efficiency improvements, 'then maybe we can add a further 5%-8% improvement with our system.'

 Lesley Bankes-Hughes
Publishing Director/Editor

 Email: lesley@petrospot.com