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APRIL 2017

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Contents

Front Cover - For more than two years, Becker Marine Systems (BMS) has operated a branch office in Houston, Texas. During that time, BMS has positioned itself in the North American market, winning numerous orders for the company's various product ranges. Major orders include delivery of rudders to the new generation of US Navy tankers being built at the NASSCO shipyard in San Diego, plus other equipment for many ship types, including brown water tonnage.
The entire Becker range of manoeuvring systems and energy-saving devices as well as 'cold ironing', the external and low-emission supply of power based on liquefied natural gas or LNG, is in demand in the North American region, the company explained.
In future, Becker's newly developed COBRA (Compact Battery Rack) maritime battery system will also be marketed and sold through the Houston office.

IMO needs to keep the ball rolling

At the annual Navigate/ IPTA Chemical and Products Tanker Conference held this month, there was quite a bit of discussion on the IMO's 0.5% sulfur cap coupled with emissions and the way forward to compliance.

Most people in room agreed that the place to discuss this was at the IMO who had the mandate to legislate for example on any future requirements for shipping emissions with regards to greenhouse gases.

Kicking off the debate was Dr Tristan Smith, reader UCL Energy Institute and lead author of the Third IMO GHG Study -2014. He said that this study conducted jointly with the Danish Shipowners' Association found that there was no technology available as yet to de-carbonise shipping between 2015-2050 by 60 %- 90% - a period of just over 30 years.

Both he and several other speakers and delegates called for technology research & development, plus pilot schemes to be implemented sooner rather than later, especially on alternative fuels. "We don't have a genuine idea of technology changes," Smith said. "There is a need for the IMO, governments and the industry to co-operate."

He also said that it would be tempting just to ignore the problem and warned of conflicting interests giving advice who could be biased one way or another.

Sveinung Oftedal, specialist director at the Norwegian Ministry of the Environment, who is also heavily involved at the IMO with the Norwegian delegation, said that a 'road map' was agreed at the IMO last October, inter-sessional groups had been formed and that a step-by step approach was needed. Data needed to be analysed into some form of mechanism going forward.

Ardmore's Mark Cameron said that his company is using the current technology available to save fuel and thus emissions, most of which was good and agreed that the IMO should lead the discussions to address the future issues.

Delegates were told that LNG was still a fossil fuel and the use of biofuels was damaging rain forests. The IMO's senior technical officer Dr Edmund Hughes posed the question - how do you replace a 50 MW engine? Whatever it is, it must be practical.

Oftedal stressed that technical expertise was needed at the IMO and not just politicians. "Without testing and pilot schemes, there won't be future technology," he warned. "We cannot afford to fail or others will step in," he said in a veiled reference to the EU and US threat.

Cameron agreed that the industry must do something and was confident that there was a reasonable level of commitment from shipowners.

The next major hurdle for shipowners is meeting the 0.5% sulfur cap by 2020.

IBIA's Unni Einemo said that when analysing the effect of ECAs on the fuel market, the lessons learned were that residual fuel blends to meet 1.5% and 1% limits presented some quality issues and frequent sulfur disputes. The shift to 0.1% ECA sulfur limit was largely met by MGO, as emerging alternative fuel formulations presented both benefits and challenges.

She also claimed that the availability of 0.1% sulfur limit fuels proved to be better than expected, while the forecast price impact of the shift to 0.1% content fuels was softened by the oil price collapse. "Compliance appears to have been good," she said, according to port state control figures.

An analysis of the Notices of Protests (NOPs) suggested that less than 20% would qualify as 'off-spec' in a commercial case applying ISO 4259. The majority of sulfur NOPs related to ECA fuels. However, suppliers saw a 90-95% drop in sulfur claims in 2015 with NOPs falling by about 80%. She warned that the 0.5% sulfur limit is likely to increase blending and hence risk of sulfur 'off-spec' disputes.

Rush for fuel

Most were in agreement that just before the 2020 switch over date, there would be a mad rush to comply putting extreme pressure on supplies, which today are still a bit of an unknown, apart from a comprehensive review from Delft University.

Will there be enough heavy fuel oil available for those who have opted to fit scrubbers? Somewhat surprisingly LNG as a fuel was not expected to take off as predicted earlier, probably due to logistical problems in obtaining natural gas at ports and harbours.

Perhaps the overriding question is - who is going to pay for this - as inevitably there will be a cost attached to whichever way the industry moves. It is also interesting to note that nobody is predicting the future price of fuel of any description having been caught out by the recent oil price collapse.

Shipboard scrubbers, purifiers, blenders, etc all cost money, both to fit and to operate. We would have to see a significant upturn in charter rates across all sectors to make a quick return on investment.

Will the major charterers buy into to this as after all, many of them pay the bunker costs? Are the banks and financiers listening?

Only time will tell - probably the year 2020.

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TANKEROperator

Vol 16 No 5
Future Energy Publishing Ltd
39-41 North Road
London N7 9DP
www.tankeroperator.com

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SUBSCRIPTION
1 year (8 issues) - £150
Subscription hotline:
Tel: +44 (0)20 8150 5292
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Printed by RABARBAR s.c,
Ul. Polna 44; 41-710 Ruda Śląska, Poland

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Court examines 'narrow channel' and 'crossing rule' application

In a decision handed down in March, the Admiralty Court agreed with the VLCC's 'Alexandra 1' interests on the application of rule 9 of the Collision Regulations (Colregs) - the narrow channel rule.

In 'Alexandra 1'* and 'Ever Smart' [2017] EWHC 453 (Admlty) the Court considered which of two rules, the narrow channel rule (rule 9) or the crossing rule (rule 15), applied in circumstances where one vessel was exiting a narrow channel and the other vessel was navigating towards that channel in preparation for entering it.

Both rules presenting different requirements, their simultaneous application would be unsafe and the Admiralty Judge has confirmed that on the facts of this case, the narrow channel rule applied and the crossing rule did not apply. In the circumstances 'Ever Smart' was ordered to bear 80% of the liability for the collision.

Facts - On 11th February, 2015, a collision occurred between the laden VLCC 'Alexandra 1' owned by Nautical Challenge Ltd, and a laden container vessel, 'Ever Smart', owned by Evergreen Marine (UK) Ltd, just outside the dredged entrance and exit channel to Jebel Ali in the UAE.

'Ever Smart' was departing the port via the channel and shortly prior to the collision had disembarked the pilot and was about to exit the channel. 'Alexandra 1' had been waiting to enter the port at anchorage when she was instructed by port control to wait "at buoy No.1" where the pilot (the same pilot due to disembark from 'Ever Smart') would board for the inbound passage through the entrance channel.

As 'Ever Smart' exited the channel her Master called to increase the engines to full sea speed so that at the time of the collision, just outside the channel, she had a speed over the ground of 12.4 kn. 'Alexandra 1' engines were at slow ahead while awaiting the pilot in the vicinity of the buoy. The port bow of 'Ever Smart' struck the starboard bow of 'Alexandra 1' at an angle of about 40 deg leading aft on 'Ever Smart'.

The parties were able to agree largely on the navigational facts, but a more substantial dispute remained regarding liability, and more particularly the relevance and applicability of the narrow channel rule and the crossing rule under Colregs rules 9 and 15 in this situation.

Rule 9 of the Colregs, entitled Narrow Channels, provides at rule 9(a): - A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.

Rule 15 of the Colregs, entitled Crossing Situation, provides: - When two power-driven vessels are crossing so as to involve risk of collision, the vessel, which has the other on her own starboard side, shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

On behalf of 'Ever Smart', it was argued that at the time when she was proceeding along the dredged channel heading towards the exit (and entrance) point and 'Alexandra 1' was near to the channel entrance, the containership was positioned on the starboard side of the VLCC so that, pursuant to rule 15, it fell on the latter to keep out of the way of the former.

Limited application

'Alexandra 1' interests disagreed and submitted that the crossing rules had very limited application to questions of navigation in and around a narrow channel and, in particular, did not apply to a vessel in a narrow channel and a vessel navigating in preparation for entrance to the channel, as in the case at hand. Also, the VLCC was not on a suitably constant direction or heading to ever be on a course for rule 15 to apply.

There was no dispute that the dredged channel was a narrow channel for the purposes of rule 9 of the Colregs.

The Admiralty Judge, Teare J, reviewed a number of English authorities dating back to 'The Leverington' (1886) in which the application of the crossing rules in the vicinity of a narrow channel had been considered. Some of the statements of principle (particularly in 'The Canberra Star' (1962)) supported the case of the 'Alexandra 1'.

Teare J derived assistance not only from 'Canberra Star' but also from a decision of the Final Court of Appeal of Hong Kong, which examined the relationship between the crossing rules and the narrow channel rule in circumstances (similar to, but not identical to the present case) where one vessel was navigating along a narrow channel and another was preparing to enter the channel.

In Kulemesin v HKSAR (2013) 16 HKCFA 195, Lord Clarke considered the issue, as well as the previous English authorities, before noting at paragraph 225 of his judgment: "…vessels approaching a narrow channel and intending to proceed along it are not bound by the crossing rule but must enter the channel and, as they do so, keep as near to the starboard side as is safe and practicable in accordance with r.9. It seems to me to follow that a vessel shaping to enter the channel should, as a matter of good seamanship, navigate in such a manner that, when she reaches the channel, she is on the starboard side of the channel in accordance with r.9."

In summary, Teare J said: "I have therefore concluded that rule 15 of the Colregs, the crossing rule, did not bind 'Alexandra 1' when she approached the dredged channel leading to Jebel Ali and so she was not under a duty to keep out of the way of 'Ever Smart'.

"Her duty, as a matter of good seamanship,

and as formulated by Lord Clarke, was to navigate in such a manner that, when she reached the channel, she would be on the starboard side of the channel in accordance with rule 9."

Having reached this conclusion it was not strictly necessary for the Judge to deal with the other submissions by 'Alexandra 1' as to why the crossing rule did not apply on the facts of the present case, but helpfully he did.

In particular he considered whether the VLCC was on a 'course' for the purposes of rule 15. The Judge noted that 'Alexandra 1' had been proceeding at slow speed and variable heading while proceeding in the vicinity of buoy no.1 while awaiting the pilot.

He commented:"At such a slow speed 'Alexandra 1' was not very manoeuvrable. Nevertheless, she made progress in a broadly east south easterly direction towards the entrance of the channel as she waited to embark the pilot. Was she on a sufficiently constant direction or heading to be on a course? I do not consider that she was. Her 'course made good' varied between 81 and 127 deg (and her heading varied between 84 and 112 deg). It is difficult to describe that as 'a course' (though her preliminary act describes her as being on an east south easterly course).

"I would describe her as maintaining a broadly east or east south easterly heading as she waited for the pilot vessel to approach. That required her to have some, but not very much, way on. I would describe 'Alexandra 1' as waiting for the pilot vessel to arrive rather than being on a course. Had a good lookout been kept on board 'Ever Smart' from C-21 until collision it would have been apparent that 'Alexandra 1' had moved less than a mile. It would or ought to have been obvious that she was waiting to embark a pilot," he said.

The finding on this point, although not necessarily determinative in the case, is nevertheless a helpful reminder that in order for the crossing rule to apply, each vessel must be on a sufficiently defined course ('The Alcoa Rambler' [1949]). On the facts of this case, the finding that the VLCC was not 'on a course' provided an alternative basis to show that the crossing rule did not apply.

Having determined the principal issue between the parties, the Judge went on to assess the conduct of each vessel and to apportion liability.

Apportionment of liability

The Judge found 'Ever Smart' to be in breach of the narrow channel rule (failure to keep to the starboard side of the channel) and also of failure to keep a good visual and radar lookout. The 'Ever Smart' was found to have proceeded at an unsafe speed, having put her engines to full sea speed, and also of failing to take avoiding action prior to the collision. In terms of culpability the Judge described these faults as "very serious".

'Alexandra 1' was found to have failed to keep a good aural lookout to the extent that her Master had misunderstood VHF conversations between another vessel and port control that had hindered his assessment of the situation. However, whilst this was a held to be a significant error, which affected her navigation, the errors of 'Ever Smart' in her lookout were, in the Judge's view, "much worse".

Having considered all the evidence, Teare J concluded that 'Ever Smart' should bear 80% of the liability for the collision and 'Alexandra 1' should bear 20% of the liability for the collision.

Conclusion

The decision of the Admiralty Judge is a very helpful illustration of the application of the narrow channel rule, and why that rule is not necessarily displaced merely because it is alleged two vessels are crossing, and also provides a useful assessment of the policy underlying different rules within the Collision Regulations.

As the Judge said: "To have two sets of rules with different requirements applying at the same time is of course unsafe and cannot have been intended by those who drafted the Collision Regulations. Similarly, where one vessel is within a narrow channel and has a vessel on her port bow on a crossing course outside the channel but proceeding towards it in preparation for entering it, the vessel in the narrow channel cannot be under a duty (pursuant to the crossing rules) to maintain her course and speed and at the same time under a duty (pursuant to the narrow channel rule) to keep to the starboard side of the channel since the two duties may, depending upon the circumstances, require different action."

**'Alexandra 1' interests were represented by Clyde & Co (Irvine Marr, Partner, David Owens, Senior Associate, Martyn Haines, Master Mariner) who supplied this article.*

Clyde & Co expands MENA shipping team

Clyde & Co has expanded its shipping practice with the addition of Ian Chung, joining as Partner based in the law firm's Dubai office.

He brings a wealth of transactional, non-contentious experience to Clyde & Co which will complement the firm's existing contentious shipping/ transportation and offshore marine practice in the Middle East, the company said.

For example, Chung has worked in the Middle East since 2008 where he specialises in corporate and finance work in international trade, maritime and oilfield services. He joined from Holman Fenwick Willan (HFW) in Dubai where he was a Partner in the firm's Corporate Group.

He acts for regional and international financiers and operators and has been involved in and led many of the largest transactions in those sectors in recent years.

Chung commented: "With a strong heritage in shipping, I am honoured to be joining Clyde & Co which has an outstanding global reputation and a market-leading shipping and asset finance practice in the Middle East.

"I am excited about Clyde & Co's growth plans in the region, as well as the opportunity to work with the firm's broad and diverse client base and to collaborate with colleagues in Southeast Asia and Europe as part of my practice," he said.

Christopher Jobson, Lead Partner of Clyde & Co's Shipping practice in the Middle East, said: "I am delighted to welcome Ian to the firm where he will provide our clients with significant shipping and asset finance expertise from his eight years' regional experience.

"We see this as an exceptional investment in our shipping practice, which will be greatly strengthened by Ian's non-contentious and asset finance experience," he explained.

Clyde & Co has four partners and 16 lawyers in its Middle East shipping practice and is consistently ranked Band 1 for Shipping in the UAE by Chambers Global and Legal 500.

With specialist marine expertise based at the Abu Dhabi, Doha, Dubai and Riyadh offices, Clyde & Co said that it is able to fully service clients in the marine industry across the entire region.

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Greek owners still have an eye for a bargain

Not surprisingly, Greek interests were in the vanguard of the few newbuilding and sale & purchase deals reported recently.

However, in a slight departure from the norm, thus far this year, there have been a few more yard resales and newbuilding VLCC sales reported involving Greek interests. The VLCCs have ranged in price from around $80-$83 mill each, illustrating just how far newbuilding prices have fallen.

For example, brokers have reported that Enesel ordered two VLCCs in South Korea for around $83 mill each.

Newbuilding resales believed concluded in 2017 included two Metrostar VLCCs sold to Olympic Shipping for $81 mill each and Pantheon Tankers who reportedly took another newbuilding VLCC for about $81.5 mill.

TMS Tankers, part of George Economou's Cardiff Group, has been very active this year, taking a newbuilding Suezmax for $43.7 mill. In addition, the company purchased a 2011-built VLCC for $57 mill and an 2012-built Aframax for just over $29 mill.

New Shipping was believed to be involved in the purchase of a 2015-built VLCC for $60 mill, while Victor Restis' Enterprises Shipping & Trading was connected to the purchase of four 2008-2010-built Indian-controlled Aframaxes for just over $90 mill en bloc.

William Bennett, senior analyst at VesselsValue, said that at the beginning of March, the highest value Greek tanker fleet was Dynacom with 65 vessels valued at $2.42 bill (see table).

Second came Maran Tankers with a value of $2.3 bill from only 51 vessels. However, these vessels were primarily relatively new VLCCs, due to the company's large newbuilding programme, which is still ongoing.

According to Ted Petropoulos' Petrofin Research report released towards the end of last year, in general the Greek growth story contained some elements of distress among the smaller fleet sizes, as many companies experienced negative cash flows and the increasing reluctance of banks to provide further restructuring.

Top 10 Greek Tanker owners by value*

Company	Vessels	Total DWT	Total Value (USD mill)
Dynacom Tankers	65	10,681,900	2,418.97
Maran Tankers	51	13,717,600	2,290.47
Tsakos Energy Navigation	65	7,295,000	1,821.35
TMS Tankers	47	6,206,000	1,535.19
Minerva Marine	63	7,101,200	1,512.85
Thenamaris	55	6,354,600	1,373.62
Navios Maritime Acquisition	36	3,950,000	956.96
Pantheon Tankers Management	22	4,404,300	792.04
Delta Tankers	25	3,782,000	748.07
Almi Tankers	15	2,912,500	734.05

Greek fleet value

Ship Status	Vessels	Total value (USD mill)
Live	4,161	71,520.86
On order	285	16,647.97
Total	**4,446**	**88,168.83**

Greek tanker fleet value

Ship Status	Vessels	Total DWT	Total value (USD mill)
Live	1,328	133,365,700	26,516.14
On order	139	18,460,400	6,484.94
Total	**1,467**	**151,826,100**	**33,001.08**

**As at the beginning of March 2017*

Source VesselsValue

But on the whole across all vessel types, Greek owners used the poor markets to expand and add younger vessels to their fleets, despite the need to commit greater capital resources in the absence of bank finance.

Banks retreated last year with only a few actively expanding in shipping and most licking their wounds. As bank finance had the ability to raise bank finance. This resulted in the rapid expansion of non-banking finance institutions and funds, which supported Greek owners to secure inexpensive tonnage but at higher borrowing costs.

With new order activity declining to a record low, the considerable newbuilding deliveries that took place during 2016 were

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achieved by a combination of bank finance, non-bank finance, leasing and cash, Petrofin said.

Bigger younger fleets

The trend towards bigger and younger vessels continued unabated. Economies of scale continued to impact Greek shipping not only in terms of operating costs, procurement and insurance costs savings. Hence, it is not surprising that the 68 largest Greek companies in all sectors increased their fleet share to 65.38% last year.

Greek owners also took advantage of bank ordered sales of modern vessels, increasingly by German banks and owners. These sales were usually not supported by soft financing as the banks looked to exit shipping and reduce their loan portfolios. En bloc loan portfolio sales did not materialised to the extent anticipated by the market, as the discounts offered to banks did not meet their expectations.

The tanker rate fall last year brought this market to the attention of private investments funds. Although activity had slowed down last year, as the year closed, there was considerably more interest seen in drybulk.

IPO activity, however, remained slow, as no public companies escaped the assault on their share prices, due to weak earnings and value impairments. However, Petrofin believed that there was a change in the wind towards the end of last year, especially for drybulk shipping and more activity in this sector was expected from public markets, together with a recovery in company share prices.

Although global newbuilding activity has slowed and there has been a large reduction in Chinese shipbuilding capacity, the ground gained in the supply side of the industry was not matched by the demand side where international trade growth was lacklustre. Hence, the shipping industry is not expected to experience boom conditions in 2017, even though there has been a modest improvement lately across most sectors, the report said.

Having invested massive amounts of capital, Greek shipping needs to digest its gains and continue to grow selectively and qualitatively. It would not be surprising for fleet growth to slow as newbuilding deliveries slow. However, the Greek owners interest in modern secondhand vessels has been considerable and this should ensure a yet further solid performance in 2017, as can be seen during the first quarter of this year in the tanker sector.

The number of Greek based/owned companies continued to decline in 2016. The 1.5% decrease registered by Petrofin represented a drop of 10 companies across all vessel types, bringing their number down to 638. Considering the level of financial difficulties encountered by Greek shipping, this fall was described as modest.

In 2016, 25 plus vessel fleets constituted well over half of the Greek total in dwt terms (65.38%), and the number of companies involved in operating this number of vessels or above, has grown to 46 compared to 41 in 2015, 40 in 2014 and 35 in 2013.

The larger owners were getting bigger and with it, their fleet grew younger. The top category of 25 plus vessel fleets aged 0-9 years expanded significantly from 154.3 mill dwt in 2015 to 188.4 mill dwt in 2016. The companies with substantial fleets had climbed to 30 up from 24 in 2015, 22 in 2014 and to 14 in 2013.

Those with fleets of over 1 mill dwt constituted 77.47% of the tonnage, up from 76.7% of the total fleet in 2015, 74% in 2014 and 71.33% in 2013. However, their number remained at 68.

Interestingly, the report said that 16-24 vessel fleets were down to 26 companies from 30 in 2015 and their tonnage fell from 41.4 mill dwt to 29.5 mill dwt. This reduction favoured the higher and lower fleet size segments.

The very young fleets (0-9 years of age) continued to rise. They held 73.5% of the whole of Greek fleet in dwt terms, compared to 73.47% in 2015.

Over the last 19 years of Petrofin Research, the overall number of Greek companies in all sectors declined by over 31%. Greek shipping is a good example of economies of scale at work and clearly the trend towards consolidation and concentration will continue, the report predicted.

According to Petrofin, last year the large tanker fleet (vessels over 20,000 dwt) showed a marked increase in tonnage by 14.6 mill dwt to 131.6 mill dwt, compared to 2015's small increase of only 220,751 dwt. The number of vessels also significantly went up by 43 to 851.

The number of tanker companies fell by three and age wise, there was a marginal drop to 9.35 years average from 9.49 years reported in 2015.

Looking at Petrofin's analysis, it can be seen that there is a clear trend of fleets getting larger but the number of companies remained virtually the same. In all three sectors, there is strong evidence of economies of scale at work, the report said.

Meanwhile, the Hellenic Chamber of Shipping recently announced the creation of 'Maritime Hellas', the first Greek maritime cluster with the aim of promoting the interests of the Greek shipping and maritime community sectors, bringing together professionals active in the 'Blue Economy', as well as in all the related areas.

The joint decision was announced during a board meeting of the Piraeus Chamber of Commerce & Industry by the Hellenic Chamber of Shipping and the Union of Greek Shipowners. Non-profit NAFS has been assigned to organise the cluster's website.

"This is an open invitation to the country's dynamic shipping community to enterprises active in supply, equipment, repair and support services, which is to the benefit of all stakeholders… This maritime cluster maybe the 17th established in Europe but aims to become No. 1 as Greece, being a maritime nation, relies greatly on its shipping sector," said Vassilis Korkidis, Piraeus Chamber of Commerce president at its launch.

The total 'Blue Economy' accounts for 5.4 mill jobs in the EU and has a gross value of €500 bill annually, it was claimed.

Large tanker fleets showed a marked increase in tonnage - Eastmed's 37,000 dwt 'Agios Nikolaos IV' seen on the Thames

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Penfield Marine opts for Q88VMS

US and UK-based commercial shipmanagement concern and pool manager Penfield Marine has installed Q88VMS - a recently introduced voyage management system.

The company said that it needed a voyage management system to support its staff, enabling calculations and voyage estimates to be generated, to get business fixed with no delays, analyse data and manage a range of accounting-related processes, with the ability to adapt to changes as they occur.

Q88VMS has been configured to navigate users through tasks in whatever order suits them, eliminating the need to input data that is unrelated to the user's job function, thus enabling them to focus on their own tasks.

By extracting data from Q88VMS, Penfield is able to publish a daily report to its pool partners, providing them with the metrics they need to understand the pool manager's view of the market, through a simple automated process.

In addition, initial budgets and voyage economics created for financial statements, accounts receivable invoices generated by the operations group as well as invoicing history, are now tracked through Q88VMS.

Founded in 2012, Penfield Marine hit the headlines when ships under its management secured the first two crude cargoes shipped from the US since the lifting of the 40-year export ban.

As a commercial manager, Penfield said it was focussed on capturing opportunities for its chartering customers, pool members and other shipping investors. To undertake this, it relies on a combination of trusted personal relationships and up to date IT tools to keep it one step ahead of the market.

Penfield uses Q88VMS to manage its day to day business, taking advantage of its dedicated functionality for chartering personnel, operations and finance. As a company strongly focussed on trading opportunities, Penfield needed a system that could - long before a voyage is completed - analyse data and manage a range of accounting-related processes, requiring flexibility and the ability to adapt to changes as they occur.

CEO Tim Brennan explained that Penfield was looking for a voyage management system that was different from anything on the market. That meant not just enabling the chartering team to run quick and accurate calculations, track cargoes, ship fixtures and stems but also work across platforms and locations.

"Our focus on trading means we need to do quick calculations," he said. "Q88VMS enables us to easily run calculations and position lists and analyse the various options for our vessels. The results are fast and precise."

Mobile devices

Being an Apple Mac-based company, Brennan said that being able to use Q88VMS on desktops, iPads or iPhones was deemed a necessity not a luxury. The ability to check position lists or voyage status via a mobile device is also a big advantage, he said. He also said the ability to share information and work collaboratively is the hallmark of any successful business.

"We are a completely web-based company and very much focussed on using digital platforms to share information and data, so having a position list we can all work off is very important to us," he explained.

Once a ship is fixed, estimates already created in Q88VMS become an active voyage. All pertinent information - from timings to bunker consumption, port costs and invoicing – are handled via VMS, allowing for consolidated reporting and tracking of the complete process.

To operations director, Brian van Aken, the ability to immediately pick up and run with the voyage reflects the flexibility and real-world functionality built in to Q88VMS. "The fact that Q88VMS is designed well, by people who understand shipping is a great advantage," he said.

Because Penfield built its business from the ground up, it needed to ensure that there was no unnecessary development overhead or barriers to making future improvements. Q88VMS is laid out so that it takes the user through their tasks in the order that is most natural for them, the company said.

There is no need to input data unrelated to a person's job function, which enables users to concentrate solely on executing their own respective tasks. If the operations team needs port details, the user can click on the port and see everything he or she needs to know including arrival, agency details and bunker figures. The system also provides one-click accessibility to complete cost histories for that specific port.

"With Q88VMS things are where they properly should be. It makes it an easier and more streamlined process if you don't have to perform unnecessary clicks, because the data you need is right in front of you. It has a sleek design, an intuitive layout and is simple to use," van Aken said.

Supporting simple, timely analytics, Penfield's spot chartering team is constantly making decisions about positions relative to the broader market. To gain an understanding of how the team is expressing that view, CFO James Knowles needed the ability to extract data and combine it with other sources to produce a full picture for all stakeholders.

"Q88VMS enables us to generate timely analytics on market trends and trends within our own business," he explained. "The ability to build out our own analytics based on voyage information means we can see how the business mix is changing, how chartering staff are responding to market conditions and how the operations team is performing."

Connecting to data from Q88VMS enables Penfield to publish a daily report to its pool partners, providing them with the metrics they need to understand the company's view of the market. Rather than rely on a labour-intensive, multi-step process of replicating data from voyage calculations, Penfield can simply refresh its templates and share the results internally and with its partners.

"It's very helpful to be able to easily see how our team is making risk decisions," Knowles added. "Using Q88VMS is essential to monitoring, aggregating and articulating the strategies of the business."

Even before a voyage is completed, Penfield's

accounting and finance department can use the data to manage the processes to help them perform the accounting process. In addition to initial budgets and voyage economics created for financial statements, pool controller Erin Flink said accounts receivable invoices generated by the operations group, as well as invoicing history, are tracked via Q88VMS – to be accessed company-wide thanks to its ease of use and accessibility.

"The data extracted from Q88VMS for daily reporting gives management access to this information prior to preparation of formal financial statements," she said. "Because the system provides the finance department with access to all voyage emails, it is possible to address audit requests or research voyage changes."

When designing the interface between VMS and its accounting systems, Penfield identified flexibility as a key approach.

Flexibility Key

Flink's team wanted the ability to pull information out of Q88VMS and review it prior to importing into the accounting software. It also needed to map revenue and expense line items in Q88VMS into categories, numbers and formats used by the accounting software, revising rules if needed.

In addition to availability of a complete audit trail, the finance team also needed to be able to take a snapshot of one point in time, such as a balance sheet date, on either a voyage-by-voyage basis using summary reports, or from the inception of voyage activity. Flink said initial attention was paid to areas where integration would provide the greatest efficiency, allowing Penfield to perform its day to day activities effectively and focus on additional automation as time allowed.

"Being able to do the integration in stages has been very valuable, as we did not have existing systems in place and benefited from the opportunity to define the process cycles both on the operations side and accounting/finance side before focusing on integration," she added.

Cloud Based

Cloud-based Q88VMS was developed to offer the tanker industry an intuitive voyage management system tailor-made for tanker chartering and operations. Designed by people with tanker chartering and operations experience and using the latest technology, Q88VMS understands what each department involved in the voyage process needs in a system, the company claimed.

Penfield Marine - a snapshot

Founded in 2012 by Tim Brennan and Eric Haughn, Penfield Marine is a boutique commercial management company operating tankers worldwide in the company's Panamax/LR1 and Aframax/LR2 pools.

From its offices in Southport, Connecticut and London, UK, Penfield provides shipping services to a wide array of clients, which includes chartering customers (major oil companies and oil traders), pool members and shipping investors.

Today, the company commercially manages around 23 LR1s and six LR2s in the two pools.

Alfa Laval opens major test/training centre extension

Alfa Laval officially opened the second phase of the Aalborg-based Test & Training Centre on 1st March.

Alfa Laval's Test & Training Centre

This involved the building of a large extension to cater for gas testing, making the facility the world's most advanced centre for environmental and combustion technology for use with any type of fuel, the company claimed.

Originally opened in 2014 as a 250 sq m centre, the new facility is now 1,350 sq m in size and caters for almost all of Alfa Laval's marine offerings. For example, the centre houses R&D in exhaust gas cleaning, ballast water treatment, steam production, fuel cleaning and other key areas.

The original 250 cu m testing space was essentially a full-size machine room on land, equipped with Alfa Laval products that were installed and integrated into major process lines around a 2 MW marine engine.

At a wide ranging presentation in Aalborg, Alfa Laval explained the test centre's concept and outlined some of the technology available on site. Among the new equipment fitted in the extended centre are burner systems, inert gas systems and also a full scale Alfa Laval Gas Combustion Unit (GCU).

"Our investment in the Alfa Laval Test & Training Centre reflects the extraordinary changes we see in the marine industry," explained Peter Leifland, Alfa Laval's Marine Division president. "Tightening emissions legislation is driving many customers from residual fuels towards LNG and other alternatives. As a comprehensive marine supplier, we must be at the cutting edge in supporting our customers, no matter what fuel they choose."

Today, Alfa Laval claims a substantial portfolio of solutions for gas as fuel and gas as cargo. This includes Alfa Laval Aalborg dual-fuel boiler systems, the Alfa Laval FCM One Gas booster system, Alfa Laval Smit inert gas systems and the Alfa Laval GCU, as well as a complete range of heat exchangers for working gas at different pressures. Even more solutions will be required in the very near future, the company said.

"Within 15 years, it is expected that thousands of vessels will be sailing with LNG as fuel, compared to the hundreds using gas today," said Lars Skytte Jorgensen, Vice President, Alfa Laval product centre boilers. "We can clearly see emission regulations driving the trend. But the success of the transition will depend in large part on advanced technology, much of which has yet to be developed."

At the new centre, Alfa Laval is currently testing a new dual-fuel burner for gas-diesel applications on smaller boilers, which will later be developed into a multi-fuel solution in partnership with the Danish Technical University in Copenhagen. A development project is also running for large burners and boilers, involving comprehensive tests with both gas and diesel flames. In addition, the GCU will be subjected to test flame and heat flow characteristics in different conditions thus identifying possibilities for improving performance even further.

Alfa Laval's Peter Leifland

The GCU is designed to deal with LNG boil-off gas in a safe, reliable and environmentally responsible manner. It measures 23 m in height and can burn up to 4.5 tonnes of LNG per hour – the rough equivalent of 60 MW. To enable indoor work with the unit, extensive preparations were necessary.

"The GCU fans move 458 cu m of air per hour at full load, so automatic systems connect its control with the large doors of the facility, which must be open during operation," explained Jorgensen

According to Leifland, the costs of investing in the centre are far outweighed by the benefits; "After just three years of operation, we can point to many areas where the Alfa Laval Test & Training Centre has accelerated our R&D and improved its quality. Exhaust gas cleaning, where our Alfa Laval PureSOx platform is fully ready for the 2020 global sulfur cap, is just one example," he said.

Ballast water

With the IMO Ballast Water Management (BWM) Convention taking effect this September, customer interest in BWTS, including Alfa Laval's PureBallast has been growing, the company said.

Specifically, interest has been growing in a PureBallast system with high flow capacity, the company said during the presentation at the Aalborg centre.

While interest for high flow PureBallast systems is increasing, Alfa Laval explained that it was preparing to support vessels needing the technology. The IMO and US Coast Guard (USCG) type-approved PureBallast 3.1 features a unique single-filter solution, which enables higher capacities – up to 6,000 cu m per hour – with a small footprint.

For example, Alfa Laval recently signed a contract to supply two South Korean LNGC newbuildings, with installations comprised of two parallel 3,000 cu m per hour systems per ship.

"Traditionally, many have operated under the assumption that high flows require chemical treatment systems," said Kristina Effler, Alfa Laval PureBallast global business manager. "But today, more shipowners and operators are seeing the benefits of PureBallast's enhanced UV disinfection technology, which can handle a much broader range of flows than other UV systems."

The benefits of this third generation BWTS include reduced installation costs and a lower OPEX, meaning substantial savings over vessel life cycle. In addition, Alfa Laval PureBallast has a decade-long record of ensuring compliance that is unmatched by any chemical disinfection system, the company claimed.

"The high interest in Alfa Laval PureBallast provides clear evidence of growth in the retrofit market, and there are many reasons this is happening right now," said Anders Lindmark, head of Alfa Laval PureBallast, Alfa Laval Marine Division. "We have received lots of interest directly tied to our recent USCG type approval, and we're also seeing greater numbers of shipowners preparing for the IMO convention."

For shipowners who put off selecting a ballast water treatment system during the lengthy ratification process for the BWM Convention, the global requirements taking effect in September leave little time to make a decision, the company warned.

"Alfa Laval is well prepared to guide customers who are only now entering the market," said Lindmark. "We've developed a wealth of knowledge in more than a decade of experience with ballast water treatment, and we're providing resources to help shipowners understand their options."

He explained that it takes around nine months for a BWTS to be installed, which includes the planning, preparing and engineering phases. Lindmark said that Alfa Laval had geared up its production schedule to cope with 2,000 systems per year and thought that the market would see some 35,000 ships fitted through 2025 - around 15,000 newbuildings and 20,000 retrofits.

Alfa Laval has published a white paper on ballast water management, as well as a comprehensive book that explores the legal, technical and business implications of different compliance alternatives.

Scrubber technology

Alfa Laval claimed that its PureSOx is today's most complete SOx scrubber platform, with multiple operating arrangements, two scrubber designs and a range of compliance profiles for meeting the 2020 global sulfur cap.

Working closely with customers, Alfa Laval is pursuing improvements and options to make it even more flexible and optimised, the company said during the presentation.

PureSOx was launched in 2012 to allow vessels meet SOx limits while continuing to use economical heavy fuel oil. Subsequently, it has become popular with shipowners and operators in Emission Control Areas (ECAs). Moreover, it has evolved into a highly flexible scrubber platform, fully prepared for the 2020 global 0.5% sulfur cap.

At the Alfa Laval Test & Training Centre, the technology is being adapted for the widest range of customer needs, the company said.

"Compliance is always in focus, but customers have a broad spectrum of other requirements," said Erik Haveman, exhaust gas cleaning sales director. "Those can go well beyond open-loop, closed-loop and hybrid arrangements, or the choice between U- and I-designs. Today we can match a vessel's sailing profile by optimising PureSOx for different compliance needs, and we offer many options to suit a vessel's individual circumstances."

Alfa Laval core technologies are found not only in the scrubber itself, but also in the patented separator technology of its water cleaning unit and in the heat exchangers used for cooling the circulation water. In addition, PureSOx has taken a central role in much of the work at the Aalborg centre.

The scrubber fitted at the centre has been used in developing the PureSOx platform, but also for solving individual customer challenges in exhaust gas cleaning. Designed for 1.5 MW, it can be pushed to its physical limits by the centre's 2 MW engine, which would be unsafe and impractical on board a vessel.

"In the controlled environment of the Alfa Laval Test & Training Centre, we can really work with extremes," Haveman explained. "This lets us innovate and meet design targets more quickly, but it also allows us to explore customer-specific challenges and inquiries. For example, we can look for the best way to cool a hot scrubber for start-up, or find ways to adapt the system for a particular engine type."

Alfa Laval's Anders Lindmark

Work at the centre and elsewhere has meant continuous improvement of the PureSOx platform, especially with regard to size and resource use. A significant size reduction for the U-design scrubber was announced last year, and tests have been performed with many different filling elements and sprayer arrangements to find the lower possible water consumption. Minimising pressure drop across the system, which reduces fuel consumption by the engine, is a further area of focus, the company said.

Likewise, new options are being introduced at a steady pace. "Recently we introduced an option for open-loop scrubbing that complies with the strict pH requirements of the US Vessel General Permit," said Haveman. "As the 2020 global cap approaches, more shipowners and operators will be looking at scrubber solutions than ever before."

The company said that around 5,000 vessels would be fitted with scrubber technology by 2025 and the cost would be in the region of €1 mill per ship, depending on the scrubber size.

Methanol and LPG fuel

Alfa Laval FCM One Low-Flashpoint (LF) booster systems are claimed to have been a success on methanol-fuelled tankers fitted with ME-LGI engines. Now Alfa Laval is supporting MAN Diesel & Turbo (MDT) as the engine series is further developed to work with LPG as a fuel.

In late 2013, Alfa Laval was chosen by MDT to deliver low-flashpoint supply systems (LFSS) for the world's first methanol-fuelled tankers. A year

Alfa Laval PureBallast

earlier, the two companies were collaborating on fuel conditioning for MDT's new 2-stroke diesel engines with liquefied gas injection (LGI) technology.

"MAN Diesel & Turbo has worked closely with Alfa Laval in development projects like exhaust gas recirculation, where Alfa Laval PureNOx technology cleans the circulation water," said Søren Jensen, MDT's vice president and head of R&D, 2-stroke business. "That, together with deep expertise in fuel conditioning, made Alfa Laval the natural choice to deliver the low-flashpoint supply systems for methanol."

As a result, Alfa Laval's FCM One Low-Flashpoint (LF) technology was installed on 50,000 dwt tankers built at Minaminippon in Japan and Hyundai Mipo Dockyard in South Korea. The vessels' three owners, MOL, Westfal-Larsen and Marinvest, have since logged over 4,500 running hours with the FCM One LF in the past three years.

"The effectiveness and market-readiness of our ME-LGI engine technology has been clearly demonstrated by the fleet," claimed Kjeld Aabo, MDT's customer director. "Alfa Laval's low-flashpoint booster technology has played a significant role in that success, and we look forward to further co-operation as the application develops."

New booster developments are already underway, Alfa Laval said at the presentation. MDT is currently modifying the ME-LGI engine series to use LPG as an alternative fuel, and again Alfa Laval is preparing the booster system. After more than one year of development, the first Alfa Laval FCM One LPG will be delivered to MDT's Copenhagen test site in the coming weeks.

"Tests of the engine and booster are expected to be completed by the end of 2017," said Roberto Comelli, Alfa Laval's business manager, fuel conditioning systems. "In the meantime, Alfa Laval is preparing to support MAN Diesel & Turbo when the first LPG-related orders come in."

Boiler touch control

Finally, a touch control system is being rolled out for new and existing Alfa Laval Aalborg boilers.

First to be fitted were the Alfa Laval Aalborg OL and OC-TCi boilers, which will now feature the advanced control system with a simple touch.

With its graphical touch screen display and intuitive two-touch navigation, the new common control platform for all Alfa Laval Aalborg boilers, will be a familiar interface for crews, regardless which boiler they work with. It has already been fitted on board a range of newbuildings, and additional deliveries are underway, the company said.

"Our boilers themselves have always been at the cutting edge," claimed John Pedersen, Alfa Laval's manager boilers & heaters. "With Alfa Laval Touch Control, we take the same lead in steering them."

It has already been proven in the engine room on other marine Alfa Laval systems. In addition, it is used at the Aalborg centre, where it steers the boilers and aids the continuous development and optimisation of systems for new boiler types. During training, the centre's rig is used to show the many ways in which boiler operation can be optimised.

"The system is intuitive and incredibly easy to learn, even for less skilled crew members," said Pedersen. "Two touches of the screen provide access to any setting or function, yet there are user levels and password protection to keep inexperienced operators from making mistakes."

Intuitive control means easier and better boiler operation. With a complete view of the plant and easy access to all functions, crews can make faster, smarter decisions that optimise boiler use. Supporting those decisions are features such as integrated manuals and user-defined trend pages.

"Alfa Laval Touch Control gives operators an easy-to-use interface with a full graphical overview of the plant," Pedersen said. "With everything literally at their fingertips, they can pinpoint issues more quickly and easily than ever before."

The control system is PLC-based, which gives it plug-and-play simplicity and high durability in the engine room. With coverage for all major bus interfaces, it is easily connected to on board communication systems. Similarly, Alfa Laval Service engineers can quickly retrofit it to an existing Alfa Laval Aalborg OL, OS-TCi or OC-TCi boiler, as has already been undertaken on a number of tankers.

Trials were undertaken on board Greek-managed tankers for around four to five months.

"This is boiler control for today's operational requirements, but also for the future," Pedersen concluded. "As boiler technology changes and legislation creates new demands, Alfa Laval Touch Control will let vessels and their crews adjust with ease."

Aalborg OC-TC boiler and economiser at the centre

Modal Training's new UK centre opens its doors

A major marine training facility, equipped with Kongsberg Maritime marine simulators, has opened at Modal Training's new site.

Room B Class B bridge simulator at Immingham

Based in Immingham, on the south bank of the UK's River Humber, Modal Training is claimed to be the first independent training organisation in the UK to offer such a comprehensive a range of integrated Kongsberg ship, offshore vessel, engine and control room, HV, DP, radar and VTS simulators.

Powered by Kongsberg's latest K-Sim full picture technology, the simulators will allow training to be provided on all vessel types, including tankers.

In pride of place is a Class A full bridge K-Sim offshore vessel simulator, with a fore and aft bridge, DP2 dynamic positioning with K-Pos interface and anchor handling. It is one of just three in the world to be configured in this way for offshore training - the others are located in Norway and Singapore.

In addition to meeting the training needs of individuals and businesses in the Humber estuary, it is expected that the new facilities will attract trainees from throughout the UK and worldwide.

Sam Whitaker, of Modal Training, said: "As well as being Europe's fourth largest trading estuary and the UK's largest and busiest multi-purpose ports complex, the Humber is home to the UK's rapidly developing wind energy sector.

"Our aim therefore is to meet the training

Kongsberg engine room simulator

Panoramic bridge view

needs of the many global businesses, which are establishing themselves around the Humber, as well as providing a new and valuable opportunity for individuals and existing businesses to train locally.

"We are also keen to play our part in addressing the anticipated shortfall in qualified British seafarers, which is expected to grow to more than 4,000 in the next seven years – as recently predicted by the The UK Seafarer Projections Report.*"

Wide ranging

The equipment installed will allow Modal to offer training for a wide range of maritime roles, including deck and engineering officers and crew, marine pilots and Vessel Traffic Service (VTS) operators.

In addition to providing the opportunity to acquire basic skills and learn standard operating procedures, simulator training can accelerate learning because key environmental factors can be changed at the flick of a switch.

Wind direction, sea state, weather conditions and light levels can all be adjusted to make the exercise more challenging. Obstacles and difficulties can be introduced to test individual responses and team work. Dangerous scenarios can also be created for emergency response training.

Each part of the simulator system can be operated independently, or be interconnected to provide full vessel operation exercises for an entire crew.

When the accreditation process is complete, the new Kongsberg simulation suite will be used to deliver a wide range of courses including: Bridge Resource and Team Management; Dynamic Positioning (DP); ECDIS; Navigation and Radar (NARS); Global Maritime Distress and Safety System (GMDSS); Human Element, Leadership & Management (HELM); High Voltage (HV); Engine Room; and Vessel Traffic Service (VTS).

It can also be hired either for bespoke training or process development work.

Modal Training is funded by the Grimsby Institute Group, supported through the Humber Local Enterprise Partnership by a Local Growth Deal grant of £2 mill.

A Modal spokesperson told *Tanker Operator* that the training centre had received interest from tanker companies, as the Humber is a major tanker port.

The centre is also looking into the installation of a liquid cargo handling training tools for the future as an additional 'bolt on' facility.

Training- Fundamental changes on the horizon

In a presentation, newly installed KVH senior vice president for training and content, Mark Woodhead outlined his take on how fundamental changes in training will be possible as the bandwidth between ship and shore improves.

There will be a significant upgrade in the content and interactivity of training. As part of the KVH family, Videotel for which Woodhead is now responsible, is now able to move rich content from shore to ship enabling a better training experience to be delivered - smart training for a smart ship.

Crew will see an upgrade in content from showing a picture of a pump to showing 3d dimensional animation of the pump in virtual reality (VR). "We will also see the introduction of more immersive content," he said. "Augmented reality with enable us to overlay training on to real life scenarios and virtual reality will immerse the seafarer in scenarios allowing them to experience training rather than watch it." The content will be richer and VR will give the trainee a better experience.

For example, enclosed spaces are areas where an avatar can be used for training ashore. He thought that the VR training concept would eventually migrate from the shore to the ship.

He said that Videotel was in discussions with a large shipmanagement company to install VR type training ashore. He also said that the company was aiming to offer up to 10 VR programs by the end of this year.

However, he thought that an even bigger development than content improvement will be the application of 'big data' to training.

"Imagine if we could access a sample of more than 13 mill test results, to find out how your crew performed? Videotel's experience and solutions means we can analyse the largest database of crew training records available, more than 13 mill and rising. We have 345,000 crew in our system or 10 times the crew engaged by the largest shipmanager operating today. What can you do with that data?" he asked.

Typical questions that could be addressed include -

- How do all Chief Engineers perform on a specific test? Interesting.
- How do all Chief Engineers perform in comparison to the other crew on that test? – More interesting.
- How do Chief Engineers perform on that specific course in comparison to Chief Engineers on thousands of other vessels? – Very Interesting.

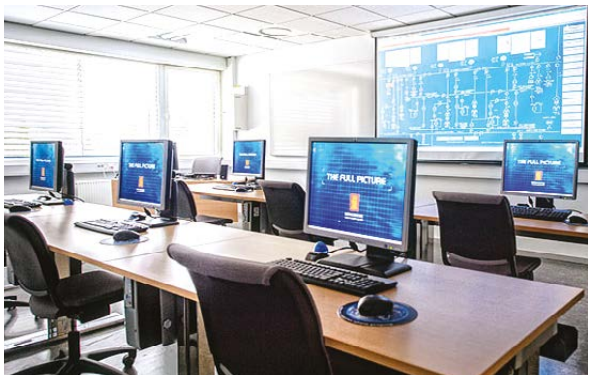
This power becomes exponential when you link databases together, Whitehead said. "By comparing how a Chief Engineer performed on a course with the performance of the vessel, we can begin to align training with performance…….", he explained.

Training has traditionally been a product sold to the industry. KVH believed that training will move to a service model where providers like Videotel take a greater responsibility for the training of crew, especially for companies with smaller fleets, by introducing matrices and schedules.

"Why be burdened with the need to create your own training matrices and reports when we can use our years of experience and industry knowledge to do it for you, integrate your existing content into our 850 programmes and manage the service?" he stressed.

What difference will connectivity bring to training and ultimately performance? He explained that while seafarers remain remote and unconnected, the focus of training is on the quality of the materials on the vessel (inputs).

"We need to use more immersive content, 'big data' analysis and expert trainers to ensure that training is linked to changes in behaviour and performance. The data and the content are available and connectivity improvements will bring the final piece of the jigsaw. This is where KVH will focus its efforts in future," he said.



Kongsberg's VR training room

Kongsberg's viewpoint

Elsewhere, Kongsberg Maritime's training division has introduced a new virtual classroom solution covering a wide range of disciplines.

Designed for the pre-course preparation phase, Kongsberg Maritime's new online remote training system uses a live video link between instructors and students integrated with dynamic on-screen presentations, emulated system software and assessment tools.

Pre-course remote training preparation modules are already available for dynamic positioning operators and engineers. For automation students, remote training modules are available for several K-Chief 700 courses including Step 1, Step 1 – LNG and K-Chief 700 for bridge personnel, in addition to the K-Chief 600 basic course.

Remote training is also now available for preparation for the K-Fleet marine fleet management software course and will be developed further for other courses offered by the company's training division. In addition, virtual classroom-based remote training presents an efficient way to provide familiarisation and refresher training for crews on new or upgraded Kongsberg software.

"Our new virtual classroom solution is a complete and integrated remote training offering that enables our instructors to conduct live sessions with course participants prior to them attending the course. By teaching and assessing knowledge and competence levels at the preparation phase we are aiming to reduce the time needed at training centres, which can save customers both time and money," said Eirik Hågensen, vice president studies and training, Kongsberg Maritime. TO

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Pirates in sophisticated targeting using navaids

In 2016, a shipping company began to notice strange events. Pirates seemed able to instantly locate the most valuable cargo on their ships, looting and departing the vessels at lightning speed.*

Wider reports simultaneously indicated that pirates were increasingly able to locate valuable target ships in open waters with uncanny accuracy.

What links these revelations together is that, as we move towards a digitally-controlled shipping industry, where vessels are interlinked by real-time data, pirates are increasingly using position and timing data to mount ever more sophisticated and strategic attacks.

It turned out that the shipping company's systems had been compromised by hackers who stole the bills of lading for the fleet, while pirates were found to be obtaining secret Global Navigation Satellite Systems (GNSS) co-ordinates and also using AIS to target vessels more effectively. Research has even shown the AIS could be compromised to divert a target ship into a trap.

Increasingly, sophisticated targeting has become essential as pirates have moved away from hostage-taking and instead begun to mount swift, targeted 'hit-and-run' attacks on high-value cargo ships, such as attacks on tankers in Southeast Asia.

The key problem is that recent advances in maritime navigation technology, developed to boost the efficiency of commercial trade, have inadvertently opened up new vulnerabilities that pirates can potentially exploit to dangerous effect.

For example, GNSS underpin the radar and other navigational equipment that allow port authorities to track global sea traffic, enable high-precision dock positioning systems with centimetre-level accuracy and facilitate 'e-navigation'. In future, the MonaLisa project even envisions GNSS data driving a maritime version of air traffic control, to monitor and guide sea traffic.

Yet these innovations mean that much of maritime logistics will be heavily dependent on satellite navigation data that is vulnerable to malicious or accidental interference.

GNSS signals are beamed from satellites orbiting 20,000 km above the earth. The signals are weak and almost indistinguishable from background noise by the time they reach earth, requiring complex algorithms to identify and track them. This makes them susceptible to being interfered with or 'spoofed' by counterfeit signals.

University of Texas researchers have demonstrated the ability to lead a large boat off-course by producing a fake GPS signal. Two US Navy patrol boats were even captured after reportedly being lured into Iranian waters by fake GNSS co-ordinates.

Growing threat

This threat is growing because the rise of software-defined radio technologies means that radio frequency signals can now be cheaply and easily processed with computer software. Pirate 'spoofing' devices could in future lure ships into the path of attacks. By misleading a vessel as to its true location, pirates could also cause a target to transmit a false location to the AIS, misleading coastguards and sending law enforcement to the wrong location.

The increasing 'connectivity' of shipping also poses a further threat to satellite navigation. Researchers have discovered holes in maritime GPS that make it vulnerable to cyber-attack. As ships, containers and rigs increasingly connect to the internet, it is possible for hackers to break into 'connected' GNSS receivers and alter navigational data, luring a ship into the path of pirates. A recent report exposed devastating cyber attacks on the maritime oil sector and a security consultant to the oil and gas industry revealed that ships and rigs are riddled with computer viruses.

Even worse, some tanker operators are responding to the threat by turning off their AIS in pirate-infested shipping routes, which renders it difficult for law enforcement agencies to locate them. The real key to averting attacks is for the shipping industry to find new ways to secure maritime navigation data and reduce the industry's reliance on any one electronic navigation aid.

The development of new satellite navigation constellations, such as Europe's Galileo, China's BeiDou and Russia's GLONASS, offers an opportunity to provide additional backup to GPS. Industry is stepping up to the challenge by developing a generation of more robust satellite receivers that can connect to multiple satellite constellations. These receivers will use a range of GNSS frequencies and signals to ensure continuity of service in the event that any one signal is interfered with.

By taking a position 'fix' from the consensus among an array of satellite constellations, they can also easily spot a 'spoof' signal. They could allow shipping companies with government authorisation to access secure signals, which have added protection against jamming and spoofing. To add further protection the shipping industry must also work to secure all its networks and systems against cyber attacks so that satellite navigation data collected by the receiver cannot be interfered with when being used.

As we move towards 'e-navigation', data security is now fundamental to the security of every vessel and its cargo. Putting the correct safeguards in place will help inspire confidence in the data-driven revolution that is changing the shipping industry.

QinetiQ's Nigel Davies

**In this article, Nigel Davies, QinetiQ's Head of Secured Navigation, argues that satellite navigation technology is increasing piracy sophistication.*

TO

Dyneema passes VLCC mooring rope longevity

With the shipping industry focusing on improving safety and effective VLCC operations, Cosco Dalian, has claimed to be at the forefront of best practices and technology focusing on operational excellence, health, safety and environmental protection.

For example, since the 'Cospearl Lake' became one of the world's first VLCCs to be successfully equipped with mooring ropes made with DSM's Dyneema fibre in 2008, Cosco Dalian has equipped 16 VLCCs with a total of 332 mooring ropes made with the patented fibre. Among these was the 2009-built 'Cosjade Lake'.

Since going into service, more than six years ago, 'Cosjade Lake' has been involved in 64 docking operations taking an average of 30 minutes each.

After such a long time of securing operations in a variety of extreme conditions, the company said that it was time to inspect the VLCCs strong lightweight Dyneema mooring ropes, which were claimed to have provided the vessel with a safer, more secure and faster mooring operations, versus traditional steel wire ropes.

The visual inspection concluded that the ropes, which are protected by a sleeve where they come into contact with the fairlead, were still in good condition. They showed little wear even after six years of operations. Further inspection showed that the ropes should be capable of providing 10 years of service life at their current rate of wear. And with an end-to-end switch, they could last even longer, the company claimed.

"After more than six years spent operating in a variety of extreme conditions, the rope continues to perform reliably with minimal maintenance," said Gu Fang, 'Cosjade Lake's' Chief Officer. "We have not needed to make any replacements and the ropes show only a little wear. In fact, they have helped us to reduce the personnel, time and resources needed to moor a vessel of more than 298,000 dwt, allowing the crew to focus on other operational needs on the vessel."

After six years of operation, DSM Dyneema ropes were said to be good for 10 years service

It was a convincing case for Cosco Dalian, as Zhao Jin Wen, the company's deputy general manager, noted: "The performance, quality and reliability of the mooring ropes with Dyneema have clearly benefited our operations, as well as the health and safety of our employees and the environment. Since 2008, when we had the first successful trial, we have gone on to equip 16 of our VLCCs with ropes made with Dyneema and we are looking to equip more of our vessels in the near future."

The VLCC 'Cosjade Lake' was one of 16 VLCCs fitted with the rope

Kedar Sule, DSM Dyneema's marketing manager maritime, commented: "At DSM Dyneema, we offer our rope-making partners a wide range of support. This means we not only underwrite the performance and reliability of each and every Dyneema fibre, we also provide expertise through our global application development and technical service team. The result, as in the case of the 'Cosjade Lake', is outstanding performance over the long-term."

TO

Dyneema fibre mooring ropes advantages

- **Seven times lighter:** A mooring rope made with Dyneema is claimed to be seven times lighter than a steel-wire rope of the same strength and diameter.
- **Increased mooring speed:** Dyneema ropes cut VLCC docking times from around 240 minutes with mooring ropes made with steel-wire rope, to around 30 minutes. This reduces the personnel, time and resources needed to moor a vessel.
- **Health and safety advantages:** Mooring ropes made with Dyneema are claimed to be safer and easier for crews to handle. No hand, wrist or back injuries have been reported from mooring operations. The ropes eliminate the risk of steel-wire backlash with the possibility of serious injury or even death.
- **Less maintenance:** Dyneema fibre ropes require minimal maintenance, compared with their steel wire rope counterparts – and no greasing or lubrication is required. This also means that these ropes do not fall foul of the US rules that specify the use of more environmentally friendly (and more expensive) grease for lubricating steel wire ropes.

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Keeping an eye on the fleet

SKF has helped an unnamed client introduce condition monitoring (CM) on a tanker.

The company is planning to extend the operation across the fleet, said Anders Welin, SKF's business engineer without naming the vessel or owner.

SKF claimed that CM is a vital resource in any industry, as it helps to protect assets from sudden failure. The operation is undertaken using an array of sensors to monitor machinery and detect potential problems at an early stage.

One of the most widely used methods is the use of vibration monitoring to assess the 'health' of the asset.

In the tanker's case, serious problems with the reduction gearbox bearings had caused extensive damage. With SKF's help, the customer introduced CM into two ships in the fleet for early detection of any emerging problems.

CM is a good example of a technique that has many hidden layers, SKF claimed. Beyond the visible hardware, there is a network of sensors gathering information. This is collected and transmitted to a central storage or 'cloud', where it is analysed by SKF's CM experts. Any findings are reported with clear recommended actions for the crew.

In this particular case, bearing and gear mesh fault signals from the gearbox and generator were monitored.

One innovative aspect claimed was the use of SKF's new SKF Multilog Online systems IMx-8 as the 'gateway' to the CM's service, which was developed to compliment the earlier IMx-S systems boasting a number of improvements.

For example, it has eight channels, instead of 16 or 32, which is more suited to this type of application, as IMx-8 can be installed closer to the application being monitored, meaning less cabling and simpler installation.

In addition, it is more compact – as it will fit into an existing cabinet rather than in a tailor-made cabinet. Furthermore, it is rugged for marine use and meets the stringent environmental requirements set by the classification societies as part of its type approval process.

Its compactness makes it ideal for use in space-restricted applications, such as small size thrusters or reduction gearboxes – where for practical reasons, instruments often need to be located as close as possible to the monitored machinery to reduce cabling.

At the same time, the IMx-8 boasts a vastly expanded memory of 4 GB, which allows the retention of huge amounts of data - useful in the event of Ethernet connections being lost to the cloud. In addition, the system can be powered via an Ethernet cable (PoE), thus simplifying the installation.

SKF' Multilog IMx-8 system

Setting up the new system is also claimed to be much easier than in earlier systems, as rather than using a serial connection, this is now undertaken via an APP, which helps service engineers and crew to view data instantly.

SKF Multilog Online Systems IMx-8 is claimed by the company to be affordable and easy to use and, as such is an ideal way to help shipping companies take their first step into CM. It is initially being marketed to the marine and offshore sectors.

In the cloud

In normal operational machine conditions, raw data is sent to the cloud and analysed at SKF's Remote Diagnostics Centre (RDC). Included in the service, SKF will deliver event reports in case of changes to the asset's condition and complete machine analyses, as agreed with the customer.

In the current tanker pilot study – which began in November, 2016 – the health of a gearbox is being monitored– taking vibration data at key locations in order to check for problems, such as bearing and gear mesh wear.

The system is also capable of identifying unbalanced and misalignment problems between the generator and the shaft, which further enhances the benefits to the user, SKF said.

The company also said that it must be remembered that this type of CM system is about more than just the on board hardware and sensors, as its real advantage comes from the RDC service that analyses the data using the application knowledge, gained over the years – before making timely, cost-saving recommendations.

An SKF spokesperson told *Tanker Operator* that the name of the tanker and management company could not be revealed at this point in time, but claimed that during the pilot trials, the customer had seen the benefit of the CM system.

Installing a CM system on the asset gives the assurance that the vessel can operate without any problems. If the condition changes on board, the customer gets immediate notice through an event report and information about the problem.

For example, the event report helped the customer adjust how the generator is engaged to minimise the stress on the gearbox giving a smoother start up process, the spokesperson said. TO

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Automation partnerships – A vital consideration for tankers

When someone mentions the words automation in relation to shipping, chances are that you'll think of a gleaming, unmanned vessel.*

This can blur the fact that the vessels we use, particularly tankers, are already highly automated, with an increasing number of systems that must communicate electronically. For example, systems that monitor a vessel engine's temperature, pressure, fuel levels, viscosity and flow control would all be linked by an automation system managing the overarching operation of a vessel's engine.

Other examples of automated processes include - propulsion plant operation, auxiliary machinery operation, cargo on-and-off-loading operation, navigation and alarm systems management.

As these systems communicate, there are optimisations to be found, as the systems work together. Power can be managed more effectively, saving fuel, and alarm systems can be integrated to track performance and give further visibility into a vessel's electronics.

However, the proper integration of our ships is something that has historically been overlooked. The reason is simple; the budget for automation is small, and hence, there is little incentive to optimise, rather than sticking with solutions bundled in with other systems.

At the design stage, ship designers might have a low level of understanding of electronics and automation, so this design element is overlooked. Later in a vessel's life, the apparent complexity involved in replacing and upgrading a system is a barrier to improving or replacing an automation system.

At Høglund, we've seen time and again that this is a costly oversight. Not only are the benefits to automation significant; but also if automation is handled incorrectly, this can result in faults that might incur significant time and resources to decipher and resolve. These can range from the relatively minor, to 'mission critical' issues, that can lead to missed deadlines, or even potentially accidents.

Sirius Shipping has taken advantage of the automation system

As the number of sub-control systems on board ships increases, such bugs can be difficult to track down. In response, crews will devise workarounds to avoid such problems, and make do with poorly performing systems.

This was the challenge that confronted Sirius Shipping in 2016. The tanker and LNGC manager was finding that its ships with the most highly interconnected systems, the tankers 'Olympus' and 'Tellus', were in fact the least efficient and reliable.

Engineers frequently had to be called out to the vessels, sometimes requiring software updates onsite and in onshore offices as well, resulting in costly downtime and delays, plus the additional costs and disruption in bringing engineers on board. The effect on the company's business was tangible. The downtime required to host engineers meant delayed voyages, which in turn created difficulties with Sirius Shipping's clients, who required delays of even a few hours to be reported and explained.

Sirius knew Høglund from 2012, when the company had worked on the LNG bunkering vessel 'Seagas' . The first vessel of its kind, this delivered fuel to the gas powered ropax ferry 'Viking Grace'. It was clear that Høglund's problem-solving approach was different, and they were up for the challenge. Not only was changing the ships' existing automation systems technically challenging, but the drydocking window was short – eight days. Despite scepticism from the shipyard, Høglund went ahead and delivered the project within the timeframe.

Systems installed

Høglund installed integrated systems that controlled cargo, power management and monitored performance. The results were

Tellus' was one of the least efficient vessels in the fleet, despite being one of the newest

immediately noticeable - the power management systems are much more reliable, and enabled discharging operations to run more efficiently. At times the new systems enabled the ships to run on two engines rather than three, which enabled better fuel efficiency.

Not only did this improve performance, but it gave Sirius an increased level of visibility and insight into the performance of the vessel, as well as enhanced responsiveness to any potential issues. Crucially, Sirius also installed Høglund Remote Connnection for remote service and support. This meant that as the crews began to get used to the systems, engineers didn't have to come on board to install updates or optimise the systems that had been installed.

In addition to the reliability and performance benefits, both ships' automation systems are now secured for the next 10 years, over which time maintenance is expected to be much more straightforward. This should last for the rest of the oil and chemical tankers' operational lifespans, typically 20 years in total.

Høglund takes care to base its systems on off-the-shelf, commercially available hardware that it knows will be available in 15 years' time. This contrasts to other approaches, whereby suppliers make their own hardware and decide after a few years that it is out of date. This can mean having two or three generations of hardware in 10 years, plus new software, which can provide a significant hurdle to maintenance teams.

The tanker segment needs reliability; as it struggles with the volatility of the oil market, oversupply issues and the burdens of complying with new regulation, owners and operators desperately need solutions that will increase their peace of mind without increasing costs.

As the electronic systems on vessels become increasingly interconnected and complex, it's debatable how long the industry will accept sub-par performance. Automation suppliers will need to act as active partners, supplying solutions that make their customers' lives easier, and don't incur endless visits from engineers and

delays. The early adopters who find trustworthy, innovative automation partners will be the first to reap the benefits.

This article was written for **Tanker Operator by Børge Nogva, CEO, Høglund Marine Automation.*

A look at 2020 - opportunities and challenges

There will be major changes for owners, managers and operators to deal with when the IMO's specification switch for bunker fuel goes into effect on 1st January, 2020.

Vienna-based JBC Energy, a boutique oil market research company has recently released a multi-client study that tackles the IMO regulatory change from every relevant angle, providing a detailed take on the supply, demand and price changes that have to be expected in the wake of this sizeable specification switch. It was analysed by McQuilling Services.

The main goal of the study was not only to provide insight into the supply options for bunker fuel with a 0.5% sulfur limit, but also to highlight the side effects this will have on other fuel markets and perhaps almost of equal importance, how the world is going to deal with the large amounts of at least temporarily unused high sulfur fuel oil.

Fuel oil or Not? It seems quite clear that alternative fuels (ie, LNG, methanol, etc) will not be able to substitute for large amounts of fuel oil in 2020, essentially leaving two options on the table - one being a compliant bunker fuel the other being the use of exhaust scrubbers.

Given the high level of uncertainty, whether it is regarding future fuel prices or the availability and cost of scrubber technology, it is quite likely that the use of a compliant bunker fuel will be the go-to solution in the early stages of the spec switch (Figure 1).

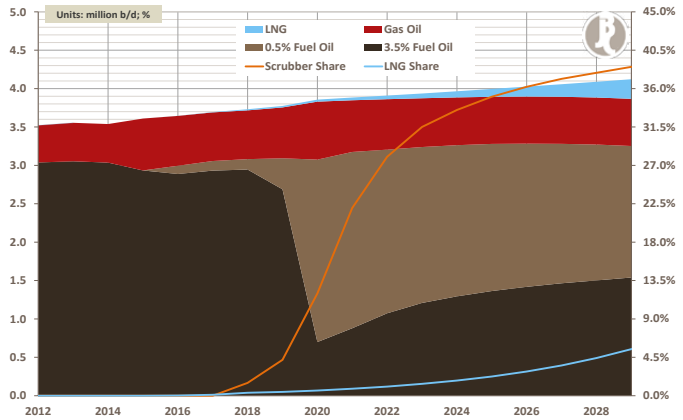

Fig. 1 - Bunker Fuel Mix (millionb/d): Source JBC Energy

JBC Energy's study provides a detailed explanation as to why this bunker fuel is likely going to be a fuel oil based solution, rather than the more frequently proposed increased use of marine gasoil, McQuilling said.

The scrubber question is all about price. Every shipowner will have to deal with the scrubber question and try to decide whether it presents an economically viable option.

JBC Energy's gives an insight into the fuel price spreads that could be expected in a world that is limited to 0.5% sulfur. Besides that, it lays out a base case path for the demand effect if there is an increase in such unit installations, arguing that timing and engine size will be the key factors shaping any successful scrubber investment.

As for fuel composition & quality, JBC Energy's proposed solution to the fuel supply question suggests that the future 0.5% sulfur bunkers should have improved stability and storage characteristics relative to the current global average HSFO barrel (Figure 2).

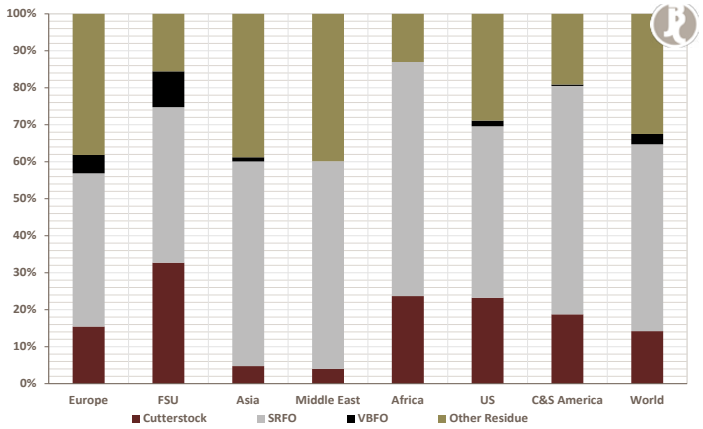

Fig. 2 - Composition of Final Region and Global 0.5% Fuel Oil Pool in 2020: Source JBC Energy

At the same time, shippers that operate scrubbers and use HSFO are more likely to have to deal with worsening fuel qualities, for example when it comes to issues, such as the concentration of various metallic contaminants in those fuels.

The importance of storage. Given that the global nature of the spec change prevents any one country from delaying its onset, and also the tendency to push back investment decisions until there is more certainty regarding price spreads, there is a high likelihood for some parties will be caught unprepared.

This is why JBC Energy sees a strong need for sizeable storage operations, including the floating option, in order to guarantee a somewhat smooth transition process. In a simplified manner, this means that pre-2020 you will see a very strong focus on storing (and transporting) suitable low-sulfur fuel oil components (Figure 3a/b), while the post-spec switch time will be dominated by a large build up of HSFO stocks.

Other challenges and opportunities

To satisfy demand in the much larger 0.5% fuel pool, ECA-compliant 0.1% material may

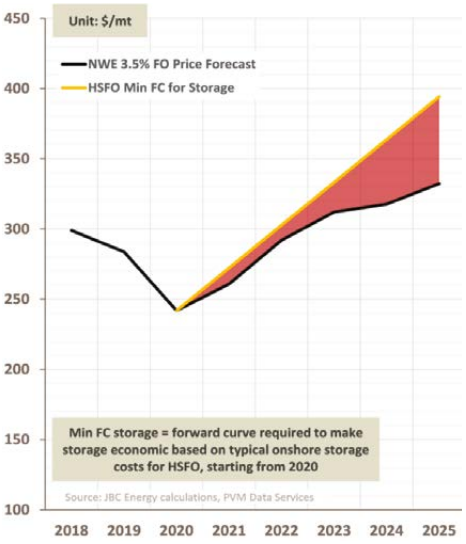

Fig. 3a - HSFO Price Forecast and Storage Economics (US $/mt): Source JBC Energy

shift temporarily back to relatively higher gas oil usage after the appearance of 0.1% fuel oil blends has already taken back almost 50% of the demand that initially migrated to marine gasoil.

For the average vessel in the tanker fleet, McQuilling estimated that the daily fuel cost will be somewhere in the region of $12,000 in 2020, compared to an estimated $6,500 per day in 2017 for the same ship using current 380 cSt 3.5% bunker fuel.

For those finding it difficult to access finance to fit scrubbers, there might be the potential for co-operation with trading companies, as alternatives to banks and investors, as the latter might have a more optimistic view on the eventual feasibility of such an investment.

Tonne/miles and freight rates for dirty tankers are likely to receive a substantial boost. JBC Energy said that it saw potential for crude runs to have additional upside resulting from the spec switch, while the need to optimise the global distribution of residue streams should unlock extra demand for dirty freight.

Floating Storage

In addition, requirements for floating storage of low and high sulfur residue streams are expected to be an additional pillar of support for freight rates over the crucial period from 2019 through 2021.

The study includes - independent and unbiased insight into all relevant supply, demand and price aspects; detailed explanation of the implications for all relevant stakeholders; regional fuel oil balances by quality; general fuel oil quality aspects; storage requirements; global bunker fuel demand forecast and a comprehensive price forecast, McQuilling concluded.

In another report, fast forward to 2020 with the help of Gibson Shipbrokers. The event is the annual Alternative Fuels Award ceremony.

The best newcomer Oscar went once again to LNG, still not quite worthy of the big prize, while the lifetime achievement award went to fuel oil for decades of loyal service to the shipping industry.

So who will win the ultimate prize 'compliant low sulfur fuels' or 'scrubbers'? Who has got the correct envelope?

The above paragraph may be a little dig at events at the recent Hollywood Oscar's ceremony, however it does illustrate the huge amount of uncertainty that currently surrounds the sulfur limits issue, Gibson said.

Wait and See

Shipowners appear to have adopted a wait and see approach, while many refiners have the headache of whether to make considerable investment in upgrading, in what are in, many cases, old inefficient production facilities. In addition, what will become of all the surplus of high sulfur fuel (HSFO), effectively a by-product of the current cracking process?

Looking at some of the options, increasing use of low sulfur fuels has been widespread

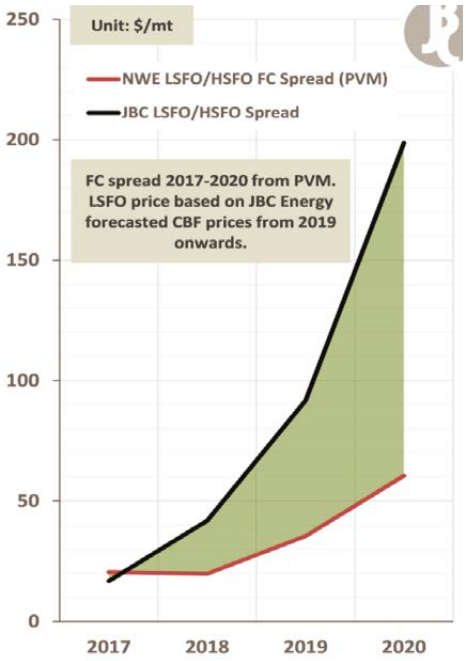

Fig. 3b - HSFO Price Forecast and Storage Economics (US $/mt): Source JBC Energy

over the past few years with the growth of ECAs. During the recent low bunker price environment, the additional ECA low sulfur fuel costs have been absorbed by counterparties. But where will the oil price be in 2020?

Another option is to continue to use HSFO and install a 'scrubber' to clean the engine emissions prior to exhaust discharge, but this solution requires upfront capital investment. Higher bunker prices would make this a much more attractive solution, as the price differential between distillates and HFO would be that much greater and consequently the scrubber repayment period would be quicker. However, there are other considerations to be considered not least the age of the vessel.

With many owners controlling large fleets, investment in scrubbers could be considerable even if technology brings down equipment costs. Given the above it is hardly surprising that owners are adopting a wait and see approach, Gibson said.

Different Approach

Refiners have a different approach in asking who will pay the huge investment costs to change refinery plant to produce compliant fuel – namely distillates? Here the challenge is whether there will be enough compliant product to meet demand by 2020. The industry estimates that on current requirements refiners will need to replace around 250 mill tonnes of HSFO with a substitute to meet the 0.5% maximum sulfur specification.

Alternative fuels have been developed by several of the oil majors, but the challenge is to find a cost-effective way to remove the sulfur from HSFO. This also raises the issue of compatibility between the new hybrids. Also, why would refiners want to develop cheaper alternatives as owners already pay a premium for distillates? Should owners favour adopting scrubbers, the incentive for refiners to develop cheaper cleaner fuels disappears.

In conclusion, Gibson said that it will be difficult to pick a winner. In reality, each solution has its own merits in the right set of circumstances and in all probability, each will take a share of the prize.

It is not surprising that shipowners have adopted a wait and see approach. The headache of current trading environment is perhaps prohibitive for owners to sanction more debt and in the end owners will leave the party without clutching any awards, Gibson said.

TO

Significant fuel savings claimed with Smit inert gas technology

An Alfa Laval Automatic Fuel Efficiency Module (AFEM) has been introduced to reduce the fuel consumption of the company's Smit combustion inert gas systems.

It is essentially a modification, which ensures the inert gas that keeps cargo safe during offloading is only generated in the exact amounts required.

In a two-year pilot project, the AFEM allowed Italian tanker company Navigazione Montanari to achieve an average fuel savings of 30%.

Navigazione Montanari owns and manages a fleet of 21 tankers. They operate worldwide, but particularly throughout the Mediterranean region. In recent years, the company has focused on improving its environmental standards, especially with regard to minimising CO2 production and fuel waste.

The 2002-built 40,000 dwt product carrier 'Valle di Navarra', was chosen as the test vessel for the project. The ship primarily sails in the Mediterranean, carrying gasoil and gasoline cargoes. Compared to similar vessels fitted with Smit Combustion systems, the 'Valle di Navarra' discharges frequently – up to three times per week – which provided Alfa Laval with ample statistical information on the AFEM's performance and reliability.

Data collection was one reason that Alfa Laval decided on a particularly long pilot programme, but guaranteeing the cargo's safety and reliable availability was even more crucial, the company explained.

"The AFEM modification is part of the inert gas generator's combustion control circuitry," explained Mart Blankert, Alfa Laval's manager customer support, Inert Gas Systems. "A failed module could prevent cargo from being discharged, meaning expensive delays in port. Working with potentially volatile cargo, we took our time with the pilot to ensure that everything functioned as intended."

Alfa Laval Smit combustion system

"The AFEM was designed with capabilities for full override in case of any such problems," added Alessandro Federico, Navigazione Montanari's technical director. "And although you expect some issues with any pilot project, we're glad to say that we never lost a minute of commercial operation with the AFEM."

Federico also pointed to the close co-operation the company had with Alfa Laval during the pilot testing period. For example, he said that Alfa Laval's engineers provided responsive assistance and support to ensure the AFEM performed properly and that the inert gas system only produced the necessary amount of inert gas during offloading. This enabled the operational expenses related to inert gas production on board the 'Valle di Navarra' to be greatly reduced.

"With the AFEM installed, the inert gas generator capacity is constantly adjusted," explained Federico. "Purging can never be fully eliminated or avoided in practice, but an optimum setting is maintained. We can see most of the fuel savings at lower discharge rates, where they can be up to 30%."

Continuous development

"The AFEM project was part of a broader goal of continuous product development here at Alfa Laval," Blankert said. "When a customer chooses one of our systems, we see it as the start of a partnership that lasts for the lifetime of the vessel. We're constantly innovating new improvements that help keep total lifecycle costs to a minimum, and we strive to make them available for existing installations as well."

For vessels with Smit Combustion systems already installed, the AFEM will soon be available as a retrofit solution to be installed and commissioned by a trained Alfa Laval service engineer.

For new inert gas systems, the AFEM will be available as an added option at the time of the original installation.

Maersk – keeping crew engaged on energy efficiency

To begin with, energy efficiency is not the top criteria for most seafarers, but with a bit of effort you can get them more involved.

One of the hardest aspects of improving vessel energy efficiency is getting crew more involved, said Rajat Saxena, energy efficiency manager at Maersk Tankers, speaking at *Tanker Operator's* 'Ecotankers' conference in Copenhagen on 6th March.

Without management effort, "energy efficiency is not the top criteria for any seafarer, it's a habit you [as a manager] have to develop over time."

The highest concerns for crew are usually maintenance, and keeping the vessel on schedule. "They're not paying for the fuel so they don't really care. In many instances even the owner does not pay, it is the charterer's fuel."

However, enormous amounts of money are spent on fuel and in ways to try to reduce the fuel costs. If the crew are not engaged in the effort to reduce fuel usage, there is a great deal of wastage, he said.

In total, Maersk Tankers used 300,000 tonnes of fuel in 2016, which cost about $99 mill. Of this, 76% of the fuel was used at sea, the rest onshore.

The spending continues. Companies spend $250 to $300 per month per vessel on weather routing services. If the vessel is fitted with a torsion meter to measure power, that costs $13,000 -$15,000 to install. A mass flow meter to measure the flow of fuel to the engine can cost around $6,000- $9,000 per vessel.

Maersk's energy efficiency project

began in 2009, when Maersk Tankers and Broström were merging, and Maersk wanted Broström to follow the same standards on energy efficiency. They thought it would be a six- month project.

However, when Maersk staff began looking at the data, they found that they were not as good at energy management as was thought. They could see that similar vessels, with similar trade patterns, had different fuel consumption patterns. So the project became much more involved. As a result, the energy efficiency project is still ongoing eight years later, and now has a 15 member team working full time on it.

As a result of their efforts, the energy efficiency teams claim a 20% reduction in fuel consumption and CO2 emissions, against baseline 2010.These gains have also proved very helpful in persuading senior management to take an ongoing interest in the project, Saxena said.

Over time, the process has become much more self-driven, with crew taking responsibility for finding ways to reduce fuel consumption, he said.

There are other benefits to reducing fuel consumption, including less wear on the machinery, thus lower maintenance costs and fewer breakdowns.

Also, the CO2 emissions reduce, so the 'sustainability profile' improves. This may lead to a financial impact if vessels are ever subject to carbon pricing or penalties of some kind.

Efforts to keep crew engaged in energy consumption can also help them to become more involved in general, including other aspects of vessel running costs and safety, he said.

Maersk Tankers' Rajat Saxena

You should not aim to get every single person engaged, but "at least aim for 80 or 90%," he said. "If you achieve that you are doing brilliantly. Take small steps at a time, don't aim to reduce energy consumption on every piece of equipment on every vessel."

Don't monitor all equipment at the same time, choose one piece of equipment and continually review its performance, and do that for the whole fleet and/or the sisterships.

When the analysis has been completed, list all the vessels, and then give the 20 worst performers the attention. Once their performance is improving, move onto the next 20. Don't try to target all vessels at the same time, he warned.

Maersk suggests that vessels joining the pools have meters to measure performance, including flow meters (measuring fuel consumption) and torsion meters (measuring the power of the propeller shaft), which would improve performance, although this is not compulsory. It is very difficult to improve fuel consumption if you are not able to measure performance, he reasoned.

Crew attitudes

When trying to get crew engaged on energy efficiency, their responses differ, and the approach has to be adjusted accordingly. There are some really engaged crew, who, when you give them a suggestion, they "not only absorb it they give you a better suggestion back," he said.

Then, there are "positive people, not as engaged as the first group, but when you give them an idea they'll accept it, they'll make your life relatively easy," he said. "Then there are the sceptical types. When you tell them something, they say, 'yes, let's see what happens, maybe it will work, maybe it will not.' Then there are ones who just reject everything outright."

"Then there's the uninterested, they really don't care, they say 'yeah we'll do it' but never do it. They'll report whatever you tell them to report, but not implement it. They are the very difficult ones. They are the ones who need a little bit of extra care and motivation. That is the hardest job," he said,

With the last group, you may need a more formal performance evaluation, including showing them key performance indicators (KPIs) of how their efforts compare with other vessels and other crew.

But the majority of crew respond very positively, but like most people do not like change. "So it's a lot of change management. If you show them that is possible, it has been done by others, they will usually accept it. It takes time but it can be done," he said.

Employment set-up

The amount of effort involved in getting crew engaged also depends on their employment set-up.

Some crew members employed by Maersk go back to the same ship regularly. There are also crew who change ships. There are also vessels in the pools, operated by Maersk with different owners, who employ their own crew. All of these need different approaches to crew engagement, he said.

If seafarers keep returning to the same vessel, it is much easier to motivate them. "They know what they are going back to," he said. "It is like an ownership feeling they have. If the crew is with the company for a long time, we are able to develop that habit in them more easily."

Conversely, "the most difficult ones are the ones which are for one contract only," he said. "We see that a lot for the pool partners' vessels."

In this case, it can be better to focus on the shipowner's KPI and show them that their company will earn more money with a better performance. Shipowners can be given a bonus linked to their vessels' performance.

Competitive pressure

One of the best ways to get uninterested people engaged is to show them data from vessels, which are outperforming them, he said.

Data "holds maximum value," he said. "Whenever my team members tell me this Chief Engineer is a little difficult to convince, I always give them this advice - take out the data from sister class of vessels who have been able to do what you want them to do, show it to the Chief Engineer,"

he said. “In 99% of the cases, they will agree, it’s not impossible.”

“People generally are competitive, especially Masters and Chief Engineers,” he said. “If you show them their colleagues are doing slightly better than them, they will improve their performance, they will help you achieve the results you want to get. In a competitive environment you see the best coming out of a lot of people.”

A KPI for each vessel’s performance on energy efficiency can help bring uninterested people on board, although this has to be managed well, he said.

Crew managers, vessel superintendents and fleet group managers, and even the company’s CTO need to be involved. If you engage the crew, but not their managers, the effort could be wasted.

They should be assessed on precisely the same KPIs as the vessels, so they are encouraging the crew to push the KPI in the right direction.

Financial benefits

Maersk also manages to link the fuel performance to the payments made to pool partners.

“If a vessel if continually losing money, the pool partner is forced to think, why is this vessel not doing well.”

Discussing energy efficiency during informal seminars works very well.

Maersk aims to send three or four energy efficiency team members to each seminar, to talk to seafarers about energy efficiency, learn more about the scenario on board, and gain a better understanding of why they do or don’t take something positively.

“That gives us an opportunity to explain why we want them to do what we want them to do, why we do things the way we do things, and what benefit comes from doing what we are doing. They will open up a lot to you,” he said. “Informal settings really help.”

If you make a ship visit, or ask crew to come to the office, it can be very formal. “They are on the back foot trying to defend their actions,” he said.

Feedback and newsletters

Feedback and constant communication is one of the most important ways to achieve engagement. “If you are talking to crew on a regular basis trying to understand what their challenges are, trying to explain it can be done in a better way, making friends with them,” he said.

Monthly scorecards “really help,” he said. These can be published and discussed with the crew with a monthly phone call. And you also need to show the crew how they are making progress. “The crew realise the office is really serious about this, they want this to be improved,” he said.

“We started sending out monthly newsletters and to discuss the overall performance of the fleet in terms of energy, highlight any best performing vessel in terms of any measure that they were undertaking,” he said. “When you give people the credit for the good work they have done, it really helps, and it encourages others.”

Appreciation

It is important to show appreciation for people who have done good work. “Tell them, your work is of great value not only to the vessel but to the whole company,” he said. “Then others can get motivated to do similar things. Do that on a regular basis and be generous.”

The Maersk team is looking for ways that the feedback could be provided on a daily basis. “The longer you wait, the chances for improvement are less,” he explained. “If follow up stops, engagement starts dropping.”

If you don’t regularly ask crew how it is going on energy efficiency and whether they need help, other issues can take priority. And “once it has gone down it is just as good as restarting for the first time.

Regular interaction is the key."

Knowledge sharing

Maersk also used an online tool for sharing knowledge and ideas about energy saving. "We realised there are a lot of engaged people in our company. They are willing to take out some of their free time and invest in sharing with others what they know," he said. "The whole fleet could see there are people working on things they were not thinking about."

Knowledge sharing keeps people motivated. "It gives them a feeling they are doing a lot more than their usual work," he said.

The platform is a social media type tool, where crew are given login IDs. They could put in comments and 'like them'. Comments have to be allocated against topics like 'energy efficiency in cargo operations'.

"If you give them the whole criteria then it's difficult to manage. We gave them a specific topic to put their ideas on." he said.

A video of Saxena's talk and slides can be downloaded at **http://conta.cc/2ggl7iT**

Turning to Lauritzen Kosan, this LPG carrier management company has developed a sophisticated vessel performance management system.

Sverre Patursson Vange, Lauritzen Kosan's head of performance management, together with Jakob Buus Petersen of Vessel Performance Solutions, explained how it works at the conference.

The core of the system is being developed together with TORM, Force Technology, Vessel Performance Solutions and Aalborg University, as part of the Danish 'Blue INNOship' research programme supported by Innovation Fund Denmark, among others.

Gas carrier specialist

Lauritzen Kosan specialises in LPG and hybrid gas shipping, including fully refrigerated ethylene, semi-refrigerated and pressurised gas carriers, with 32 vessels in total. It has a sister company Lauritzen Bulkers, specialising in drybulk.

Lauritzen Kosan's Sverre Patursson Vange

Lauritzen originally set up a performance management department to look at all aspects of performance, including vetting observations, port state control reports, safety, crew retention, overdue maintenance and costs. The department calculates a wide

Sverre Patursson Vange (left) listens to Jakob Buus Peterson (right)

Jakob Buus Peterson

range of KPIs, some of which are used to calculate bonuses for staff and third party technical managers, as well as to generate reports and understand trends.

It can be something of a sport among the chartering fraternity to try to claim money back on the basis of vessel performance not being as per the charterparty, Patursson Vange said. These claims have led to expensive law suits.

Since the beginning of 2017, the performance management for both the bulkers and the gas carriers is handled within the same department at Lauritzen, and all relevant data is gathered into the same system.

The team started with just one person (Patursson Vange), and now has five people globally covering both bulk and the Kosan business.

Access to data

When Patursson Vange first looked at the market for a ship performance data analysis system, he found that most of them wanted to retain the data, and just provide a monthly pdf report.

He did not think this would meet the company's needs. "I would like to have all the data and make my own reports, address the vessel with the data, show it to the Chief Engineer on board, show it to management and my colleagues," he said. "If I just get one report per vessel in a pdf format I cannot really work with it."

It would also be useful for the company to understand how the data is being analysed, keep track of the original data, and re-run the calculation if a better way is developed for undertaking the analysis.

A company also needs the full data so it can respond to queries. Sometimes payments to pool partners are adjusted, due to low performance. "If we do that, they reply in two minutes, asking, 'can we see the data, how did you get to the point of saying you're going to deduct us,'" he said. "I need the raw data, I need the analysed data and some way of showing how we did the calculation."

Blue INNOShip

Partly to try to resolve this, Lauritzen got involved in a Danish group project called 'Blue INNOShip', which started in 2015, to develop its own software tool and data standard for managing vessel performance.

'Blue INNOship' is a project with around 40 partners, including suppliers, shipowners, consultants, universities and schools, not for profit organisations, authorities and classification societies. Altogether, there are five work streams – ship design, performance, alternative fuel, emission reduction and retrofit. It is funded by the project partners, Innovation Fund Denmark, the Danish Maritime Fund and Orient's Fund.

Lauritzen decided to get involved in the

performance and monitoring area of the project. Shipping company TORM was also involved, as well as Force Technology, Vessel Performance Solutions and Aalborg University.

The main development work was undertaken by Vessel Performance Solutions, a Danish company led by Jakob Buus Petersen, a former director of vessel performance with class society ABS (2012 - 2014), and head of the vessel performance department at Maersk Maritime Technology from 2004 - 2012, and Kristian Bendix Nielsen, a former head of hydrodynamics with Maersk Maritime Technology (2012 - 2014).

The software includes data gathering, quality control and analysis tools.

Altogether the system has eight man years of software development.

As a result of the software, company management can monitor everything occurring in a fleet. They can see where a vessel's consumption was higher than was expected and how performance declines over time, perhaps indicating that the vessel is due for hull cleaning or re-application of a coating.

As well as developing data collection and analysis tools, the project team aimed to develop an open standard for exchange of vessel performance data, so it can be easily downloaded and shared freely between software packages. Shipowners will be free to change software and analytics provider whenever they want to.

For example, a shipping company will be able to say it will only work with a data collection company, which is able to deliver the output in a standard format.

Data collection

There are two options for data collection – manual (such as asking for data to be written down every day at noon), or automatic data reporting (auto logging). Auto logging can be a natural follow on from the noon reports, once the amount of data required gets too much.

Having a manual data entry system (such as a noon report) does have the benefit of keeping seafarers aware of what they are doing, knowing that the data they enter will be used to calculate KPIs, which will be used to assess how well they are doing, Buus Petersen said. "If you put an auto logging system on a ship you have to create that awareness in another way."

With auto logging, there are issues of data storage, integration and security, and decisions about how much data and which data should be sent ashore.

Before the project started, TORM and Lauritzen between them had three different data collection systems for noon reports, and two or three different platforms for auto logging data. So a major challenge was working out how to get them all to fit into one system.

Data analysis and reporting

A core component of the software is a vessel performance analysis engine, which receives the operational data and event data, and analyses it, with the output being available via a web application.

Both the core data and the calculation results can be stored in a database. This can then be accessed by any other software application, or have customised access developed to meet the needs of different companies.

There is an 'ongoing voyage monitoring' tool, which monitors charterparty compliance. It includes a 'hard' evaluation about whether the vessel is complying with the charterparty. There are also tools to see if a vessel would be able to meet the terms in a charterparty prior to signing.

The biggest challenge is working out how to put everything together to get a consolidated scorecard for an individual vessel and for a fleet, he said, where companies can track changes in performance, even on a daily basis.

Ultimately a view of the data needs to be accessible for the various stakeholders, including technical managers, charterers, operations managers and crew, who might not need to see the same information.

A useful performance indicator can be 'added resistance' – if you can calculate how the vessel is moving through the water, compared to how it should be moving, taking into account wind, waves, draft and trim. That can be a useful performance indicator, because it can show you that (for example) the hull needs cleaning or re-coating.

Data quality module

Ensuring high data quality is a challenge. Buus Petersen has seen around 25 different noon report formats over the past few years. "Some of them were very close to being of extremely poor quality and some of a very good quality," he said.

To try to improve data quality, the software has a validation engine, which can undertake statistical analysis, to get a sense of the quality of the data, and spot errors.

Not all of the errors are due to the human element, there are also errors in the auto logging systems, for example due to a failing sensor.

Making it work

To get value from the system, a good understanding of the base line (where you are now) is needed, making a decision on where you want to be a year from now, and be able to monitor the progress, Buus Petersen said.

"The trick is not to get data but to get data we can convert to something useful," he said.

You also need to deploy manpower. For example, consider that Maersk has about 16 people in its vessel energy performance team, and uses 300,000 tonnes of fuel per year, it is employing one person per 18,750 tonnes of fuel used, which may be a sensible metric.

The system needs to be transparent, so everybody can see how they are doing.

It is very important that people have trust in the numbers that the system generates. "If you have a system that comes out with sometimes rather arbitrary numbers, people will lose their engagement," he said. "So this is a major thing."

A lot of thought needs to go into making sure the KPIs drive the right behaviour.

There was a story of a seafarer who managed to write an inverse algorithm of the data validation engine, which would calculate what numbers were needed to enter in order to get a good KPI. It is hard to do anything about that, Buus Petersen explained.

Sometimes crew are motivated to put in incorrect data, because the correct data has something in it, which will reflect badly on them.

A solution to this could be to try to persuade the crew that the system is about helping everybody perform better, not catch people out.

"The human factor is extremely important, the attitude you go back to the crew with decides if you win or lose that battle," he concluded.

*(The conference report will be concluded in the May issue of **Tanker Operator**).*

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