

September 2018

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Special Report



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EDITORIAL

# It's all in the mind



**Richard Clayton**  
Chief Correspondent  
[Lloyd's List](#)

“Excellence is not a skill, it’s an attitude.” So believes the American writer Ralph Marston. It reflects what another writer, Sir Winston Churchill, thought: “Attitude is a little thing that makes a big difference.” The shipping industry will have failed in its drive for environmental protection and higher levels of safety if we fail to change attitudes.

SMM is a celebration of maritime technology. Technology to enable the transition to low-sulphur fuel, technology to manage ballast water discharge, technology to join the dots of a connected ecosystem. The world’s showcase of maritime hardware and empowering software will never make that big difference unless and until there is an equally significant change of attitude.

Can that change of attitude come through the imposition of a regulation? Of course not. Imposed restrictions generate resentment and frustration, even where the regulators are supposed to be ‘on our side’. Can attitudes be changed by installing a new piece of kit? Rarely. Often, the fitting of next-generation technology dulls our need to remain mindful of the human obligation to look out of the window or to keep an eye on levels.

This Lloyd’s List SMM 2018 Special Report comes with a health warning. Excellence, like sustainability and safety, is not a direct outcome of investment in technology. The technology on show at SMM are tools that enable. Like a shiny but low-tech spade, the shiny and high-tech ballast water treatment system, LNG power system, or environment-friendly coating system are tools that enable maritime to meet its obligations.

If tech becomes the message and if, to repeat Marston’s analogy, skill defines the level of excellence, there will be no change of attitude.

This report sets out the challenges ahead and suggests the best ways to meet them, but don’t overlook the little thing that makes a big difference: attitude.

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# Overcoming the 2020 hurdles

Exhaust emission regulation under MARPOL Annex VI has grown ever more stringent and will peak for SOx in a little more than a year, on 1 January 2020.



The first MAN dual-fuel engine was installed on a TOTE container ship. Hartmann Reederie's liquefied ethylene gas carrier (LEG) *Gaschem Beluga* has a similar engine that uses ethylene as fuel instead of LNG

No shipowner can be unaware that from 1 January 2020, the permitted cap on sulphur levels in marine fuels drops from 3.5% to 0.5% unless some form of emission abatement technology has been installed on the ship.

Operators and ships' crew that navigate in ECAs or the EU and some Chinese ports have already experienced the need to use much lower sulphur content fuels.

Before Baltic and North seas SECAs were established in 2006, it was felt there would be a shift to distillates. Scrubbing technology was in its infancy and although dual-fuel engines did exist, their *raison d'être* was mostly to allow LNG carriers to operate by burning HFO rather than the boil off gas from the cargo which could be re-liquified and returned to the cargo tanks.

Today, scrubbers and LNG are both seen as major parts of the solution to the 2020 dilemma of what option shipowners should choose to meet the new requirement.

However, since not all ships are suitable candidates for scrubbers – although most medium to large vessels are – or for conversion to run on LNG if they do not have a dual-fuel engine, it will be distillate fuels that will be used by most owners in the short term.

Estimates vary as to the number of ships that will eventually be fitted with scrubbers. However, given the payback period has shortened considerably as crude oil prices have risen sharply from a 2015-low to today's levels, some believe the figure will be as low as 2,000 vessels; others believe 8,000 is possible.

There are two main types of scrubbers – wet and dry. The latter are poorly represented in the shipping arena with just a small number of system suppliers. They work by chemical reaction turning the SOx in the exhaust stream to gypsum, which has a market potential for sale.

Wet scrubbers can be either open loop, by which the dissolved sulphur is discharged to the sea after treatment to remove any oils, soot and other

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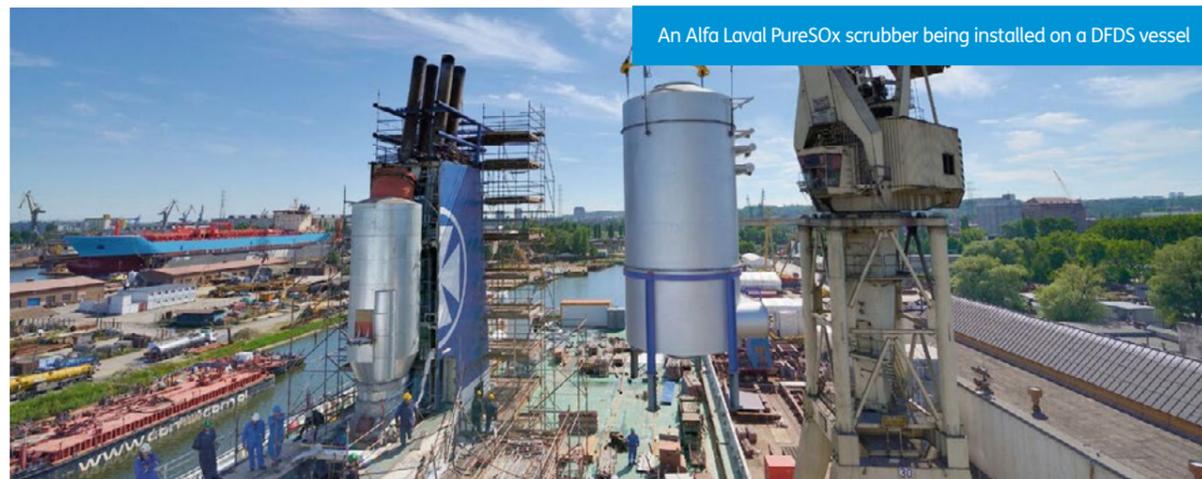
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An Alfa Laval PureSOx scrubber being installed on a DFDS vessel

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noxious substances, or closed loop by which the wash water is discharged ashore. Hybrid versions that can operate in either mode are common choices, but most recent sales have been open loop.

IMO guidelines on disposal of wash water do not prohibit discharge to sea, except in some territorial waters, but some believe that will change. Opinion is divided as to the harmful effect of discharging wash water, but most agree more data will be needed.

Scrubbers currently offer a payback period measured in months rather than years, with the potential to pay for themselves in under one year. That would make scrubbers an attractive prospect even if rules around wash water subsequently change, because the system cost would have been more than recovered before any new rules could take effect.

**LNG provides an option**

After a very slow start, LNG is now gaining acceptance as a marine fuel outside of the gas carrier and offshore sectors. The single engine direct drive propeller is the favoured option for owners of bulkers, tankers, containerships and other larger ship types. For that reason, four-stroke dual-fuels have a market limited to offshore vessels, cruise ships and smaller vessel types.

Arguably, the largest factor in acceptance of LNG has been the advent of dual-fuel, two-stroke engines in the form of MAN's ME-GI and WinGD's XDF ranges, now specified for all main ship types including CMA CGM's new series of LNG-fuelled mega containerships, Sovcomflot's ice-classed Aframax tankers, Ilshin Logistics' 50,000dwt bulk carrier and UECC's Auto Eco class of PCTC.

Opting for LNG is mostly the preserve of newbuildings, although over recent years, the likes of Wärtsilä, MaK and MAN have been building engines capable of conversion from oil burning to dual-fuel versions. So far only a small number of

conversions have been done, notably the feeder containership *Wes Amelie*, but with the potential for financial assistance for conversions, more will likely follow.

**More than SOx being watched**

In a perfect world, all bunker suppliers and shipowners would play by the rules regarding sulphur content and SOx emissions, but widespread cheating is feared. Without testing all fuels before use, operators must rely on the accuracy of figures quoted in the bunker delivery note to prove compliance should they be required to do so.

Owners could protect themselves from blame by PSC authorities by using exhaust monitoring systems that can record the SOx element of the exhaust on a continual basis. Many already do this to prove compliance with the NOx code and in some cases, the same equipment may be usable. There are many suppliers active in this area and their equipment ranges from relatively simple devices through to systems that data log the exhaust component gases correlated to the vessel's position.

Some of these systems could also have a role in the monitoring, reporting and verification (MRV) of CO2 emissions as required for EU vessels worldwide and for other vessels operating in EU waters and for the similar IMO Data Collecting System which begins in January 2019. The EU scheme is aimed at gathering data on CO2 emissions, whereas the IMO system is subtly different, requiring only fuel consumption to be recorded. Both only apply to ships above 5,000gt.

Data required under the EU's MRV rules is extensive and differentiates between emissions at sea, in EU waters and at berth. Because ships may be burning several different types of fuel after 2020, and the CO2 emissions may vary by fuel type, a constant monitoring system may give more accurate results than calculations using official emission factors for different fuel types.

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# Shrinking prospects as rules change

Shipowners brace for enforcement of ballast treatment regulations.

If things had gone as planned, every ship afloat today and subject to the 2004 Ballast Convention would by now have a ballast treatment system.

Instead, a reluctance of countries to ratify the convention and doubts over the robustness of the type-approval process has left most ships without a ballast treatment system, although a final programme for installation was agreed at MEPC 71 in July 2017.

The new rules, which allow owners of any ships but newbuildings to defer installation until the first or second IOPP (International Oil Pollution Prevention Certificate) renewal after September 2017, effectively push final compliance out to 2024. That may be good news for shipowners – allowing them to hold off paying for a system while absorbing the cost of meeting the 2020 sulphur cap – but it is yet another hurdle for system makers to clear, recouping investment in development and type-approving their systems.

Almost 70 systems have been granted type-approval under

the original IMO G8 process, but there has been constant criticism of the robustness of the process. MEPC 70 approved new guidelines in 2016 and the MEPC 72 meeting in April 2018 upgraded the guidelines to new mandatory rules.

Systems that were approved to the older G8 standard will not need to be changed and they can still be installed until 28 October 2020, but not thereafter. After October 2020, only systems that have been approved under the new G8 process will be permitted. That means that all system suppliers will have to submit

their products to the new type-approval process and pass the requisite tests before they can begin to market them.

As of publication, only one system maker – Alfa Laval – had announced completion of testing to the new rules and achieved type-approval.

For shipowners prepared to commit soon, a system that complies with the older standard might be a good economic choice.

With a crowded marketplace and recognition that the present newbuilding level will probably

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*Attention is beginning to shift from installing systems to policing and enforcing the rules on ballast treatment.*



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Norway's Optimarin was the first manufacturer to obtain US type-approval, in addition to IMO type-approval, for its (OBS) ballast water treatment system

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not support more than 10 to 20 makers once the retrofit bonanza has passed, some makers with approved systems may decide the expense of re-testing to the 2016 standard makes no economic sense and thus withdraw.

#### US type-approvals mean an end to AMS

Although the IMO type-approval process is the most important for most shipowners, US rules will apply to all ships trading there. The US is not a party to the 2004 convention and has developed its own ballast treatment regulations. Although treatment standards in the US regulations are essentially similar, a more stringent standard is envisaged for the future.

Type-approvals under US rules have lagged those under the IMO process and since there was no question of delaying the introduction for ratification purposes, the US Coast Guard and EPA allowed IMO approved systems to apply for Alternative Management Status (AMS). That was an interim measure that permitted systems to be used until sufficient US type-approved

systems were certified.

Since the first such system gained approval in December 2017, eight more have followed and a further seven had completed the testing process and applied for approval up to the end of July 2018. The approved systems and those awaiting final approval represent most of the treatment technologies.

The three smallest in terms of capacity are all UV systems, while electrolysis, electro dialysis and chemical injection are used in the medium and larger capacity systems. Two of the first three systems approved by the USCG were UV systems, definitively disproving the argument often advanced that such systems would not be able to meet US requirements.

With sufficient systems now considered to have been approved, the AMS process is no longer open to new applicants. Those already granted the interim status will lose it after five years from the date it was granted.

Owners of ships with AMS approved systems will have

to hope the system maker completes the US type-approval process before the dispensation given to them expires, otherwise they will have to replace the system if continuing to trade to the US. In the near to medium future, US authorities will likely require ships to fit one of the approved systems or give a valid explanation why one is not suitable, which suggests time is running out for systems without US type-approval.

#### Building experience and trust

Irrespective of whether a ship will be trading in US waters or elsewhere, attention is beginning to shift from installing systems to policing and enforcing the rules on ballast treatment. The experience-building phase (EBP) of the IMO convention, established through resolution MEPC.290(71), is aimed at collecting data that will be used for reviewing the effectiveness of ballast treatment and, if necessary, develop amendments to the convention.

Ballast treatment may be carried out on ships on a large scale, but the results and effectiveness of treatment are not immediately obvious to the crew involved. Standard crew, not having relevant scientific know-how, are unlikely to determine if a system is working, let alone meeting the treatment standards.

Fortunately, a raft of new products from, for example, Chelsea Technology Group and Aqua Tools, have been developed to allow simple tests to be undertaken.

The basic processes of the products are like those of fuel and lube testing. Although not mandatory, testing will enable a crew to be aware of problems before entering a port and potentially falling foul of PSC inspections. Some system makers may even consider incorporating the technology into their own products.

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# Advanced technology's flip side

As shipping's stand-alone systems give way to a connected world, greater vulnerability is inevitable.

The threat posed by cyber criminals and malicious hackers has been talked about for a long time. In many respects, shipping is no more at risk than any other industry. It may even be considered safer since it has been a late adopter of digitalisation in some areas.

The shore-side of shipping is regarded most at risk from cyber-crime, purely because the rewards are more obvious if it is finances that are being targeted. That may change if perpetrators decide ships are more vulnerable and, potentially, more valuable.

Joe Walsh, partner at Clyde & Co, said an onboard cyber-attack would be daunting. "The big question is how do you resolve such an attack commercially — and via which agencies? No-one wants to be the first through the wringer in terms of finding that out, so the emphasis has to be on ensuring good cyber security right across your organisation."

The industry's highest profile cyber attacks have been against Maersk in June 2017 and COSCO in July 2018, but malware and phishing take place every day on an industrial scale across the maritime sphere. In the days after Maersk was hit, the company estimated that its losses might run to \$300M. The full extent was probably never revealed, but at the World Economic Forum in Davos in January 2018, Maersk Chairman Jim Hagemann Snares revealed the company had been obliged to replace 45,000 PCs, 4,000 servers and install 2,500 applications across its global empire.

When COSCO was hit by a similar ransomware attack, damage was said to have been limited to its operations in the Americas, with its UK system shut down to avoid similar problems. Unlike Maersk, COSCO apparently operated with regional IT networks rather than one global system and the company has said it believes that approach limited the damage.

The question of IT networks must be considered by all organisations within maritime. Digitalisation is becoming more pervasive and with both electronic reporting and route sharing imminent as the maritime single window and e-navigation loom closer, getting the right IT network will take on greater importance. Even without malicious intent, simple changes or migrating to a new system can create havoc, as evidenced by the Port of Felixstowe's horror story in June 2018.

Felixstowe port operator Hutchison Ports migrated the container port's computer system to a new set up and immediately hit problems. Issues with the new system — intended to combine the five different operating programmes previously used for moving boxes around the port — meant that the rate of handling boxes dropped to just eight an hour instead of the normally expected 20-30. Although officials initially said the problems would be resolved quickly, line operators were still reporting delays one month later and some ships left without reloading empties.

Where ships are concerned, getting it right will involve more than the organisation's IT department. The modern ship with

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*Whatever technology is available to assist will only be as good as the last attack it prevented*

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its connected systems such as ECDIS, VDR, integrated navigation and bridge systems, electronically controlled engines, machinery monitoring and reporting systems and a communications system that might allow access to crew and contractors' personal devices, is probably more complicated than the average office. Adding to the problem is the fact that the vessel operating company's own IT specialists will very likely not have direct control of the ship's local network, installed and serviced by multiple sub-contractors.



*The emphasis has to be on ensuring good cyber security right across your organisation*

**Joe Walsh,**  
Partner, *Clyde & Co*



The modern ship with its connected systems is probably more complicated than the average office and thus vulnerable to cyber attack

The weak links in any computer network are the access points such as communications including wi-fi and Bluetooth and peripheral devices such as memory sticks, cards, floppy discs, CD and DVD drives, among others. Use of all such devices and the design of the system is something that must be addressed. Although only as good as the self-discipline of the officers and crew, procedures to control and limit access are essential elements of a good security system. Addressing this now may prevent headaches later, as IMO Resolution MSC.428(98) encourages IMO member states to ensure cyber risks are addressed in safety management systems no later than the first annual verification of a company's Document of Compliance after 1 January 2021.

There is no shortage of assistance and advice available in relation to cyber security, as class societies, P&I clubs and communication service providers have all developed tools and services to assist. For example, Inmarsat's Fleet Secure is a subscription service that can be added to

the Fleet Express communications package. No extra hardware is required for the service which, through its premium version, monitors communications in real time for viruses and other threats. Fleet Secure also monitors all removable media devices that may be attached to the network.

Several of the leading class societies have devised services aimed at assisting operators assess risks and have created voluntary notations covering varying degrees of cyber security. The notations measure the degree of interconnectivity of systems and the protection that is in place. However, they can only be a snapshot of a system; the notations' validity would be in question if the vessel changed hands and different risk management procedures were adopted by the new owner.

Cybercriminals, like the technology they exploit, will change and adapt rapidly and if any form of security is to be of use over time, so must it evolve. Whatever technology is available to assist will only be as good as the last attack it prevented and, short of abandoning new technology, continual vigilance is the only real protection.

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# Catalyst for change is itself changing

The modernisation of GMDSS is nearing culmination and will require some rewriting of SOLAS.

Next year, the Global Maritime Distress and Safety System (GMDSS) will have been fully operational for 20 years and the Search and Rescue (SAR) Convention under which it falls will be 40.

GMDSS and SAR are at the very core of the IMO's safety work and, as such, are kept under constant review and will very soon enter the next stage of evolution. A modernisation plan agreed in March 2017 at the IMO's Sub-Committee on Navigation, Communication, Search and Rescue (NCSR) takes account of the development of new technologies, new services and the gradual demise of some older safety services.

GMDSS was conceived some 11 years before it became fully operational and the world of communications has been transformed since. Shipping's modern communications revolution can be traced back to the advent of GMDSS and the requirement within it for all but vessels operating solely in areas where Navtex (Navigational Telex) or other HF NBDP maritime safety information messages are transmitted, to carry appropriate Inmarsat equipment.

What comprises appropriate Inmarsat equipment has been limited to mostly Fleet 77, SafetyNet or the ubiquitous Inmarsat C. Non-Inmarsat services and VSAT have always been excluded from GMDSS, although this is beginning to change.

Before the GMDSS system came into effect, communication with ships at sea was, to say the least, extremely difficult, relying on radiotelephony unless an Inmarsat A terminal (first available in 1982) allowing telex communications was installed on the ship.

The requirement for most ships to carry at least one Inmarsat C terminal not only gave Inmarsat a monopoly on GMDSS services, but also sparked the communications revolution, as operators soon learned that both routine and urgent messages could be transmitted.

Communication using Inmarsat C was not instant, as the messages were relayed on a store-and-forward basis, but shore-staff could at least prepare and send a message at any time without needing to rely on an intermediary. Broadband and VSAT are now seen as the future of marine communications, although they were not envisaged as part of the original GMDSS structure.

Because GMDSS was in place before the 9/11 terrorist attacks in the US in 2001, developments that occurred as a result of those attacks – such as the Ship Security Alert System (SSAS) and Long Range Identification and Tracking (LRIT) – are not included as part of GMDSS.

AIS (originally an anti-collision tool that was hijacked for



An Inmarsat launch. The company's loss this year of monopoly on GMDSS satellite safety services will be a radical change for the system

*The IMO has intimated that the modernisation of GMDSS will not involve any more carriage requirements for ships*

security purposes) and its evolved version of VDES (VHF Data Exchange System) – that provide a bridge between security and e-navigation uses – both came later than GMDSS.

On the other hand, text-based maritime information systems such as Navtex which first appeared in the 1970s are seen by some as obsolete technology. Navtex or similar local services provide information for waters up to 200 nautical miles offshore. The international service for ships transmits on 518kHz in English while local services – where they are provided – operate on 490kHz and are normally in the local language, for use by fishing, leisure and other inshore craft. They can provide useful printed navigational and weather warnings, but several national services have been closed as obsolete, with their role taken by more modern communication devices.

Arguably, the most radical change in the new GMDSS will be the ending of the Inmarsat monopoly on satellite safety services. After a long struggle supported by the US delegation at the IMO, Iridium was finally accepted as a GMDSS service provider at MSC 99 in May 2018.

At the same meeting, Inmarsat's Fleet Safety broadband

services were also given GMDSS approved status and the Chinese BeiDou satellite navigation service was granted a request for evaluation as part of GMDSS. Iridium's accession to GMDSS status will create a requirement that suitable equipment for ships be developed and type-approved before any operator can switch from Inmarsat services.

Iridium's journey to GMDSS acceptance was not easy and there have been numerous objections along the way. Most of those questioned the stability and longevity of the Iridium constellation, but with just one more in its series of multiple satellite launches to make, expected before the end of 2018, the Next constellation is almost complete. One factor very much in its favour is the ability of Iridium services to operate in the higher latitudes, allowing for a communications service to complement the new IMO Polar Code.

The modernisation of GMDSS is nearing culmination and will probably be completed by 2024. As well as changes to the service providers and new equipment that may be needed to allow Iridium and potentially other newcomers to participate, the modernisation also needs a complete rewrite of chapters IV and V in SOLAS.

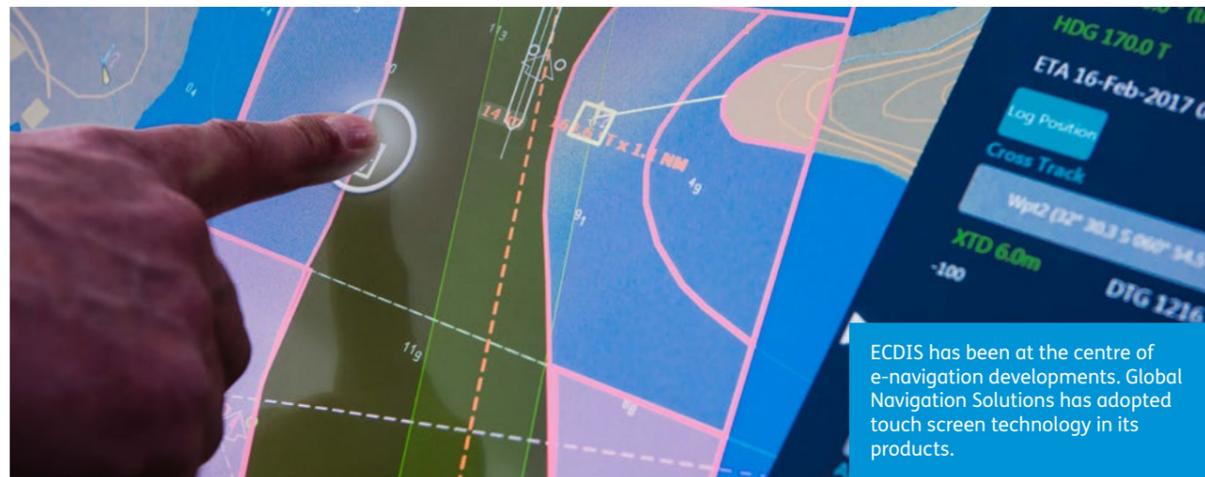
The IMO has intimated that the modernisation of GMDSS will not involve any more carriage requirements for ships.



Mandatory GMDSS equipment was an enabler of the satellite era in shipping

# A double-edged sword

E-navigation brings a raft of advantages, but commercial doubts remain.



When the IMO formulated its strategy for e-navigation at MSC 85 in 2008, most core objectives in the document related to safety, including exchange of information between ship and shore. To some, e-navigation is inextricably linked with autonomous ships (an unmanned vessel would require electronic navigation since no human would be onboard to operate the vessel). However, e-navigation – as envisaged by the IMO – is to complement, not replace, human navigators.

Most will equate e-navigation with ECDIS (Electronic Chart Display and Information System), the development of electronic charting having made much of the concept possible. An ECDIS programmed with a ship's passage plan brings together information on the vessel's planned route and limitations, in a manner useful to traffic management systems and other navigators, if shared.

Most mariners welcome the safety aspects of e-navigation and information sharing.

Not hidden, but the shortest

objective included in the IMO's initial strategy document among those relating to safety and navigational matters, was one that read 'provide opportunities for improving the efficiency of transport and logistics'.

To some, this objective has been elevated and tied in with environmental matters to manage shipping, with environmental issues trumping commercial matters.

In the EU, the EfficienSea, MonaLisa and STM (Sea Traffic Management) projects have examined the possibilities of managing shipping traffic for safety and efficiency reasons. The STM project, for example, includes in its vision statement 'A maritime world where the crew focuses on safe navigation instead of reporting, where port calls become even more efficient and just-in-time.'

In terms of the traffic between European ports, the projects involved account for a very small proportion. The crews of ships that have taken part speak positively of some of the

safety benefits, but the reaction of operators, cargo interests and others involved in the commercial aspects of shipping, as to the long-term impacts of traffic management, has yet to be reported.

Linked to the e-navigation and information sharing between ship, shore and authorities is the concept of a maritime single window (MSW) by which cargo and customs reporting is done by submitting data electronically to a single point, rather than electronic or manual delivery of FAL forms, manifests, crew lists etc. to different authorities in ports.

Combining the e-navigation and MSW potential poses the possibility that the traditional role of the port agent could be usurped.

However, a weakness in reliance on electronic information transfer is that satellites, the internet and even power supplies are potentially vulnerable. Over-reliance on such systems without a workable backup could lead to a compromise of both safety and efficiency.

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