RIVERTRACE

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MARITIME INDUSTRY 2.0: THE FUTURE IS DIGITAL

The digital revolution is transforming the world and global business as we know it. Data is being generated, shared, stored, and analysed in volumes at speeds that are increasing exponentially every year.

Until recently, the maritime industry has largely been an analogue operation, relying heavily on traditional methods. This has made the industry a slower adopter of digitalisation compared to other global industries, which is surprising given the magnitude of the industry that moves 90% of the world's goods by sea.

The international shipping industry is an industry in which standards, protocols and hierarchy provide rule and order, this means that making adaptive changes to anything new that is not enforced through regulatory requirement, can be slow.

The move to electronic recording and reporting methods is a good example. Shipping industry inhabitants and regulatory bodies are very accustomed to using paper manuals and guides, these have remained the norm for decades, even centuries.

However, the favoured use of paper documentation has several drawbacks, one of which is the burden on crew and onshore personnel time associated with paperwork and the other being the introduction of human error into record keeping. In recent years, in parallel with the maritime industry starting to embrace digitalisation at an increasing rate, the use of digitalised methods of monitoring and reporting has increased.

The use of digitalised reporting methods and electronic documentation on board ships and for information exchange between ship and shore is the primary method to alleviate crew time burden associated with traditional paperwork, it also removes the risk of human error.

As such, the industry has, in recent years, started to move towards the greater use of electronic documentation, such as electronic record books, for shipping operations. An electronic record book could be a device, system or software application designed to facilitate accurate entries for discharges, transfers, and other operations into an efficient electronic format, while complying with International Conventions and Flag State requirements.

This move to exploit the power of digitalisation for monitoring and reporting purposes has been accelerated by a recent shift international regulation - from the 1st October 2020, the International Maritime Organization (IMO) amendments to MARPOL Annexes I, II, V and VI will permit the use of electronic record books entered into force. For Rivertrace, the permitted use of electronic oil record books is a welcome step change in the industry, and we support this with our smart technologies and collaborations with other original equipment manufacturers (OEMs), described later in this white paper.

In the past, ICT systems, the IoT and connectivity costs may have been seen as an expensive add on without real benefit in the past, the truth is that in today's industry the benefits far outweigh the risk since greater digitalisation can offer transformative impact to operations in so many ways.

GAZING INTO THE FUTURE

Maritime Industry 2.0, and our quest to exploit the benefits of increased digitalisation is supported by huge advances made in ship connectivity over the past decade. The growing use of and demand for satellite communications allow for the efficient use of masses of data –commonly referred to as big data – between ship and shore.

An influx of new digital technologies, and adaptations made to existing technologies to give them new digitalised capabilities, is also supporting the realisation of the industry's digital dreams and aspirations. For some, this means the streamlining and optimisation of ship operations, but for some, the thinking goes further towards autonomous ships.

Autonomous ships are, of course, a step beyond the initial stages of digitalisation being undertaken today. However, ships with greater autonomy will become a reality in the not so distant future. Whether a fully autonomous ship will be developed and on the water within this century is unknown. But what is certain is that adaptions to technologies that support greater autonomy in shipping operations will be required and fast.

For the meantime, the maritime industry is looking to create greater efficiencies both in the supply chain and within individual ship operations in order to safeguard the competitive advantage. Also, it can be anticipated that ship operations, inspections and interactions at port will become more remote in the future. Safeguarding competitive advantage and conducting more remote ship operation methods have both been aspects heightened in the global COVID-19 pandemic, which had a great impact on the international shipping industry.

The global pandemic of late 2019/2020 caused a major shakeup in shipping. Shipowners, operators and managers redeployed their staff for remote working, with increased use of cloud-based services, video conferencing and instant messaging on shore. At sea, restrictions around travel to contain the spread of COVID-19 impacted crew changes and also ship inspections, forcing inspection authorities such as Port State Control and Flag States to use remote inspection methods.

Classification societies anticipated a move to remote inspections in the future, with many investing in drone technology. However, the remote methods deployed during 2020, supported by digital technologies, may mean that more remote ways of working in the shipping industry are adopted faster than anticipated.

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As such, leading companies in the maritime industry are exploring ways to leverage new technologies to improve the safety and productivity of their assets. In turn, OEMs are offering digital technologies and adapting existing technologies to function within a digitalised ship to support their ship owner customers.

Therefore, digitalisation is changing the way companies work and how ships are operated: it's tearing down walls, changing business models, and it's happening rapidly.

KEY MILESTONES IN THE DIGITALISATION OF SHIPPING

Until the introduction of radio on ships at the beginning of the 20th century, once a ship had left port it was isolated from communication with the shore.

The early capabilities of ship to shore communication were limited to voice, Morse, and telex for navigational and safety purposes. The capability and coverage of these systems gradually evolved during the 20th Century, and, in the 1990s, the Global Maritime Distress Safety System (GMDSS) brought the introduction of satellite communications and simple, yet effective, digital messaging to support distress alerting. The early capabilities of digital communications were limited, but there has recently been an unprecedented boost in communication capabilities due to completely different drivers emerging.

Thankfully, for ship operators and the crew onboard, both the capacity and coverage of ship to shore communication has been gradually evolving. Therefore, it can be said that this gradual evolution of communication capabilities laid the foundations for the digitalisation of the industry.

ADVANCES IN SHIP CONNECTIVITY

However, in the past decade we have experienced a step change in ship connectivity, with digital signals that can be transferred from ship to shore, and in the reverse direction, at significant rates. Advances in satellite communications are improving connectivity, allowing for massive increases in the volumes of data transferred at ever-lower cost.

Satellite communications systems now support highly advanced communications and data transfer between ship and shore compared to some decades ago, it also gives the crew some much needed communication with home and entertainment.

The expansion of satellite VSAT has been a key milestone passed for ship connectivity in this century to-date. Satellite communications are now fitted as standard to 98% of merchant vessels.

But challenges remain, communications often need to be maintained over wide areas of the globe for ships on the move. This requires global 'mobile' communications coverage all around the world, even in remote areas of the ocean.

Cost and bandwidth remain to be bottlenecks for ship operators investing in satellite communications, as it is expensive to accommodate bandwidth using applications in a maritime setting.

It is the advances in satellite communications coupled with a surge in ship sensor equipment and data analytics that has provided the foundation for mass digitalisation across the industry – resulted in what is known as 'connected vessels'. By leveraging greater connectivity, ships have become sophisticated sensor hubs and data generators, producing and transmitting information from anywhere, often in real time.

VSAT is a larger type of terminal operating towards geosynchronous satellites on C-, Ku- and Ka-bands. There is a large amount of available spectrum on these bands, and as such data rates are considerably higher and traffic costs significantly lower than L-band systems. Also, Due to the lower antenna gain, VSAT services on C-band provide excellent deep-sea coverage due to wide beams covering large sea areas, but also require larger ship antennae.

VSAT subscription rates vary depending on satellite dish size, coverage, and bandwidth and the main barrier for the adoption of VSAT is the size and cost of the end-user equipment.

In contrast to MSS at L-band, the VSAT market is highly competitive and has been an active arena for many commercial and technological developments in recent years.

Over the last years, Ku-band coverage has also improved and can now offer a very cost-effective alternative to C-Band.

So far, in the industry, only heavy data users have found the initial investment in VSAT worthwhile, which explains why there are considerably fewer VSAT installations than smaller, cheaper, and more narrow-band L-band products.

Inmarsat Global Xpress: Inmarsat's 5th generation of satellites (three I-5 satellites launched in 2013-2015) will support a new network called Global Xpress (GX), with a global network entering commercial service early in the second half of 2015.

With Ka-band satellites built by Boeing, Inmarsat are entering the VSAT world with a new maritime service called Fleet Xpress.

The Fleet Xpress service, according to Inmarsat, is capable of delivering data rates of up to 5 Mbps/50 MBps (uplink/downlink) over all maritime trading routes with a cost that is equivalent Ku-band VSAT devices. This is a game-changer for the shipping industry since it allows higher bandwidth and stable connections for all ships at a reduced price.

THE CONNECTED SHIP

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Ship connectivity acts the enabler for new digital applications on board ships that use a multitude of sensors around the ship to feed data into the applications. The data collected can then be fed into reporting or sent up to the bridge for real time use by the crew, or to shore for vessel and fleet performance management, for example.

EARLY MOVERS

Engine manufacturers were an early mover in exploiting the benefits of digitalisation, as an OEM. In the past, engine maintenance and overhauls were reactive and on a time-based schedule. A preventive maintenance scheme is based on the assumption that a component has a given lifetime, after which its failure rate increases. Condition monitoring, as an alternative concept, has been widely and actively adopted in aviation in the last decades.

Condition monitoring system rely on sensors (temperature, vibration, pressure etc.) for detecting symptoms of the failure modes of selected components or systems. The sensor readings are collected and stored locally on board the ship, and then pre-processed before the data are sent to an onshore data centre for further analysis and long-term storage. To-date, several condition monitoring products have already been introduced in the maritime market, e.g. Rolls Royce's Hemos [/70/], Wärtsila's Propulsion Condition Monitoring, and ABB's RDS system. These systems also allow the engine OEMs to gain insights into their products' performance in an actual operational environment in order to improve future products.

WATER QUALITY MONITORING AND REPORTING: SMART TECHNOLOGY, SMART THINKING

As the industry take steps to exploit greater digitalisation to optimise and streamline ship operations, so must original equipment manufacturers (OEM) adapt technologies to support customer needs.

This means that OEMs must, with great priority, digitalise their technologies to support the industry's move towards greater digitalisation.

For Rivertrace, the evolution of smart water quality monitoring technology is part of embracing digital transformation in our specific area of technical expertise. We are continuously developing our systems to support automated data logging to remove human errors, we are also putting our services online to support those customers who prefer to use electronic formats for reporting and the calibration of equipment. We are also working to connect our water monitoring systems, including our Oil Discharge Monitoring Equipment and enhancing and expanding the ways in which we can help our customers remotely is always evolving.

We call this our Digital Transformation Journey, which is a multi-faceted approach to introducing the integration of digitalisation across our range of water monitoring systems and services.

COLLABORATION IS KEY

We also believe that collaboration with other OEMs will enable us to support our customers in their journaled towards exploiting digitalisation. To-date, collaborative partnerships have allowed us to digitally adapt our range of water monitoring systems and services.

For example, our collaboration with Prevention at Sea collaboration for the SENSEAS E-ORB system, which is described below.

Our work with development partner Intellore has allowed us to convert our customer calibration functions into a digital, web-based portal which is also described below.

DIGITAL CALIBRATION PORTAL

In September 2020, we established a new, web-based calibration portal that will enable complete transparency for water monitoring equipment compliance and inspection.

The free-to-access digital portal, that can be retrieved at any time via desktop and mobile browsers, was developed by Rivertrace in conjunction with development partner Intellore. Hosted on the AWS (Amazon Web Services) cloud, the portal allows Rivertrace's network of staff, customers, OEMs and agents to access important information relating to the entire range of Rivertrace monitoring products, including calibration forms, product manuals and certification.
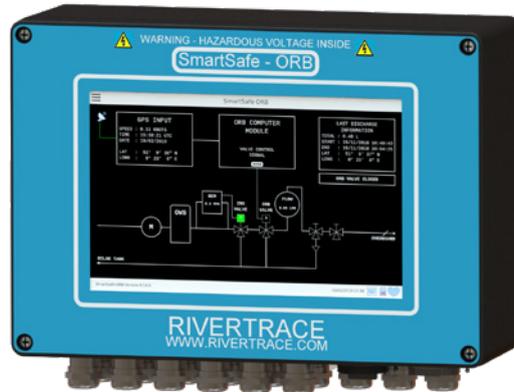
Once registered, a user can enter the IMO number of any vessel that has Rivertrace monitoring equipment onboard and track its movement and ETA for next port call. This enables the easy set-up of appointments with agents to carry out calibration checks, as and when required.

Additionally, the digitalised system is designed to send e-mail reminders to Rivertrace and monitoring equipment users when re-calibration checks are due. With all parts, customer information and serial numbers integrated with Rivertrace's Manufacturing Resources Planning System, accurate information required for calibration is provided seamlessly. API (Application Programming Interface) integrations enable the automation of transactions and ensure that accurate, valid information is easy to find.

ELECTRONIC RECORD BOOKS

A key element of the MARPOL regulations is the requirement to record discharges of shipboard substances and materials which could cause pollution to the environment. Traditionally, these record books have been maintained in paper form.

The SMARTSAFE ORB Bilge Overboard Security System was developed by Rivertrace to prevent the vessel from illegal discharge "Magic Pipes" and minimise discrepancies in the oil record book. In its simplest form the Smartsafe ORB will utilise the ships GPS and records each 'event' of the bilge water discharge process. The control module will store these events for a period of three years exceeding MEPC requirements.

SMARTSAFE ORB can also provide electronic recording of the discharges. When connected to the ship's LAN system the monitor will send automated emails at set intervals. The data is then interpreted and recorded in the Rivertrace Connected database and shown on the user-friendly dashboard interface. All data including the email report can be accessed through the dashboard providing the user with a full auditable trail of the discharges. The discharge data can also be used as an automated entry into your electronic ORB.

From the 1st October 2020, the International Maritime Organization (IMO) amendments to MARPOL Annexes I, II, V and VI that will permit the use of electronic record books entered into force. This means that the Oil Record Book, parts I and II (MARPOL Annex I, regulations 17.1 and 36.1) can be used officially in electronic format from that date.

In anticipation of this regulatory shift, Rivertrace and prevention at sea joined forces with Prevention at Sea to provide an integrated SMARTSAFE ε-ORB discharge monitoring system. This system provides the industry with a smarter, simpler way to improve processes and recording data.

ε-ORB (PAS electronic Oil Record Book) is a software application developed by maritime technology and marine risk prevention firm, Prevention at Sea Ltd. An electronic oil record book (ε-ORB) is a software application designed to replace the traditional paper oil record books

(ORB) (Part I and Part II) and facilitate accurate ORB entries into an efficient electronic format.

This software application has been integrated into the SMARTSAFE ORB monitoring equipment, resulting in the launch of a new system named SMARTSAFE ε-ORB, developed by Rivertrace and Prevention at Sea under a newly formed joint venture SENSƐAS.

The bringing together of the two systems through an API created by digital technology provider Intellore, will allow data collected by Rivertrace's SMARTSAFE ORB to be automatically entered into the certified Electronic Oil Record Book, the Prevention at Sea Ɛ-ORB, removing the need for manual entries.

The SENSƐAS ε-ORB software application will allow users to replace traditional paper oil record books (ORB) (Part I and Part II) and facilitate accurate ORB entries into an efficient electronic format. This prevents the input of vague entries, incorrect ORB format and code mismatches and supports automatic and secured transmission of records between the fleet and their operator offices by using the existing communication systems onboard.

The ε-ORB system was the first ORB to be approved by a major flag state (Liberian Registry). Since then it has achieved certification from 3 IACS members and several approvals from most major flag states.

LOOKING TO THE FUTURE

In a changing industry, Rivertrace is at the forefront of water quality monitoring technology and services, evolving systems to support the increased use of digitalisation to optimise ship operations.

The shipping industry will continue to experience digital transformation, with shipping companies having to switch from the traditional way of operations into a modern and smart environment.

For water quality monitoring, greater demands for electronic methods of reporting and also for the collection and transfer of data from ship to shore are fast becoming the norm. The industry will witness great changes in coming years and many adaptations will be required.

At Rivertrace, we encourage ship owners and/or operators to take advantage of digitalised water quality monitoring and reporting in order to future proof that aspect of ship operations.

In line with developments, the smart era is here to stay, with shipping presenting more and more innovations, improving trade, safety and environmental footprint, Rivertrace is here to provide the systems to support smarter shipping and the technical expertise to ensure a smooth transition into the digital era.

Martin Saunders, Operations Director at Rivertrace says: **"Digital technology is changing the landscape of our industry. As a company, we are embracing digital transformation and we want to pass on the benefits to our global customer base. Supporting our customers in achieving their quest for simplified, continuous monitoring and efficient operations through greater digitalisation is what we do."**

Please contact Rivertrace for further information:

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