

MacGregor News



Customer magazine Issue 172 Autumn 2017

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reality training**
improves safety
and efficiency
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MacGregor shapes the offshore and marine industries by offering world-leading engineering solutions and services with a strong portfolio of MacGregor, Hatlapa, Porsgrunn, Pusnes and Triplex brands. Shipbuilders, owners and operators are able to optimise the lifetime profitability, safety, reliability and environmental sustainability of their operations by working in close cooperation with MacGregor.

MacGregor solutions and services for handling marine cargoes, vessel operations, offshore loads, crude/LNG transfer and offshore mooring are all *designed to perform with the sea.*

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MacGregor is part of Cargotec (Nasdaq Helsinki: CGCBV).

An innovative, resilient past predicts a bright, robust future



Although our roots with the Pusnes brand go back to 1751, this year marks the 80th anniversary of our MacGregor brand. It serves to remind us how far we have come as a company and benchmarks our position for the future. We have proven our ability to be innovative, set new standards and shape the industries in which we operate. We have also shown our resilience during difficult times. Through significant

new orders for new equipment and services, which will benefit the business of our customers, they have shown their continued trust in MacGregor.

Our extensive collaborations with key industry stakeholders (page 10) and academia (page 15) show our willingness to cooperate, share ideas and secure our place at the table for the industry's future. We know that this future is firmly linked to widespread and ongoing digitalisation. Our advances in this area are focused on delivering more efficient, value-creating solutions for our customers, with a strong emphasis on service.

Service advances include our simplified service agreements, which offer customers guaranteed cost savings. These are complemented by a new, predictive maintenance service, OnWatch Scout, which informs operators of potentially-critical component errors before they happen (page 28).

In the digital arena, a strengthened portfolio of specialist service solutions includes navigation and communication equipment, voyage data recorder systems, and a maritime data engine interface that standardises data and makes it easily accessible for real-time use (page 8).

We use innovation to improve the performance of our customer's operations. These innovations include our progress and participation in the development of autonomous shipping, using virtual reality to train operators to be more efficient and safer, optimising on-board cargo systems to ensure that containerhips can carry their maximum payload and therefore offer the best return on investment, and by providing the technology that enables an operator to switch from traditional, heavy steel rope to fibre-rope systems that maximise a crane's capabilities, even in ultra-deepwater lifts.

Amongst these advances we never take our eyes off safety and our drive to continuously improve standards. We know that high-value investments, in a naturally high-risk environment, set special requirements for marine equipment reliability and quality; operators depend on us to set these standards (page 24).

We also do not shrink away from our environmental responsibilities, rather seeing them as a commercial advantage. We continue to carve out our position in relatively new markets such as the renewable energy sector (page 30), while also setting eco-efficiency standards that we must meet as part of a wider corporation (page 20).

To maintain and develop MacGregor's market-leading position in the decades to come, we will continue to adapt and pioneer intelligent engineering that meets and exceeds industry needs. We will pursue ever more customer-focused lifecycle services and strengthen resources through continuous investment.

Michel van Roozendaal,
President, MacGregor

news 360°

Broader online presence boosts customer service

MacGregor is completing the first phase of its improved online presence with the imminent launch of its new website. It is designed to help customers find the information that they need easily and quickly. “We also want to serve our customers well in the digital arena,” says **Minna Karhu**, Vice President, Communications, MacGregor. “With clear and improved navigation, the website has an enhanced contacts feature to ensure that customers are able to reach their



MacGregor contact more easily.

“We defined the new content structure with our customers in mind,” she adds. “We welcome your feedback from visiting the pages, which you can leave at communications@macgregor.com.”

Proven expertise secures French floating linkspan order

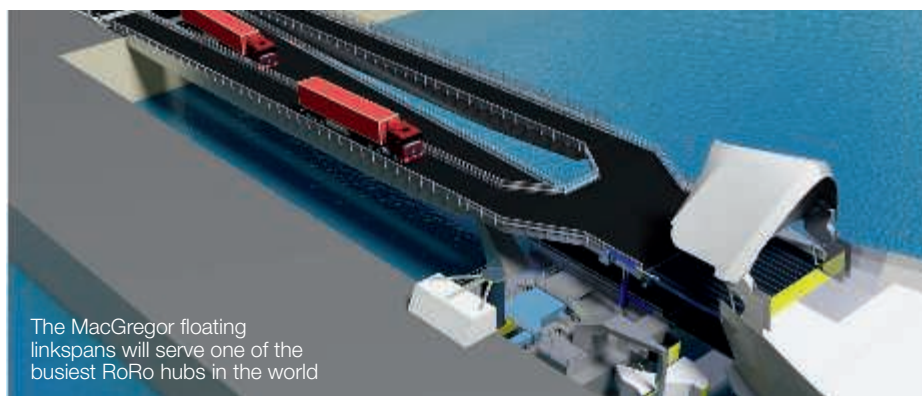
A contract has been signed with one of the world's largest civil engineering construction companies, Bouygues Travaux Publics, to design, fabricate and install three floating linkspans in France. The equipment will be delivered during 2020.

“MacGregor's proven expertise in delivering large and sophisticated linkspan projects was one of the key reasons for securing the order,” says **Michel van Roozendaal**, President, MacGregor. “Customers value our capabilities to design

solutions according to customer specifications and for delivering on time.

“We have had a long and successful relationship with this customer,” he adds. “In 2009 we delivered two linkspans to Morocco and we have been involved in the ‘Garden Bridge’ project in London.”

The linkspans will serve traffic in Calais, which, together with Dover, is one of the busiest RoRo hubs in the world. Each floating linkspan will be constructed from 1,500 tonnes of structural steel.



The MacGregor floating linkspans will serve one of the busiest RoRo hubs in the world


Accelerate Energy calls for MacGregor mooring and riser expertise

MacGregor has signed an order for the delivery of a complete mooring and riser system that will serve the new Moheshkhali floating liquefied natural gas (LNG) terminal operated by Accelerate Energy. It is being developed off the island of *Moheshkhali* in the Bay of Bengal, Bangladesh and is planned for completion in 2018.

“We are happy to be involved in this interesting collaboration project,” says **Høye Høyesen**, Vice President, Advanced Offshore Solutions, MacGregor. “We bring our vast expertise in managing demanding mooring projects and also our lengthy experience in the mooring business.”

MacGregor's scope of supply includes on-vessel equipment, Flintstone mooring connectors, as well as project management for the fabrication, procurement and installation of the complete mooring and riser system for the FSRU. Delivery of the FSRU terminal will be completed in the second quarter of 2018.

“This order is a natural step in our strategy to expand to the FSRU market with one of world's leading players,” says **Michel van Roozendaal**, President, MacGregor. “It proves the combined strength of both MacGregor and Flintstone; a company that MacGregor acquired the majority shares in last autumn.”



The loss of coal miners from ineffective wooden hatches inspired the MacGregor brothers to develop the first steel hatch cover

80 years of growth and innovation for the MacGregor brand

MacGregor is now entering its eightieth year. In 1937, to promote and sell the steel hatch covers that engineer brothers **Robert** and **Joseph MacGregor** developed and patented in 1929, MacGregor & Company was formed in Whitley Bay on the north-east coast of England.

The brothers' belief in the need for steel hatch covers stemmed from what they saw as the unnecessary loss of coal miners in the North Sea from ineffective wooden hatch covers. Their design was deceptively simple; it consisted of five articulated leaves that

stowed neatly at the end of each hatch. It was revolutionary, but persuading shipbuilders and owners to change from the tried and tested wooden covers proved surprisingly difficult.

Over the years that have followed, MacGregor has grown both organically and through acquiring new companies. In 2005 it became part of Cargotec Corporation. Today, MacGregor continues to lead and shape the marine and offshore markets with its strong portfolio of market leading brands and an unrivalled service record.

Head office in Singapore now established

In line with MacGregor's strategy to meet the needs of its global customer base and to strengthen ties in Asia, the company has now established its head office in Singapore. Michel van Roozendaal, President, MacGregor, has already relocated to Singapore and has been joined by Jani Oksanen, Vice President, Finance, MacGregor.

With a global customer base and large geographic span of operations, MacGregor continues to have a strong leadership presence in Europe, where the majority of the company's competence centres are located. "As a global market leader in cargo and load handling, serving our customers worldwide, a head office in Singapore is a natural fit for MacGregor as the majority of shipbuilding takes place in Asia," says **Michel van Roozendaal**. "Furthermore, close to 70 percent of MacGregor's sourcing volume is purchased from Asian manufacturers."

The new head office is based in existing premises in Singapore, which MacGregor shares with its sister companies, Hiab and Kalmar.

Teekay Shipping trusts MacGregor service

A five-year service agreement has been secured with Teekay Shipping Ltd. The contract covers 115 vessels and comprises spare parts, maintenance, training and project support.

"Teekay is one of our key customers and we are delighted that it trusts MacGregor to keep its fleet's cargo handling and

mooring equipment working," says **John Carnall**, Senior Vice President, Global Lifecycle Support, MacGregor.

Established in 1973, Teekay is one of the world's largest marine energy transportation, storage and production firms, with fleets of vessels specifically designed for these tasks.

"Historically, Teekay has held similar agreements with our Pusnes and Hatlapa brands and this latest agreement is a natural extension of these services, and incorporates all the benefits of our global MacGregor portfolio," says **Steve Goodchild**, UK Branch Manager, MacGregor.

Shared data is at the heart of a digital future

MacGregor is striding towards a more efficient, safer digital future by creating a culture of innovation and embracing the need to collaborate and share data and expertise

As the marine industry feels its way towards a more efficient, safer future through digitisation, there is still an elephant in the room, one which takes the form of ineffective data sharing and a reluctance to collaborate across the industry. Ownership and the quality of data are two further hurdles.

The benefits of shared data are fairly obvious; without it the industry cannot move forward. But it requires fundamental shifts in managerial philosophies and will to some degree level the playing field. However, by sharing data, untold opportunities are possible and companies can still forge their own future through their individual use of the information.

MacGregor is confronting these issues head-on. In addition to its own market-leading expertise, one of MacGregor's greatest advantages is that it is part of a wider organisation, Cargotec. Within Cargotec there are several business areas, a host of knowledge and multi-disciplined teams for MacGregor to drawn upon including the software arm, Navis.

Streamlining global trade

"The purpose of Navis is to make global

trade smarter, safer and sustainable for everyone," explains **Raj Gupta**, Chief Technology Officer & Senior Vice President Engineering, Navis. "We work in collaboration with terminal operators, carriers and other parties to make processes more efficient and at the same time therefore more profitable.

"As a company we have traditionally worked with terminal operators, but over the last few years have moved to work much more closely on the shipping side with, for example, carriers. We understand that a terminal uses software solutions and so does the carrier line, offering solutions that can act as an interface, or if a carrier uses our solutions and so does the terminal, crucial data, notwithstanding the need for confidentiality, can be shared across the XVELA collaboration platform."

Mr Gupta recognises that there is a worldwide need to look at efficiency and the market's overcapacity. "It needs to become more efficient to become more profitable," he says. "I equate what is happening now in the shipping industry with the airline industry of the 1990s, which was plagued by inefficiency and overcapacity; rarely did I travel on a full flight back then,

By sharing data, untold opportunities are possible and companies can still forge their own future through their individual use of the information

nowadays rarely is there an available seat on the flight. The industry got smart, using data-driven forecasting and trends to its advantage. This is exactly what the marine industry has to do, I am particularly thinking about containerised trade, but I am sure that other shipping operations could benefit from the same valuable approach."

Benefits of data transparency

At the berth, a ship needs to be quickly unloaded, loaded and sent on its way. It is simple in one way, but the sheer amount of data, from stowage to storage planning, accompanying a vessel and its payload means that this is a complex process with huge quantities of repeated and inaccessible data. "We need to remove non-transparent data," he stresses. "All data, apart from that, which is sensitive, should be



Raj Gupta, Chief Technology Officer & Senior Vice President Engineering, Navis: "Having similar data from thousands of vessels will offer the industry countless opportunities for very accurate data-driven forecasting"

“Navis software optimises the planning and storage of containers and constantly works towards removing the human error factor”

Raj Gupta

UK. MacGregor's role in the event was to discuss its expertise in relation to the introduction of an autonomous vessel ecosystem.

Mr Gupta notes that two key regulatory advances that will strengthen the digitalisation process are the EU monitoring, reporting and verification (MRV) regulations of carbon dioxide (CO₂) emissions from maritime transport and the International Maritime Organisation's (IMO) data collection system to monitor fuel consumed and other relevant energy efficiency data. The MRV regulations enter force in January 2018, with the IMO fuel-monitoring legislation fully effective from January 2019.

"We are able to offer products that are able to record this data," says Mr Gupta. "Having this data and similar data from thousands of vessels will offer the industry countless opportunities for very accurate data-driven forecasting."

It is understandable that operators argue that the fewer the regulatory constraints, the easier it is for shipping and the cheaper it is to transport and receive goods around the world. However, by automating the whole monitoring, reporting and verification process the industry will benefit from a reduction in its administrative burden and also avoid the 'red tape' in monitoring and enforcing compliance.

"Going forward, MacGregor is in an enviable position able to leverage its position in Cargotec and benefit from the ability to integrate software capabilities into its cargo handling business; few companies are able to offer such an integrated approach," he concludes. ■

available across a shared data exchange, like our XVELA solution; this transparency will drive efficiency and have positive safety and environmental effects.

"Navis software optimises the planning and storage of containers and constantly works towards removing the human error factor," he says. "Even in the short term, significant energy savings, along with efficiency and safety advances can be achieved. The planner becomes more efficient and the port becomes safer. A control room in an automated port oversees the seamless transfer of containers around the port, which delivers huge efficiency advances, lessens the likelihood of cargo damage and ultimately can save a life by eliminating dangerous working practices.

"For the carrier lines, our software offers greater data accuracy and availability

and optimises container stowage in terms of weight, container size and type, route, visibility for line of sight, and much more.

"In addition to our N4 TOS and carrier solutions, our XVELA exchange provides a transparent data-sharing platform, which means that information can be stored and accessed when needed, and the industry becomes much less error-prone and safer.

"Along the way this will push players together and drive data sharing. Greater information availability and standardisation, predominantly driven by rule-makers, will of course speed this process along as well."

Advances on the horizon

In June this year, MacGregor – as part of a Finnish delegation – participated in the ninety-eighth session of the IMO's Maritime Safety Committee, which met at the UN body's headquarters in London,

Widened digital portfolio promises

a wealth of operational advantages

A strengthened portfolio of digital services offers MacGregor customers a one-stop-shop for hardware, software and servicing, easing maintenance burdens and enhancing efficiency

A strengthened digital portfolio, including specialist service solutions, which complement a market-leading range of core equipment and services, ensures that MacGregor customers benefit from all the advantages that a single, high-quality, expert partner can deliver.

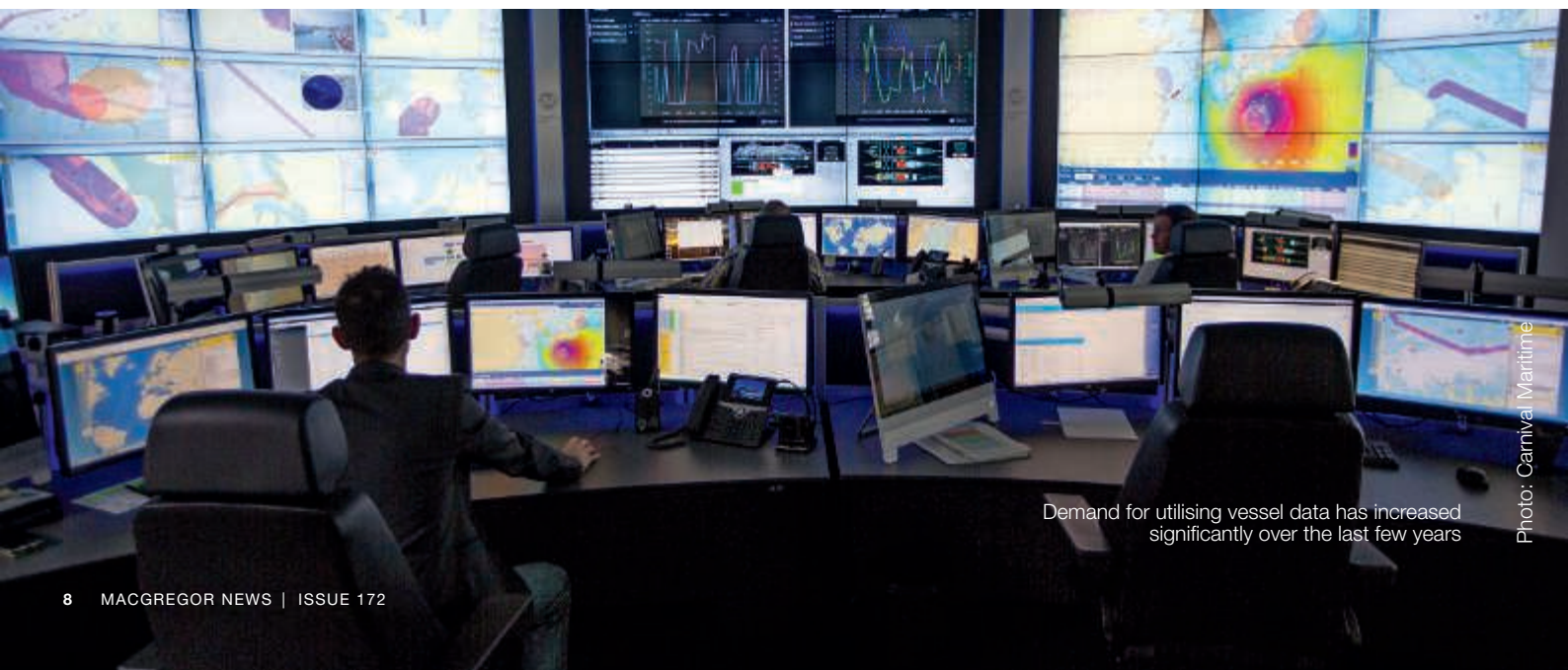
As part of its strategic aim to lead the market in intelligent cargo handling,

in 2016 MacGregor's parent company, Cargotec, acquired the German maritime software specialist, Interschalt. As part of its integration, in 2017 the Interschalt software division became part of Cargotec's software arm Navis, and the Interschalt service business became part of MacGregor Global Lifecycle Support.

"Our wider digital service offering will

save shipowners and operators time and money; this is what counts in commercial shipping," says **Alexander Nürnberg**, Senior Vice President, Technology and R&D, MacGregor.

Interschalt's existing service business boosts three main areas for MacGregor; navigation and communication (NavCom) equipment; voyage data recorder (VDR)



Demand for utilising vessel data has increased significantly over the last few years

Photo: Carnival Maritime

systems, and a maritime data engine (MDE) interface that standardises data and makes it easily accessible for real-time use.

Essential NavCom services

MacGregor can now offer a comprehensive range of advanced services for shipboard navigation and communication equipment. “We can individually customise modular services that can be combined into contract packages,” says **Andy Haynes**, VP Sales and Portfolio, MacGregor Global Lifecycle Support. “These range from mandatory annual surveys to full maintenance contracts covering all the maintenance and repair needs of navigation and communication equipment. The major benefit to the shipowner is a condition-based flat rate for its fleet.”

Navigation equipment covered by a MacGregor/Interschalt NavCom service includes voyage data recorders (VDRs), as well as gyro compasses, magnetic compasses, and radars from various manufacturers.

“Inoperative essential navigation and communication equipment endangers crew, ship operations and a vessel’s safety,” notes Mr Haynes. “Therefore we understand that the rapid delivery of services and spare parts is critical.”

More than just a recorder

“Our VDR G4e and S-VDR G4e models

are more than just data recorders,” explains **Nicola Jensch**, Sales Manager of Interschalt solutions. “VDRs have been mandatory since 2002. However, through a series of developments, these simple data collectors and storage devices have been transformed into smart data providers with additional tracking and monitoring features, which MacGregor can now offer.”

Innovative MacGregor/Interschalt VDRs are available with optional real-time monitors with off-track alarms on board and ashore. Detection of non-conformity between the real-time position and the corridor data alerts those in charge such as the designated person ashore.

“Our VDRs are known to be one of the most reliable systems on the market,” says Ms Jensch. “They comply with the latest IMO performance standards and more than 900 commercial vessels sail with these systems on board.”

Standardised, accessible data

Demand for utilising vessel data has increased significantly over the last few years.

The MacGregor/Interschalt maritime data engine (MDE) is a software application that standardises vessel data, which is collected from voyage data recorders and other ship systems. It makes vessel data available via the standardised OPC-UA interface enabling its real-time use.

“Our wider digital service offering will save shipowners and operators time and money; this is what counts in commercial shipping”

Alexander Nürnberg

“Each ship has a unique equipment configuration, posing the challenge of having to standardise data for general and system-independent use and to optimise it for further use,” notes Ms Jensch. “This applies both to an individual ship and to an entire fleet. In many cases, each supplier installs its own system on board, resulting in enormous quantities of disparate data, which our MDE makes available in a uniform structure.

“Our MDE delivers two advances not found in traditional on-board data-collection systems,” Ms Jensch adds. “The first is that all data from one or more ships in a fleet with different data structures, independent of the data source and deployed platform, can be standardised and made accessible in the same structure. The second is that the MDE is an Industry 4.0 compatible network solution that makes real-time data available through a standard interface for third-party system integration, making it a very cost-effective solution.” ■

New software investment drives RoRo operational efficiency advances

MacGregor has recently acquired the rights to use promising new software from Lekven AS, which increases the operational efficiency of RoRo vessel operations and drives port-call optimisation. Further development is planned for the software for ships, ports and related operations.

“We are focused on widening the digital portfolio that we can offer to customers; ship and operational efficiency software is a natural addition,” says **Alexander Nürnberg**, Senior Vice President, R&D and Technology, MacGregor. “This business intelligence software is the first of its kind

on the market. It is easy to operate and has clear interfaces and reports.

“It has had a 15-month trial with a global pure car truck carrier (PCTC) shipowner/operator in European ports and has shown very positive results,” adds Mr Nürnberg.

“MacGregor is very well known and a respected player in the RoRo business,” says Software Developer, **Endre Lekven**. “It has lengthy experience and pioneered many new services and solutions for the market over the years. I am very happy to join MacGregor and share my expertise.

This comes from a shipping company side, where I have built the software and is based on improving shipowner and port businesses by fully using business information.”

“This collaboration is an ideal fit for MacGregor’s strategy to support RoRo shipowners and operators by improving their existing and future fleet efficiency,” continues **Magnus Sjöberg**, Vice President, RoRo Division, MacGregor. “To start with, we are focusing on improving the logistics efficiency of PCTCs and minimising their waiting times in port.”



Cross-industry collaborations bring **autonomous future closer**

With decades of experience and multi-disciplinary expertise, MacGregor takes its place at the collaboration table in shaping the industry's more efficient, safer future and for making unmanned shipping a viable proposition



The concept of unmanned shipping
brings with it the promise of safer,
more efficient operations

MacGregor participated in the 98th session of the IMO's Maritime Safety Committee to discuss the introduction of an autonomous vessel ecosystem



The world fleet increases with every passing year, as does the number and complexity of systems on individual newbuilds. But at the same time, shipping faces a labour crisis and a widening gap between demand and supply of trained seafarers. Yet, global trade must continue, and the concept of unmanned shipping brings with it the promise of safer operations, using vessels which through machine-learning can become eco-efficient and more operationally-efficient in a way that would be impossible for human crews.

The idea of unmanned shipping has cropped up many times, but is even now often greeted with scepticism. Even only a few years ago, when automation had been tried and tested in aerospace and was in the process of being refined in the automotive industry, the topic of autonomous ships was treated as fanciful in

“MacGregor started the transformation journey several years ago and is proceeding step-by-step towards autonomous equipment operations and eventually autonomous vessels”

Alexander Nürnberg

many circles and faced a deluge of questions. Would today's satcom connections have sufficient capacity to enable ships to be operated remotely? Who owns the data? Could crewed and unmanned vessels sail together? What about piracy?

Now, thanks to leaps and bounds in the development of satcom and navigation technologies, these questions are being

answered. However, the technology is only at proof-of-concept stage, and autonomous shipping proponents need to work hard to ensure that their technologies are marketable and cost-effective at the outset, as well as economically viable in long-term operation. To achieve this, experts must come together and expertise should be shared at all levels including a place at the authorities' table.

Experts come together

In June this year, MacGregor participated in the ninety-eighth session of the International Maritime Organisation's (IMO) Maritime Safety Committee, which met at the UN body's headquarters in London, UK. MacGregor's role in the event was to discuss its expertise in relation to the introduction of an autonomous vessel ecosystem.

In addition to MacGregor, the Finnish delegation included four other Finnish companies, the Finnish Transport Safety Agency (Trafi) and the Finnish Ministry of Transportation. Together they were on a panel and presented the 'digital Finland' concept and outlined an autonomous vessel ecosystem strategy, highlighting the need to change current IMO safety rules and regulations to make autonomous sea traffic possible.

The session was attended by representatives from around 170 IMO-member countries and organisations. "Participating in such a high level meeting was very rewarding," says MacGregor representative **Arto Toivonen**. "Being able to contribute our expertise to the official presentation supports our strategy to shape the industry. Autonomous vessels require the IMO to alter its rules and regulations in line with industry transformation. Collaboration is crucial to success and for its part in the ecosystem, MacGregor brings its expertise in terms of cargo safety and efficiency; ultimately with a view to make future operations more sustainable."

Following this event and similar campaigns by the Norwegian Maritime Authority, as well as representatives from Denmark, Estonia, the Netherlands, the

“Collaboration is crucial to success and for its part in the ecosystem, MacGregor brings its expertise in terms of cargo safety and efficiency; ultimately with a view to make future operations more sustainable”

Arto Toivonen

UK, Japan, South Korea and the US, the IMO announced that it would consider new regulations to govern the new automated vessels frontier. Not even nations with large populations of seafarers stood in the way of the proposition. The IMO will now discuss unmanned vessels at its next Maritime Safety Committee (MSC) 99. Not known as an early adopter, IMO's stance should serve as a wake-up call for sceptics that the industry is on the move.

"MacGregor wants to reshape and transform the industry to make it much more efficient, safer and more sustainable," says **Pasi Lehtonen**, Senior VP, Strategy, Business Development and Marketing, MacGregor. "In the segments where we

operate, we see a lot of unnecessary waste in the form of inefficiency, damage to cargo, and continuously dangerous working conditions. Our aim is to minimise waste from the value network; collaboration on the development of autonomous technology for containerships is a good example of where industry leaders can work together to transform the industry. We are ready to bring our considerable experience in intelligent cargo and load handling into this process."

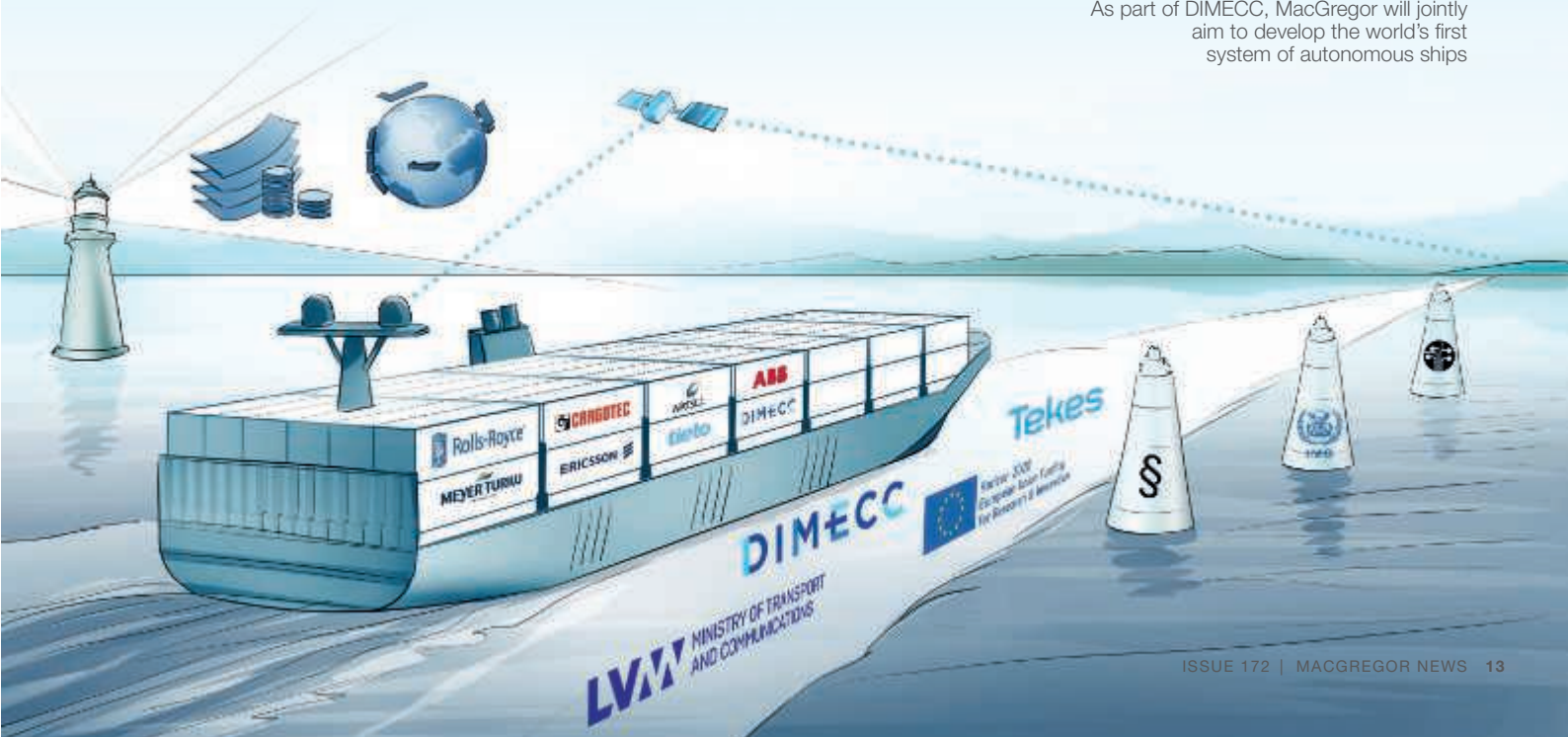
Commercial collaborations

In line with this thinking, in March this year MacGregor and Rolls-Royce signed a Memorandum of Understanding (MOU) to collaborate on research and development to explore the impact of developments in autonomy for cargo ship navigation and cargo systems on board containerships.

"This collaboration will harness both companies' unique experience laying the groundwork for the development of autonomous container ships," says Mr Lehtonen.

"As a leading provider of cargo handling solutions and services for container ships, MacGregor brings a detailed knowledge of the cargo sector and can provide valuable

As part of DIMECC, MacGregor will jointly aim to develop the world's first system of autonomous ships



insights into marine cargo operations and the technology and systems needed to make them as efficient and safe as possible,” said **Asbjørn Skaro**, Rolls-Royce, Director Digital and Systems.

The first test ground

In a more recent development, MacGregor has announced its participation in the advanced co-creation ecosystem, One Sea. Founded in 2016 and led by DIMECC (Digital, Internet, Materials & Engineering Co-Creation), the goal for the ecosystem’s partners is to jointly develop the world’s first system of autonomous ships.

Their shared vision is to enable fully remote-controlled vessels in the Baltic Sea in three years and to achieve autonomous commercial maritime traffic by 2025. The Baltic Sea has long been a hotbed of innovative thinking thanks to its status as an emission control area (ECA), with operators in the region managing to comply with some of the maritime sector’s strictest regulations – often, even exceeding them.

Now, under the One Sea initiative, it is to become one of the first testing grounds for autonomous ships, and in August DIMECC announced opening the first globally-available autonomous maritime test area on the west coast of Finland.

Managed and controlled by DIMECC, the test area is open to anyone wishing to test autonomous maritime traffic, vessels, or technologies related to it.

Comprising a consortium of top industry players including MacGregor and Rolls-Royce as well as Wärtsilä and ABB, with support from the Finnish funding agency TEKES, the aim is to cultivate a fully autonomous maritime ecosystem in the Baltic Sea, which will provide a roadmap for cooperation and coordinated development between industry, research institutes, class societies and authorities, enabling the adoption of autonomous vessels elsewhere around the globe.

When it comes to development of systems and solutions for technologically advanced, safer operations, MacGregor has a key role to play, explains Senior VP of R&D and Technology, MacGregor, **Alexander Nürnberg**. “The benefits of co-creation are obvious,” he says. “Software experts, together with systems and equipment experts can improve efficiency and safety throughout the whole value chain.

“MacGregor started the transformation journey several years ago and is proceeding step-by-step towards autonomous equipment operations and eventually autonomous vessels. The steps we have already taken on this journey include the ability to have greater connectivity to

equipment. This means that we can undertake performance monitoring and further enable condition-based monitoring and predictive maintenance.”

Pushing performance boundaries

The name MacGregor has long been associated with market-leading cargo handling technology and it has not stopped pushing at the boundaries of performance excellence. In recent years, MacGregor has turned traditional cargo handling system design on its head through its PlusPartner concept. It is an innovative approach that starts with the cargo profile and works forward from this point to ensure that a ship design considers all components of the cargo handling system as a whole. This maximises cargo carrying efficiency, flexibility and profitability. The cargo systems onboard existing ships can also be re-considered using the same principles.

With this optimisation of cargo handling processes and such a rich pool of expertise in vessel automation, shipping looks to be eliminating the weakest links in its value chain in the coming years. It is no surprise that so many nations around the world now regard fleets of unmanned vessels as an inevitable and imminent development. ■

Bulk shipping to benefit from automation advances

MacGregor and ESL Shipping Oy, part of Aspo Plc, have agreed to jointly develop and test an autonomous discharging feature on MacGregor bulk handling cranes, designed to offer safety and efficiency advances.

“Autonomous crane operation improves efficiency and safety,” says **Leif Byström**, Senior Vice President, Cargo Handling at MacGregor. “Discharging operations can be monitored and controlled from the bridge and therefore eliminate the need for personnel in hazardous operational areas.”

ESL knows MacGregor cranes very well and relies on their proven technology. The cranes will be fitted on board ESL Shipping’s two new liquefied natural gas (LNG)-powered Handysize bulk carriers.

“Our new environmentally-friendly LNG fuelled ships will be operated on very demanding trades with a high number of voyages, port calls and crane operating hours annually. Autonomous operation will further increase our competitiveness and offer our clients unforeseen efficiency and safety advances,” says **Mikki Koskinen**, Managing Director at ESL Shipping Oy.

“We are very excited about collaborating with ESL on this development project,” continues Mr Byström. “By combining the expertise of a forward-thinking shipowner and operator with our expertise in intelligent

cargo handling, we can reduce unnecessary waste in the value chain and therefore develop safer and more efficient solutions for unloading bulk cargoes.”

The vessels are planned to enter service during the second quarter of 2018, when their automation testing capabilities will commence.

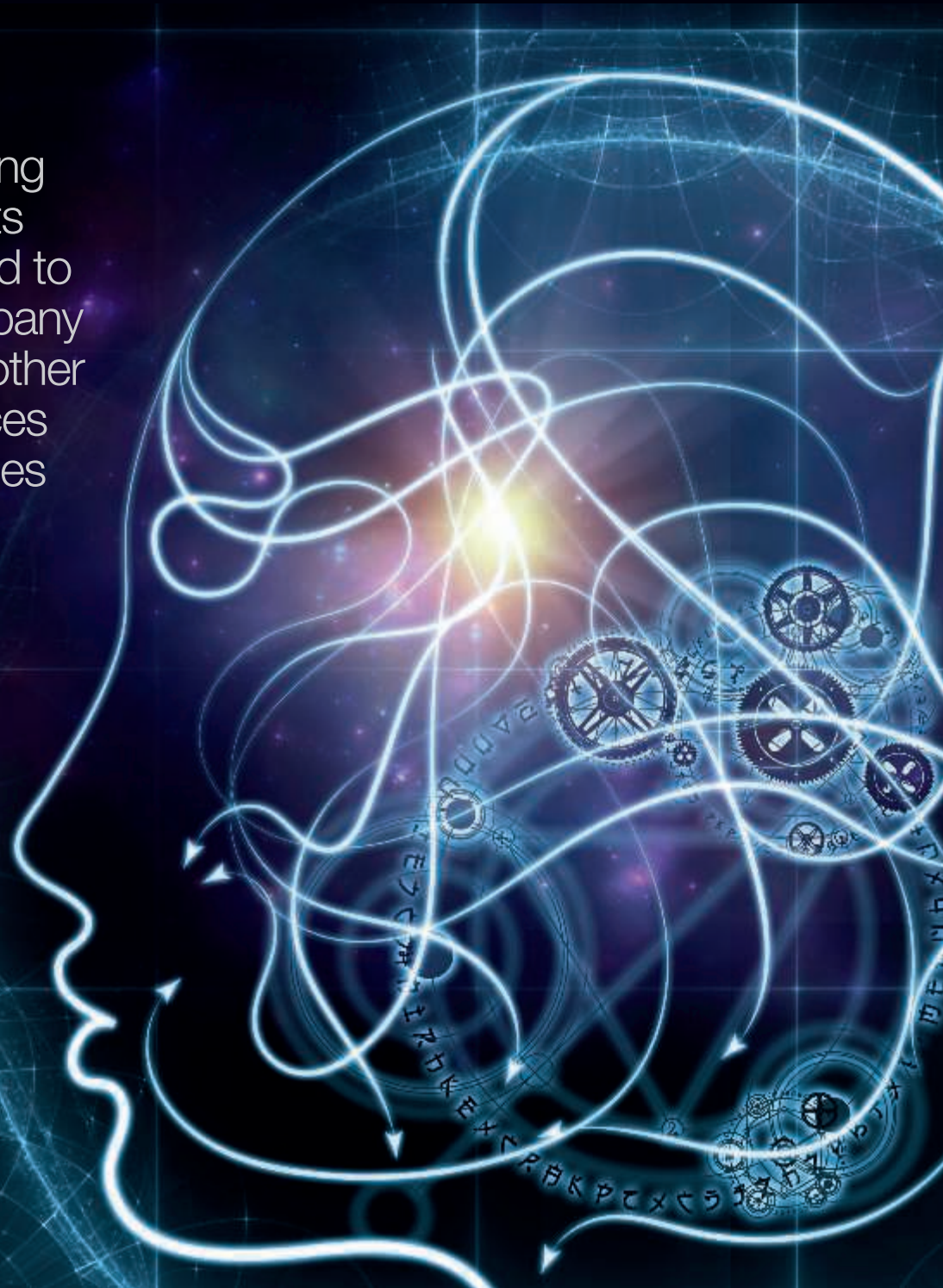


MacGregor and ESL Shipping will jointly develop and test an autonomous discharging feature on MacGregor bulk handling cranes

External research

extends a company's industry insights

MacGregor understands the importance of making an ongoing commitment to its own research and to expose the company to scrutiny from other informative sources such as universities



MacGregor is no stranger to industry and university collaborations, participating in numerous projects over the years. It values collaborative approaches and understands that research is designed to create competencies that outlast individual projects by developing existing processes, creating new knowledge and through organisational changes based on insights gained throughout a research cycle.

“We have multiple ongoing collaborative R&D projects, both in business development and also in product development,” says **Henri Paukku**, Director of Cooperation and Funding, MacGregor. “We encourage knowledge sharing inside our organisation and my aim is to help

others within MacGregor build collaborative relationships with universities and together then identifying interesting focus areas for research and innovation.

“Collaboration works well when mutual benefits are easy to identify,” he notes. “From the university’s side, I think it needs to find and adapt theories to match our current problems – this is the universities’ value proposition for MacGregor.”

A different perspective

“Research collaboration is important because of the different perspectives it provides,” Mr Paukku continues. “We tend to be very focused on the details, while researchers can consider a wider, more general level or a cross-industrial view.

“We have multiple ongoing collaborative R&D projects, both in business development and also in product development”

Henri Paukku

Universities also help set up situations in which new ideas are tested, raising new questions which lead us to new opportunities.

“Fundamentally, I think that working with universities gives companies a better insight into their own organisations.”

MacGregor looks to use this better insight to meet the needs of today’s changing industry and sees its expertise as a crucial driver in this new landscape.



With a three-decade background in cargo handling and now a recent university endeavour, Industry Professor Matti Sommarberg, understands more than most how the merchant shipping industry is transforming

Photo: TUT photo library

Industry Professor, **Matti Sommarberg**, from the Tampere University of Technology, Finland, understands more than most how the merchant shipping industry is transforming. He enjoys the benefits of a three-decade background in the cargo handling industry and now a more recent university endeavour.

“Business predictions are most often based on histories,” Professor Sommarberg explains. “Currently, you could argue that the containership market is going through one of its normal economic cycles, one that I have witnessed many times over. These cycles are driven, yes by a need to replace tonnage, but it is entirely dependent on consumer demands. For hundreds of years merchant shipping has existed and even today, despite the progressive changes that we see within the industry, its premise is still the same, it meets consumer needs. I do not see this fact changing significantly, but how we meet these needs will fundamentally change.”

Ships have been getting bigger to cope with a general increase in consumption. This is not limited to container shipping, but also includes larger bulk carriers to meet the rise in demand for raw materials to support infrastructure development and energy production. “However, it is important to note that these increases are largely driven by a growing middle-class and at some point this will plateau,” he notes.

The changing shape of business

Business in the merchant shipping industry is increasingly directly and indirectly impacted by the rise in digital technology. “This is changing the shape of how to do business; how companies serve their customers and will ultimately alter the products and services that a company offers,” says Professor Sommarberg.

“In system integration businesses, there is a high value in combining technologies into products to solve a problem. Components and systems can be

refined to reduce fuel consumption and increase efficiencies. Products still have to function in the environment that they serve; lifting heavy loads or keeping a vessel watertight, but digitalisation will eventually significantly impact these physical products as well. These are the hidden drivers of technological advances.”

“We do not yet know the full implications of a network economy or the exponential changes that digital technology will bring... However, it is clear that we will still need the tool maker”

Matti Sommarberg

On one level, the impact of digital technology across industries is easy to see; almost everyone works on computers in some capacity and smartphones are ubiquitous. Professor Sommarberg believes that this disparate collection of technology within every business will one day bring about an exponential technological revolution; one that people are not capable of seeing as it is on such a massive scale. “At the beginning these changes look reasonable and progressive, but at some point in time, these technologies will combine and the end result holds almost countless opportunities.”

A new business model

Alliances in the merchant shipping sector are making businesses more competitive. “Although not on this magnitude, they have happened for years,” he says. “The question that we should be asking ourselves is: should there be a business model change?”

“Thirty or forty years ago, with a new wave of digital technology, companies were developing in-house systems at great expense. Then these companies looked out to see that perhaps shared platforms and

co-creation could increase their business’ value-chains and the entire eco-system. This required a paradigm shift. Companies are becoming more data-centric and are learning that success is based on how you intake this knowledge more effectively and what you then do with it.

“We are approaching the arrival of a network economy, but there are considerations for the platforms that this network will depend on. I often ask the question: how successful would the internet have been if there had been five or even ten internets? Its success was dependent on it connecting everyone in one place. The success of a network economy will be dependent on much the same phenomena.”

Disruptive and progressive technology

Professor Sommarberg notes that from his own research the biggest barriers to a network economy are managerial beliefs and a lack of capabilities. “We see that truly disruptive innovations do not often come from within industries themselves. Businesses have an inherent wish for the ‘status quo’ and this is really not surprising, it is logical; they have invested in a structure that supports the way they operate. A disruptive technology would potentially undermine this investment. Successful businesses were potentially once disruptive; they remain successful because of their stability and continuation in feeding a market need that they in part created. However, disruptive technologies are arriving along with other more progressive changes.”

MacGregor recognises these barriers and looks to preserve its innovative roots. A notable example was pioneering the use of electric-drive products decades ago. “For quite some time, electrification has been a major technological trend and it is also one of the biggest advances in recent times in merchant shipping,” says Professor Sommarberg. “Electric-drive products provide a way to store or recover energy through their use and remove any

potential environmental impact of oil pollution as they eliminate the need for hydraulic oil. If more of them enter service, then there are obvious benefits from economies of scale, so they can then be even more competitive.

“There are many other advances that I could mention and I should also highlight 3D printing. I am not sure yet whether it will be evolutionary or revolutionary, it has the potential for either.”

Service is key

With all these digital changes, a key factor that will have even greater influence in the future is service. Through direct data collection from equipment and data-sharing platforms, it is possible to achieve deeper business understanding by using

performance data, safety statistics and maintenance data, and by applying artificial intelligence tools. This knowledge will improve products and services. Businesses can then share these benefits directly with the customer and through the development of improved or new equipment. “The benefits of this are so clear and of evident value that we should no longer be talking about them,” he stresses. “We should be implementing them. We have the tools, we have had the tools for a while; we now need to do something.

“We do not yet know the full implications of a network economy or the exponential changes that digital technology will bring. For example, this might include technology with augmented intelligence; learning how to operate

“For quite some time, electrification has been a major technological trend and it is also one of the biggest advances in recent times in merchant shipping”

Matti Sommarberg

better as it performs. This in turn will inform how we design and build a product and it has implications for the materials we use to construct it. However, it is clear that we will still need the tool maker. The future lies in being able to combine the acquired knowledge and having the skills to use it. This is why collaborations with companies and the academic community will be beneficial.” ■

University collaboration empowers cargo handling business strategy

A university collaboration that reached its conclusion this summer was the three-year R&D project, part of DIMECC's (Digital, Internet, Materials & Engineering Co-Creation) Rebus project with Turku School of Economics and Åbo Academi in Finland.

During the project, collaborative action research focused on empowering MacGregor's cargo handling business

strategy and developing value-adding operational practices.

Henri Paukku, Director of Cooperation and Funding, MacGregor, has been involved in the project since its beginning. “Initially we were challenged to thoroughly analyse the structure and dynamics of our industry,” he says. “The research team also helped us to structure our organisational changes and

development processes when we were going through the transformation of becoming a more service-oriented company from a very product-focused one.”

Notably, the project led to the development of the MacGregor PlusPartner concept, including the Cargo Boost service, which are already benefitting MacGregor's globally operating customers.

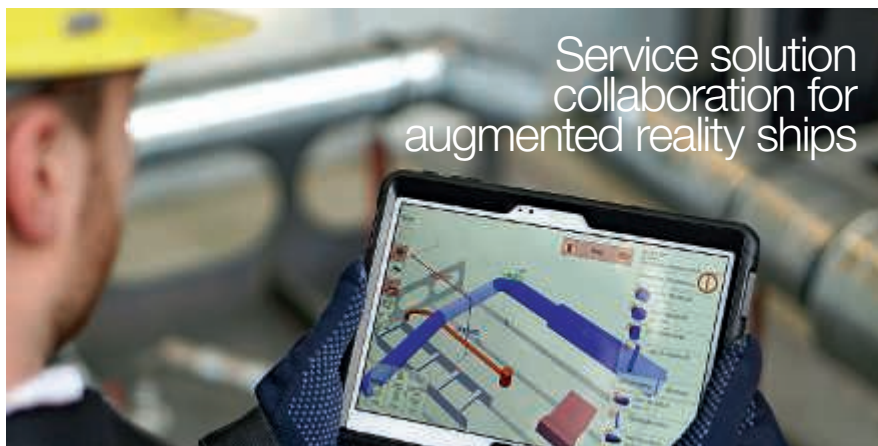
The shipping industry depends on safe, reliable and efficient towing operations

New robotics project promises efficiency and safety increases

MacGregor has entered into a new three-year robotics project with the University of Agder in Norway. The purpose of the project, which is partly funded by the Norwegian Research Council, is to further develop a long-reach lifting and mounting manipulator robot so that it could ultimately be adapted and further developed for precision robotics in challenging environments.

"Currently, the lifting and mounting manipulator is being developed for automating the construction of facade panels," says **Eivind Gimming Stensland**, Director, Technology & Development, Advanced Offshore Solutions, MacGregor. "Ultimately, we hope it will combine the best of various technologies, which will then be adapted and further developed for use in remote operations and the offshore industry."

The manipulator will use robotic controls and an advanced sensor system. "Automated build processes contribute to increased quality, efficiency and safety," Mr Stensland adds.



Service solution collaboration for augmented reality ships

MacGregor has started a joint research project with the Technical University in Hamburg, Germany, to develop an augmented reality-based system, supporting maintenance and service activities on ships. The aim is to have a solution that offers real-time images with enriched information, allowing the replacement of traditional user manuals with digital service documents that have embedded augmented reality for intelligent visualisation. The system will provide easy-

to-understand, step-by-step instructions for regular maintenance tasks. Furthermore, tele-maintenance and spare parts ordering facilities will be integrated into the digital documentation system.

The project, funded by the German Government, started in July 2017 and is planned for completion at the end of June 2020. MacGregor will collaborate and share expertise with the university as well as with Alfred Kuhse GmbH and MAN Diesel & Turbo.

Collaboration project enables remote-controlled harbour tug operations

MacGregor has announced its participation in a collaboration project that will see the company work together with industry partners, academia, a shipowner and the Hamburg port authority to enable remote-controlled harbour tug operations by 2020 and to start marketing the technology during 2022.

As the remote-controlled tugs will be crewless, winch-handling processes need to be automated; MacGregor will develop the technical solution for an autonomous rope handover system.

"The shipping industry is dependent on safe, reliable and efficient towing operations," says **Jörg Peschke**, Director, Drives and Controls, R&D and

Technology, MacGregor. "Ships are getting bigger and bigger, whilst harbour infrastructures will remain the same in size. Therefore it will be increasingly difficult to coordinate and control the number of vessels involved in towing manoeuvres.

"In the future, software-supported central operators will optimise towing manoeuvre patterns and coordinate the collaboration of various tugs," Mr Peschke continues. "Remote-controlled harbour tugs are key to this kind of application and will improve the safety, reliability and economic efficiency of future tug boat operations."



Photo: F. Berkelaar

Eco-efficiency guidelines drive sustainable shipping developments

As the need grows for environmentally-improved operational practices, MacGregor continues to strengthen its efforts to provide eco-efficient global cargo handling solutions that meet customer needs

Resource efficiency and sustainable development are overarching considerations to ensure natural capital growth, optimised yields and a reduction in emissions. The International Maritime Organisation (IMO) cites that current shipping emissions account for about 2.5 percent of global greenhouse gas emissions, with recent estimates predicting an increase of up to 250 percent by 2050 depending on future economic and energy developments.

Everyone has a role to play in reducing this predicted rise, but how much impact

can one company, such as MacGregor, make?

“One company can act as a benchmark or as a shaper, raise issues and instigate dialogues – sometimes challenging long-held business models and beliefs,” explains **Karoliina Loikkanen**, Director, Corporate Responsibility, Cargotec. “The future is about networking, partnerships and collaboration, influencing cross-organisational boundaries and creating new innovations and applications.

“The maritime and cargo handling industries must find ways to increase efficiencies and decrease emissions,”

Ms Loikkanen continues. “This will mean the need to rethink current business practices. I believe that major changes will come through improvements in operational efficiency, through emission and resource efficient equipment and services.

“This might include the need to adopt new ship designs and cargo transportation planning. MacGregor’s PlusPartner solutions provide the means for this. There is also a need to update inefficient existing fleets to better serve customers; this is about resource efficiency. MacGregor can assist here as well with services such as a Cargo Boost (page 23). As part of a



Major changes will come through improvements in operational efficiency, through emission and resource efficient equipment and services



“To gain the most from digitalisation, we need to share information and create common platforms and networks to ensure greater information flow”

Karoliina Loikkanen

wider corporation, we can also offer the industry our XVELA data exchange, which is a transformative, cloud-based collaboration platform that delivers transparency, efficiency and profitability to a network of carriers and terminal operators.

“Other major improvements are possible through innovative technology,” she notes. “Fundamentally, equipment still needs to operate in challenging environments even with the need for ever stricter environmental regulations. MacGregor’s electric-drive cargo handling equipment portfolio supports extremely efficient, safe, reliable operations, and eliminates the risk of hydraulic oil leaks into the sea from the ship’s structure.

“Eco-efficient business practices are already ingrained in other industries. If we compare eco-efficiency in the forestry, chemical, food and clothing sectors, we can see a sizeable growth over the last few decades; an enormous change already visible in our everyday lives. The marine industry will eventually face the same changes.”

Eco-efficiency drives

Acknowledging the need for a more holistic approach towards sustainable operations within its field, Cargotec recently introduced its eco-efficiency offering, which is applicable to all its business lines, including MacGregor.

The eco-efficiency offering is a set of criteria based on the environmental impacts and benefits of its products and services. Categories include operational efficiency, efficiency for environmental industries, emission efficiency and resource efficiency.

The criteria have been approved by external auditor DNV GL Business Assurance Finland, part of the global DNV GL Business Assurance. The audit report states that Cargotec has defined appropriate criteria for the offering based on the environmental impacts of products and services during the usage phase and that the products and solutions included in the offering meet the criteria.

Cargotec’s eco-efficiency focus areas will have direct efficiency and environmental benefits for MacGregor customers. To ensure that they continually do so, they are reviewed and approved annually.

Industry-shaping developments

“As a global forerunner, Cargotec can shape the industry by driving higher sustainability standards to its solutions,” says **Mika Vehviläinen**, Cargotec’s CEO. “Digitalisation presents optimisation opportunities, which are vital to increasing eco-efficiency. Our services can support a circular economy by extending product lifecycles with, for example, modernisations and product conversions.”

“Digitalisation is a great opportunity to increase efficiency and minimise unnecessary risks,” agrees Ms Loikkanen. “Entire cargo handling chains will become increasingly optimised along with remote services and service schedules.

“Automation is a key trend shaping the industry. At this stage, autonomous shipping is still in the early stages of development, but it holds promise. I would not say that automation alone will lead the way to a more eco-efficient future, but it will certainly set new standards and shape current thinking, which is a prerequisite for development.”

The cargo handling industry will also be shaped by the need for renewable energy; wind and solar power capture are definitely increasing. “Many countries have already taken action to set limits on fossil fuel industry development and with the Paris climate agreements it is clear that renewables are the area set to grow in the future. We believe that our solutions are ideally suited and are already serving this sector, like our involvement with Statoil’s Hywind project, which is the world’s first floating wind farm (page 30). Someday we may even see hatch covers with solar panels installed, capturing energy to feed into a ship’s power system.”

Cargotec’s eco-efficiency focus areas will have direct efficiency and environmental benefits for MacGregor customers

A shared future

“To gain the most from digitalisation, we need to share information and create common platforms and networks to ensure greater information flow,” she says.

“I believe there is a definite need to discuss development issues in common forums, with regulation developers, industrial representatives and with various competence centres. There are vast technological opportunities available, but to best shape the industry towards a more sustainable future, we need to increase the discussion and share knowledge.” ■

An empty slot is wasted money

Tough markets and changing requirements dictate that operators should regularly check to see if their containerships are as productive as they can possibly be; no opportunities should be missed

Market requirements are continuously changing and these changes will affect the expected cargo profiles on a given trade. The container vessels working on those trades should therefore have their cargo systems reviewed on a regular basis to ensure that they are still optimised for their current requirements. This is the

viewpoint of **David Greening**, P.Eng, Senior Naval Architect for leading independent owner and manager of containerships, Seaspan Corporation. It is one that MacGregor shares.

“The one and only purpose of a containership is to transport containers, so the cargo system must be considered at every stage of the design process starting from day one up until delivery and commissioning of the vessel. Thereafter it should be monitored in service to ensure that it remains effective as market conditions change,” says Mr Greening.

“In these market conditions it is vitally important that we provide vessels with minimised fuel requirements and flexible cargo loading systems, which allow for maximum cargo intake of the available cargo,” he continues. “We must also keep in mind that the cargo profiles are continuously changing, so flexibility is key.”

Seaspan opts to optimise

In line with this thinking, at the end of 2016 and early in 2017 Seaspan contracted MacGregor to optimise the cargo systems on board eleven 10,000 TEU container vessels, known to Seaspan as ‘SAVER 10000s’.

The work was carried out under a MacGregor Cargo Boost service, which is designed to improve cargo carrying efficiency and the earning potential of existing container vessels. The upgrades included an individual plan for these ships. It focused on improving their earning potential, resulting in an efficient, modern and attractive fleet for today’s challenging market.

“Reports coming in from the vessels since the modifications have been consistently good”

David Greening



The MacGregor Cargo Boosts have resulted in more flexible, efficient cargo loading, higher cargo intake and better control of the vessel's GM and resulting lashing forces

“So far seven operational SAVER 10000 vessels have completed modifications and returned to service,” explains Mr Greening. “An additional four undelivered SAVER 10000s have been modified and will be going into service shortly.”

Consistently good results

“Reports coming in from the vessels since the modifications have been consistently good,” notes Mr Greening. “Analysis of the actual cargo loaded shows that the modifications are working as planned during the design stage. The operational GMs have dropped from over 5m to less than 3m, significantly reducing lashing forces, allowing capacity for additional cargo.

“Also feedback from ship’s crew indicates that the ISO gap adaptors enable the faster loading of TEUs on deck and lashing of those containers.

“The operation of the modified cargo securing system fully meets our expectations,” he says. “It allows for more flexible, efficient cargo loading with easier lashing operations, providing better control of the vessel’s GM and the resulting lashing forces. This in turn increases the vessel’s cargo intake capacity.”

Seaspan is a progressive company and understands that as the industry changes, it must meet these needs.

When the order for the work was placed, Seaspan said that: “Market conditions and technology are always



Arto Toivonen, Naval Architect, MacGregor: “MacGregor is able to capitalise on new lashing rules by accurately calculating a ship’s route-specific cargo arrangements; a good reason why operators should consider cargo system efficiency if the vessel is redeployed”

evolving; in this fleet upgrade programme, we have taken advantage of the latest technology to deliver more competitive ships for our clients. We trusted MacGregor because of our long cooperation and its ability to deliver the overall cargo system upgrade from design and hardware to training, and the software in the form of MACS3 loading computer from Navis.”

In addition to cargo efficiency upgrades, Seaspan also implemented other structural changes to improve its fuel efficiency. ■

Cargo Boosts: plug every available slot

A container ship’s capacity is measured by the number of its container slots. However, slots can be available, but unsuitable for use because they may not match the available mix of container sizes and weights. Therefore the cargo system is not efficient or flexible enough, but there are ways to improve the situation.

In 2015, MacGregor officially launched its MacGregor PlusPartner concept, a forward-thinking approach to ship design that considers all components of the cargo handling system as a whole. For existing ships, MacGregor offers Cargo Boosts, which re-think the cargo system so that it can be used to its maximum capacity on specific routes. The process starts by studying the ship’s cargo system with the customer and reviewing it against anticipated routes and cargoes.

Route-optimised vessels

Since 2013, lashing rules changed to consider route-specific lashing. This allows ship operators to carry heavier containers higher in the stack if operating in calmer waters and provides a greater number of stowage options.

“MacGregor is able to capitalise on this by accurately calculating a ship’s route-specific cargo arrangements,” explains **Arto Toivonen**, Naval Architect, Container Ships, MacGregor. “This is a good reason why an operator should reconsider cargo system efficiency if the vessel is redeployed.”

MacGregor commonly looks to make improvements in under-performing cargo handling systems in the following areas: cargo securing manuals; calculations based on route-specific rules; maximising capacity by increasing stack weights (either by re-calculating according to latest rules or through engineering solutions); lashing arrangements; mixed stowage opportunities; and adaptations to lashing bridges.

Details of Seaspan’s ‘SAVER 10000’ Cargo Boosts

The Cargo Boost used for Seaspan ‘SAVER 10000’ ships was designed to maximise these vessels’ earning potential and bring them up to par with current cargo requirements.

The 10,000 TEU vessels underwent the following improvements to their cargo securing systems:

- Stack weight increase to take advantage of existing hatch cover strength
- 13 bays were altered to allow for loading mixed stows
- Modification to the lashing system in the outermost rows to increase the loadable weight and number of containers in these stacks. The outer stacks are subjected to wind loads that often limit loading on the upper tiers; without these upper tiers the wind loads are taken by the inner stacks, reducing the number of containers in these stacks.
- Modification of the lashing system to allow for the use of either internal or external lashing system depending on the charterer’s preference.

These modifications were selected as they worked together to allow the movement of heavier cargo out of the cargo holds up onto the deck and therefore delivered maximum control of the vessel’s operating GMs and lashing forces while providing improved cargo loading flexibility.

Tomi Sundell, Cargotec Risk Manager: "All marine operations entail risk... However certain risks are unacceptable. These include risks to safety, risk of non-compliance and the risk of environmental damage"



High-stakes at sea require a robust safety culture

High-value investments, combined with a high-risk environment, set special requirements for marine equipment reliability and quality; a safe industry depends on operators having reliable partners

At sea, lives, cargo and vessels are at risk from being exposed to the raw elements of nature, as well as that of equipment misuse or malfunction. “There are high-value stakes at sea,” says **Tomí Sundell**, Cargotec Risk Manager. “Thousands of people sail on board cruise ships, billion-Euro offshore platforms produce millions of Euros daily, and container ships carry the majority of the world’s global trade. The risks are high – rescue and support can be expensive and far away, so can take a long time to arrive – this is without considering the catastrophic environmental and financial consequences of a major oil spill or accident.

“Operators must have reliable partners for all critical elements of their businesses”

Tomí Sundell

“Operators must have reliable partners for all critical elements of their businesses,” continues Mr Sundell. “This includes the shipyards that build the ships and platforms, equipment suppliers that deliver components, and the workforce for their operations.

“They must also have sufficient redundancy; even if one part fails, others will secure safe operation and business continuity. All parties must be aware of the risks and understand them so that the right risks can be taken. This may sound counter-intuitive, but certain risks must always be taken to achieve the desired objectives.”

Appetite for risk varies

“All marine operations entail risk and we understand that appetite for risk varies. Risk assessment is an integrated part of non-standard or critical projects. If there is not the right balance between the appetite for risk, the likelihood of it happening and the benefits, then we change the parameters until it is worth taking. When all parties understand the risks that need to be taken, they can be mitigated to an acceptable level.

“However,” he explains, “certain risks are unacceptable. These include risks to safety, risk of non-compliance and the risk of environmental damage.

“We understand that high-value investments at sea, in combination with a high-risk environment, set special requirements for reliability and quality. MacGregor has a proven track record in equipment

“We are continuously looking at ways to reduce risk. One method is remote equipment monitoring”

Tomí Sundell

performance and it takes its place in a chain of responsibility for safety; we all have to work together to maintain and improve safety standards. This is a continuous process within MacGregor.”

Safety in all processes

A true safety culture is built within companies. The biggest improvements in safety records can be seen when companies decide to change their safety culture and implement it throughout all their processes.

“There are examples when the safety records of companies have improved considerably after an acquisition by a company with a mature safety culture,” Mr Sundell notes. “A change of culture is never easy and fast. It takes time and effort.”

False economies

Many accidents at sea and in port are caused by mistakes, poor maintenance or ingrained bad practices. Well-planned maintenance and training can certainly help eliminate some of these risks. Mr Sundell concedes that during these difficult economic times, maintenance and training may suffer.

“It is a false economy to think that you can economise on maintenance,” he says.

“Simple procedures, like failure to grease bearings, can literally result in the collapse of the crane. It is often during emergency procedures, when other equipment may have failed, or in extreme sea states that you need your equipment and crew to perform to their maximum capabilities. Training will ensure this works for the crew and reliable, high-quality, well-maintained equipment will deliver on all other counts.

“As a leading industry supplier, it is important to make training and maintenance attractive to customers and communicate their benefits. Properly trained operators and maintenance personnel improve safety and efficiency by reducing accidents and equipment downtime and by making the most of equipment’s capabilities, you can maximise your profitability. Furthermore, experience and safety records outlining accidents and near-misses can be used to develop operator-specific training,” he says. “It really is a win-win situation.”

Reducing risk

Until now, risk has often been reduced by a conservative approach, which can lead to more expensive operations, but the industry as a whole and MacGregor as a company are looking for smarter ways to reduce risk. The backbone of this will be from advances in digitalisation.

“We are continuously looking at ways to reduce risk,” Mr Sundell continues. “One method is remote equipment monitoring. Connecting equipment to the Internet of Things (IoT) enables on-line follow-up and automatic alarms. These advances are part of our digitalisation strategy. We are also well aware of and developing ways to overcome the new risks that inherently come with this territory.”

Safety has to be a priority as the industry changes. Traditional bastions of safety include classification societies, regulatory bodies and Port State Control. P&I clubs and insurers also contribute greatly towards risk management.

“Contracts and insurances are important, but they come into the picture too late, when something has already happened,” he says. “Regulations are also important, but they are often set at a minimum level.

“Regulations are only a starting point for a safe industry. As a leading manufacturer we not only undertake safety advances within our own product development we also advise rule-makers when there are obvious needs to address troubling safety concerns. For example, the historic series of tragic bulk carrier losses due to a serious underestimation of forces endured by the vessel and its hatch covers; MacGregor

voiced its concerns and was strategic in changing the rules.

“New regulations can sometimes also create new business opportunities,” Mr Sundell adds. “Leading suppliers and key industry stakeholders, such as MacGregor, play an important role in improving safety. They have the best resources and know-how to develop products and services that drive safety advances.

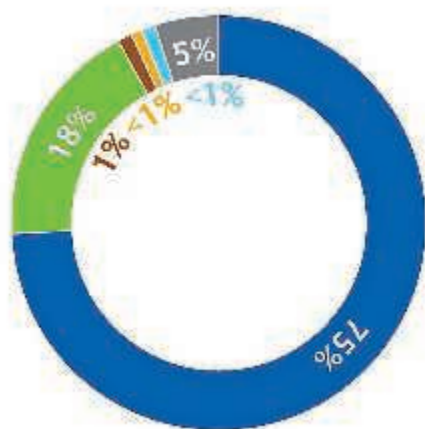
“We should promote reasonable requirements for safer products and practices towards authorities, customers and other stakeholders. This will set the safety bar higher and could save lives and deliver an advantage to the forerunners that adopt them. ■

Autonomous ships promise safety and efficiency advances, but raise risk concerns

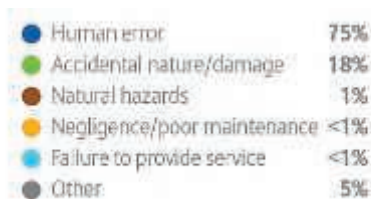
According to analysis conducted by risk expert and leading global insurance company, Allianz Global Corporate & Speciality (AGCS), almost 15,000 marine liability insurance claims show that human error is behind 75 percent of the value of all claims analyzed, which is equivalent to USD 1.6 billion.

“Given the role of human error in maritime incidents it is assumed unmanned vessels could be safer,” AGCS says. “At the same time the risks inherent in having a crew, such as injury or loss of life, will be significantly reduced or even eliminated. Then there is the potential to improve both efficiencies and productivity by saving on crew and fuel costs. An unmanned ship could free up more space for cargo in place of accommodation and crew support systems. The introduction of designated automated shipping lanes could make logistics easier, increasing the reliability of cargo transport.”

The phased introduction of autonomous shipping is on the horizon and MacGregor expertise is being employed on a number of projects to further its development (page 10). However, all stakeholders are aware that autonomous shipping comes with inherent risks. AGCS cites potential issues around collision and environmental risks; cargo management and safety in the absence of crew; fire protection; stability, draft and hull integrity and security; and cyber risk.



Human error has long been regarded as contributing to the majority of incidents in the shipping sector. It is estimated that 75% to 96% of marine accidents can be attributed to human error¹. In addition AGS analysis of almost 15,000 marine liability insurance claims between 2011 and 2016 shows that human error is behind 75% of the value of all claims analyzed, equivalent to over USD 1.6 bn.



14,828 liability insurance claims analyzed between 2011 and 2016 (September 13)
Source: Global Claims Review: Liability in Focus, Allianz Global Corporate & Speciality

¹ Safety & Shipping 1912-2012 From Titanic to Costa Concordia, Allianz Global Corporate & Safety

Revolutionary concept crane on track for market reality

MacGregor is driving a new wave of fit-for-purpose technology in deepwater environments; spear-heading these developments is an innovative fibre-rope subsea crane that is currently being built and will be ready early next year

Economic change has seen an expansion in global deep and ultra deepwater offshore operations. MacGregor is advancing this field with its fibre-rope offshore crane, known as FibreTrac. The first unit is currently being built and will be ready for testing early in 2018.

“MacGregor launched its fibre-rope crane range in 2016 and as part of demonstrating its capabilities we have entered into a programme to build, certify and validate it,” says **Ingvar Apeland**, Director Load Handling, Advanced Offshore Solutions at MacGregor. “I believe that it will be one of the world’s most advanced fibre-rope knuckle-boom cranes that the market has yet seen.”

Raising market potential

Fibre rope weighs virtually nothing in water, so regardless of the length of rope paid out, it does not add anything to the load experienced by the crane. “This is in complete contrast to the situation with wire rope, where the ever-increasing weight of wire paid out limits the load permissible in relation to depth,” explains Mr Apeland.

“By employing fibre-rope technology, a crane is able to use its full lifting capacity at practically any depth, so a smaller crane and vessel can be used for more assignments, and owners are able to bid on a wider range of contracts.”

The FibreTrac crane will comply with the latest DNV GL regulations, with the first system fully-certified in compliance with DNVGL-ST-E407. “Compliance with DNV GL’s strict regulations should provide end-users with even greater confidence in the long-term use of this technology,” he notes.

“DNV GL is excited to have been chosen for the technology assurance and certification of this project,” says **Arnstein Eknes**, Director for Special Ships at DNV GL. “Compliance with DNVGL-ST-E407 enables the long-term outcome of this technology to be certified, by moving towards focus on the ‘lifetime management’ of key elements within the system. Owners and operators can document towards their customers the fitness for purpose over the entire lifespan, managed with basis in the certificate of designated service.”

From concept to reality

The FibreTrac crane will have a 150-tonne safe working load capacity and will incorporate many unique technologies including a Parkburn deepwater capstan with a

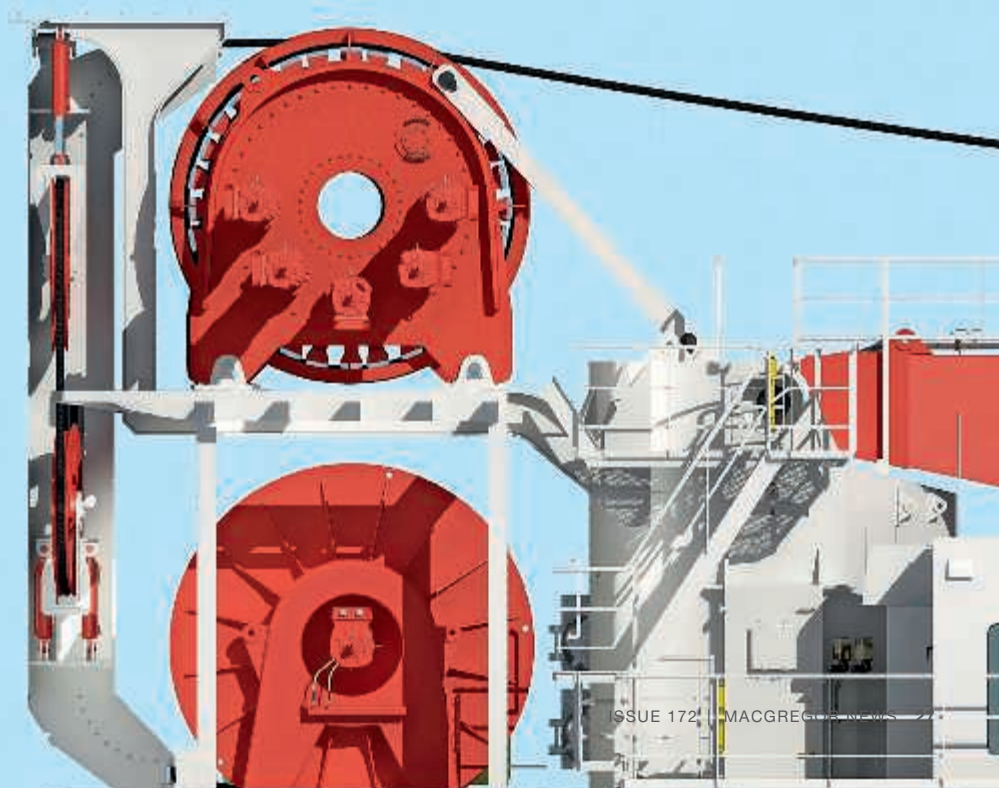
storage winch capable of accommodating 4,000m of 88mm rope. It is available with both hydraulic and electric drive options.

An advanced rope monitoring and management system maximises rope lifespan and provides constant lift line status for the operator.

“Fitted with MacGregor’s latest control system, it will offer the advantage of real-time data feedback to onshore locations using the MacGregor ‘OnWatch Scout’ feature,” says **Ole Andreas Sorensen**, Product Manager, Global Lifecycle Support, MacGregor.

For owners wishing to benefit from the technology for their existing cranes or stand-alone winch systems, the MacGregor fibre rope solution can be retrofitted due to its flexible, modular crane design. ■

By employing fibre-rope technology, a crane is able to use its full lifting capacity at practically any depth



A watchful eye can end downtime disasters

Ten years' experience with remote equipment access is the basis for a new, predictive maintenance service, OnWatch Scout, which foresees critical component errors and reduces costly equipment downtime

Unplanned downtime for operational equipment can result in the nightmare scenario of high repair costs and a loss of both income and reputation. MacGregor knows that it is impossible to entirely eliminate the chance of breakdowns, which can be the result of human error, environmental conditions or mechanical failure.

"Lifting operations using heavy, advanced machinery present potential downtime problems. On the rare occasions when failures and breakdowns occur, it is vital to restore normal service as quickly as possible, particularly as a simple component failure can stop the equipment and the entire operation," says **John Carnall**, Senior Vice President, Global Lifecycle Support, MacGregor.

Prevention is best

"We offer extremely effective on-demand and emergency services, but MacGregor believes that it is even better to try to prevent these events from happening in the first place," Mr Carnall adds. "However,

this is not as easy as it seems; emerging failures are often not recognised or not possible to recognise. We are therefore turning to sensor data to detect changes that are not perceivable to humans."

In the offshore industry, the prolonged malfunction of a subsea crane could cost the owner or the end customer hundreds of thousands of dollars. Therefore, in addition to new planned maintenance agreements, MacGregor currently offers offshore operators immediate technical support services via OnWatch, a secure online remote diagnostic system and 24/7 access to an expert support team.

Building on several years' experience with this service, MacGregor has developed OnWatch Scout, which connects equipment to advanced monitoring systems that constantly analyse component condition and predict maintenance needs. The information is then made available to the customer through an internet-based portal. This portal is the interface for managing maintenance tasks including live updates, notifications of upcoming issues, access to documentation and bulletins, and

interactive communication with OnWatch experts.

Essential customer input

The team developing the new, predictive service has spoken at length with customers about their wishes and expectations. "The majority of customers want optimised maintenance schedules and a greater degree of predictability," says **Cathrine Vikebakk Stien**, Project Manager, Advanced Offshore Solutions, MacGregor. "Operators have also asked us for improvements in information about equipment condition and maintenance needs, and requested closer connections to our service expertise."

Eivind Engenes, Manager Engineering & Technical Support, Advanced Offshore

“The majority of customers want optimised maintenance schedules and a greater degree of predictability”

Cathrine Vikebakk Stien

Solutions, continues: “In addition to detecting component errors, OnWatch Scout analyses equipment condition and predicts future unwanted scenarios. It detects if there are patterns in component state or equipment behaviour, which by experience, and in the future artificial intelligence, can indicate the potential risk of failure.

“In short, we replicate our technical knowledge into advanced algorithms to predict these failures and make it digitally available to our customers. It is all about shifting from a reactive to a proactive approach.

“Increasing equipment uptime will provide real value to MacGregor customers, enhancing their operations and their profitability,” he adds.

Intelligent cargo handling

OnWatch Scout is a part of the MacGregor digital portfolio and is a

notable example of how the company is using digitalisation to offer enhanced services to customers.

“Strengthening our digital portfolio is part of a strategy to lead the industry in intelligent cargo handling,” says **Håkon Jørgensen**, Director, Digitalisation, MacGregor. “OnWatch Scout is a service specifically targeted at solving a problem for MacGregor customers by using intelligent software. We currently have thousands of operational merchant and offshore cranes, which can be connected and benefit from this service.”

“In addition to these existing cranes, OnWatch Scout forms part of a wider increase in market potential for performance-based deliveries.

“If we can offer guarantees for performance-capacity and uptime, there will be new business opportunities that will supplement – perhaps even replace – traditional equipment deliveries,” Mr

“We offer extremely effective on-demand and emergency services, but MacGregor believes that it is even better to try to prevent these events from happening in the first place”

John Carnall

Jørgensen notes. “OnWatch Scout could be a crucial solution for offering extended services and forming new business models.”

Mr Jørgensen believes that OnWatch Scout is also an important step towards remote and autonomous operations.

A prototype OnWatch Scout service will be trialled on the offshore and merchant cranes of leading operators throughout the next twelve months and plans to expand the service to other products are ongoing. ■

DOWNTIME



Big bills: unplanned downtime

- Loss of revenue
- Expensive express repairs
- Rental of substitute equipment or ship
- Reputation damage, making it harder to win new contracts

MacGregor technologies propel **offshore wind energy production**

MacGregor technology is supporting the renewable fuel economy through novel innovations geared towards advancing commercially viable, ecologically sustainable wind power systems

The renewable energy sector has seen a number of significant developments in recent years; advances that are helping to provide greater global energy security. With an abundance of space and plentiful resources, offshore wind farming is one aspect of renewable power-generation that encourages the development of innovative solutions for environmental engineering.

Offshore wind speeds tend to be higher

and less variable than on land and any increase in speed of only a few miles per hour can significantly strengthen the amount of energy produced.

By the end of 2016, Europe commanded approximately 88 percent (12,631 MW) of all offshore wind installations with the remaining 12 percent comprising China, Japan, South Korea and the United States.

Currently, numbers stand at 14,384MW of installed offshore wind power capacity

in 14 markets worldwide. According to the Global Wind Energy Council (GWEC), 2017 is forecast to surpass 2015's record total, with roughly 60GW of additional installed grid-connected capacity globally; 3GW is scheduled to be installed across Europe alone. This figure is predicted to rise to an annual market total of around 75GW in 2021, resulting in a combined worldwide total of 800GW by the end of the year.

The substructures (pictured) of Hywind's five new 6MW floating wind turbines will each feature a Pusnes substructure mooring connection system

Photo: Nils Petter Midtun / Statoil



“MacGregor was chosen for the task because of its long history of designing and delivering very reliable mooring solutions”

Jan Martin Grindheim

Capitalising on a growing market

Today's widespread focus on a more diverse energy mix to reduce emissions is conducive to greater offshore wind opportunities across the world and as such, the global market forecast is promising. According to market analyst Westwood Global Energy Group, the UK, Germany and China are expected to spearhead future offshore wind spend, collectively accounting for 39 percent of the EUR 402 billion total global capital expenditure (CAPEX) over the next decade; a result of increased installation activity and investments in new European projects.

The Group forecasts a peak CAPEX

of EUR 47 billion for 2020, propelled by emerging markets in Europe (including France, Sweden, Denmark, the Netherlands and Poland), the US and South Korea. It also predicts that between 2017 and 2026, these markets will contribute more than 14.5GW of additional capacity; a CAPEX of EUR 69 billion.

Winds of change

MacGregor continually strives to foster new approaches to support the renewable energy industry. At the end of 2015, it made the notable shift into this sector when it secured an order to supply mooring systems for the world's first floating wind farm; Statoil's 30MW Hywind pilot wind farm, in Scotland, UK.

Following six years of testing and a successful demonstration project off the coast of Norway, the floating farm has reached its final destination; an area known as the Buchan Deep – 25km off the coast of Peterhead in Aberdeenshire, Scotland.

All MacGregor's Pusnes substructure connection mooring systems were delivered to the site in 2016, in preparation

for the installation of the five wind turbines. “The offshore installation of the last wind turbine was completed in mid-August,” says **Jan Martin Grindheim**, Director, Floating Solutions at MacGregor. “Our equipment met all expectations and the installation process went smoothly.”

The Hywind pilot farm is now operational, powering up to 20,000 households in the UK. “This contract represents a step change for MacGregor in terms of entering a new industry sector,” adds Mr Grindheim.

“The project hinges on applying proven technology in new applications,” he continues. “MacGregor was chosen for the task because of its long history of designing and delivering very reliable mooring solutions for offshore floating production units operating in harsh North Sea conditions.”

Hywind is designed to demonstrate cost-efficient solutions that will enable the commercial capture of wind energy in harsh environments. MacGregor was contracted to deliver a Pusnes substructure mooring connection system to each of



the pilot project's five new 6MW floating wind turbines. The ballast-stabilised turbine structures are each equipped with a three-point mooring system employing site-specific anchors.

The wind farm covers an area of approximately 4.2km² and operates in waters over 100m deep, with average wave heights of 1.8m. Wind speeds in the area are roughly 22mph (10m/s).

Turning the tide on energy efficiency

Despite the abundance of offshore wind energy, lowering the levelised cost of this type of energy capture and also smoothing any fluctuations in its power-generation profile is the ultimate aim for an energy supplier.

Continuing its participation in innovative projects, in 2016 MacGregor won a contract to supply highly-specialised winches for use in the Nemos enterprise, an innovative project that uses established offshore substructures, such as wind turbines, to anchor specially-shaped

floating structures that capture up to 80 percent of available wave energy.

The Nemos floating structures are approximately 20m long and are moored using two fibre ropes controlled by MacGregor winches. They move in a controlled trajectory, delivering the optimum degree of movement to maximise energy capture.

Following several years of initial endurance and performance testing, the first commercial Nemos pilot project was installed in 2016 at the Danish Wave Energy Centre (DanWEC) in Hanstholm, Denmark. Operations began in early 2017, with the project set to be fully operational by the end of the year.

Pioneering crane technology

Efficient construction coupled with regular maintenance and turbine inspections are paramount to safe and effective wind energy capture. MacGregor is at the helm of developing and delivering innovative technologies to support this industry.

MacGregor continually strives to foster new approaches to support the renewable energy industry

All five Hywind wind turbines are now operational



MacGregor recently introduced its award-winning 3D Motion Compensator (3DMC), a flexible retrofit device designed to enhance the load-handling precision of an offshore crane in challenging offshore environments.

The 3DMC compensates for the roll, pitch and heave motions of a vessel to minimise any movement of the load in relation to a fixed point in space. Therefore, during operations that require a greater degree of precision than that available from a standard crane, such as transferring equipment to or from offshore wind turbine structures or any small fixed platform, the operator can opt to use the 3DMC jib.

“A diverse range of load handling capabilities means that the crane and therefore the vessel can be used for more assignments and owners will be able to bid on a wider range of contracts,” says **Geir Roland**, Director, Global Product Support at MacGregor.

The 3DMC comprises a main boom that can be hoisted, lowered, slewed and extended and is fitted to the knuckle-jib of new or existing MacGregor subsea/offshore cranes. It has been designed for easy installation and makes use of the existing hydraulic power unit and control system of the crane. The unit can also be swiftly mobilised to a crane with the relevant fittings. This allows the 3DMC to be shared within a fleet.

When not in use, the compensator can remain fixed to the side of crane’s knuckle-jib to allow full operational use of main and whip winches.

The 3DMC uses similar motion-compensating technology as MacGregor’s first-of-its-kind offshore three-axis crane, which gives extremely accurate load positioning.

“Turbine platforms are about 20m above the water and they are often only a few square metres, so precise load handling is necessary,” Mr. Roland continues. ■

Strengthening solutions through strategic partnerships

Demonstrating its continued commitment to strengthening offshore solutions and drive to enable wide-ranging collaborative capabilities, towards the end of 2016 MacGregor acquired majority shares of Flintstone Technology – a UK-based specialist in advanced technology and products for the mooring and fluid handling industries.

MacGregor has a long and successful history of delivering capabilities that often exceed customer expectations, but sometimes the technology needed for specific requests simply does not exist.

“At this point, we can either embark on developing technology especially for the customer, which we have done many times in the past, or we search the market for those hidden gems, which is exactly what Flintstone is,” says **Høye Høyesen**, Vice President, MacGregor Advanced Offshore Solutions.

“It has seen gaps in the market where offshore operators are seeking new or more advanced capabilities and has invested in highly-specialised technology that can make these operational wishes a reality,” adds Mr Høyesen.

Initially established in 2012 as a product design consultancy in Dundee, Scotland, Flintstone Technology has since completed several projects and, in 2013, the company developed its first product; the buoy turret connector. In 2014, Flintstone won its first major contract to supply mooring connectors to two offshore energy developments in the North Sea.

“We are very happy to join MacGregor,” says **Andrew Clayson**, Managing Director at Flintstone Technology.

“We are a small team with very competent and innovative engineers. We see great potential to add value for customers. We like to challenge existing solutions and look for ways to improve, exactly what MacGregor is renowned for. Becoming part of a bigger company also brings many benefits, both for customers and our employees,” adds Mr Clayson. ■

Photo: Roar Lindefeld / Statoil



Advanced training spaces make virtual a reality

A new facility offers virtual reality training to improve the safety, efficiency and cost-effective deployment of MacGregor equipment

MacGregor has opened a specialist academy dedicated to providing advanced training for both customers and its own personnel. Located in Arendal, Norway, the academy has a purpose-built virtual reality (VR) showroom. Within this risk-free environment, participants learn how to complete real-time, complex manoeuvres safely and efficiently through simulated technical challenges.

Divided into two zones, the VR showroom features an authentic operating chair for offshore crane simulations, as well as an area where users can walk around a simulated ship, familiarising themselves with the safe operation of its equipment.

“Virtual reality technology has improved dramatically in recent years,”

says **Geir Roland**, Director of Advanced Offshore Solutions, Global Lifecycle Support at MacGregor. “We can pass these advances on to our customers and employees at our new facility and through portable training programmes.”

“The software has been developed by our experts and is based on their expertise, physics engine computer software and field experience. We believe this offers a unique and powerful tool to the market,” adds Mr Roland.

The value of knowledge

VR training is particularly valuable for customers looking to maximise the operational benefits of their MacGregor equipment. “Customers can offer their crew fully-immersive training programmes,” says **Jan Finckenhagen**, Training Manager, Advanced Offshore Solutions, MacGregor Academy. “This will reduce the likelihood of causing injury to personnel or damage to equipment because they have already tried and tested it. Our aim is to help customers use their equipment safely and efficiently.”

Realistic 3D visualisations are achieved with the use of VR headsets, which enable users to view very small details of an operation, as well as the wider picture. The headsets are linked to large, wall-mounted screens, aiding the training process by allowing instructors to observe exactly what the user sees.

“As you move around and turn your head you see exactly the same things that you would see if you were on board. It is a very convincing experience,” adds Mr Finckenhagen.

“You can also explore restricted, dangerous areas that you would not normally access. This provides otherwise unobtainable perspectives on specific operations, which can prove very useful.”

Realising product capabilities

Customers can explore and test a product’s capability before production begins using MacGregor simulation software such as C-HOW.

This facility is now MacGregor’s simulation training hub, offering product-specific courses across a broad product range. ■

Realistic 3D visualisations enable users to see very small details of an operation



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It is brave to be safe

It is not brave to take risks. MacGregor personnel take the time to double-check and make their decisions based on what is safe.

MacGregor has a market-leading reputation for safety. We identify and mitigate risk as a part of our daily work, in the office and in the field. We speak out if we have doubts and stop a job if it is not safe. Safety takes priority over all other considerations.

As part of our commitment to a safety culture our employees use a new safety app, delivering monthly safety updates and educational modules.

It is not brave to take risks; it is brave to be safe.

