

MacGregor News

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Welcome

A warm welcome to the latest edition of MacGregor News which I trust our customers, business partners and colleagues will find interesting and informative.



Despite challenging market conditions, MacGregor has achieved some notable successes during 2019 which continue to demonstrate our commitment to supporting our customers' business activities, and the wider maritime industry in which we are a long-standing participant.

Our breadth of cargo and load handling knowledge and expertise was further enhanced in July by the acquisition of TTS, and it has been a pleasure to welcome our new colleagues who joined on August 1st.

We believe that the combination of MacGregor and TTS will indeed make us 'stronger together', with an ability to better serve customers worldwide through, for example, an enhanced service network and technical support capabilities.

In the merchant shipping market, we are very proud to have been selected by one of our

container shipping customers, Mediterranean Shipping Company (MSC), to collaborate on the cargo system design for the Gülsün class of ultra-large containerships, with eight in the series of ships now at sea.

In offshore oil & gas, we introduced the new MacGregor fibre rope crane, with application of this technology enabling the crane to use its full lifting capacity on the load at practically any water depth.

We have made progress in the development of new, digitally-enabled capabilities that will provide operational benefits across the areas of safety, reliability, payload capacity optimisation, efficiency and simulation based training services.

In China, we have continued to strengthen relationships with our customers and the state-owned enterprises, with the acquisition of TTS further extending our presence in this important shipbuilding and shipowning country.

In that respect, we look forward to welcoming visitors to our exhibition stand at Marintec China taking place in Shanghai during the first week in December where we will be showcasing some of the capabilities outlined above.

Please enjoy reading MacGregor News and we would be happy to provide more information on any of the topics covered that are of particular interest.

Michel van Roozendaal
President, MacGregor

Latest News



MacGregor designs innovative cargo system for the world's largest containership, *MSC Gülsün*



© MSC Mediterranean Shipping Company

MSC Mediterranean Shipping Company has been working with MacGregor for many years to develop and introduce new innovations that improve cargo-carrying efficiency and maximise profitability. MacGregor has helped translate operational requirements into new cargo system configurations and methods, and supported MSC in their daily operations and responding to changing needs.

In 2018, as part of its goal to utilise the latest generation

of green technologies to minimise environmental impact, MSC ordered eleven 23 000 TEU vessels. The first vessel, *MSC Gülsün*, was delivered in July 2019. At 400 m long and 61.5 m wide she is the world's largest containership and the first in the series of this class of vessels.

Working closely with MSC, MacGregor designed an industry leading cargo system for *MSC Gülsün*. The innovative solution,

combined with a 24 container wide ship design, takes *MSC Gülsün*'s total container capacity to 23,756 TEU which is 1,500 TEU more than the largest containerships have previously carried.

"Through close cooperation with MacGregor we can develop new solutions that are of mutual benefit and help us grow together," said Giuseppe Gargiulo, Head of Newbuildings, MSC Mediterranean Shipping Company.

Cooperation with COSCO Shipping strengthened

A framework purchasing agreement was signed with COSCO Shipping in August and covers support of MacGregor equipment installed on more than 1,000 ships operating worldwide.

COSCO Shipping is one of the world's largest shipowning groups, with a wide range of shiptypes operating globally. The agreement will enable more effective inventory forecasting across the fleet, and additionally

provides for the scope of services to be further enhanced.



MacGregor Breakbulk Optimiser improves cargo carrying and planning efficiency

The MacGregor Breakbulk Optimiser has been developed together with customers to improve information transparency, efficiency and operator performance in the breakbulk industry. It is a cloud-based service that optimises asset utilisation by unifying and

creating a more disciplined approach to cargo planning.

Planners are able to more easily react to last minute changes as the software optimises the stowage plan. Commercial decision makers are able to use valuable

information to make fact-based decisions to enhance business performance.

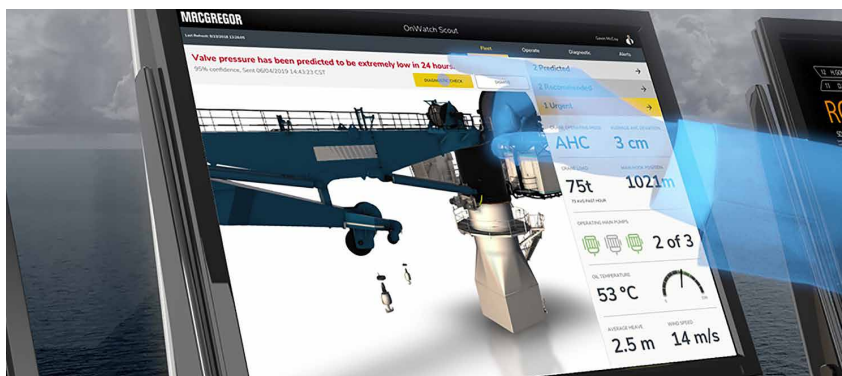
Breakbulk Optimiser will be available in 2020 following further development of the solution in close cooperation with customers.



OnWatch Scout - customer focus at sea

In July, MacGregor had the opportunity to sail on the Eidesvik Offshore Support Vessel, Viking Neptun, on a four day voyage between Rotterdam and Stavanger and hold detailed discussions about the new condition and predictive maintenance digital offering, OnWatch Scout, which has been installed onboard.

Eidesvik is one of three Offshore and Merchant pilot customers operating in Europe and Asia that MacGregor is currently working with as part of the OnWatch Scout development and in-service testing process.



Fishing vessels of the future

MacGregor continues to develop and provide integrated system solutions for the fishery and research vessel markets worldwide, including the Rapp electric fish pump which is the first submersible pump for pelagic fishing vessel applications.

The innovative system provides higher pumping control and efficiency at lower power requirements and without the risk of lubricant spillage. It supports fishing vessel owner and operator needs to deliver high quality, prime condition

catch as consumer demand for fish continues to grow.

The first vessel to be fitted with the innovative pumping design is MV Research, owned by the Shetland based Research Fishing Company and operating the North Sea and North Atlantic Ocean.



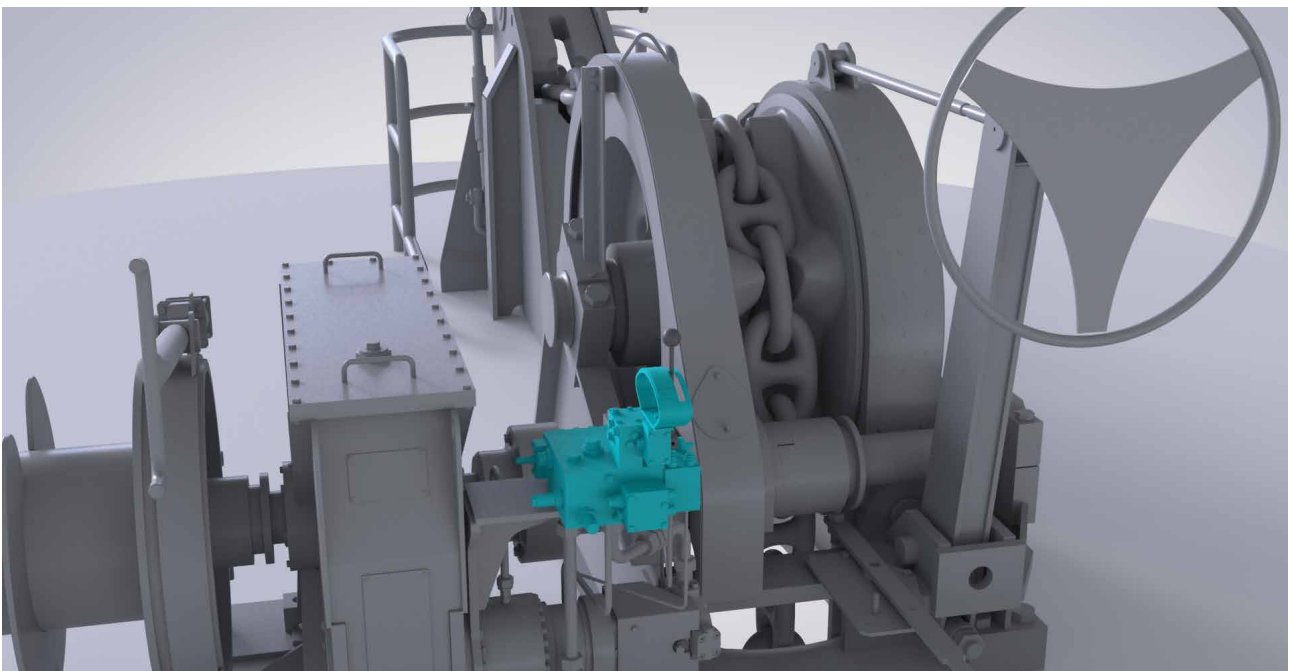
Intelligent control block prevents windlass motor damage

The risk of severe damage to the windlass motor is a common concern during anchor heaving in heavy weather conditions, where the anchor chain strain exceeds the safe load for the windlass resulting in motor damage, chain loss and downtime.

The new TTS Intelligent Control Block protects against this risk by automatically adjusting when overload is detected to maintain the correct balance between chain tension and windlass power. This prevents the motor from being damaged, and provides

the crew with additional time to take any alternative action necessary.

The Intelligent Control Block is available for all new TTS windlasses and can also be ordered as an upgrade for existing TTS windlasses.



MacGregor at Marintec China

Marintec China will be held during December 3-6 in Shanghai. MacGregor will be showcasing our portfolio of services and solutions that help customers to enhance their operational activities and efficiency.





Pragmatism should drive the adoption of digital agendas

By focusing on a select group of commercially impactful digital solutions, enriched by customer input, near-term benefits are achievable; Dennis Mol, Vice President, Digital and Business Transformation explains how

If there was a generation of operators that could really benefit from the commercial advantages of digitally-enabled equipment maintenance and the optimising of cargo space, it is this one. So one might ask why is uptake slow?

Often when we talk about digitalisation, accelerated learning and intelligent solutions, it is part of a wider discussion dominated by theoretical-level or longer-term concepts, such as fully autonomous vessels, which means

that realisable near-term advances sometimes become lost in the dialogue.

At MacGregor we are involved in visionary discussions, which are important and relevant. However, focusing on blue-sky thinking and talking about what digitalisation can do in the broadest terms only serves to drive a wedge between shipowners and operators and block access to these near-term benefits, particularly in current market conditions.

Creating solutions customers need and understand

MacGregor is offering a pragmatic approach. We are 'doers' and well known for our engineering capabilities. We listen to customers, designing equipment and whole solutions that meet the requirements of a specific ship and its operations.

We can also do this in the digital arena, creating a solution that the customer needs, understands and will gain benefit from.

MacGregor has chosen to focus on a select few, commercially impactful digital solutions to bring to the market. This moves away from visionary stories about where the market could go, and towards the provision of real services that have a tangible operational impact.

The benefits are truly tangible because our intelligent cargo handling applications translate into valuable, commercially viable solutions.

A population of experts

In line with an accelerated development approach, we completed our first '[Google Design Sprint](#)' in March with the objective being to develop a valuable customer concept and digital mock up during the one week 'sprint.'

We have simulation software that our engineers use to pre-design and analyse how, for example, an offshore crane works in reality. A [Google Design Sprint](#) includes thinking about how such a digital simulation

platform can help to prepare for and advise real-time operations, with higher efficiency and increased operational windows within its safety margins.

We are asking customers to join us because we believe that with more enriched information, especially weather data, currents and wave heights, the simulation platform will be able to deliver much greater prediction and safeguarding accuracy.



► ANIMATION: CARGO BOOST
<https://youtu.be/pmqEUL0upI8>



Moving from a conceptual remit

Our approach is breaking down traditional barriers, and our experience is that customers are willing to share information that may have previously been considered as commercially sensitive. We are demonstrating our intention to be practical and share our knowledge, moving our digital advances out of a conceptual remit.

The idea that companies must disrupt or be disrupted to survive has relevance for us all. If we are not thinking along the lines of a tangible digital agenda, you can be sure that others will be. These companies are smart and agile and we are alert to their capabilities, but what they do not have is our extensive operational knowledge.

Our cargo and load handling experience is second to none. A newcomer cannot really develop a valuable application until it fully understands the market and operating

environment. MacGregor has a very strong position and we are able to translate our operational and technical knowledge into valuable, new solutions.

Having said this, we are also open across all of our digital developments to collaborating with start-up companies, particularly in the areas of geospatial weather analytics, the use of on-board devices to support capacity optimisation and the ability to analyse offshore crane data. These capabilities can provide actionable insights and help accelerate the development of new services for our customers.

We are not promising the world because we know how difficult it is to deliver that, but we are ambitious for our customers and ourselves. We are taking encouraging cases, working closely with customers and learning from each other to deliver commercial value.

Four focus areas

When it comes to digitalisation, MacGregor is focused on helping customers to enhance their operations either through earning more money on the ship, or to build and operate more efficiently and with lower costs.

Our digital agenda is concentrated in four specific areas; predict, safeguard, optimise and automate. These are ‘category’ words referring to the potential value we can create by applying or deploying digital technologies.

To explain this further, our ‘predict’ category includes elements such as enhanced maintenance capabilities. Here, for example, we can use our knowledge to develop algorithms that can predict when certain equipment requires maintenance, based on use and condition rather than conventional ‘time based’ service schedules.

The offshore crane and associated Google Design Sprint work referred to earlier is a

relevant example within the ‘safeguard’ and ‘optimise’ categories.

MacGregor’s proven **Cargo Boost** service is included within the ‘optimise’ category. Over the past three years, more than 100 containership optimisation upgrades have been completed for highly reputable owners and the benefits demonstrated in service.

Applying this knowledge, we have started a development programme to tailor our optimisation algorithms for breakbulk ships focused on increasing capacity utilisation and accelerating the stowage process.

The fourth category is ‘automate’. Good examples of activities in this area are our autonomous offloading crane technology and automated mooring systems, the latter currently under development, which apply technological advances from a robotics domain.

Scalable solutions, available to many

The MacGregor digital agenda is valid for one vessel or an entire fleet. The kernel of a solution must be as widely applicable as we can make it so that it is scalable and of benefit to the many,

not the few. There will always be a degree of customisation required but, by minimising this, we are able to offer cost-efficient solutions to shipowners, operators and shipbuilders today.

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Interconnected intelligent systems enable an autonomous future

From the conceptual realm to reality, MacGregor is systematically working on the development of autonomous technologies that will further contribute to raising safety and efficiency standards

An automated maritime industry includes a certain irony for developers; it relies on human intelligence to develop a complex series of interconnected technologies for its creation, but these will ultimately reduce the need for human intervention from a wide range of marine operations.

A well-programmed and maintained machine can work almost endlessly without any loss of efficiency. Equipment lifetimes can also be prolonged as smoother operations reduce the strain on mechanical components, and power consumption demands will be lower in line with rising efficiencies.

However, it is not one isolated development that will secure this safer, more efficient environment but many smaller advances that will be integrated together, with this process being critically dependent on internal and external stakeholder collaborations.

“The success of partial or fully autonomous operations will rely on greater connectivity between systems,” says Per Strandberg, Director R&D, Cargo Handling. “The important part will be to standardise connection protocols so that a system, comprising a number of components, can work effectively together.



Intelligent crane undergoing trial

MacGregor's pragmatic approach to the development of engineering solutions means that the progression of its autonomous portfolio is very much customer-driven.

ESL Shipping approached MacGregor to work collaboratively on developing the world's first autonomous discharging bulk cranes. Initially, three such cranes have been installed on

board one of ESL's two new liquefied natural gas (LNG)-powered bulk carriers, with an equivalent shipset fitted on the second vessel and ready for future use.

"Once we are able to demonstrate the system's operational capabilities, this will have a significant impact on the industry and inspire other operators," notes Strandberg.



First automated mooring system nearing completion

Also nearing completion is the two-year trial of MacGregor's first automated mooring system, which has been developed in close collaboration with Kongsberg Maritime. The system will be fitted on the fully-electric, 120 TEU open hatch container feeder vessel, *Yara Birkeland*, which will eventually perform autonomous dry bulk shuttle operations for its Norwegian owner, Yara International.

MacGregor will deliver the autonomous mooring system towards the end of this year, with the vessel scheduled for delivery in 2020. "The containership will gradually move to autonomous

operation by 2022 and, during these two years, Yara will test its automated capabilities," says Jan Martin Grindheim, Director - Floating Solutions, Offshore Solutions Division.

"The autonomous mooring system uses some of the competencies from our commercial vessel mooring systems and constant tensioning technology, but it is distinctly new and employs advanced robotics and sensors," notes Grindheim. "It is an enabling technology, providing one piece of the puzzle that helps an operator get to a point where they can run smaller vessels port-to-port without the need for crew on board."

When in service, *Yara Birkeland* will replace 40,000 truck journeys a year.

“If you think about this on a global scale, autonomous vessels such as *Yara Birkeland* could be used to remove trucks from dense, heavily-populated areas, significantly reducing environmental impact.

“By delivering this system and proving that it works we will demonstrate our ability to build in autonomy and robotic solutions for advanced operations, and show that even small operations can benefit from significant safety and efficiency gains, before then applying the technology to different manually completed operations,” Grindheim highlights.

Transformational customer innovations

MacGregor’s autonomous technology collaborations extend beyond these two examples. Tommi Keskilohko, Director of Customer Solutions, Merchant Solutions Division says: “Our target is to lead the development, application and implementation of transformational customer innovations.”

MacGregor is part of the One Sea project, a high-profile ecosystem with a primary aim to pioneer the development of autonomous commercial maritime cargo traffic by 2025. “Our extensive experience and knowledge of through-life containership efficiency allows us to widen and accelerate developments that will enable the autonomous operation of cargo systems on board,” explains Keskilohko.

“Through many different collaboration projects with key stakeholders and enhancing the processes by which we are able to collaborate, we aim to accelerate the adoption of intelligent systems and autonomous operations,” he adds. “These, alongside optimised cargo and load handling

operations, will improve the efficiency, safety and sustainability of shipping.”

For MacGregor, this includes the development of a practical digital agenda, designed to help customers enhance their operations through increased vessel earnings, operating more efficiently and reducing emissions per unit of cargo carried.

“We have identified value that we can create by applying or deploying specific digital technologies,” he continues. “Examples include MacGregor’s proven Cargo Boost upgrade, which has benefitted more than 100 containerships in service, and our new Breakbulk Optimiser tool that provides data transparency and enables fact-based decision-making.

“Breakbulk cargo is notoriously inefficient to load and transport, but through our insights we can make the stowage and planning process faster and easier, whilst increasing vessel utilisation rates and the performance of our customers’ businesses,” highlights Keskilohko.

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Our extensive experience and knowledge of through-life containership efficiency allows us to widen and accelerate developments that will enable the autonomous operation of cargo systems on board.

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New roles in the maritime industry

The industry's drive for greater digitalisation and the increasing adoption of automated maritime operations, leaves a question about the roles left for humans in the system.

"Roles will change," says Per Strandberg. "If done correctly, automation will deliver increases in safety by removing human errors, but it will not automatically be like that. Without a crew on board to solve a problem, an autonomous vessel either needs to be extremely robust or offer greater levels of redundancy than traditional vessels. Today, the crew play a vital role in effective redundancy capabilities, a factor that should not be underestimated when considering a more automated future.

"Who will assume responsibility for a remotely-operated ship?" he asks. "One thing is certain; responsive, expert service teams will need to be available to provide support, together with advanced remote monitoring systems, so that the integrity of the autonomous vessel is continuously supervised.

"MacGregor is starting to test our autonomous systems and, through the application of our extensive cargo handling expertise, we are participating in the discussions that will define the standards and regulations required to safely and effectively implement automated maritime processes" concludes Strandberg.

► ANIMATION: YARA BIRKELAND
https://youtu.be/Co211gU_J5w



Game-changing advances turn the tide on convention

Leveraging proven technology and extensive knowledge, MacGregor's new fibre-rope offshore crane offers enhanced load handling at unrestricted water depths

Industry change is driven by many factors. Legislation often provides the biggest push, but second to that is the development of new technologies. Some of these deliver small

step-changes; others significantly alter the landscape and cumulatively can change what were previously thought to be the limitations of the industry.

Overcoming the extreme water depth challenge

Always striving to progress the industry through improvements in safety and efficiency, MacGregor focused on overcoming one specific challenge; the limitations that water depth places on conventional steel wire offshore cranes. As well as the load, these cranes must bear the ever-increasing weight of the steel wire as it is paid out, ultimately limiting a crane's permissible load in relation to depth.

"By using fibre-rope, which is neutrally buoyant in water, a crane is able to use its full lifting capacity on the load, rather than the steel wire, at practically any depth," says Lene Stray, Sales and Marketing Manager, Load Handling Solutions, Offshore Solutions Division.

"The benefits are enormous; water depth is no longer an issue, but far more significantly for flexibility and cost-efficiency, a smaller crane and vessel can be used for more and larger assignments, enabling its owner to bid and operate on a wider range of contracts.

"In addition, fibre-rope intrinsically has other advantages. It is substantially lighter, easier to store and significantly less expensive to transport compared to steel wire. When tension in the rope is released you can inspect the strands easily and look into the core, without industrial radiography or ultrasonic testing being required. If sections need to be repaired or replaced, new lengths can be spliced in with ease," continues Stray.

Built, verified and class-approved

Fibre-rope technology is not new, but its application to offshore cranes is. One may question why it is not prevalent in the industry, given its far-reaching advantages and potential to fundamentally overcome operational limitations. “There are several reasons for this,” explains Stray. “We know that the offshore industry has struggled for the past few years, and the introduction of any new technology, no matter how significant, requires investment and confidence.

“We are so confident in our fibre-rope crane that we built a full-scale version to test and verify it. The first **FibreTrac** crane was delivered this year and customers have recently been invited to see its remarkable capabilities for themselves.

Feedback has been very positive and it is now a commercially ready product, which we expect to see in operation soon.”

Extending potential even further

Every new offshore crane is delivered with advanced connectivity built-in, with the majority of cranes in service already having this inherent capability. This is in preparation for another technological step forward; the ability to add intelligence to the maintenance platform.

“High quality, accurate, predictive maintenance is possibly one of the most important elements

of service provision,” says Daniel Lundberg, Director - Service Business Models, Digital and Business Transformation.

“We have pilot programmes trialing these capabilities with both offshore and merchant customers and will introduce a working prototype of our predictive service tool, MacGregor **OnWatch Scout**.



Minimising downtime improves revenues

“OnWatch Scout will enhance the fibre-rope crane, just like other MacGregor equipment, by minimising downtime. Each customer that we speak to wants this solution because it ensures increased performance and cost control. Predictive tools, which enable one to understand tomorrow’s events today and help to reduce unplanned downtime, ultimately reduce maintenance costs and increase revenue and profitability.

“The foundation for OnWatch Scout is years of operational data derived from MacGregor’s current service tool, OnWatch, which provides operators with a rapid remote support capability once an equipment issue has been detected.

“We have taken the events recorded through OnWatch and learned from the warning signs, applying intelligent machine-learning and algorithms to it,” explains Lundberg. “Currently we are validating this data to ensure that it is applied correctly to actual service events logged with our equipment, and engaging with our service engineers to fully understand these and the steps taken to rectify them. This process is essential for advancing the machine-learning model.

“Our experience with OnWatch has given us a head start and we are going to leverage this and accelerate the commercial availability of a reliable and effective predictive maintenance tool,” he concludes.

- ANIMATION: ONWATCH SCOUT
<https://youtu.be/rvLaE75q9qQ>





What price to put on value?

When price alone determines contract success, purchasers beware. This rarely yields economic value throughout the lifecycle and will ultimately suffocate innovation. Mattias Gunnarsson, Vice President, Sales and Marketing, MacGregor Cargo Handling, calls for the industry to address this trend and focus on longer-term value

The rapidly changing landscape of the merchant shipping industry, from both a regulatory and technological perspective, presents one challenge; but the undercurrent of historically low order volumes and pressure from low operating margins, provides another. This has served to create an environment where short-term gains typically prevail at the expense of longer-term profitability and sustainability.

We have to put value back into the decision making equation, with 'what is of value' being determined by customers and market segment in which they operate. For example, a shipowner will value a product or service that can enhance payload capacity, safety, reliability, operational efficiency and environmental sustainability. A shipbuilder, on the other hand, might prioritise process efficiency and reduction in total installed costs.

Accessing critical information

The only way to fully understand what customers value the most is to work closely with them and then work hard to deliver against their expectations. However, in the current climate it is sometimes difficult to have these important conversations as the purchasing focus is very much on unit cost and not lifetime value.

The industry needs to consider the true value of a product or service in terms of what it can ultimately deliver to a business, the knowledge and expertise that goes into creating it, and the cost of developing and bringing it to market.

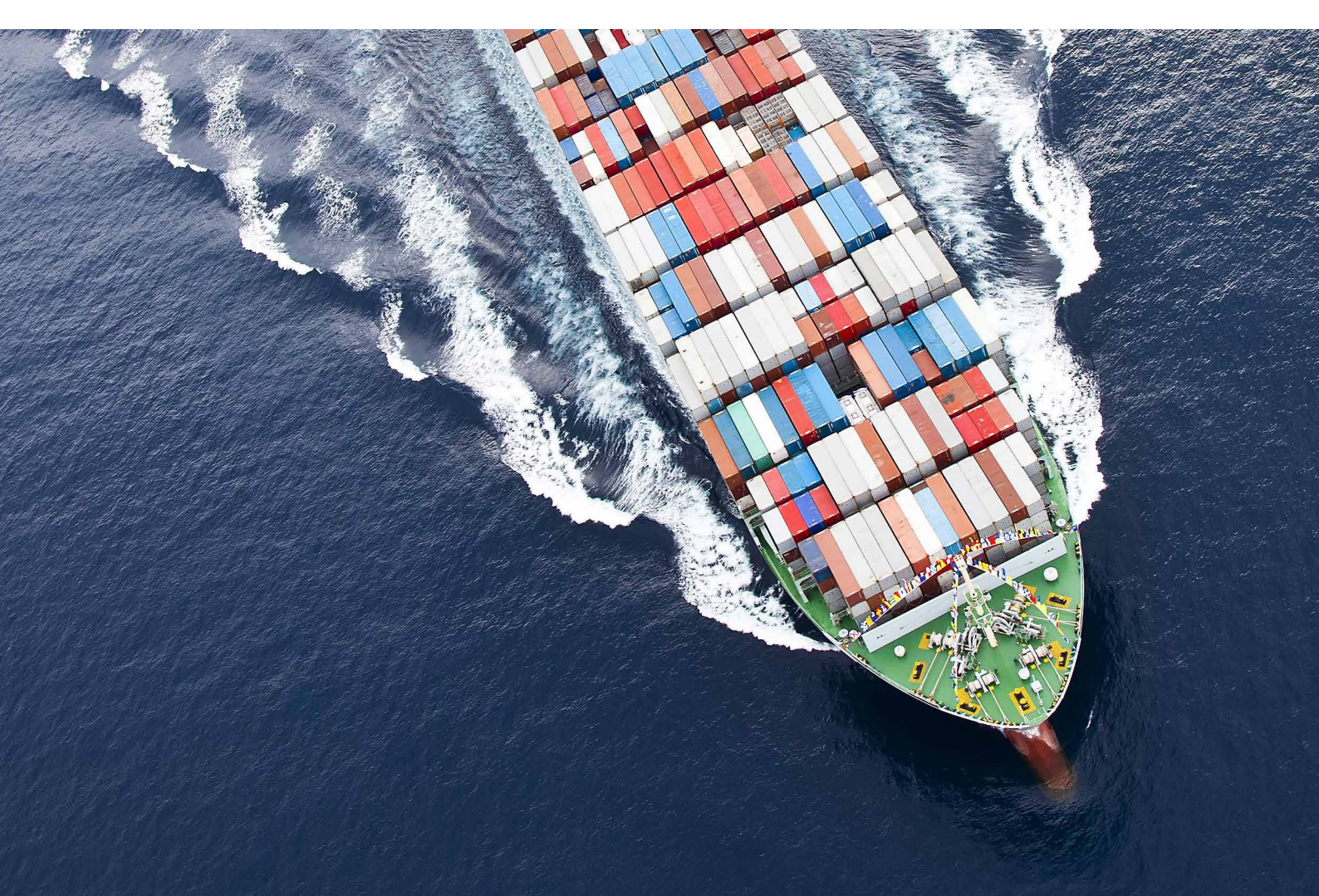
Patent protection: asset or burden?

So should we look to patent-protect our solutions from being copied? In many cases, but not all, this is actually a hindrance more than an asset. This is because the majority of contracts are now awarded through a tendering process, where your equipment or system has to be directly comparable to another, and being unique can potentially disqualify you from being considered.

If there is a risk of being excluded from a competitive tender because there is no direct

comparison to your offering, where is the incentive to innovate?

In the most extreme sense, simply focusing on price prevents both suppliers and end-users from developing. If the industry becomes so squeezed that the leaders no longer have the resources available to undertake research and development or set new standards, where will innovation and progression come from?



Adding value to different shiptypes

We know from experience that operational value can be added by considering each vessel as one holistic system, regardless of type. This is an approach that RoRo vessel owners, for example, have always taken as vehicle access equipment needs to be properly integrated and therefore considered early in the design phase.

The MacGregor PlusPartner concept has also been developed around this approach, where all parts of the cargo handling system are considered and designed as a whole. Early involvement in a newbuild project to gain a full understanding of the operating profile, which is then incorporated into the cargo system planning phase, ensures that a containership's utilisation rate and earning capabilities are maximised.

For containerships already in service, Cargo Boost enables the shipowner to re-design the cargo system to maximise capacity on

a specific route. Cargo Boost is a proven example of an upgrade offering that is delivering significant customer value, with more than 100 upgrades completed over the past three years.



Identifying and responding to market needs

MacGregor has established its reputation on a commitment to developing and delivering high-quality engineering solutions that overcome challenges and solve operational problems.

Our electric drive portfolio, for example, has championed the use of variable frequency drives that not only offer significant environmental benefits through the elimination of hydraulic oil and very low power consumption demands, but also deliver additional savings through increased efficiencies and reduced installation costs across all shiptypes.

The growth in electric drives has taken place in parallel with the development of our digital technology-enabled cargo handling capabilities. This includes the introduction of a bulk handling crane with autonomous discharging technology.

Designed to improve the safety and efficiency of dry bulk handling, it is now being tested on board a new liquefied natural gas (LNG)-powered bulk carrier.

Through an industry-wide perspective and considerable experience, MacGregor's aim is to deliver the highest lifecycle value for shipowners and operators, and provide shipbuilders with the lowest total installed costs.

Whilst adherence to constrained budgets is of course important, customers and suppliers need to maintain a collective competitiveness to ensure mutual long term sustainability. If we continue with an over emphasis on cost, the incentive and resources available to meet tomorrow's challenges and support future growth of our industry will be diminished.

Servicing by the OEM saves money and secures asset value

Effective, expert maintenance, provided as part of a longer-term service commitment between OEM and customer, ensures optimum reliability, on-time responses, cost savings and effective risk management says John Carnall, Senior Vice President, Global Services Division

In the last ten years, reported shipping incidents have increased by 33%, with the same percentage caused by machinery damage or failure. In many cases, these incidents could have been avoided through periodic visual inspection, but the prolonged industry downturn has meant that maintenance budget cuts have run so deep that even these have been impacted.

Every equipment supplier in the market is aware of the difficulties facing the industry and recognises that cost control has become a main driver in the maintenance sector. However, saving money does not mean stopping maintenance activity; it means doing it right first time and avoiding costly repeat work.

With raised levels of cost-awareness, it is even more important that shipowners, charterers and fleet managers look to original equipment manufacturers (OEMs), such as MacGregor, for their maintenance and technical support requirements.

Purchasing non-OEM spare parts and service support, or deferring planned maintenance, does not represent real value as this will

cost more in the longer term, with owners also missing out on the commercial benefits of optimised equipment availability and performance.

Effective maintenance practices minimise failure and incident related risks, with insurance companies better able to manage and substantiate a claim if they are able to demonstrate that proper maintenance had been undertaken.

OEMs know their equipment better than anybody else. They can more easily assess and determine its condition to ensure that parts are not replaced unnecessarily, and develop tailored, cost-effective plans for repair and renewal. OEM technical personnel can also make relatively small adjustments to operational parameters that deliver material performance benefits.

It is generally accepted that effective maintenance practices positively support commercial operations, so OEMs need to help customers with making the right service support choices in an environment of constrained budgets.

Close is good, even closer is better

Whilst good maintenance practices positively support business operations, you have to start by being close-by. My belief is that the closer you are to a customer, the better you support them.

One of the goals at MacGregor has been to strengthen our global footprint and we now have 60 service offices in 31 countries, following the acquisition of Rapp Marine last year and TTS this year.

Branch offices are the front line for customers and we are currently 80% through

implementing our objective of being able to provide local support in all of our customers' time zones. This is core to our service commitment and based on regional hubs which support the local offices.

Additionally, we have recently developed a field service tool that provides our service technicians with extensive equipment-specific information, including maintenance and upgrade history. Over 25% of our field based technicians are now using the tool, and we are working towards it being available to all by the end of 2020.

“ OEMs know their equipment better than anybody else. They can more easily assess and determine its condition to ensure that parts are not replaced unnecessarily

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The changing service landscape

Optimal equipment reliability and availability is the priority. We are establishing planned, preventative maintenance and spare part framework agreements with our customers, with more than 3000 now in place, and progressing towards condition-based monitoring and the ability to predict component failure.

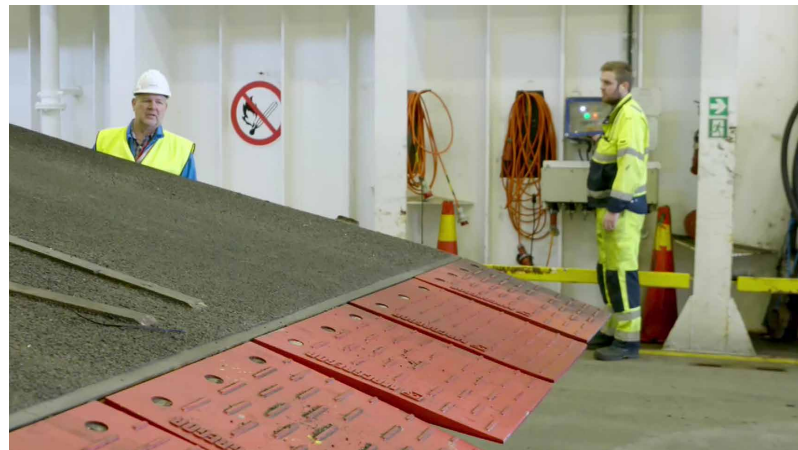
To support effective dry-docking activities, we have developed a planning tool based on each vessel's unique IMO number. MacGregor customers are contacted up to 18 months before the docking is due to arrange an advance equipment inspection, followed by the provision of a condition report and recommendations. This enables parts to be ordered in sufficient time and required planned in alignment with the dry docking schedule.

By taking a planned, preventative maintenance approach, through tailored framework agreements, owners can be assured that their equipment is kept in prime operating condition, with good records and the use of OEM spare parts to minimise safety and failure risks.

To support the development and provision of predictive maintenance services, all new operationally critical equipment will be supplied to customers with a data transfer capability included as standard. Retrofit possibilities will also be provided for existing installed equipment.

In the area of environmental sustainability, MacGregor has launched a range of biodegradable, environmentally acceptable lubricants (EALs) and we provide a switching service for customers wanting to take advantage of these.

We have also introduced a cost-effective solution to address noise pollution in ports, called 'Soft Flaps', which replaces the steel flaps traditionally used at the end of a ramp.



► VIDEO: SOFT FLAPS
<https://youtu.be/gQurAMKi9vc>



Effective service support relies on two-way communication

Saving costs does not mean cutting down on maintenance activities; it means being focused on doing it the right way. When we are able to have an effective dialogue with customers,

jointly plan required work and then carry it out as agreed, we are the best at what we do and can deliver the world-class operational support that is expected of MacGregor.

Bringing the value of expert knowledge closer to customers

The environment is virtual, but the expertise is real; MacGregor's Jan Finckenhagen and Floor Meijs explain how virtual reality crew training can make complex operations safe and efficient

Effective crew training is essential within the offshore industry, with some elements being a mandatory requirement and other courses aimed at optimising onboard safety, efficiency and equipment reliability.

However, not all training offers the same capacity for in-depth learning and fully immersive, virtual reality training proving valuable to customers seeking to maximise the operational benefits of MacGregor equipment and systems.

The development of simulation software for mission-critical equipment is undertaken in close liaison with our design and technical departments, which then ensures that training in a virtual environment is as realistic as possible and delivers the intended commercial benefits.

For example, bow-loading system transfer of crude oil between production units and shuttle tankers is environmentally sensitive work and highly regulated. It is consequently a legal requirement for crew to receive training prior to

operating such equipment, even if they have been working at sea for many years. Here lies the advantage for an operator because there is a material difference between conventional classroom-based teaching and virtual reality training.

The more realistic the training, the greater the depth of learning. By undertaking virtual reality training, every possible operational scenario can be simulated, including weather and sea state changes; all mimic operational conditions enough for a participant's brain to perceive that the environment as real, which is key to learning. Emergency situations which cannot be fully tested onboard can be simulated, as well as maintenance and troubleshooting. This reduces the likelihood of injury or equipment damage because proper operation has been tried and tested in a risk-free environment.

Personnel from different companies, with varying degrees of experience, attend the courses that we facilitate and share their knowledge, which also brings a unique contribution to the training.



Capable crew create additional commercial value

The primary objectives of all virtual reality training programmes are to optimise equipment use, minimise errors and avoidable damage, and enhance service and maintenance capabilities. Accidents mostly happen because of unfamiliarity with equipment and unpractised routines. Within a virtual environment, crew can quickly and safely gain equipment-specific and operational familiarity prior to going onboard.

MacGregor has established a state-of-the-art training facility in Arendal, Norway which is divided into two zones:

1. An offshore crane simulator including an operator's chair and portable remote control, which behaves in exactly the same way that it would onboard;
2. A zone where participants can walk around the simulated ship, familiarising themselves with safe operation of the installed equipment. The use of 'real' equipment in practice exercises provides huge potential for knowledge transfer.

The system software is linked to an advanced simulation platform called 'C-HOW'. Digital copies of equipment are created, and customer-specific operating scenarios and hazardous and unusual situations can all be simulated and trained on.

As part of further progressing the training programme, we are also developing a virtual reality function that can be used for predictive purposes during operation. This uses our extensive operational knowledge to create 'what if' scenarios and the ability to manage them effectively, enabling personnel to make better decisions and execute tasks in an optimal way.



Positive impact on equipment maintenance

Customers gain troubleshooting and maintenance knowledge as a result of their training experiences. Feedback from customers and our own service departments demonstrates that crew who have attended these courses have improved their operational knowledge to such an extent that they no longer call us for minor troubleshooting and service issues.

With more effective training, the value for the operator is that the crew onboard can repair the things they are supposed to repair, with

MacGregor service personnel only travelling to undertake complex tasks where our expertise is used more effectively.

Virtual reality training is a time-efficient way to train crew and establish high safety and efficiency standards prior to the vessel leaving for offshore operation. It can save days, if not weeks, of time in comparison to conventional classroom and onboard training methods, enabling the operator to focus on the vessel's primary purpose whilst at sea.

Building a virtual future

In the future, operators wishing to have more control of their own knowledge and crew training will be able to take advantage of portable virtual reality systems.

We recognise that the most powerful, deep-learning experiences are to be gained through a combination of training opportunities, encompassing immersive sessions in our

facility that are then augmented through the use of portable systems in customers' own facilities.

Enormous scope remains to develop virtual reality capabilities even further and we are only just beginning to explore its full potential through interaction with our customers, with requests to do so steadily increasing.

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China enhances its strengths while the maritime market waits for recovery

Mega-mergers, strong alliances and a narrowing competitive gap between global shipbuilding powerhouses mean that when market recovery commences, China is aiming for a greater share. Jane Chen, MacGregor's Vice President, Strategy and Head of China, explains

The global shipping and shipbuilding markets are waiting for recovery, and at the forefront of this hungry queue is China. When this comes, it will be met by leaner, more efficient and technologically advanced players than the industry has ever known.

Gaps between the global shipbuilding giants are narrowing, and capabilities that once distinguished a country's expertise in building particular vessel types are gradually diminishing. Within this levelling market, China is poised and ready to compete in both

its traditional grounds and within previously untapped arenas.

China's position in the global shipbuilding industry is already substantial. In terms of contracting activity, Clarkson Research analysis at the end of August showed that China held a 44 percent share of global shipbuilding by number of newbuild contracts placed and a 38 percent share by tonnage.

However, China currently only secures around 33 percent of the market by value which is similar to the European shipbuilding industry that builds around ten percent of the global fleet by tonnage.

This indicates that whilst China has diversified from building smaller, simpler vessels to larger and more value adding ships, it is still not comparable with the European yards focused

on high-value, high-technology vessels and cruise ships in particular.

This is well-recognised by China; it has been a long learning curve but the gaps are narrowing. Whilst this has been driven in part by the 'Made in China 2025' initiative, strategies were already in place to close the value gap. Chinese state-owned shipyards are now targeting higher-value shiptypes, including liquefied natural gas (LNG) carriers and cruise ships.

In preparation for growth and consistent with the industry consolidation trend, there are mega-mergers taking place within China's shipbuilding industry, primarily between the two state-owned enterprises (SOEs), China Shipbuilding Industry Company (CSIC) and China State Shipbuilding Corporation (CSSC). Post-merger, the combined group will be the largest shipbuilder in the world.

Increasing shipowning position

China also has a growing shipowning role in the industry. For a long time, it ranked fourth in this sector but in 2018 became the second largest shipowning nation, overtaking Japan.

Whilst Greece remains the world's largest shipowner, many new investments have been backed up by Chinese financing and China also

became the leader in the second-hand tonnage market during this year.

Central state-owned China COSCO Shipping, including newly acquired OOCL, is now the largest global ship owner with a relatively young and modern fleet, and is also expanding its footprint in international ports through significant investments.

Becoming self-sufficient

All Chinese companies, and particularly the SOEs, are being encouraged to be more independent in technology development and self-sufficient. This is designed to safeguard the country's long-term growth, the integrity of critical industries and to push China to move up the value chain with more speed.

China's SOEs are also major employers, stabilising local communities, and their survival and increasing competitiveness is

therefore essential. A strategy that ensures this is one of vertical integration, where a company controls more than one aspect of the supply chain.

While the market is depressed, it is natural for the Chinese SOEs to prioritise "feeding the family first". Hence being regarded as a 'family' member for a Western players would be beneficial, either through a strategic cooperation or joint ventures.

MacGregor in China

MacGregor has held a strong market position in China for decades, which has been further strengthened through the recent acquisition of TTS.

TTS has three joint ventures in China, two with CSSC and one with CSIC, which are well established and recognised by Chinese customers. In accordance with Chinese competition authority conditions related to the acquisition approval and for a hold-separate period, MacGregor and the TTS joint ventures must operate independently in the China market. This applies to certain equipment supplied for newbuild projects, with the requirement continuing through to July 2021.

The combination of MacGregor and TTS capabilities globally provides a stronger service network, a wider product range and greater expertise to offer optimised solutions that create even more value for customers, both shipbuilders and shipowners. With a strong parent company and shareholder support, we also have the financial capacity to invest and innovate for our customers; something that not everyone can afford in this climate.

MacGregor also needs to compete effectively in the Chinese market with 'fit for purpose' reliable equipment that is cost-competitive. As such, and for example, we have reengineered and optimised our portfolio of selected equipment to ensure that it meets the needs of customers with both technologically advanced and more simpler requirements.

Jane Chen, MacGregor's Vice President, Strategy and Head of China



Ready for tomorrow

As an industry leader, we must move forward. MacGregor is doing this through the development of innovative, digital technology-enabled and environmentally sustainable solutions that deliver real commercial and operational benefits to customers, and fulfil our social responsibilities.

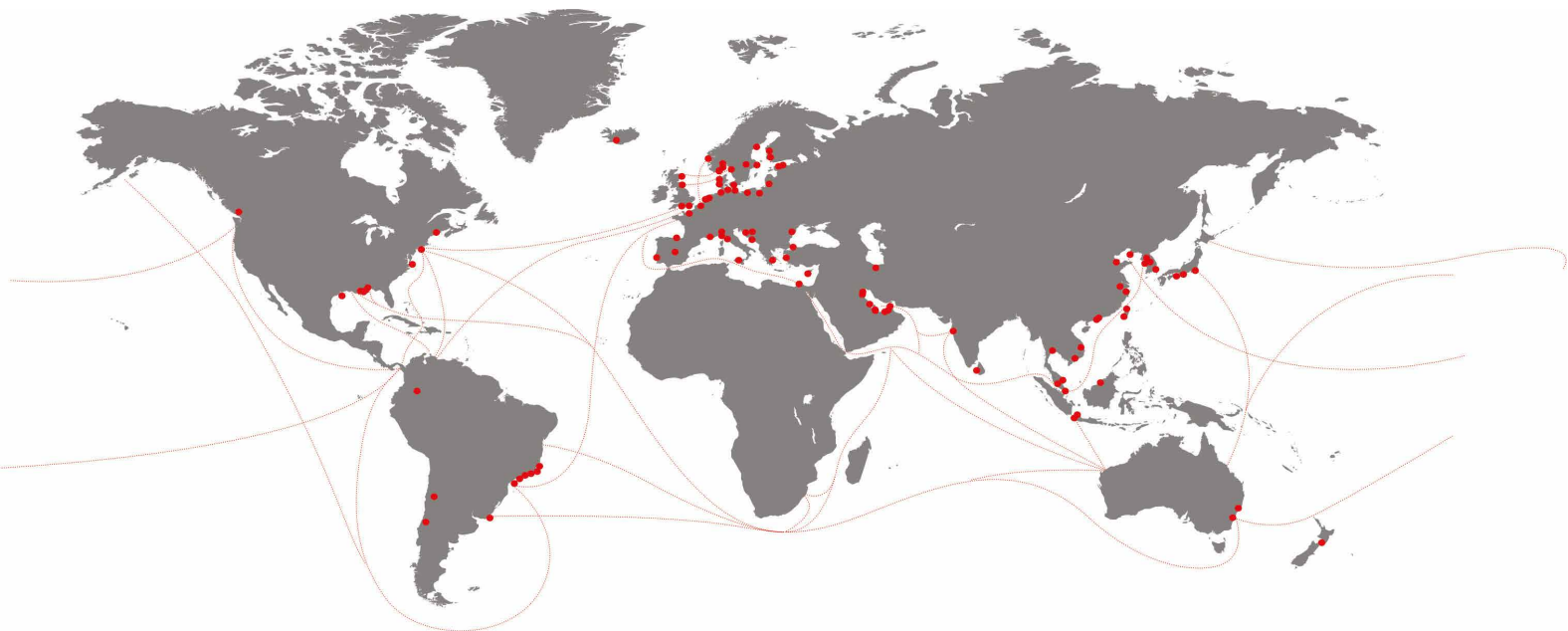
One notable example is OnWatch Scout, a cloud-based digital solution designed to maximise operational availability and minimise unplanned downtime through continuous monitoring of installed equipment performance. A number of OnWatch Scout pilot trials are currently ongoing, including with Chinese shipowners.

Whilst we are operating in an era of considerable change, MacGregor has extensive local experience and we are able to compete strongly in the market through leveraging an asset-light business model and striving to ensure that our products, systems and services fully meet the needs of our shipbuilding and shipowning customers.

Strategic alliances and joint ventures with Chinese state-owned key stakeholders further strengthen our relationships and market foothold, and help to build a stronger platform to support future growth in China.

Wherever needed, you can rely on our support.
We serve our customers globally:

- Ankerløykken Marine
- Allset
- ASCA
- Becker
- BMH
- Conver-OSR
- Grampian Hydraulics
- Flintstone
- Greer Marine
- Hamworthy
- Hatlapa
- Hydramarine
- Hägglunds
- Interschalt
- KGW
- KYB - ASCA
- KYB - Kayaba Industries / Navire Cargo Gear
- Luezhoe
- MacGregor
- MacGregor-Conver
- MacGregor-Hägglunds
- MacGregor-Kayaba
- MacGregor-Navire
- Navire Cargo Gear
- NMF
- Nordströms
- Ozean Service & Reparatur
- Platform Crane Services (PCS)
- Plimsoll
- Pusnes
- Porsgrunn
- Rapp
- Triplex
- TTS
- Vestnorsk Hydraulikkservice (VNH)





MacGregor is a leader in intelligent maritime cargo and load handling with a strong portfolio of MacGregor, Hatlapa, NMF, Porsgrunn, Pusnes, Rapp, Triplex and TTS products, services and solutions, all *designed to perform with the sea*.

Shipbuilders, shipowners 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 is part of Cargotec (Nasdaq Helsinki: CGCBV).

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