Smart, connected solutions, delivering benefits **way beyond a basic function**

The industry is on the brink of a new digital era with intelligent cargo handling at its core; **Pasi Lehtonen**, Senior Vice President, Marketing, Business Development and Strategy, explains how MacGregor can help customers to capture the benefits

The fact is, the world is changing, digitalisation and intelligent solutions are being delivered at an incredible pace. As a leader in cargo handling, we also need to be a leader in intelligent cargo handling.

We are uniquely positioned to lead. Cargotec has a broad footprint in cargo flow ecosystems and a holistic understanding of every different element of cargo handling value chains. MacGregor focuses on cargo handling at sea, Kalmar in port and Hiab on the road.

But what does intelligent cargo handling mean? In the past, the maritime industry used to be a very mechanical business, driven by applications using hydraulic systems. The trend has been the gradual movement towards the electrification of equipment, which has opened the door further towards automation. It has been an evolutionary process.

Connected equipment

Our framework for developing intelligent systems is called MacGregor Smart. We are building digital features into MacGregor equipment and by the end of the year, all new relevant equipment will be configured to offer connectivity capabilities, and ready to be activated if a customer requests it. Digitally connected equipment on a vessel at sea can bring significant value to customers' operations through remote equipment monitoring, trouble-shooting, and preventative maintenance.

Connectivity in our equipment is a first step in a wider picture, leading to many other possibilities. It is still equipment-centric, but one cannot avoid or skip this step as it is the building block for future developments.

A key part of MacGregor Smart is cargo awareness. We predict the status of equipment, and then we safeguard the cargo associated with it. At this point we are not just thinking about MacGregor equipment any more, we are thinking about the cargo itself; the underlying purpose of the vessel. Is the cargo safe and lashed properly, or is it moving? Are the hatch covers leaking? Is the cargo overheating? We are not only experts in the equipment that we provide, this expertise also extends to the transportation of the cargo that our equipment moves, stows and protects.

Beyond conventional functions

If we take a typical product, for example hatch covers. They are critical parts of the vessel's structure and customers need them. Hatch covers are designed to keep the cargo and the vessel safe. But they do not guarantee that cargo condition always remains unchanged. As the industry thought leader, we have added intelligence to the hatch covers. Our systems will assess and measure hatch cover performance and inform customers if there is a leak or there is something wrong, but importantly they can also predict if there is a potential issue and pre-warn customers. Cargo hold temperatures can also be monitored to keep it at the right level for temperature-sensitive cargoes. MacGregor is going far beyond the conventional functionality of a hatch cover.

Sensors can also monitor container stacks and how they behave in a seaway during a voyage. They can signal to the bridge to divert the route if conditions are too rough and inducing too much movement, or suggest that the vessel reduces its speed. This directly benefits a customer with increased cargo safety by fewer container damages or losses, lower insurance premiums, minimised inefficiencies, and most importantly, an overall increase in the safety of the operating environment.

Planning for complexity

We can then go another step further, how do we improve and optimise our customer's businesses? How can we

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help shipowners make the most of their investments? A good example is applying digital technology, in combination with cargo handling systems and operational intelligence, to general cargo vessels. These vessels carry multiple different cargoes, including project cargoes, and call at many different ports. How do we optimally plan for that complexity?

Traditionally, it has taken a long time to plan cargo stowage on these vessels; at least several hours, depending on the nature of the cargo. Today, with new tools using algorithms and the understanding of how vessel holds and cargo handling systems are designed, we are able to carry out the planning work for cargo stowage in minutes, and in the most optimised way. This can increase the cargo carrying capacity of a vessel by up to 20 percent (see separate box).

What makes it beautiful for our customers is that we are able to link our knowledge of cargo handling systems and their operation and then think about the space as a whole. We offer this as a software advisory service, improving processes and the transparency of information. It is applicable to both new and existing vessels, like a MacGregor

Cargo Boost (page 12) for general cargo ships, and a new way to avoid running half-empty vessels.

Imagination is the limitation

In terms of benefits for customers and the industry as a whole, imagination is the limitation. Emissions are just one aspect; how can CO_2, SOx and NOx emissions be reduced? The more half-empty vessels are sailing, the more emissions they generate, which is not only ecologically damaging, but also a huge waste. Preventing such situations is the easiest way to reduce emissions. This is just one area where intelligent cargo handling can make a difference.

Within Cargotec's several business areas, all are looking into removing inefficiencies, including its software arm, Navis, which developed the advanced collaboration platform, XVELA; on its mission to make global trade smarter, safer and more sustainable.

We are applying simulation and virtual reality capabilities to our systems, benefiting customers in the early design phase of their projects, and offering powerful crew training tools. Using MacGregor software, such as C-HOW, it is possible to simulate, test and improve a product before production even begins.

Our digital portfolio MacGregor Smart is constantly expanding and extending to specialist service solutions including navigation and communication (NavCom) systems; for example, voyage data recorders (VDRs), and the maritime data engine (MDE) that normalises data from multiple sources, making it easily accessible for real-time and historical use.

An automated future

The rise in automation within the industry means that we in MacGregor are participating in a number of autonomous development projects, including the first autonomous discharging cranes (page 18).

Our cargo handling expertise is needed to predict safeguarding issues. For example, for vessels that will sail with few or no crew,

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Breakbulk solution optimises cargo stowage and improves business performance

MacGregor can now offer breakbulk owners and operators a platform to optimally plan the stowage of breakbulk cargoes in a process that increases vessel and fleet utilisation rates and improves business performance. The planning work for cargo stowage can be completed in a few minutes, in comparison with traditional tools taking several hours.

"The MacGregor breakbulk cargo optimiser is the first automated, cloud-based service for the optimised stowage of breakbulk cargos and makes full use of MacGregor's expertise in cargo handling systems and the loading-computer expertise of Navis, Cargotec's software business area," says **Tommi Keskilohko**, Director, Customer Innovations, Cargo Handling, MacGregor.

Currently breakbulk stowage planning mostly relies on time-consuming, manual planning processes based on the capability and experience of an individual planner or team of planners. No-shows of cargoes and last-minute changes can further add to the time it takes to complete a stowage plan.

MacGregor's new breakbulk solution optimises a vessel's stowage plan by taking into consideration all influencing factors including what cargo is already on board,

incoming cargoes, available cargo space, the actual capability of the cargo handling system, port rotations and vessel stability.

"Pilot cases on board customer vessels have shown that the amount of cargo that can be carried can be increased substantially, which increases operational efficiency and earning potential," Mr Keskilohko notes.

"Also there are a lot of potential process improvements," he adds. "Time-savings in planning processes and the increased availability and transparency of fact-based information are just a few of these. Reduced environmental impact is another as vessels are running at much higher capacities, which improves operational efficiency."

The MacGregor breakbulk cargo optimiser can be used for one vessel or the whole fleet, and enables users to identify predefined key performance indicators at a ship, voyage, rotation or fleet level.

"Traditionally the utilisation rates of general cargo and breakbulk vessels are relatively low and fleet-wide utilisation measurements are rarely known or recorded," Mr Keskilohko says. "Our aim is to help customers improve their businesses and MacGregor's new breakbulk cargo solution is a perfect match for that."

it is critical to understand how cargo movements can affect the vessels. Cargo movement influences a vessel's behaviour much more than people think. Cargo stacks can move; one must understand how they move, so they do not damage the vessel or the cargo.

The key to container stack monitoring is the reliability of data. If accurate information is fed into a system, the system can inform the shipowner that the vessel is going over tolerances. We cannot lash the system again, but we can let a 'virtual captain' know that a situation is changing, so the vessel can slow down or take evasive action.

Real-term benefits

When we asked our customers for their opinion about intelligent cargo handling and digitalisation services, they wanted to see the practical benefits that these can deliver. Customers are keen to think about adopting new ideas, but these have to be understandable and deliver real-term benefits.

Because of our knowledge and expertise throughout the cargo handling chain, we are able to help customers adopt and integrate new solutions that will deliver true value in the digital arena. Of course we must be able to describe, quantify and verify the benefits in monetary terms. For example, fuel consumption efficiency comparisons per tonne of cargo or container transported.

There are many open issues with the new developments including data security and ownership. Nobody is able to plan for every eventuality, but you need to take the first step to take the next step, and for us that means leading in intelligent cargo handling. ◼

The future of port call management

By combining MacGregor's experience with its new cloud-based voyage and port optimising solution, MacGregor can increase the operational efficiency of RoRo vessels and port calls, unleashing substantial potential savings for operators.

"RoRo ship performance is normally measured by its cubic metre utilisation," explains **Phillip Tipping**, Director Customer Innovation, RoRo, MacGregor. "However, this figure does not show inefficiencies surrounding port operations. Until now there has not been an effective way of measuring time spent in port and reasons for delay. These are known, but undetectable losses that can cost a shipping line as much as USD2.5 million dollars per vessel per year.

"Shipping lines need a management system to detect these losses, allow them to modify the voyages before they start and learn valuable lessons to avoid future mistakes. This is where the MacGregor voyage and port optimiser can make a difference and will allow shipping lines to maximise efficiency and minimise environmental impact, while saving millions."

The optimiser uses extensive pre- and post-voyage analytics and obeys 'do, check and act' rules, enabling it to deliver a continuously improving system. "Data can be used to identify losses, which can be verified by audits," Mr Tipping adds. "Performance can then be improved by creating, distributing and following up on actionable plans; it is the future of port call management."

OnWatch Scout: predicting the potential for costly downtime

MacGregor OnWatch Scout is being used to predict and monitor upcoming critical issues and communicate them to offshore and merchant crane customers, reducing unplanned downtime and giving back more cost control to the operator or owner of the equipment. The service also includes access to our OnWatch experts, who can connect to the equipment and effectively help resolve ongoing issues.

This prediction service is based on decades of trusted, proven knowledge and technical expertise, along with the use of sensor data, which can detect changes that are not perceivable to humans. MacGregor believes that OnWatch Scout is an invaluable service tool for customers and plans to make it widely available across its equipment portfolio.

OnWatch Scout connects equipment to advanced monitoring systems that constantly analyse component condition and predict maintenance needs. It detects if there are patterns in component state or equipment behaviour, which by experience, and artificial intelligence, can indicate the potential risk of failure. This information is then made available to the customer through multiple digital channels, which ensures an effective platform for managing maintenance tasks and continuing communication with the OnWatch experts, if needed.