What's in the box?

Container telematics can offer a pathway to safer seafarers and optimal ship operations

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Container telematics, the integration of Internet of Things (IoT) technology into maritime shipping containers, has been transforming the shipping industry in numerous ways since it first emerged, bringing visibility, efficiency, decarbonisation, security, and cost-saving benefits to help stakeholders achieve their environmental performance and governance targets. Yet, one of the most important benefits that this technology offers is also one of the simplest to describe. It makes seafarers safer. Physical checks can be consigned to history as new technology makes it possible to monitor the status of embarked refrigerated containers and integrity of dry containers from the cabin or office.

While it is important that shipping continues on its decarbonisation and digitalisation journey, it also must not lose sight of the 'social' part of Environmental and Social Governance (ESG). Improving seafarer safety and welfare standards at sea is fundamental to shipping's just transition to a more sustainable and responsible future, and an essential element of ESG reporting. It is a medical truism in that prevention is better than cure. As such, effective risk management is a vital consideration. Container telematics solutions are part of that process, simultaneously reducing occupational safety risks, improving efficiency and assuring better cargo care.

Enhancing crew safety

Refrigerated containers (reefers) need to be carefully monitored to ensure cargo conditions do not deviate from their voyage instructions. According to loss prevention recommendations issued by the West of England P&I Club, reefers should be inspected at intervals not exceeding six hours while at sea. Traditionally this has required labour intensive manual intervention, with seafarers exposed to occupational safety hazards.

A 2023 BMC Public Health epidemiological study of seafarers working on 58 German-flagged container ships over a period of 20 years found that accidents represented the most frequent reason for unfitness for sea service (31.2%) and that deck crew sustained the most injuries (22.5%). While the BMC study did not specify the location of each accident, the inference is clear – the main deck of a containership can be a challenging work environment.

By using telematics solutions to automate routine reefer checks and performance analysis, we can enhance efficiency and reduce seafarers' exposure to:

- Working on damp and slippery decks;
- Ladders and stairs;
- Working at height;
- Trip hazards;
- Confined spaces between tightly stacked containers;
- Exposure to adverse weather;
- Potentially harmful refrigerants.

Fire on containerships is a serious and growing concern. Instant and accurate information on a container that is overheating, and what is in it, is crucial knowledge in the event of a fire, where rapidly identifying the seat of a fire, the material that is causing it, and the contents of surrounding containers can make all the difference to successful firefighting.

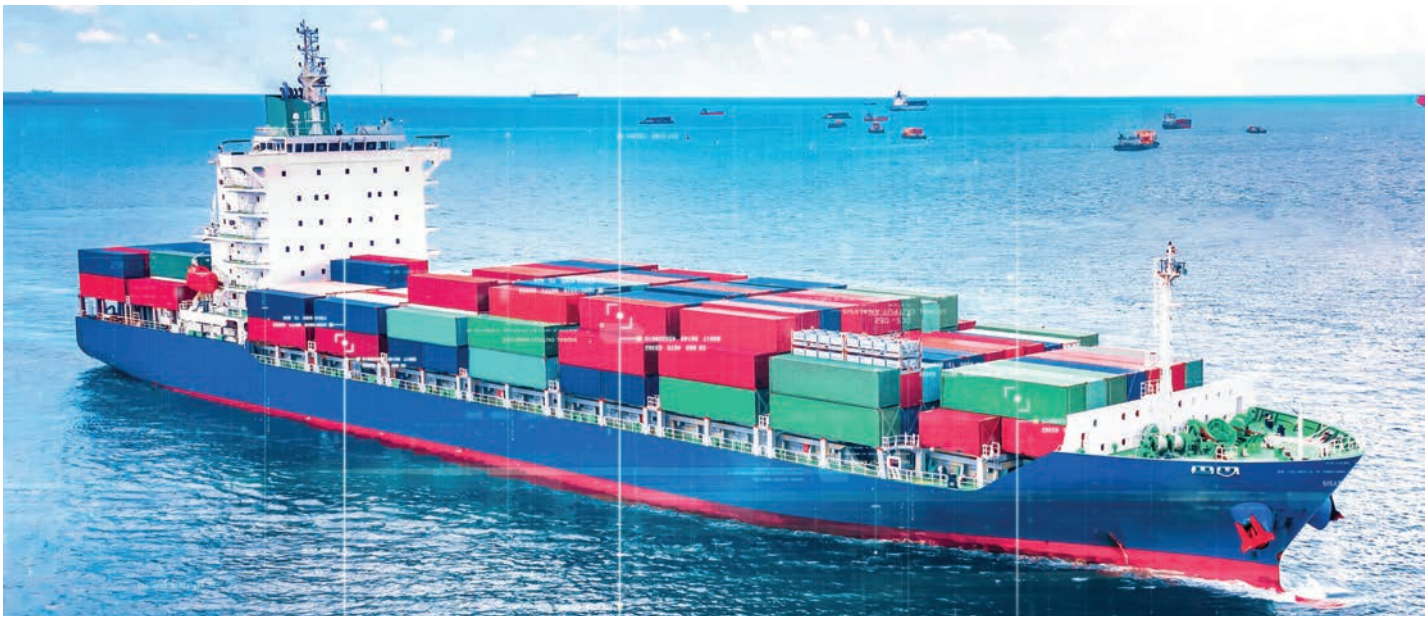
Reducing fatigue and enhancing labour conditions

Automation can help manage working hours and protect rest periods, which is vital to combat seafarer fatigue. As noted in IMO's Guidelines on Fatigue, of January 2019, 'fatigue affects everyone regardless of skill, knowledge and training'. Seafarer fatigue, commonly caused by lack of sleep, poor quality of rest, stress, and excessive workload, can lead to impaired cognition and accidents.

We know that seafarers have to contend with demanding schedules and physically challenging tasks that can contribute to exhaustion. According to Solent University's Project MARTHA, this not only leads to short-term performance degradation, thereby posing significant risks to seafarers and the operational safety of ships they operate, but can also have long-term physical and mental health effects. Constant vigilance of reefer operability is vital to prevent spoilage of perishable goods and ensure a secure food chain. By automating the process, seafarers are relieved of a repetitive and time-consuming manual task, reducing the risk of fatigue-related errors.

How automation helps

Shifting to remote routine monitoring can play a pivotal role in managing seafarer working hours and ensuring adequate rest periods. From an efficiency perspective, remotely generated real-time performance data and alerts allow crew members to focus on their primary responsibilities or other critical operational tasks that require their expertise, knowing that the telematics solution is constantly overseeing reefer performance. Collectively these outcomes can foster a safer, more productive working environment. By allowing for a more informed allocation of human resources, we can improve overall conditions for the crew.



Integrating hardware, software and data connectivity, a dedicated reefer solution is designed to allow shipping line personnel to remotely track, monitor and control the reefer unit. To reduce on board risk, it enables seafarers to eliminate manual intervention, providing awareness through alerts, by remotely accessing data logs, and by managing exceptional events – all without the need to go out on deck. Since this information is in the cloud, shore-based teams can also access and analyse data to monitor trip start and end, reefer loading and unloading events, security breaches, temperature compliance, refrigeration performance and more.

The integration of artificial intelligence to reefer monitoring adds another layer of sophistication. Diagnostic analytics help stakeholders, including shipping lines, to understand why something happened in the past and can help anticipate potential issues before they occur, enabling proactive maintenance and reducing the risk of system failures. Using diagnostics data to identify defect and malfunction trends, shipping companies can schedule repairs ashore. This not only protects the cargo, but also safeguards the seafarers responsible for servicing the reefer. Given the potential for cargo spoilage, reducing the need for last-minute fixes at sea can also alleviate a major source of crew stress.

Informing dynamic risk assessment

Unauthorised access to dry containers can also jeopardise crew and vessel safety, and cargo integrity. Leveraging the capability of IoT technologies, for example door sensors, can provide unparalleled real time monitoring against theft, smuggling, and cargo tampering. Crew are immediately alerted if a door is unexpectedly opened, enabling them to swiftly respond to potential safety and security risks, which can help to reduce the impact of security incidents (for example loss of cargo), prevent accidents, and safeguard the ship.

Alerts of this nature allow seafarers to confirm the cargo prior to investigating the potential cause of the alarm, for example whether PPE or other precautions are required based on the nature of the cargo. By providing immediate information on container breaches, door sensors can contribute to proactive safety risk management.

Taking cargo care to the next level

While routine manual checks are thorough, they are susceptible to human error and, at best, can only offer a performance snapshot at the time of the check. If something were to subsequently fail, it would not be discovered until the next physical check, with the attendant risk of cargo spoilage. In contrast, the latest generation of reefer telematics solutions continuously monitor and analyse reefer conditions, providing real-time data on temperature, humidity, and controlled atmosphere parameters.

Automating the process enhances the accuracy of monitoring, eliminates the need for routine manual container checks and minimises the need for direct human involvement. Alarms can be configured to alert crews to potential issues if set parameters are breached. They can be individually configured to meet the requirements of particular cargoes – for example, hazardous or particularly high value cargo might allow smaller margins of deviation. Deploying to a specific reefer in response to an exception event allows seafarers to routinely spend more time in safer areas of the ship. Deviation alarms also facilitate proactive maintenance, which can help to prevent cargo spoilage or, in extremis, indicate concerns that may affect the safety of the ship.

Telematics solutions can also automatically report performance data to concerned parties as required by the voyage instructions or charter agreements. In the event of a sudden reefer malfunction or failure, this allows technicians to concentrate on resolving the fault, rather than notifying stakeholders – and singular focus reduces the likelihood of a safety incident.

The benefits of live communication can be taken even further by creating a vessel-based cellular wireless network for improved shipboard cargo visibility and operations efficiency. As well as facilitating real-time data exchange between containers and the vessel, the platform can send event-based alerts directly to crew phones to expedite defect or outage investigation, again helping to ensure cargo integrity.

Built-in two-way reefer control reduces operating costs, provides redundancy, and allows corrective action to be taken onboard to remotely adjust settings in the event of deviations. Being synchronised to the cloud via satellite backhaul, the platform also grants remote shore-based access so employees can adjust parameters during the voyage, removing another task from seafarer workloads.

Shipping 4.0

The maritime world is becoming increasingly digital, and many of its processes are increasingly automated. This trend in shipping is one that can increase transparency, allow appropriate use of resources and increase safety. Given the relatively low cost of installing telematics – with monitoring solutions even gathering speed for dry containers – there can be no doubt that this digital way of working is here to stay.

Integrating IoT technology into container operations is integral to building onboard digital ecosystems, which are fast becoming expected by charter parties and beneficial cargo owners. As shipping continues to embrace innovation and container tracking, we must also harness the benefits that container telematics can bring for positive changes to enhance the seafaring experience.