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ICHCA INTERNATIONAL PRESENTS TT CLUB INNOVATION IN SAFETY AWARDS 2024

A digest of entries received & winners announced

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TT Club Innovation in Safety Award Foreword

At TT Club our delight at sponsoring these awards is only exceeded by the pleasure we have in reviewing the long list of entries that represent safety innovations from such a broad cross-section of organisations engaged in the cargo handling industry.

The publication of this Digest, which follows the success of similar reviews of award entries in past years, demonstrates the strength and quality of the innovations that have sort recognition, and reflects the drive by organisations throughout the industry to improve safety standards. It is relatively easy, given the spotlight afforded the winners of the award, to appreciate their relevance to current safety challenges and the degree of hard work and initiative that have been expended on their design and production. But the high calibre and sheer volume of safety products, processes and concepts deserve as much recognition as the award winners.

TT feels its role is as an enabler and communications conduit for innovative thinking in safety. Linking those looking to invest in safety measures, operators seeking solutions, and at times academia and regulators wishing to have a greater understanding of the safety issues pervading our industry.

I commend this Digest to the reader who is equally committed to safety and in particular draw attention to the topical relevance of many of the innovations which address current and burgeoning safety challenges.

The wide-ranging safety challenges tackled by this year's award entrants fell into four main categories. Both the advantages of using data collection in providing insight into safety improvements and the growth of learning technology in training using virtual simulation, featured heavily. In the operational environment practical products to secure cargo and distance human involvement through automation were put forward. Finally, segregating machines from people was a primary aim of many. This goal is crucial in improved safety, as the situation causes the second highest amount of incidents in cargo operations, and one with the most serious consequences.

It is the success of TT and ICHCA's primary goal of nurturing widespread and varied advances in safety innovation that is displayed through this Digest. Moreover we seek to give all entrants the oxygen of visibility in the marketplace to help develop

Mike Yarwood
Managing Director Loss Prevention
TT Club

and grow their initiative to the benefit of cargo handling operations globally.

Our further aim is to provide a tool kit that helps promote these ground-breaking ideas not just via the accolade of inclusion in the Digest but by encouraging the innovators to engage with us in discussion forums, conferences and exhibitions and further papers on safety issues that we organise. Through these efforts, we hope the relevance of the innovative solutions can be honed and their place in established safety practices of the future be cemented.

At TT our commitment to safety, security and supply chain sustainability is demonstrated not just by our support of this award but also through the wide-ranging publications on risk awareness and guidelines aimed at safeguarding supply chain operations that TT produces throughout the year. We are proud to be constantly utilising the experiences of our insured and the measures we develop them to help them in order to mitigate the dangers facing all operators across the global supply chain.

WINNER - Cross Currents 88 / G2 Ocean AS - “Spyder Netting”

a thin layer of plastic film netting, which can be rolled out across gaps and secured between layers of cargo

the challenge

When paper reel products are loaded in the cargo holds of breakbulk vessels, the stowage results in gaps between the cargo, particularly along the edges of the holds where the cargo meets the bulkheads. These gaps present a significant fall risk to stevedores working in the cargo holds. The gaps can extend many metres down through the cargo and, unfortunately, falls into these gaps have resulted in fatalities and severe injuries.

To address this issue, the mission was to design and implement a fall barrier system that could be applied to these gaps within the cargo stow.

The solution needed to:

- Reduce the risk of falls, or minimise the potential for fatality or serious injury in the event of a fall.
- Provide adequate protection without compromising air circulation. When carrying paper products ventilation is important for cargo care, so the solution should not restrict airflow through the cargo.

- Be light-weight and simple to install. The simplicity was important in order to prevent additional risk to stevedores during the installation process. It also had to cause minimal interruption to the cargo operation process.
- Avoid creating any physical damages/indentations/contamination to the cargo.
- Be a cost-effective solution, avoiding financial barriers to enhancing safety.

the innovation

The solution, "Spyder Netting", is a thin layer of plastic film netting, which can be rolled out across the gaps and secured between layers of cargo. The material behaves much like a spider's web - light, strong, and stretching under impact load.

This innovative material has many unique features:

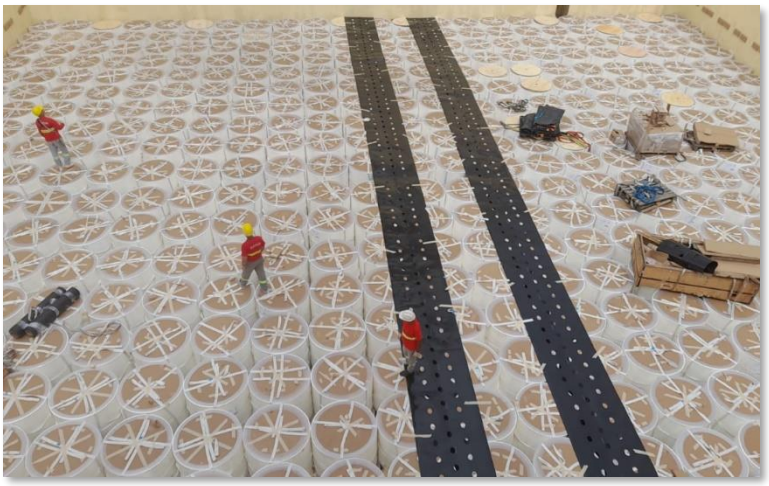
- Thin profile – Spyder netting material has a thin design which prevents indentation of pressure-sensitive cargo.
- High impact resistance – the netting withstands impacts from a 100kg weight falling from a height of 3 metres. The materials used have a high degree of durability and strength.
- The stretch properties ensure a low-impact deceleration of the falling person.
- Die-cut hole pattern – the web material is manufactured with circular cut-outs which allow airflow to be maintained.
- No specialist installation fittings, the netting is held in position by the weight of the cargo itself.
- Roll packaging – the material is supplied in roll form for a simple, intuitive, and fast installation by the workforce. No special equipment is required. Simply roll the product out like a mat.
- The material is fully recyclable.

how it was implemented

Breakbulk shipping company, G2 Ocean, approached Cross Currents 88, as experts in plastic materials technology, to assist with a solution to this safety challenge.

Cross Currents proposed two designs, both meeting the strength requirement, but physically different.

The product needed to capture the confidence of the stevedores in terms of it's effectiveness, but also their support for the installation process. Working together with G2 Ocean's stevedore and terminal partners in the US and Europe, live testing was conducted onboard vessels using several different specifications of materials. During the tests a 110kg dummy was pushed off the top of the cargo, free-falling 2.9 metres into the netting. In all tests, the netting successfully arrested the fall. Following further input from G2 Ocean's stevedore and terminal partners, we were able to find the preferred solution.



result

The project resulted in a product that removes or minimises the potential for fatalities and severe injuries resulting from workers falling into these gaps in the cargo stowage.

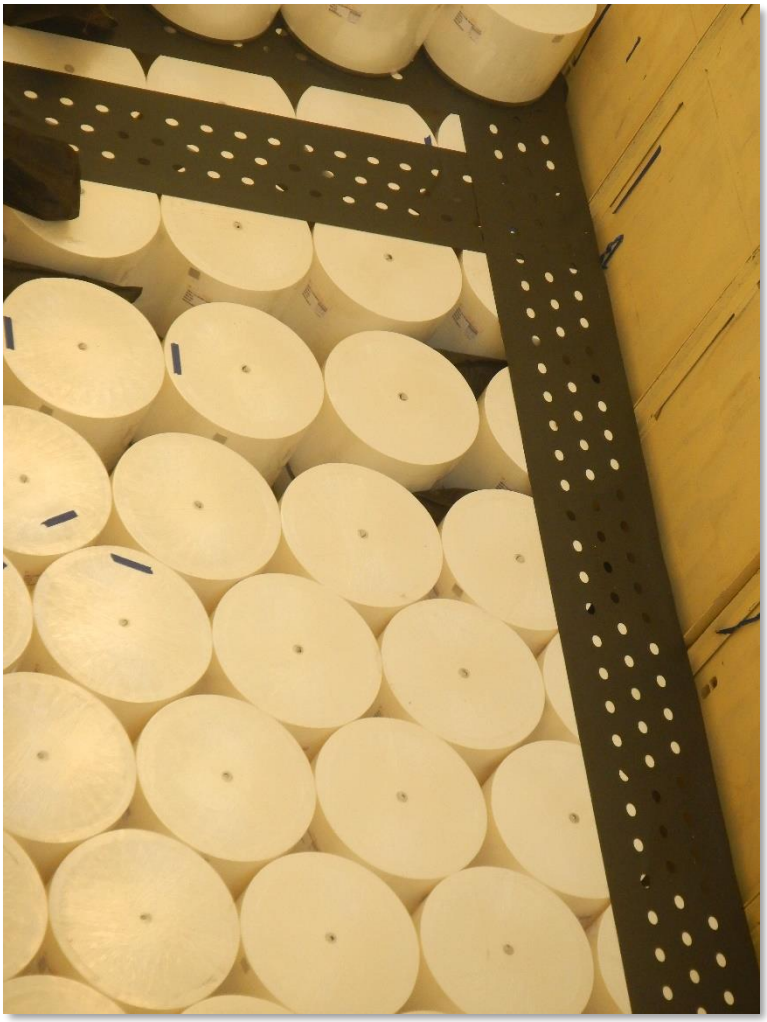
The product is easily delivered and installed in the cargo holds, without the use of specialist equipment. The solution does not compromise the care or condition of the cargo.

- Workers feel more secure and confident in their working environment.
- The project has created genuine cooperation and goodwill between G2 Ocean, their working partners, and Cross Currents 88.
- Union groups, ports, and individuals have expressed appreciation for the program.
- The product is regularly employed by G2 Ocean, in the carriage of paper reel products.

conclusion

- Lives have been saved. Soon after the adoption of the product, Cross Currents were personally thanked by a stevedore in Italy, who's fall was arrested by the netting. Since then, there have been several examples of workers who have fallen, been arrested by the netting and, completely uninjured, have been able to return to work. Previously, such falls would have resulted in injury or death.

- The objective has been successfully achieved. While it is almost impossible to completely remove these gaps in the cargo and the resulting risk of falling, Cross Currents Spyder Netting has minimised the potential for fatality or serious injury in the event of a fall.
- Working with a knowledgeable partner like Cross Currents, and involving the workers and other stakeholders has ensured all aspects of the challenge were considered and the end result reflected the concerns and requirements of all parties.
- Safety innovation does not have to be complicated, intrusive, or expensive. The simplest ideas, properly developed and executed between partners with a common goal, can be extremely effective.



LINK: customerservice@crosscurrents88.com

SHORTLISTED - Royal HaskoningDHV - Smart Mooring

addresses the safety of moored vessel operations in sheltered and exposed ports by predicting excessive vessel motions and mooring line forces

the challenge

Smart Mooring addresses the safety of moored vessel operations in sheltered and exposed ports by predicting excessive vessel motions and mooring line forces.

Smart Mooring focuses on the Harbour Master's community. Engaging with this community made us realize how challenging the work of the Harbour Master and port control is: keeping port staff and vessels safe is a massive responsibility that requires port control operators to see and foresee what is happening in their port.

With so many things going on at the same time, that central role in port control is highly challenging. And looking at some key trends in the Maritime industry that role is becoming even more challenging over time. Because what we see in the Maritime industry is that:

- Ships become larger
- Storm events become heavier and more frequent due to climate change
- Old port infrastructure remains in use, thereby stretching the initial limits and capacities

At present, operational decisions are mostly based on manually compiled data and years of experience. Still, unforeseen conditions lead to dangerous outcomes: Mooring lines fail when under peak tension and cause damage or even injury; Ships break loose and lead to consequential damage of various kinds; Excessive movement of ships cause damage to the ship or the port infrastructure, harm to the environment or lead to inefficient cargo handling.

Smart Mooring has been designed to mitigate these risks by providing insights into the safety levels of vessel moored in a port.

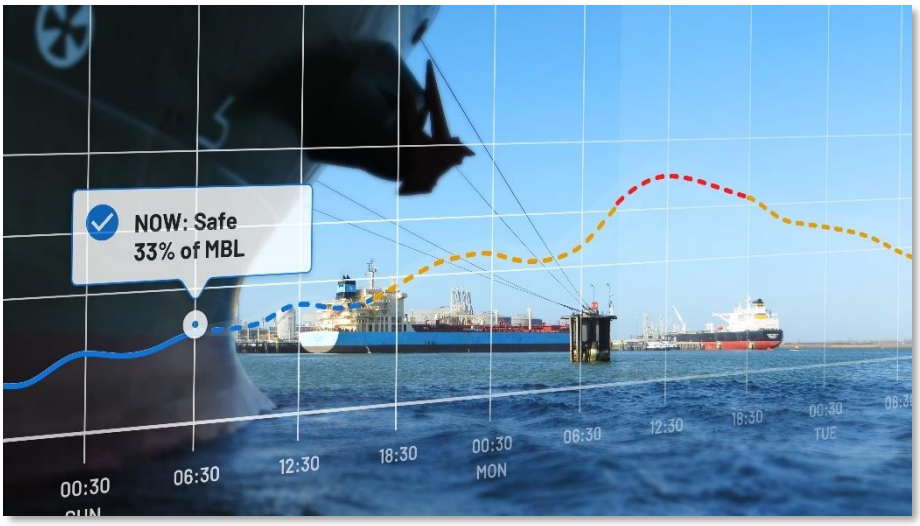
the innovation

- Smart Mooring is a software application that actively warns the port control operator or Harbour Master for expected unsafe situations of a moored ship.
- The software predicts mooring forces and ship motions days in advance and for a specific location (berth view) or for multiple locations in the port (port overview). It is simple to use and intuitive, even though it combines the dynamics of moored ships with port data and weather forecast (wind and/or waves).
- One could describe Smart Mooring as a Digital Twin, having a central role in the ship-shore interface. The engine of Smart Mooring turns data into information by describing and predicting the behaviour of a moored ship in the days ahead. The results shown on the dashboard provide insights that support operational decisions in port control operations.

The key business question it answers is:

Can this vessel moor here safely: now and in the days to come?

- Smart Mooring bridges the gap between engineers and operators by putting science behind the operational decisions.

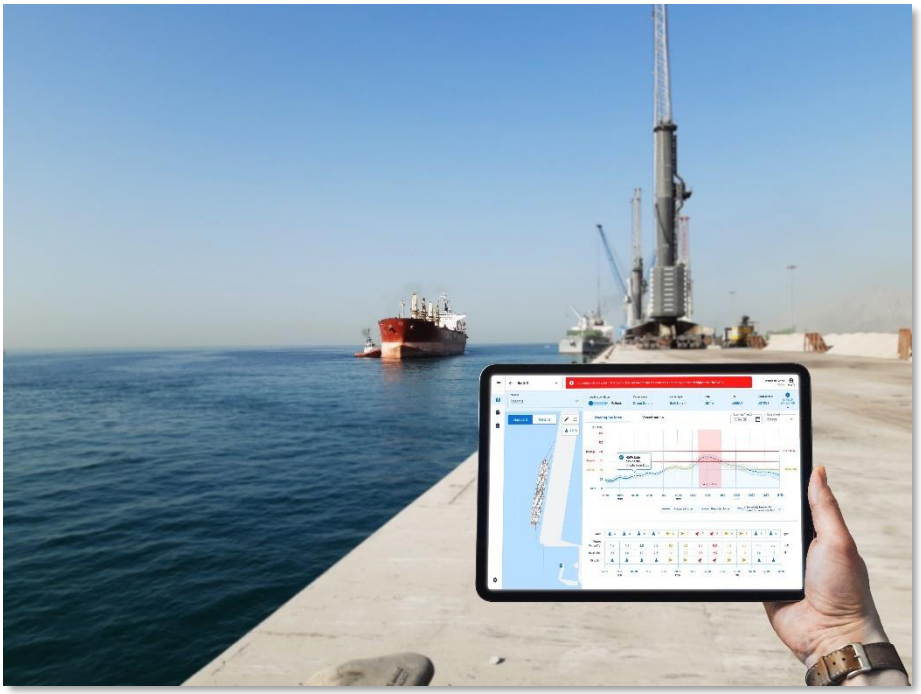


how it was implemented

In 2019 we created a prototype, which we used as a basis to build up a Minimum Viable Product (MVP), which we tested in the Port of Rotterdam (Netherlands) for wind and in RAK Ports (United Arab Emirates) for waves. Both ports became our launching partners in this development. That was important, because it gave us a short and direct connection with the actual users in port control.

Their feedback from real storm situations (including actual moored vessel incidents) has been vital for the early development of our system, not only technical, but also for its user friendliness. Besides the user feedback we connected to available data flows, like Smart Bollards and Smart Quick Release Hooks, which we (still and ongoingly) use for validation of our predictions.

After various improvements to the system, we further expanded the product with our early adaptors in 2022: Belfast Harbour, Groningen Seaports and Port of Algeciras. Building up the system for those ports required significant further developments and associated RHDHV investments. Yet, it also paved the way for a product that is suitable to serve multiple ports with similar issues in the Maritime market, which makes it a Minimum Marketable Product.



result

The result can best be presented through text from an interview with **Kevin Allen, Harbour Master, Belfast Harbour** (Link to article)

"With Smart Mooring, we can immediately see where and when we could have a potential problem with moored ships, and take appropriate mitigating action. This software plays a key role in helping us to protect against bollard overloading and failure due to excessive forces imparted by large cruise ships and additionally providing coverage for other critical and at-risk berths," said Kevin Allen, Harbour Master at Belfast Harbour.
"It's fascinating, because until you engage with technology, you don't know how better informed your decisions could be. This software provides an opportunity to mitigate risks and maintain operational efficiency with support from a digital solution, rather than investing in additional quay furniture and very much aligns with our smart port strategy."

And

*An example where **Captain Michael Magee, Group Harbour Master, RAK Ports** used Smart Mooring in his operational decision:*

A Capesize ship sat alongside the outer berth being unloaded and a Panamax vessel sat at one of the inner berths. As port staff unloaded cargo and the crew departed and boarded via gangways, the Smart Mooring system alerted to incoming bad weather.

With the two specific ships selected within the tool, Captain Magee saw that the Panamax ship was at risk of rolling and breaking its mooring lines; endangering the staff who were currently unaware of the incoming storm. At the same time, the position of the Capesize ship at the outer berth, along with the nature of its build, meant it could remain and unload safely and efficiently.

"We responded to the software and moved the Panamax ship out to anchor, until the weather passed." Captain Magee says, and it was the right call: "Everything panned out as the software predicted. The Capesize ship put out some extra mooring lines for precaution, but we were able to make the right decision to keep our vessels and staff safe."

And

A quote from ***Pieter van de Wal, Harbour Master at Groningen Seaports****, the Netherlands*

"Ships are becoming bigger and bigger, so they are more sensitive to wind. We are limited in space and we want to make sure that the ships that are moored in our harbour, can be safely moored without us having to worry about whether the lines will hold, whether it is moored well enough."

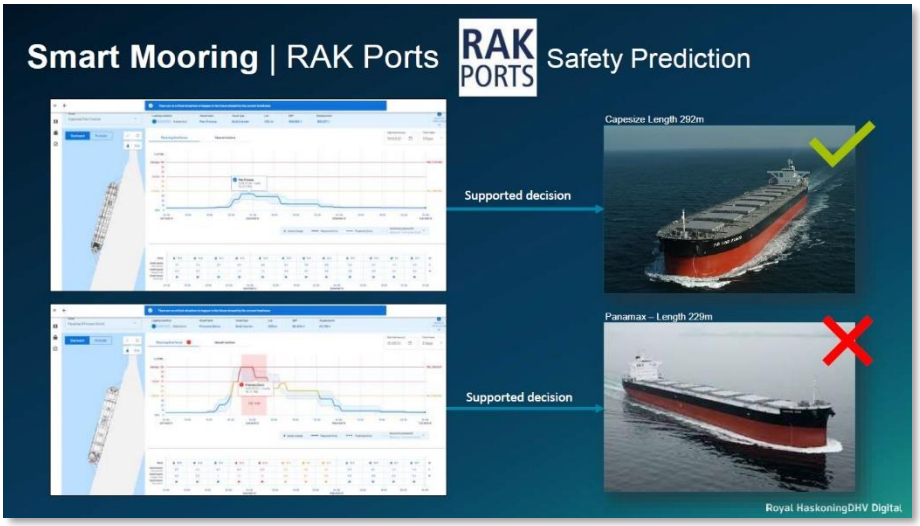
conclusion

Additional references via Weblink:

Product website: https://www.twinn.io/en/services/smart-mooring

Groningen Seaports – case movie: https://www.youtube.com/watch?v=fjy3CYTx_qs

- Belfast Harbour – magazine article: https://www.thedigitalship.com/news/maritime-software/item/8429-belfast-harbour-implements-royal-haskoningdhv-s-twinn-software



SHORTLISTED - Trendsetter Vulcan Offshore - Next Generation Lashing System

support system that reduces container motion and controls the dynamics of container stacks

the challenge

Based on a 3-year running average, approximately 1,800 containers are over boarded at sea each year, leading to significant economic, safety, and environmental concerns.

Causes of Container Losses:

Weather and Rough Seas: Areas like the North Pacific and North Atlantic are frequently subjected to hostile weather conditions. Massive waves in such conditions can pose threats to ships. If a vessel isn't adequately equipped, or if it faces severe meteorological adversity, containers can be at risk of being dislodged and lost.

Incorrect Stowage and Lashing: Proper container lashing is essential for maritime cargo safety. In cases where containers are not anchored securely using appropriate lashing bars and twist locks, they are at risk, especially in rough waters or during significant ship movements.

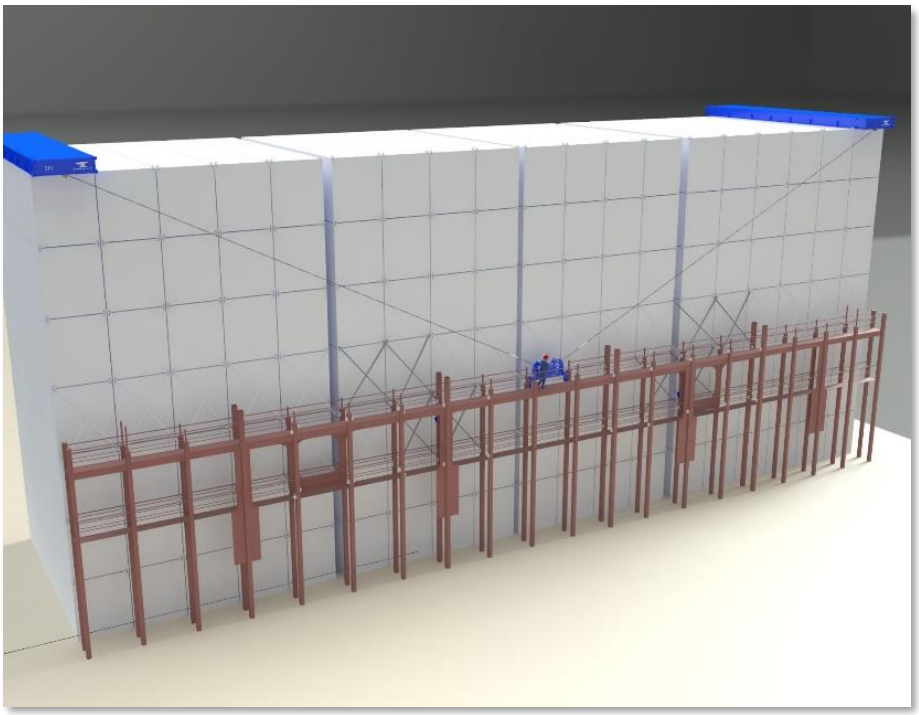
Ship Design and Stability: The stability of a ship is often contingent upon its load. Certain loading configurations can compromise a ship's balance and can make the vessel more susceptible to certain undesirable movements. In addition, phenomena like parametric roll observed in some ships, particularly longer vessels, can escalate the risk of container loss.

A system is needed to improve container stability in rough seas and reduce the risk of over boarding. Until now, no solution has adequately addressed this challenge, leaving millions of tons of cargo at risk and creating potentially life-threatening conditions for crews.

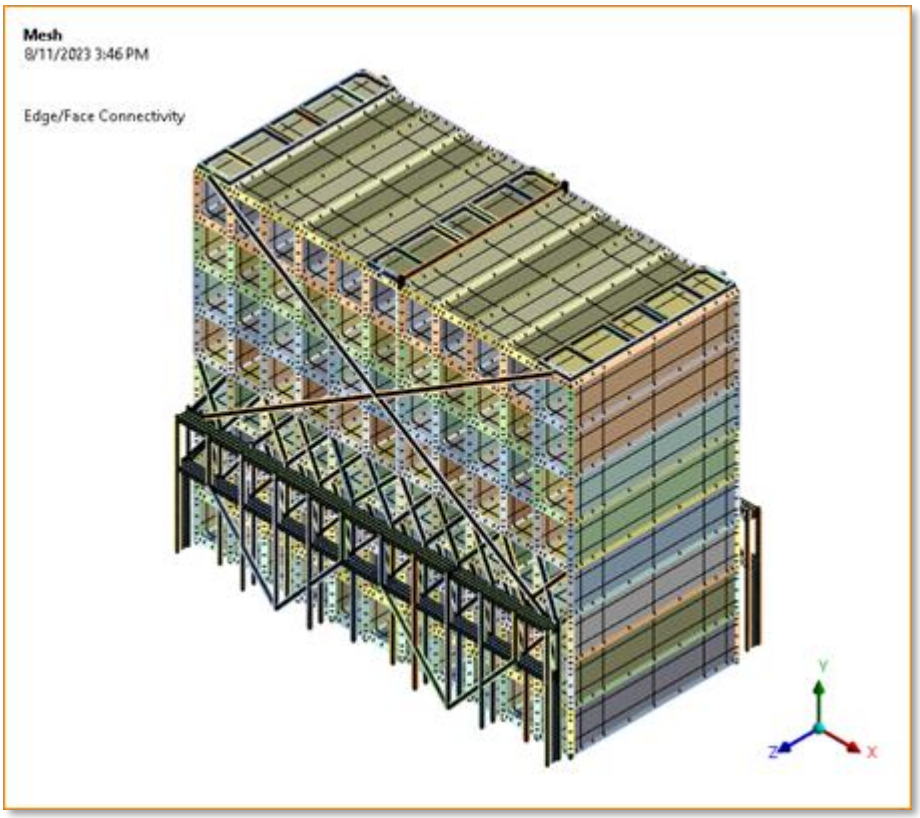
the innovation

Trendsetter Vulcan Offshore (TVO) developed a Next Generation Lashing System (NGL) that addresses the container loss problem by introducing supports that reduce container motion and control the dynamics of container stacks. By tethering the top of the outermost stacks, the NGL creates a wing wall that stabilizes the containers in the bay via enhanced tension stability. The NGL provides additional restraint at the top of the stack, which can eliminate the dynamic twistlock tensions that have been the initiating cause of many container stack failures.

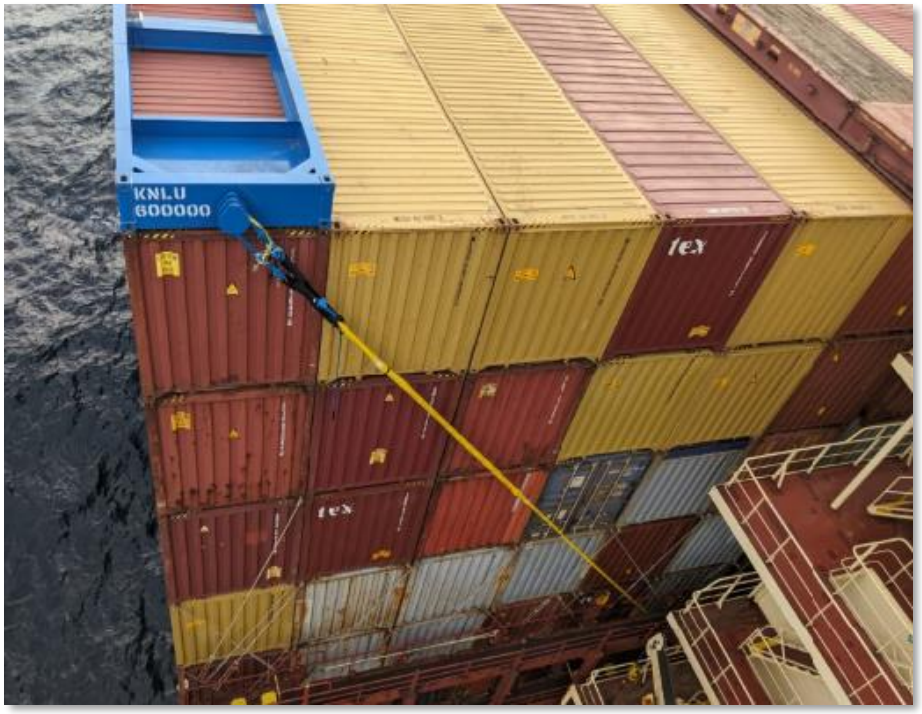
The system design includes: an anchor platform that connects to the container stack via conventional twist locks, a robust tether that connects the anchor platform to the vessel, and a unique tensioning system that provides the preload that energizes and enhances the stability beyond static lines. Through stronger fastenings, this system allows for higher container stacking and reduces the risk of container loss.



Next Generation Lashing System - NGL 1.0



Integrating TVO's proprietary Janus Monitoring System sensors into the NGL allows the tether tensions and stack dynamics to be actively monitored, adding a level of confidence to container retention. The Janus system's monitoring capabilities include both predicting and detecting parametric roll, allowing evasive action to be taken before vessel and stack dynamics enter a destructive range.



Installed Starboard side

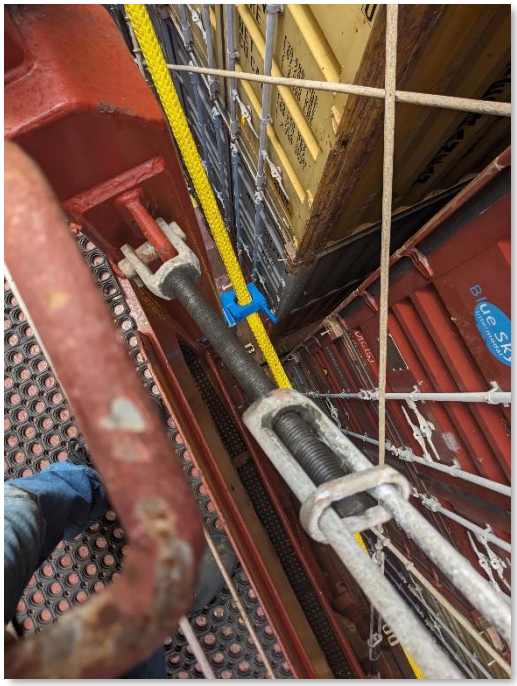
The technology was adapted from a system used in subsea oil and gas applications to arrest blowout preventor (BOP) motions using a tethering system comprising piles and tensioners that hold the BOP in place and transfer loads to the tethering system, piles, and seabed instead of the wellhead. Adapting this technology to containerships can significantly improve safety and reduce container loss.

how it was implemented

Finite Element Analysis (FEA) proved the viability of the NGL solution.

Open-source data from a containership that experienced container loss was used as input to model one bay fitted with traditional lashings and one with the NGL system. An arrangement of four stacks of containers 8 tiers high was used to analyse the effects of vessel roll on stack dynamics with and without tethers. Roll angle was analysed at 19 and 40 degrees, and tether models were analysed with 3 and 5 tonnes of preload.

Tensioner with load pin



Installed tethers running through traditional lashings

The model was then enhanced to more precisely replicate the lashing bridge of the vessel used for source data. Analyses were carried out to understand the differences in performance between branded lashing material and wire rope as well as the differences in the NGL system's effectiveness on 8-tier and 9-tier configurations. The model was also used to understand how moving the anchor points from the hatch covers to the lashing bridge impacted performance, followed by 'what if' scenarios that included hatch cover movement and a single tether failure.

TVO simulations consistently found that the NGL system safely restrained the container stacks.

Sea trials were carried out onboard a 13,700 TEU vessel traveling from Salalah, Oman, to Tanjung Pelepas, Malaysia, in June/July of 2023. The NGL test bay and the adjacent bay were instrumented with the Janus Monitoring System to measure tension loads through the conventional lashings and accelerations via the stack top accelerometers. Tension loads were monitored via load cells integrated into the NGL's tensioning system.

result

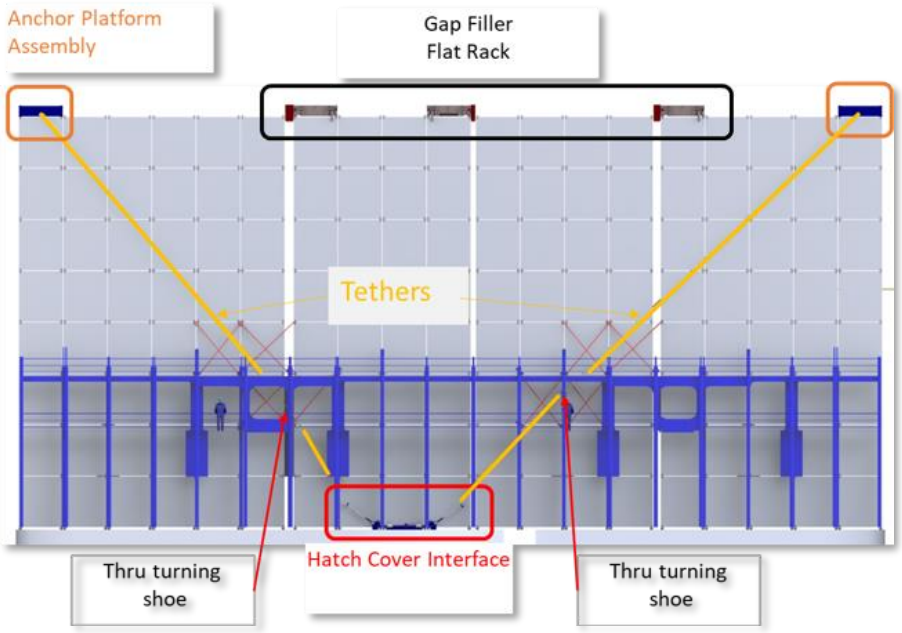
Testing was successful, and the communications system worked exaclty as anticipated.

The sea trial demonstrated that the system can maintain tension throughout deployment, indicating that the NGL system is a practical solution for reducing instances of container overboarding and has the potential to enable higher container stacks without compromising vessel or crew safety. The trial provided another instance of the Janus monitoring system effectively monitoring the vessel, stack, and NGL dynamics and displaying the results onboard and remotly.

The vessel crew noted a visable reducetion in container motion in the NGL bay as compared to other bays throughout the vessel. Due to calm sea conditions the vessel did not experience higher roll angles and acceleration, but the data gathered via the Inetial Measurement Units (IMUs) indicate the NGL system can absorb and dissipate energy originating from the ship motions and external forces.

According to a COO in Salalah, Oman, “This is what needs to happen to fix the container loss issue,” though he cautioned, “The system needs to be easier to install.”

Lessons learned have led to design changes that will simplify equipment onboarding as well as connecting and removing the lashings. The NGL 1.0, which will be available commercially in Q1 2024, features considerable enhancements that use automation to reduce installation and tensioning times.



conclusion

The successful sea trial of the prototype NGL system proves that applying this tethering concept can improve safety onboard containerships and significantly reduce financial losses.

The transfer of proven technology from oil and gas industry applications introduces a way to improve transportation by containership and reduce loss and injury. This milestone achievement was acknowledged by a CO based in pilot container vessel: “No one has gotten this far in implementing a new lashing system.”

Ongoing testing and additional installations will allow TVO to further assess the system to determine its limitations so refinements can be made to improve its performance.

The next steps being taken by TVO will address this concern, simplifying system installation and removal to streamline the processes. Another area of study will be evaluating automated

tensioning techniques that can be used to ensure consistent tension across the lashing system as sea conditions change.

The goal is to take this novel system to the next level, increasing reliability and expanding the operational window to help the maritime industry improve safety and reduce the risk of accidents and injuries.

An endorsement from a vessel captain on the pilot vessel, sums up the need for the NGL system: “Safety is my biggest worry. This [NGL system] needs to be on every vessel.”

LINK: https://www.trendsettervulcanoffshore.com/

1. Advanced Microwave Engineering - SMART 5.0 Anticollision System

tailor made anticollision solution

the challenge

The challenge is to create a safer and more productive work environment within the terminal area. We improve two Key Performance Indicators (KPI):

- Recordable Incident Rate (RIR)
- Lost time Incident rate (LTIR)

in specific areas where there are lots of vehicles (e.g. Shuttle Carriers) and pedestrians. We prevent injuries and crushes between two vehicles and vehicles vs pedestrian. Thanks to our technology we are able to provide data and index to implement corrective actions to enhance safety.

By investing in new proximity detection systems, terminal operators can grow both in business and work environment safety, because we reduce costs due to accident damages and maintenance costs.

In the meantime we obsess over data, because it provides operations leaders and safety professionals with measurables, objective facts and numbers that allow to detect and mitigate risks, solve safety problems and guide technical decisions. Frequently the Container and Port industry have safety plans in place, but those are mostly passive solutions (e.g. PPE, flashing lights on equipment to draw attention to its presence, installation of backup alarms, mirrors at corners and intersections, etc.). With SMART 5.0 and Data Insights we set the new rules to change the culture of safety.

the innovation

SMART 5.0 is the latest innovative tailor made anticollision solution, adaptable to any kind of vehicle, that minimizes the risk of machine to machine and machine to pedestrian collision.

SMART 5.0 is composed of just three devices:

1. touch screen display
2. CPU
3. sensor (The Key).

That means it's easy to install and it lowers Installation costs by reducing the number of sensors.

The sensor detects the correct position of vehicle and warns the driver in real time thanks to visual and sound alarms. It is possible and easy to set two alarms (Warning and Pre Warning) and shape the range and the size of the detection pattern (circular, rectangular, elliptical, and any other one) with the touchscreen display. The features of this solution in addition to that are Check list module, Badge module, GPS module, and Shock Module. The technology used by SMART 5.0 is Ultra-wideband (UWB)[1]

how it was implemented

The requirement was to install the solution on two Shuttle Carriers and because of the size of these vehicles, the goal was very challenging.

We have installed the Key sensors on top of the shuttle roof, and in the cabin we've installed the CPU and the touchscreen display in a visible area to the driver.

We have set, for both vehicles, two alarms warning at 10 m and Pre Warning at 20 m, shaping a rectangular area.

result

The leadership team and site managers were enthusiastic to see that in an easy way they have resolved one of their most import cost items, machine to machine collision and in the

[1] Ultra-wideband (UWB) is a radio technology that can use a very low energy level for short-range, high-bandwidth communications over a large portion of the radio spectrum. UWB has traditional applications in non-cooperative radar imaging. Most recent applications target sensor data collection, precise locating, and tracking.

meantime to lower the risk of collision with other site infrastructure,such as automated doors. This can significantly reduce maintenance and repair costs.

Installing safety sensors throughout a facility provides real time information to avoid accidents. Collecting and analyzing the data also gives insight into where and when the most dangerous "hotspots" are.

conclusion

Our systems can reduce the risk of accident in the ports and terminal industry. The high precision and sophisticated technology combined with data reports can bring safety and efficiency to another level. We are able to measure progress by balancing safety and business results.

It is difficult to generalize the cost of accidents. However, having a system which provides a single measure of safety balanced with efficiency, means site managers can monitor progress and optimize operations.

AME believes that there is no real progress without safety.

LINK: https://www.ameol.it/en/

2. ABP & Rombit - Worker Safety Solutions

real-time prevention of vehicle/pedestrian collision

the challenge

Associated British ports (ABP) is the UK's largest ports operator, handling around £150bn of trade across our network of 21 ports every year. Ports are busy places and safety is a core value for ABP, which is why we continue to invest in innovative ways to ensure the safety of our workforce. As ICHCA has pointed out repeatedly, moving equipment in warehouses and terminals is a significant threat to pedestrians, cargo, other equipment and infrastructure. Lift & crane accidents, collisions and struck-by incidents are on the rise (*ILO/OSHA, 2022).

Drivers are focused on the task at hand, aiming for a maximum amount of moves per driven hour.

- The productivity pressure sometimes leads to driving and turning 'at the limit'. This results in improper vehicle control, overturning, dangerous accelerating and braking, in turn causing accidents and damages to cargo, vehicles and the drivers themselves. A forklift, reach stacker or straddle carrier on its side typically also results in significant injuries. People being trapped by collapsing or overturning machinery represent 12% of workplace fatalities in the UK. (*H & S Executive UK, 2022)

- The routine tasks often lead to inattention blindness. While virtually all drivers are conscious of safety, it is an enduring challenge to stay aware of your surroundings. Driving backwards while loading requires a focus on cargo stability -- this is exactly the instant when things do go wrong. Vehicle collisions - or worse - pedestrian struck-by incidents are significant threats, representing 20% of workplace fatalities. (*H&S Executive UK, 2022)

While training, protection and safety awareness initiatives are abundant, there is a strong need for **real-time alerts** allowing for last-second adjustments to avert an accident.

"The Occupational Safety & Health Administration (OSHA) estimates that about 70% of forklift accidents can be prevented with new digital tools."

- Slips, trips and falls are the most common safety risk. Although usually benign, sometimes people are in distress and in need of immediate help. As port terminals are big, responding in time is a considerable challenge. The biggest issue is knowing something actually is wrong and then finding and attending to this person.

There is a need for a real-time alert system indicating positions of individual accidents or individuals during a calamity or evacuation scenario.

the innovation

ABP was the driving factor in the development of a new digital safety tool for connected workers, lifts & cranes. The association identified that telematics data was useful to track and monitor movements, but the real challenge is closing the loop: how do you translate these

insights into actionable information to the drivers; preferably exactly when they need it, while they are on the job, about to be exposed to a dangerous situation.

Together with safety technology experts Rombit and Rombit's UK partner NET4, ABP tested and implemented last-second warning technology, resulting in real-time prevention. ABP's extensive work to optimise safety across its ports resulted in the lowest number ever of Lost Time Accidents in 2021, and continuous improvement in workplace safety is a core value shared by ABP and Rombit.

During 2022 & 2023 the following 3 solutions have successfully scaled from a novel proof of value project in ABPs Garston port in Liverpool to a groupwide safety solution for ABPs 21 ports:

1. The Digital Drive Coach: This cockpit-mounted monitor prevents improper vehicle control leading to cargo damage, vehicle damage, building damage and physical injuries. The setup consists amongst others of IMU sensors: turning, acceleration, braking data is processed via self-learning algorithms (artificial intelligence). They evaluate whether movement is within tolerance standards or whether a driver needs to be alerted when no longer within the limits of safe driving.
2. Collision Avoidance: We use the exact same setup. This time the Rombit unit sends and receives UWB signals to accurately measure distance between vehicles and pedestrians. This data is evaluated within a tenth of a second.
    a. When a vehicle fitted with the Rombit anchor and a port operative with a Rombit smart badge are too close to each other, the devices will vibrate and light up, alerting the pedestrian to avoid a potential collision.

b. Meanwhile the cockpit monitor will alert the driver (visuals and sound)

The algorithms are dynamic, allowing for larger 'safety bubbles' when driving fast and smaller ones when vehicles move slow.

3. Lone Worker & Evacuation support: By adding smart badges to the safety solution, Associated British Ports (ABP) is the first ports group to invest in innovative wearable safety devices:

   a. Building on the existing PPE (high visibility clothing, eye protection, safety helmets, protective boots, and gloves), this new technology provides connected workers with a new level of protection.

   b. The new safety devices, which are worn on the wrist or arm and attached to machinery, have a wide range of uses. Not only do they provide collision avoidance alerts, but they also support lone worker support and evacuation tracking in case of emergency.

   c. The speed of reaction to lone workers in an incident is critical to minimising the danger. In case of an emergency, a lone worker can use the device to request help. Similarly, the device can alert the system if the lone worker has a fall or shock, or if no motion is detected at all for a specified period of time. This enables a swift assessment and reaction to a situation to minimise risk.

how it was implemented

The project consisted of three parts:

- Needs analysis, vendor selection and first proofs of concept (2022)
- Pilot evaluation and feature selection: ABP worked closely together with the supplier to finetune the application for (port) terminal use. (H1 2023)
- Continuation of the Garston pilot and rollout of the first operational system at Newport (H2 2023)

We formed a small steerco with key stakeholders: innovation manager, SHEQ, operations, business project team and local site/service managers. Given the plug & play factor of the solution, implementation was easy and IT support not necessary.

Apart from technology performance there were three main topics that were considered:

- Change management: One of the toughest parts in implementing new technology is convincing large numbers of (blue-collar) employees to adopt the technology. A phased approach and expert coaching upon activation of the tool proved very helpful.
- Privacy: The dataflow is designed in such a way that no PRI-sensitive data is required. The solution is fully GDPR (EU) compliant. In addition: the vendor does not own the data, the data stays in the ABP 'tenant' for a fixed amount of days before being deleted — what is remembered are general insights and metadata

Maintenance and improvements: The vehicle units and smart badges have a sim card with continuous LTE connection for safe and secure updates to improve solution quality.

result

The Digital Drive Coach, Collision Avoidance and Lone Worker solutions are

- easy to implement: installation and calibration take a few hours. Typically a project is fully up and running within a day after delivery of the units.
- self learning (AI): to minimise false positives due to normal events like smaller shocks while driving on uneven floors, the vendor deployed a self-learning algorithm. The solution keeps improving. This is an unpretentious but lifesaving application of AI (machine learning).
- easy to use: alert = danger = stop and look around. That is the only thing people need to understand. The tools also do not use 'language' only pictograms depicting the type of danger. This allows for universal deployments. General feedback about the solution is positive.

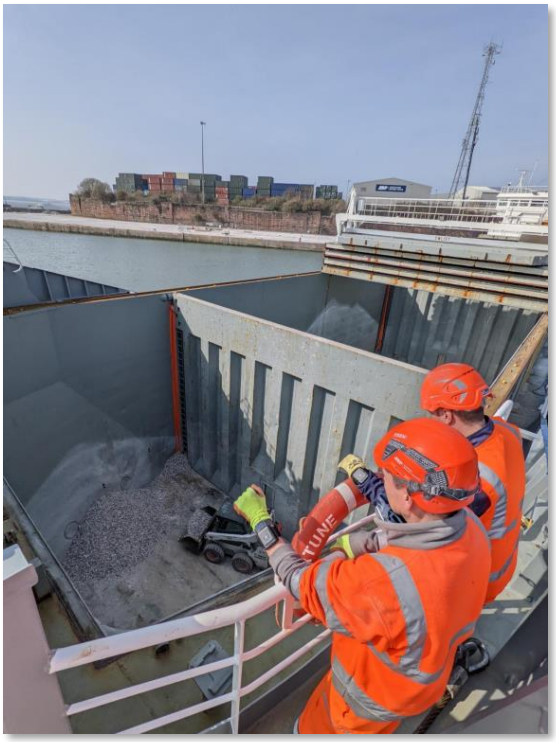
Safety effects:

1. An expected 25% reduction of unsafe events after installation and up to 70% in the long term:
    a. Harsh turning, accelerating, braking
    b. People entering warning zones / danger zones around moving equipment
2. ABP minimised response time to a calamity or individual incident thanks to the lone worker features. Realising someone is not accounted for and then finding this person usually takes hours. The wearable solution reduces alert, response and rescue time to mere minutes.
3. Next step is to translate these reductions in actual reductions in incidents and losses.
4. ABP and the vendor will involve the insurance provider to discuss how they can also benefit from these insights.

Other effects:

1. Opex reduction: driving safely results in a decrease in (unscheduled) maintenance costs, and a decrease in energy costs.
2. Productivity: there was no observed effect on the amount of moves, indicating that increased safety does not affect productivity.
3. Damaged cargo: results are evaluated to look for decrease spend (insurance and direct costs)

4. Damaged assets: results are evaluated to look for decrease spend (insurance and direct costs)



conclusion

ABP is proud of the pioneering role it plays in reducing two dominant safety challenges in our sector. We have identified a technology solution and a way to implement it that can easily be copied to other terminals. The TT Club is the ideal forum to discuss this technology-assisted approach to driver training. Truck/Lorry telematics and insurance providers have partnered for two decades in an effort to reduce road accidents. We believe the TT Club and its members can do the same for internal logistics operations involving moving equipment on the terminals.

LINK: https://www.abports.co.uk/news-and-media/latest-news/2022/abp-is-first-in-the-uk-to-trial-rombit-s-safety-wearables/

3. ABP - VR Safety Training

virtual reality port safety induction and training

the challenge

Associated British Ports (ABP) is the UK's largest ports operator, handling around £150bn of trade across our network of 21 ports every year. Ports are busy places and safety is a core value for ABP, which is why we continue to invest in upskilling our workforce. We have an in-house training provider, ABP Academy, which has developed an innovative Virtual Reality (VR) health and safety training course for employees. Watch demo HERE.

Ports can be dangerous places and having the right health and safety measures in place, as well as adequate training is vital to ensuring that everyone goes home safely at the end of the day. The use of VR makes the training more realistic and impactful, in turn making it more effective and improving safety in our ports. This technology provides a safe proactive way of experiencing and learning about the dangers faced in a port, without real-world near misses.

the innovation

Our VR safety training course is set in a simulated port environment, which incorporates different scenarios encountered by employees, including working at height and safely navigating the port estate and the office. This design is based on cross-regional and functional elements, focusing on the highest risks and widest outreach. The module can be applied not just for current use cases but to enable many more, laying the groundwork for a port metaverse, which could, in future, be used by all port users and customers. ABP owns all the models and code and is using open-source software platforms to build the applications that run the experience in a modular cost- effective way. In future, there is scope to expand the training so that it covers the use of port equipment, which will increase efficiency by eliminating the need for employee travel and for equipment to be taken out of service for training.

Research[2] has proven that using VR in training courses makes learning 4x faster than via traditional, classroom- based methods. Attendees are 4x more focused in VR training than in e-learning training sessions and 275% more confident to apply what they learned after training. Our analytics platform gathers data from randomised groups of participants and trends performance data automatically. The cloud-based engine receives data automatically from every user and adds to our data sets, helping the ABP Academy team quantify engagement and employee performance and identify future training gaps. A core objective is to reduce the number of incidents and near misses and increase awareness of 'Spot-It's' (ABP's tool to log potentially dangerous incidents).

[2] 'The Effectiveness of Virtual Reality Soft Skills Training in the Enterprise' by PwC pwc-understanding-the-effectiveness-of- soft-skills-training-in-the-enterprise-a-study.pdf

Sustainability

ABP is committed to the long-term use of this technology. As VR technology continues to advance, we can continue to increase realism and provide new and more immersive training courses for all our staff. By building and owning this technology, ABP unlocks multiple uses beyond just the proposed VR application. These include simulation modelling for operations, safety department toolbox talks and virtual port tours/experiences and more, resulting in an increase in efficiencies like reducing duplication and employee travel and delivering faster training.

how it was implemented

Associated British Ports (ABP) implemented its Virtual Reality (VR) health and safety training course through strategic steps using an agile process. This project was built with solution partners, ABP Innovation and the ABP Academy, working together to co create this imersive experience. The design, based on cross-regional and functional elements, focuses on high-risk scenarios with broad applicability. ABP owns all models and code, utilizing open-source software for cost-effective, modular applications.

Cloud-based analytics built using similar existing ABP architecture collects data from users, facilitating performance benchmarking and identifying training gaps. The program's scalability and potential expansion cover not only current scenarios but also future training areas like port equipment operation, reducing travel and downtime. ABP's commitment to sustainability involves long-term use of VR technology, enabling continuous improvement and realism enhancement.

The implementation aims to enhance safety by providing a realistic and impactful training experience, reducing incidents, near misses, and increasing awareness through existing safety tools like 'Spot-It.' Beyond training, ABP sees multiple uses for the technology, including simulation modeling, safety talks, and virtual port experiences, resulting in increased efficiencies and reduced duplication. Overall, ABP's approach integrates innovation,

ownership, and adaptability to leverage VR for effective, sustainable, and multifaceted improvements in port operations and safety.

result

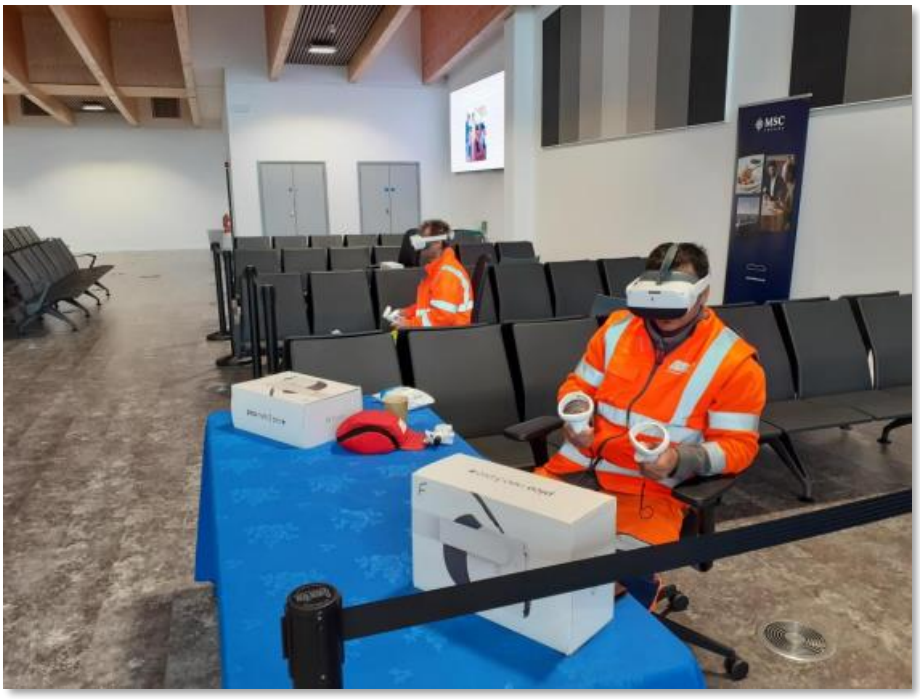
ABP has constructed and implemented this initiative, and it is currently effectively utilised for safety training across a considerable number of employees and functions throughout its network of 21 ports. The strategy of building rather than buying enables ABP to maintain flexibility in deploying VR within its self-constructed Metaverse, all the while remaining a cost-effective method for constructing and implementing modules.

Saheed Onisemo, ABP HSE Trainer, who delivers the H&S training, comments: “It is great that we were able to give colleagues an imersive insight into what learning within a 360 degrees virtual port is like.” “Whilst any decisions made in this virtual environment do not have real life consequences, participants do experience deeper learning results due to the realistic nature of the training, which helps them apply their knowledge to the real world more effectively.”

conclusion

In summary, ABP's implementation of the Virtual Reality (VR) health and safety training initiative highlights the company's commitment to innovation and employee safety. The success of the program, applied across ABP's network of ports, demonstrates a proactive approach to safety education. The VR training, providing a realistic insight into port

environments, proves effective in fostering meaningful learning experiences. ABP's initiative aims to reduce incidents and near misses, empowering employees to apply their knowledge confidently in real-world situations.



The broader impact of companies adopting VR and immersive experiences for safety training is significant. As shown by ABP, these technologies make training more efficient, with sessions typically four times faster, and increase participants' confidence by 275% in applying learned skills. The virtual approach minimizes real-world risks while enhancing the overall effectiveness of safety education. This not only improves employee safety but also suggests the potential for VR to reshape safety training in various industries. ABP's commitment to advancing VR technology sets an example for companies seeking practical solutions to enhance safety outcomes in their operations. Embracing immersive experiences in training contributes to a culture of continuous improvement and heightened awareness in workplace safety, fostering a safer working environment for all.

LINK: https://www.abports.co.uk/about-abp/safety/

4. Cargotec Finland Oy - Kalmar Collision Warning System

Straddle carrier collision warning system

the challenge

Collisions in your Straddle Carrier container yard can cost your business time, money and have a negative impact on your operations and safety levels. With Kalmar's Collision Warning System you can prevent and reduce the severity of collisions, allowing your equipment to operate more efficiently and safely with minimal downtime.

the innovation

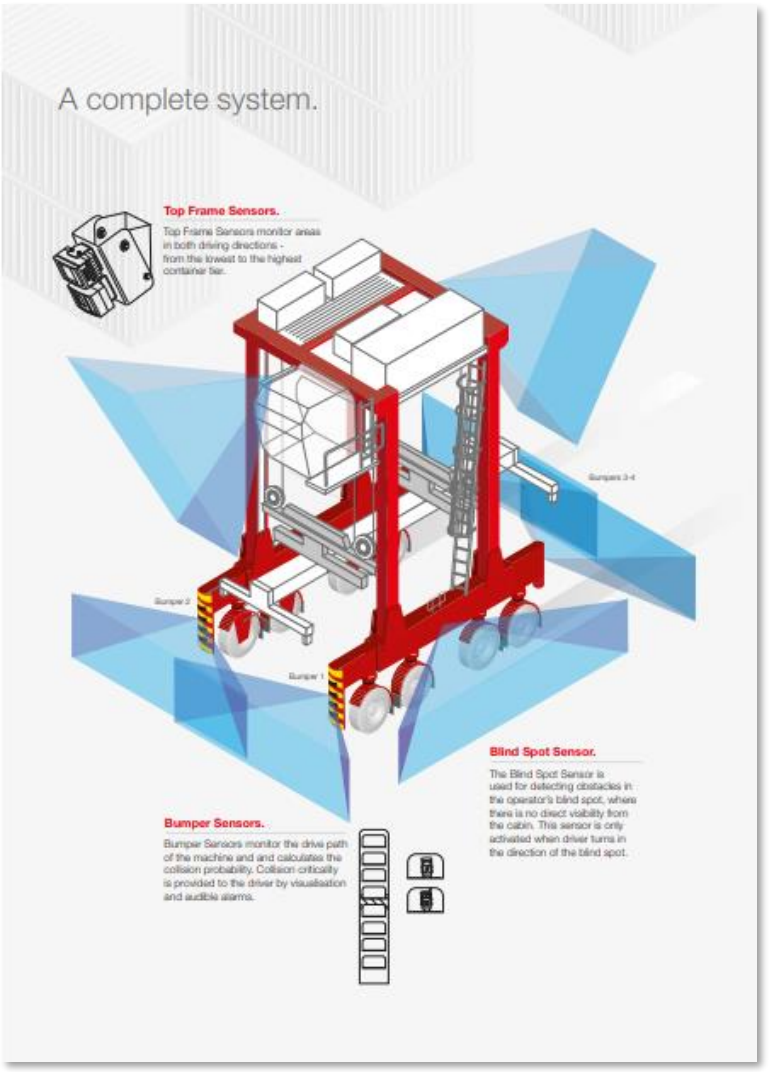
Kalmar´s Collision Warning System uses sensors fitted to a Straddle Carrier to survey the surrounding area and actively warn your operator visually and with audible alarms of any obstacles in the path of machine, its spreader or container being carried. Allowing operators to take immediate evasive action to reduce the risk of collision and damage to equipment or containers.

how it was implemented

The Kalmar Collision Warning system originated from customer needs and was developed in close colabouration with one of our customers, alongside a key supplier. The initial trials were conducted using a Straddle Carrier at Kalmar´s Technology and Competence Center in Tampere, Finland. Following succesfull tests, the system was retrofitted onto three Straddle Carriers at the customer's site for real-world testing. After several months of operational testing, the system demonstrated its effectiveness in actual use conditions.

result

The Kalmar Collision Warning System has effectively prevented Straddle Carrier accidents by alerting drivers in our customer´s operations.



conclusion

The Kalmar Collision Warning System not only makes operating your equipment significantly safer to operate in your yards, it also delivers on many other fronts:

Less maintenance and repairs

- Reducing the incidence of collisions in your yard means you will have to make less repairs to your straddle carriers, reducing costs and maintenance time.

Improved availability

- Reducing maintenance time on your equipment means they will be more available to work in your yard more often.

Longer lifetime of the machines

- By reducing the number of collisions your equipment has, they can be kept in a better condition for longer extending their operating lifetime.

Greater awareness and alertness

- By scanning the road ahead and providing alerts for any potential dangers, your operators will be kept more alert and attentive, making them safer drivers.

Lower insurance rates

- Having a collision warning system installed on your straddle carrier may result in insurance discounts as some insurance companies recognise the safety benefits of such systems and encourage their adoption.

LINK: https://www.kalmarglobal.com/equipment-services/straddle-carriers/collision-warning-system/

5. CM Labs Simulations - Port equipment simulation training

solutions based on authentic machine behaviours, accurate controls, and machine features

the challenge

Port operations can be hazardous, and particularly so for equipment operators. Operators are manipulating heavy loads using complex equipment, in dynamic operating environments. Operators also play a big part in the safety of others on the quay as they are the ones operating the equipment and their actions may impact other people – ITV drivers, people on the ship, people present on the quay.

According to a 2016 report from the International Labour Office, port work is regarded as an occupation with "very high accident rates" *despite* new and sophisticated innovations. Highlighting the risk to operators, a 2020 Port Skills and Safety report indicated that berth/quay were the top accident location in ports, accounting for 42.2% of all accidents.

Even under the best of conditions, operators have to be able to perform under a diverse set of operating conditions due to the 24/7 nature of port operations. However, even under the best of circumstances, the work is dangerous.

In the event of prolonged surges in vessel calls, for instance, pressure is exerted on maintenance and repair scheduling. This increases the likelihood of equipment malfunctions that expose operators to potential risk, including injuries or fatalities.

Other unexpected events or difficult weather conditions can provoke errors of judgment and destabilize the preparedness of even the most experienced operators.

Given these conditions, in most industries the solution is obvious: train, train, and then train some more.

But port terminals do not always have the luxury of dedicated instructional facilities or even regularly scheduled training, due to a lack of operational downtime, a lack of equipment dedicated to training, or both.

Ultimately, the challenge is to provide operators with a safe, effective means to train, so that they are prepared for the rigorous demands of port terminal operations.

the innovation

Simulation has long since earned its place as an operator training tool. However, when trainees get to the real equipment, they have traditionally needed to overcome “gaps” in simulation realism and undo the effects of any negative training.

As equipment has become more complex, this gap has become more pronounced. In complex, high-pressure environments, such as busy port terminals, this gap presents potent risks.

CM Labs Simulations' innovation has been to solve the realism gap by developing port equipment simulation training solutions based on authentic machine behaviours, as well as accurate controls and machine features. It is not just the machine and its physics – CM Labs works to model the operational conditions, so that operators become more familiar with how they should operate the equipment.

The key to this breakthrough is the true-to-life equipment behaviour embedded in CM Labs Simulations' training solutions. This realism emerges from the design work of CM Labs' experienced mechanical engineering group, together with input and validation from customers, seasoned operators, and other subject matter experts. In parallel, software engineers work in CM Labs' Vortex software engine to bring the realism to life in the shape of a holistic training tool that includes a wealth of learning and instructor tools.

Unlike other simulation developers, CM Labs' mechanical engineers have been collaborating with OEMs for decades, as well as with their expert operators—all with the goal of capturing the precise features and movement of the equipment in life-like operating conditions, so

there is no training gap for operators to overcome. The CM Labs team also has partnered with academic institutions in order to develop these innovative solutions.

The result: port terminals now have access to an innovative training tool that operators can use to develop focused skills while gaining familiarity and confidence, before setting foot inside the actual equipment.

how it was implemented

CM Labs simulation training solutions have been implemented at a range of port terminals, for a variety of use cases.

- Preparations for new equipment

Simulators give port terminals the opportunity to train to proficiency prior to delivery of remote-operated equipment. The world's first real-time remote operating station simulator was deployed by CM Labs at Ports of Auckland, in order to prepare trainees for delivery of remotely operated STS cranes.

- Updates to training programs

New Zealand's largest commercial port, Ports of Auckland Limited (POAL), uses CM Labs Simulations training to reach operational standards 33% faster, while providing a safer training environment. Likewise, by adding CM Labs' Straddle Carrier and STS Crane Training Simulation, DP World Melbourne, Australia has reduced training time by 50% and increased the rate of successful operator training by 150%.

- Evaluation benefits

Many port organizations use simulation to help instructors implement training and evaluation that is more consistent. It helps instructors to deep dive on students' progress and help focus training on where students require the most improvement. Simulation helps train for difficult moves, reducing the possibility of safety incidents.

- Terminal expansion

Port terminals that are undergoing expansion often need to train large numbers of operators in a short period of time. Without simulation, this can be prohibitively time-consuming and expensive. This has been one of the key drivers for adoption of CM Labs' simulation training at numerous ports internationally.

- New recruitment opportunities

CM Labs' solutions have had a powerful impact on the recruiting processes at the Port of Tilbury (UK). "The military are fascinated by what we were doing with simulation," said Simon Harper, Port of Tilbury's Learning & Development Manager and Director Tilbury on Thames Trust. "It attracts veterans to our programs, and it's a remarkably effective tool for recruitment."

result

Port terminal incidents tied to equipment operators are generally included in broader sets of safety metrics, so it can be difficult to quantify simulation-based training results. Still, terminals that rely on simulation agree that there are significantly fewer accidents associated with simulator-trained operators.

Other indicators are straightforward to quantify, including improved operator assessment and training effectiveness, and reduced learning curves.

- Improved operator assessment

With simulators, it's often possible to determine candidate potential within hours.

The traditional method of in-class and in-cab operator assessment and initial training is costly and tedious. Candidate qualification rates range from around 10% for complex cranes to 40%

for equipment such as straddle carriers. CM Labs' clients report that candidates having passed the initial simulator training have a nearly 99% success rate in becoming full-fledged crane operators.

Qualification rates skyrocket because the initial screening is far more effective, allowing organizations to focus on the right candidates, instead of those that don't have the aptitude to be operators.

- Improved training effectiveness

Using the traditional training method, given 100 candidates, 25-30 candidates will pass the live crane training, and of those, 10-12 candidates will become crane operators with acceptable productivity levels — 10%-12% of all candidates.

With the simulator method, 30 candidates will pass the short simulator training out of 100.

Of those, 25-30 candidates will become crane operators with acceptable productivity — 25%-30% of all candidates. The simulator approach is 2.5 to 3 times more effective.

- Reduced learning curve

Simulation makes it easier to implement concentrated seat time with targeted training objectives.

CM Labs' clients estimate that the learning curve is 6-12 months faster, which has a positive financial impact easily representing hundreds of thousands of dollars.

conclusion

In closing, just a few words from users of this innovative solution:

"It's straight out of the sim, and into productive work on the real crane."

Tony Couzner, Training Superintendent, Flinders Adelaide Container Terminal

"It improves our training success rate enormously, and it's revolutionized our approach to monitoring, measuring, and increasing productivity."

Simon Harper, Learning & Development Manager and Director Tilbury on Thames Trust, Port of Tilbury

"As a crane operator, you are responsible for the safety of the entire shipyard. And the CM Labs simulator helps train against unsafe manoeuvres."

Eric Battersby, Bulk Terminal Manager, Port of Corpus Christi Authority [PCCA]

LINK: https://www.cm-labs.com/en/simulation-solutions/vortex-training-simulators/hardware-features/

6. DP World Southampton - Safe Padding Area

safe fitting/removal of twist lock ('pinning') ops

the challenge

At many ports around the world, the activity of "pinning" is undertaken under the legs of the crane, pinning has been done in this way for the past 50 years. The process involves the fitting or removal of twistlocks for all containers that are to be loaded on deck, to lock the containers into position during sea carriage.

The area where this is carried out is most common directly underneath the operating quay cranes that are loading and discharging the containers, including the weight of the spreader these can have a combined weight of up to 65mt, sadly there have been many examples globally of crushing incidents with personnel carrying out these duties. The area is often also in the path of port vehicles, in Southampton this includes straddle carriers where the driver is in an elevated driving position at the top of the machine, 13m above the ground, where the view of personnel below can be obscured.

Figure 1 - Crane driver's view of padders.

The safety of our employees is paramount. We recognise pinning underneath the crane is not unsafe as we have multiple safe systems of work to ensure anyone carrying out this activity remains safe. However, we took the opportunity to review how we could make it even safer. The challenge was to remove personnel away from this risk area and at the same time maintain the efficiency of the port to add/remove twistlocks to the required containers without prolonging the vessel stay or the number of personnel required to carry out the task.

the innovation

For SCT 5, a separate padding area has been constructed on the Port to enable this function to be carried out away from the quay cranes. Containers are delivered to the area directly after quay crane discharge and thereafter moved to the stack for general storage or vice versa.

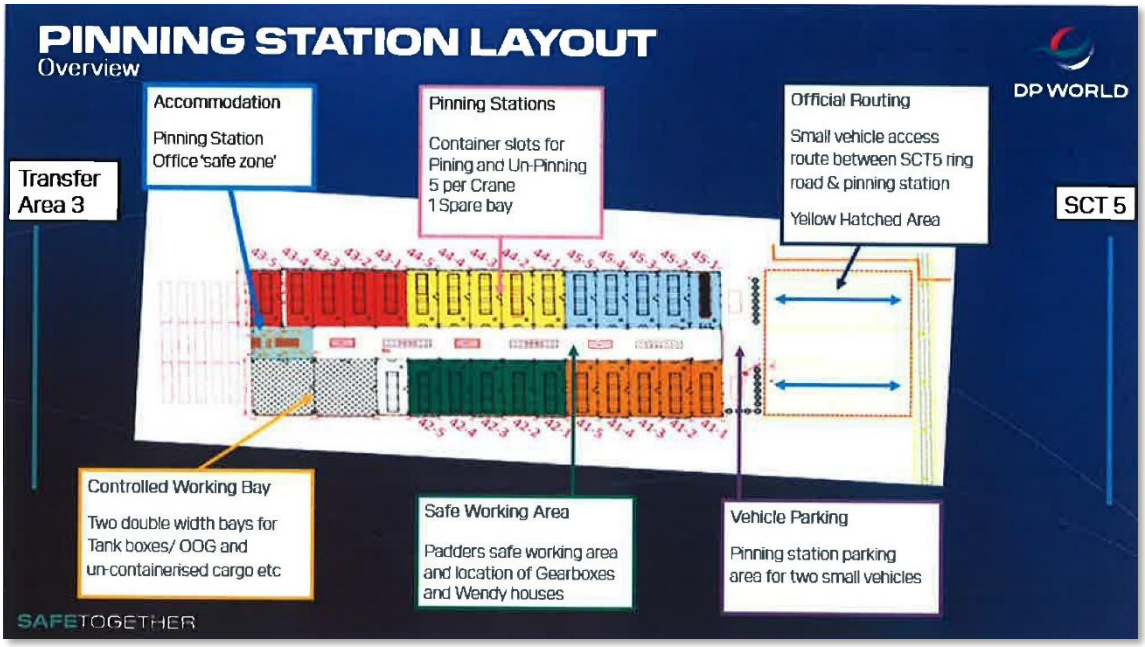
Each padder has a tablet advising the container numbers of the units in each bay and confirms if pads are to be added or removed. Jobs are flagged on the tablet once completed, which sends a message to an available straddle to arrange the collection of the container.

Figure 2 - Single barriered container bay

how it was implemented

The padding area has 25 container slots, whilst containers are being delivered padders can work other slots preventing a delay in the work being carried out.

Every individual crane on SCT 5 has 5 stations which are colour co-ordinated accordingly. Each station is operated by padders, who operate the pedestrian & straddle barriers on both ends via a button.



Each pinning station bay\has two barrier control units, with each unit containing two buttons, one raising the stradde barrier and one lowering the SC Barrier. (One for each padder if two padders are working one bay). Padders are to operate the buttons to create a safe working environment. When a padder needs to access the pinning station bay, they are to press the button to lower the straddle barrier. Once the stradde barrier is down, the pedestrian gate will open, permitting their entry. After a padder has serviced a pinning station bay, they are to leave the bay and press the button to open the stradde Barrier and in turn close the pedestrian gate. Only when the pedestrian gate is closed will the Straddle barrier raise. Buttons are to only be pressed when all padders are clear of each pinning bay.

When straddles are required to pick up/drop off these gear boxes into the safe area, the co-orindator makes sure all pedestrials are in the "safe zone" located next to the office before allowing access through the main gate

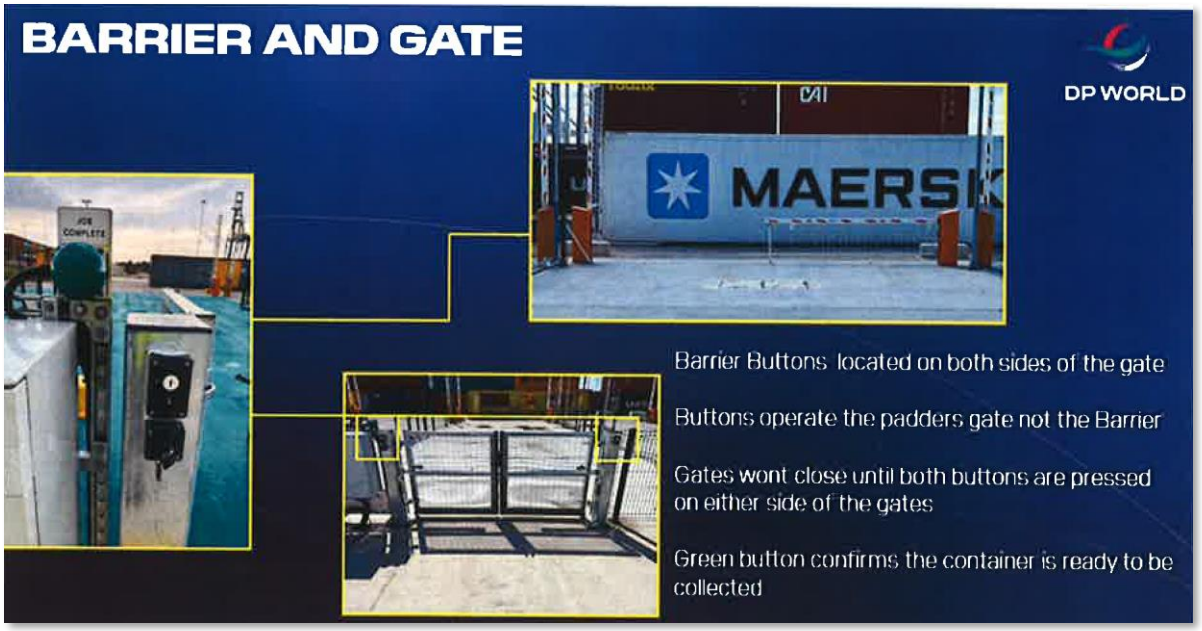
Total investment in this project was £4,500,000

result

After trials the area became fully operational from July 2023, all pinning activities for berth 5 are taking place in this area and padders are no longer located under the quay cranes

conclusion

Separate pinning stations will be developed in the future for berths 1-4.



LINK: https://www.dpworld.com/southampton

7. Euroports (Group HQ, Antwerp-Belgium) - Line of Fire program

mitigating cause/consequence from primary risks in bulk and break bulk handling

the challenge

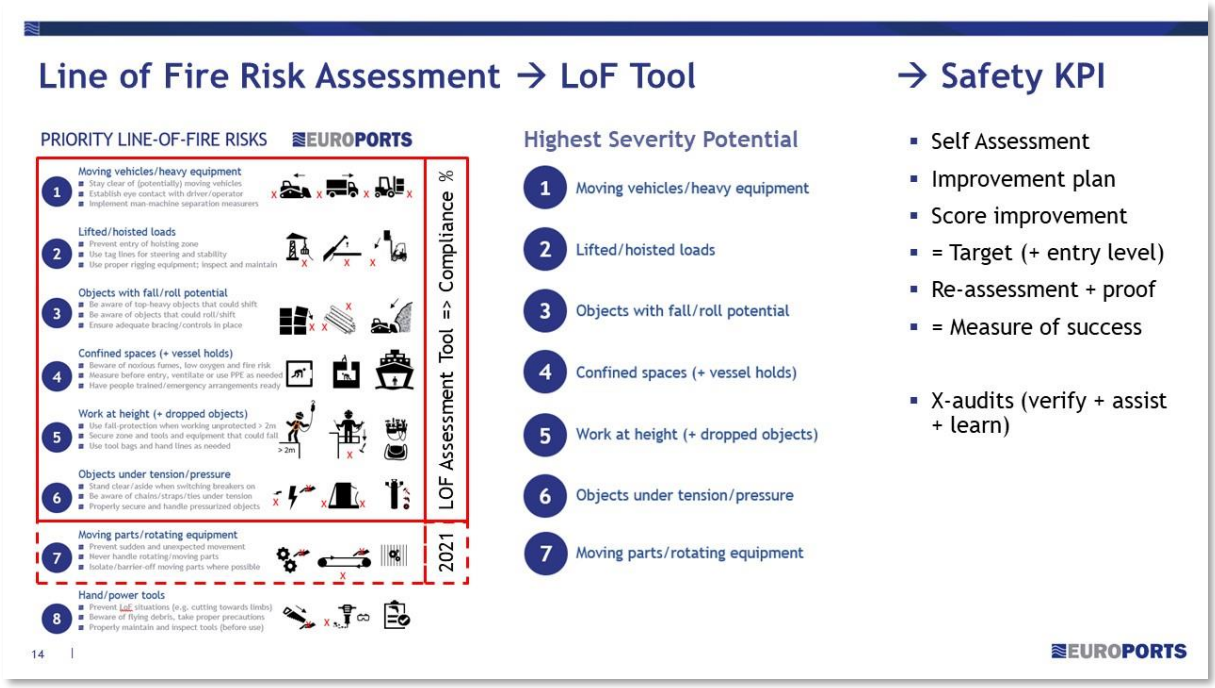
The port environment is far from benign and unfortunately, to this very day has seen its fair share of very serious, life-changing or even fatal accidents. The approximately 50 Euroports locations worldwide have not been exempt from this in the past. There was, and for the foreseeable future - as long as personnel are working in the vicinity of heavy machinery and transport means and/or in the confines of vessel holds and other limited spaces - will remain a clear and urgent need to prevent any harm from happening to these people.

Measures to achieve this should look both at preventing incidents from happening in the first place (left side of the bowtie) and to mitigating the consequences should something happen after all (right side of the bowtie).

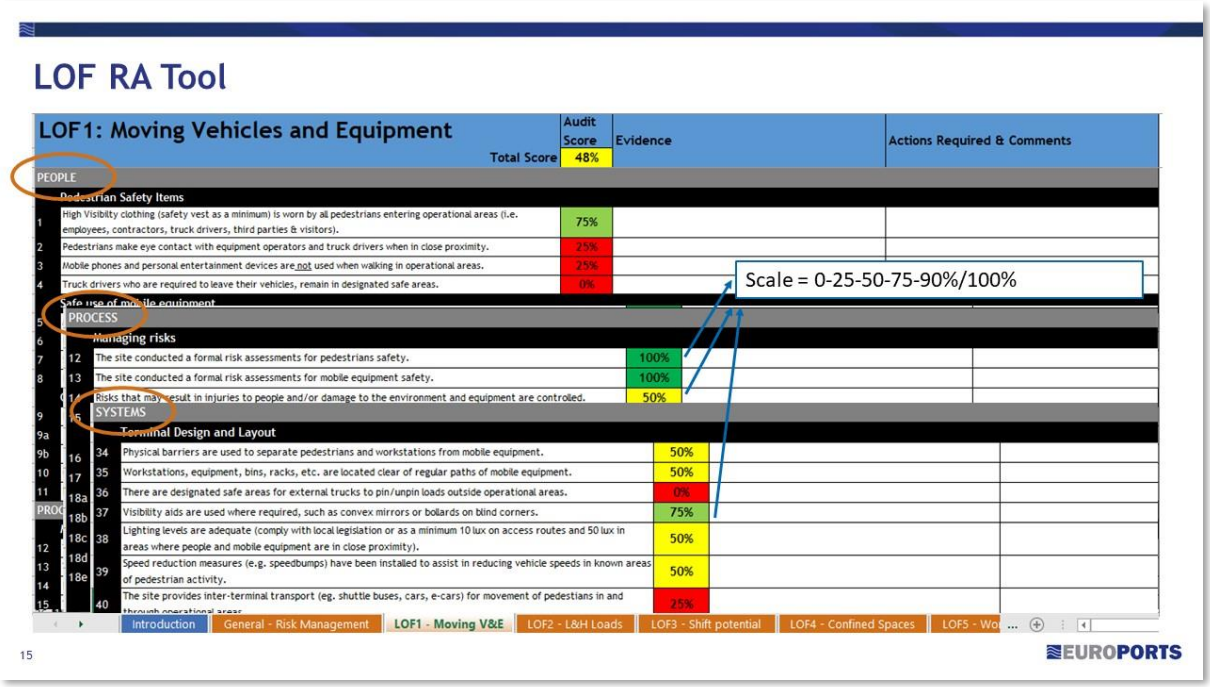
Measures need to be implemented proactively rather than reactively, often following an actual accident or near-miss.

the innovation

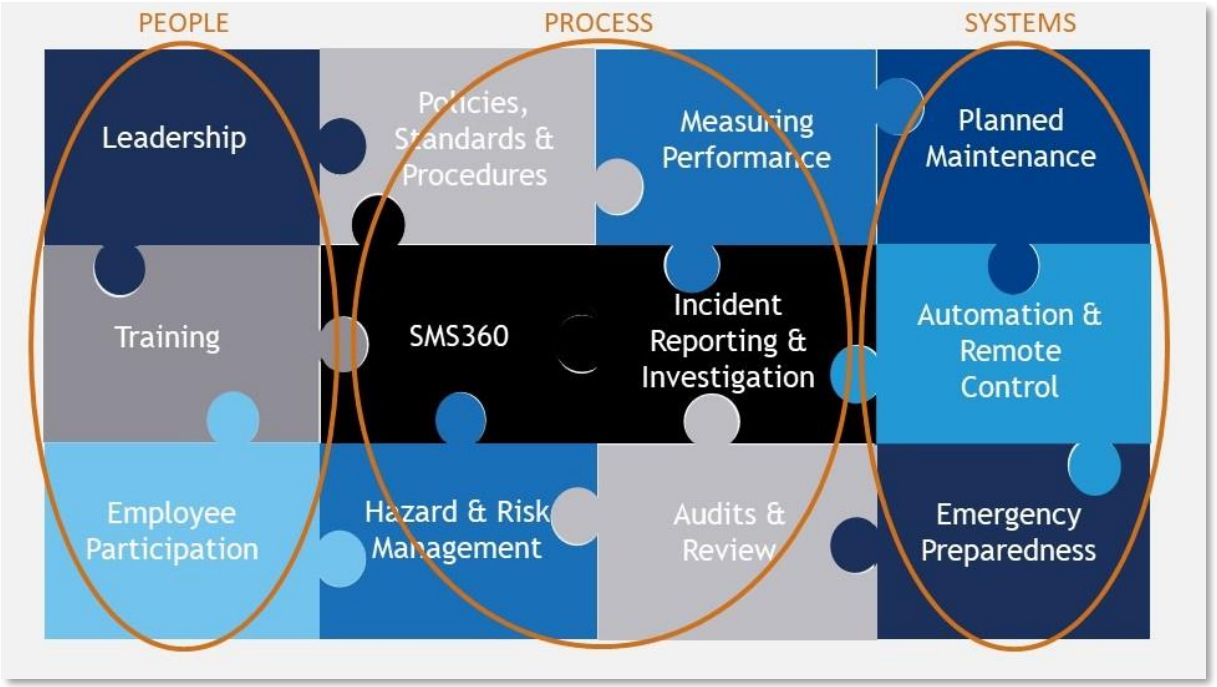
By combining several existing techniques and tools, also from previous experience, a so-called Line of Fire (LOF) program was developed, aimed at mitigating if not completely eliminating either cause or consequence, or both, from primary risks in our bulk and breakbulk handling industry. To determine these primary risks, an analysis was made of severe accidents over the previous 10 years, both within our own company as well as industry wide port operations. This resulted in the identification of 8 high risk areas, 7 of which were assessed to have the potential for accidents with a (near) fatal ending. The resulting program consists of an Excel based self-assessment tool with a scoring used for a safety bonus remuneration system on



the one hand, and a communication and learning campaign on the other. The focus of this submission for the 2023 Safety Award is on the self-assessment tool and use thereof.

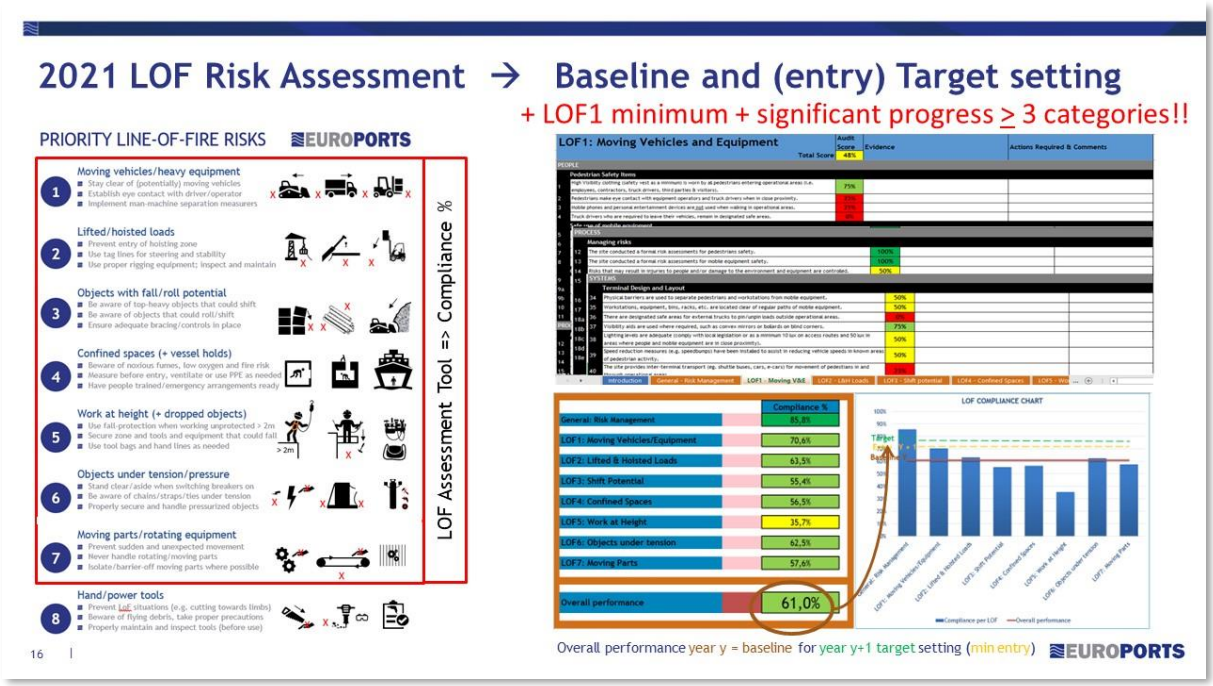


In short, each LOF-category in the tool comes with a myriad of minimum requirements that should be (put) in place to prevent or mitigate risks. The scoring per item can be 0, 15, 50, 75, 90 or 100%, but any element prone to human error may not be scored higher than 90%. The total score per LOF (and 1 general risk management) topic are summarized into one overall, average score being used for target and hence bonus award purposes (see the pictures for a better understanding).



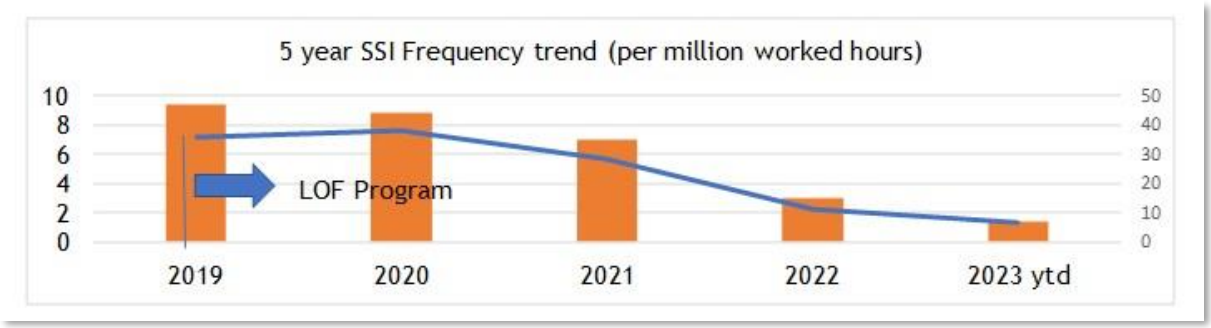
how it was implemented

First the tool was designed around 6 of the mentioned risk areas. After peer consultation and comment rounds approval and support was sought from and given by the company's executive committee. Subsequently a road tour was done throughout the countries to explain the tool to the local management teams. As a result in a next iteration, the 7th risk area was added to the tool. Finally joined sessions were organized with local terminal teams to actively start working with and finally completely filling the tool with applicable compliance scores at the time of implementation. The latter formed the baseline score for the respective locations from which the initial targets were set for the first year. As there is some room for subjectivity in scoring, it was made clear that the tool was not meant for benchmarking but for improvement purposes only. Though primarily a self-assessment tool, the measure of improvement in the score on an annual basis is used for safety bonus renumeration purposes. This is possible because proof needs to be presented for any score increase as per local action plan to the Group QHSE director and these claimed improvements are further validated during an ongoing, peer-audit system with 2 audits a year per entity (1 per year for some smaller ones).



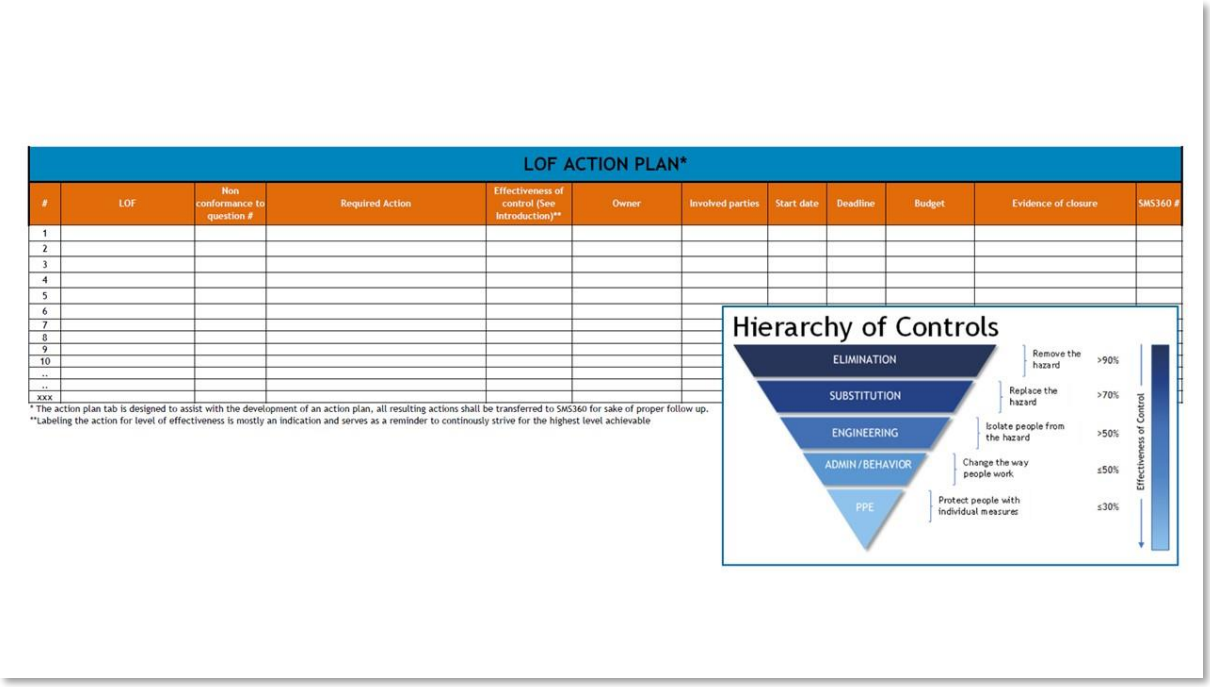
result

Qualitatively speaking, the use of the tool (and matching campaign) had a very positive impact on the pro-active further improvement of safety in our entities. Where before, improvements were primarily driven by corrective actions following lost time incidents or worse, with the implementation of the tool and the need to increase the compliance score to make the year-end target came an ever-increasing proactive mindset to fix things before they go wrong. Quantatatively speaking, the number and frequency of serious safety incidents (accidents or near misses with a life-changing or -ending potential, notably, no fatalities occurred since implementation) declined drastically in the years following implementation (2019).



conclusion

There are undoubtedly more factors that had a positive influence on our companies safety results over the past 4 to 5 years. Ironically, we did see a slight increase in so called lost time injuries (LTI), especially during the Covid-19 period. But overall, the total number of recordable injury incidents also declined. At the same time, we also invested a lot of effort in more and better reporting, initially resulting in an increase of (reported!) incidents. Adding a reward component (previously based on LTI numbers) had a positive impact on the tool's implementation and continued usage over the past 4 years, with matching results.



LINK: https://www.euroports.com/

8. Flint Systems - Virtual Reality Training Simulator

customisable universal hardware platform, able to reflect training on every machine

the challenge

Port areas, as well as other sectors, present challenging work environments, especially when it comes to safety of freshmen. Several factors contribute to the difficulty of training employees in port conditions.

Ports are frequently bustling with heavy machinery, including cranes, forklifts, and cargo handling equipment. When not operated correctly, these machines pose a significant risk, leading to accidents, injuries, and even fatalities. Moreover, the constant flow of various vehicles, such as trucks, container handlers, ships, and trains, increases the risk of collisions and accidents unless proper traffic management and safety measures are in place.

Ports handle a wide range of cargo, some of which includes hazardous materials. Mishandling, improper storage, or transportation of these materials can result in chemical spills, fires, and other dangerous incidents. These challenges are further compounded by the diverse and ever-changing weather conditions that ports are exposed to, including strong winds, heavy rain, extreme heat, and fog.

Planting an untrained or still-learning operator in a real machine under these conditions is extremely accident-prone. It is true that all these factors contribute to the considerable difficulty, cost, and often the inherent danger associated with training people to operate port machinery. The safety of human lives and equipment is at stake, making training in these conditions both essential and complex.

the innovation

Considering the safety issues described in the previous section, Flint Systems decided to answer them, creating a VR training simulator.

VR training simulator is a training device, consisting of software and hardware. We have developed a universal hardware platform, able to reflect the training on every machine. We can customize this platform by adding/removing a steering wheel, joysticks, etc.

The software side is fully integrated with the hardware platform. The machine we create in VR is a twin of the real one, reflecting physics, features, sounds, and all that is vital for the simulation.

The trainee needs to sit on the simulator's seat, put on the goggles and can dive into the safe, virtual world of training.

Flint Systems' VR simulators offer several advancements of safety, including:

- Safety of the trainees – the training takes place in safe environment
- Safety of other people – no one can be hurt by someone training in VR, contrary to conventional training taking place next to real operations
- Safety for cargo and machines
- Trainees who spent an exact number of hours on the simulator are allowed to train on real machines, which increases the safety level of training
- Trainees can train the unexpected by some dangerous scenarios lessons – e.g. working in collision with another crane, or breaking the rope, etc.

how it was implemented

Our first series of simulators was installed at the New Competencies Center, which was operational at the Port of Gdańsk during 2019-2020.

We delivered five simulators that work on three different platforms:

- RTG
- Reachstacker
- STS
- Rail port crane
- Mobile crane

The training center continues to use our simulators, providing training to numerous operators for the nearby ports of Gdańsk and Gdynia.

In fact, our client's business has expanded significantly since our initial delivery. We have collaborated on various projects, including the most recent one – the Crew Transfer Vessel (CTV) simulator, designed to train captains of CTVs operating in the wind farms off the coast of Poland that will be built in the next few years.

result

Since 2019 and 2020, many people have undergone training using VR training simulators at the New Competencies Center.

Unfortunately, we do not know the exact number, as it is confidential information belonging to our client and is crucial for their business. However, another client shed light on the exam pass rate.

The introduction of a tower crane simulator, supplied to Maukran, one of the tower crane rental companies in Poland, between September 2021 and June 2023, achieved a success rate of 90%. This means that 9 out of 10 individuals trained on our simulator successfully passed the exam conducted by the government's technical institution. This marks an incredible advancement in terms of efficiency, cost-effectiveness, and, most importantly, safety.

conclusion

Virtual reality simulators can significantly advance the safety of training and the safety of operators performing various tasks for several reasons:

- Risk-free environment: VR simulators provide a controlled and risk-free environment for training. Operators can practice and learn in a virtual setting without the potential dangers associated with real-world tasks.
- Realistic training scenarios: VR simulators can recreate highly realistic training scenarios, mirroring real-world conditions, which helps operators prepare for a wide range of situations. This realistic training enhances their ability to respond effectively when faced with actual operational challenges.
- Skill development: Operators can refine their skills and techniques in a controlled environment. This allows for gradual skill progression and mastery, reducing the likelihood of errors and accidents when transitioning to actual work tasks.
- Repetition and practice: VR simulators enable operators to repeat and practice tasks as many times as needed without the constraints of time, cost, or safety concerns. This extensive practice helps build muscle memory and competence, which can enhance safety.
- Scenario customization: Training scenarios can be customized to specific work environments, industries, or tasks. This adaptability ensures that operators are well-prepared for the particular challenges they will encounter in their job, increasing overall safety.

- Emergency response training: VR can be used for emergency response training, allowing operators to practice their reactions to hazardous situations without exposing them to real risks.
- Psychological comfort: Virtual reality can help alleviate anxiety and fear associated with high-risk jobs by gradually acclimating operators to challenging conditions. This psychological comfort can lead to better decision-making and reduced stress, contributing to safety.

LINK: https://flint.systems/

9. FM Global Safety Solutions AB - Mobile Strongroom

patented and certified shipping container strongroom

the challenge

Shipping containers have played a pivotal role in the history of global trade and logistics, revolutionizing the shipping industry by transforming the way goods are transported worldwide. While different innovations have increased the effectiveness of containers over the years, innovations in security have been relatively minor. Criminal networks are increasingly finding sophisticated ways to commit cargo theft and exploit system vulnerabilities.

Incidents of cargo theft, along with storage theft, have escalated dramatically in recent years, posing significant risks not only to individual companies and corporate supply chains but ultimately to the economy at large. This challenge has grown into a multi-billion-dollar criminal enterprise, resulting in substantial financial losses for all parties involved. As the transportation landscape continues to evolve, so do the tactics employed by criminals, constantly looking to exploit any weaknesses within the system.

The continuous evolution of security risks within the supply chain necessitates a proactive and vigilant approach to safeguard assets and maintain the integrity of global commerce.

the innovation

Mobile Strongroom, from FM Global Safety Solutions (FMGSS), is the only certified break-in proof intelligent vault shipping container in the world. It provides the highest level of container security for secure storage and safe transportation across ocean, road, and rail freight.

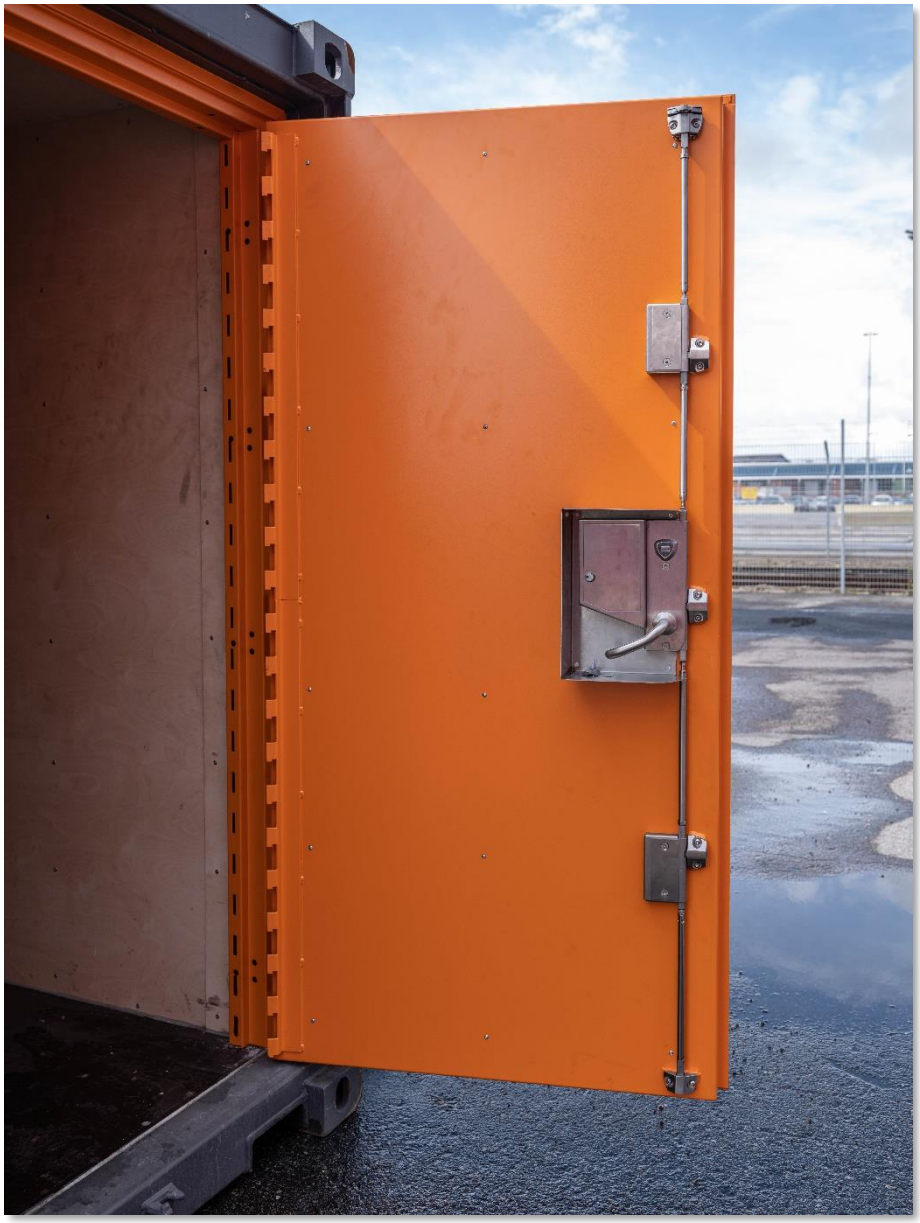
Mobile Strongroom has fully reinforced protection at every elevation of the unit including the doors. This reinforcement comes without a significant increase in weight, nor a significant reduction in storage space, due to our patented internal container structure.

Mobile Strongroom is a genuine 'smart vault', equipped with advanced real-time monitoring systems to collect data including location, temperature, humidity, shock and more. The vault doors are integrated with advanced locking technology to monitor access. Assets can be detected and logged when they are retrieved or returned.

Mobile Strongroom can also act as a stand-alone storage solution, without the need for external container doors, enabling 24-hour unattended security as part of site storage or as a last mile delivery solution, saving valuable time while reducing fuel costs and carbon emissions.

Key Features

- Keyless entry
- Self-locking
- Real-Time Asset Intelligence Terminal
- Identifying & programable vault-lock system
- Third-party hardware/software integration ready, i.e. mobile access
- High protection multi-lock, ballistic, blast and fire resistance
- Low weight, only 9,19% reduction in payload (20ft)



how it was implemented

Implementation of Mobile Strongroom required a collaborative effort involving key stakeholders from various industries, transporters, insurance companies, and industry experts. Mobile Strongroom had to meet specific requirements, with primary focus on security, while also incorporating functionality, maximum weight capacity, ease of access, and high-tech features to enable real-time integrations.

During rigorous tests by the independent state-owned research institute RI.SE, Mobile Strongroom underwent thorough assessments to determine and classify its resistance level according to EN 1143-1, which falls under ISO standards. This meticulous testing process served as the foundation for certification.

Mobile Strongroom was earlier this year introduced to the Swedish market as a secure mobile storage solution, used on site in various projects and recently with presence at leading conferences globally.

Figure 3 - A typical shipping container or a mobile strongroom - which do you think?

result

With outstanding results from the RI.SE testing, Mobile Strongroom successfully exceeded Grade 3 in accordance with EN 1143-1:2019 Scheme 5 (ISO/IEC 17067:2013). Grade 3 allows secure storage for cash, explosives, weapons, and ammunition. Mobile Strongroom is certified by SBSC - independent certification body accredited by the state authority Swedac (Swedish National Accreditation Body). SBSC also oversees the quality of both the manufacturing process and the finished product, ensuring the validation of Mobile Strongroom's excellence.

Mobile Strongroom's patented design significantly surpasses conventional security measures. This recognition strengthens its position as a leading innovation globally. The patented design not only offers a unique and unmatched solution throughout the supply chain, but also increases its intellectual property value and protects against unauthorized imitation. Our smart vault solution is poised to redefine global security standards and provide unparalleled protection in a rapidly changing world.

conclusion

Mobile Strongroom signals a new era in cargo security, supply chain transparency, and sustainability. Its ingenious design offers an unrivalled level of global shipping container

security and monitoring, while maintaining full mobility and compatibility. Mobile Strongroom represents a revolutionary solution for storing and transporting valuable cargo for various industries, while simultaneously reducing costs of labour, fuel, and emissions.

Mobile Strongroom represents a true and significant advancement in the ongoing effort to protect global trade and supply chains from criminal activity. Mobile Strongroom is not just a secure container; it's a commitment to drive the shift towards a more secure, transparent, and sustainable transport industry.

LINK: https://fmgss.com/

10. KALP GmbH Automatic Lashing Platform

insert and remove twistlocks and stackers fully automatically, eliminating the need for personnel to work nearby or under suspended loads

the challenge

Even in the most modern container terminals, twistlocks and stackers are still removed from or inserted into container corners by hand. And this despite the fact that the manual lashing process has long been identified as one of the last major safety risks in terms of work safety. Both work in the travel area of horizontal transport under the gantry crane and work under suspended loads repeatedly result in serious injuries to stevedores, including death. Numerous attempts to develop technology to eliminate the need of personnel working in the vicinity of suspended loads have been made during the years but with no or limited success

the innovation

The ALP (Automatic Lashing Platform) is the only system on the market that can insert and remove twistlocks and stackers fully automatically, eliminating the need for personnel to work nearby or under suspended loads.

The ALP operates independently of external power supply through an internal hydraulic system that utilizes the weight of the container and spreader. It has magazines that store over 1,000 twistlocks or 2,000 stackers (depending on sizing). This is equivalent to a bay of a Tripple-E Class container ship. The ALP can also be monitored and operated from a safe distance by integrating it into the terminal's own network and the corresponding integration software, or by using a handheld device.

how it was implemented

The ALP was integrated into a German terminal in Aug. 2021 and is used there in real operation. To ensure error-free handling, the relevant terminal employees (gantry crane and horizontal transport drivers) were instructed by KALP GmbH in the use of the ALP.

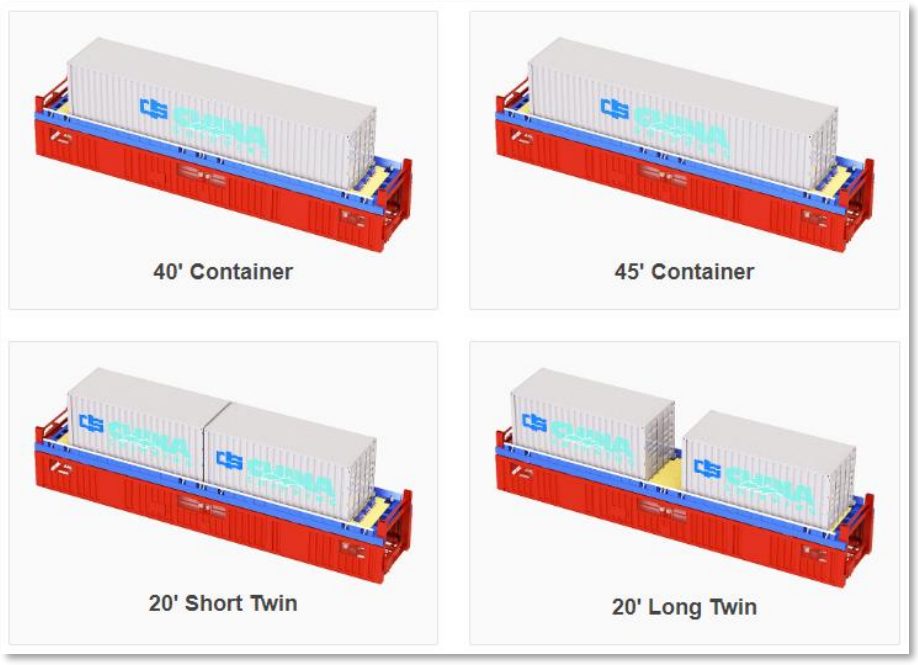
result

During the deployment of the ALP, there is no longer any need for personnel to be on duty under the gantry crane with suspended loads. In addition, an increase in productivity was observed during operations. The general acceptance of terminal operators and employees working with the ALP (gantry crane and horizontal transport drivers) was also observed.

conclusion

In order to really fully automate a modern container terminal and, above all, to fulfil all safety aspects, the use of employees in the hazardous area under the gantry must be eliminated. The ALP has shown that it is possible to operate without the need for employees to be next

to suspended loads. This means that the ALP closes the last remaining gap in terminal automation and one of the last major risks for terminal employees. In addition, the ALP can be used in any terminal. In modern greenfield as well as existing brownfield terminals. For running the ALP no changes in the terminal infrastructure are required. The ALP is the missing link in terminal automation and a huge upgrade for each terminal safety concept!



LINK: https://www.kalp-gmbh.eu/products

11. KG5 Consultancy Ltd - Vibrotrim™

mechanical bulk trimming, protecting workers from fall, crush, struck and engulfment risk

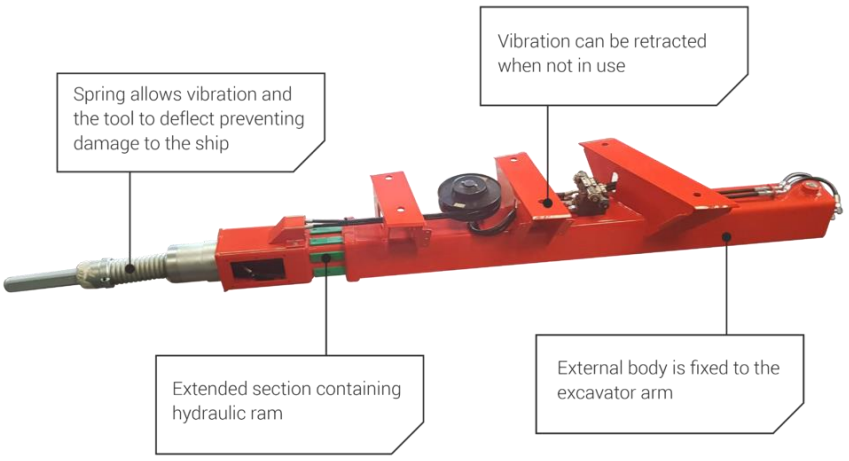
the challenge

Following a 2012 fatality in ships hold where pedestrian workers placed themselves in harm attempting to rescue a casualty then recovering the deceased I had an overwhelming drive to mechanise bulk ship trimming. Traditionally bulk trimming is done by personnel physically knocking the cargo loose with 'sticks'. I wanted to make trimming operations safer. Additionally, the 'people with sticks' approach was becoming more difficult because of the negative impact of skills drain and broader lack of experienced people.

the innovation

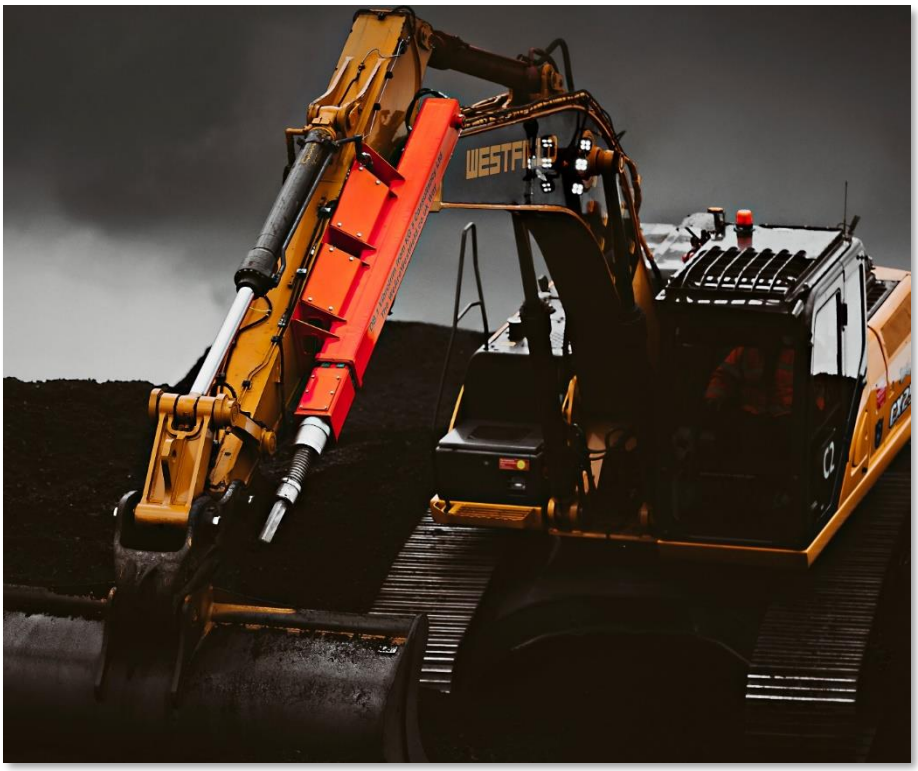
The port ship discharge industry has not had the same safety improvements that other industries such as construction and quarrying have seen.

One of the biggest risk areas is the practice of using pedestrian operators to go into the holds of ships and manually dislodge stuck cargo. These 'men with sticks' are being put into an extremely hazardous environment with only the most rudimentary of tools. It seems laughable that over two decades into the 21st century this is still the 'go to' option in ship discharge.



"The Swiss-knife of ship trimming" Adding easily deployed vibrating tool to mechanical ship trimming equipment.

- Remove pedestrians
- Reduce fall from height risk
- Reduce crane lifts
- Increase productivity
- Reduce asset and ship damage



how it was implemented

Used successfully in largest tonnage port of UK until cessation of contract.

result

- reduced risk
- improved productivity
- reduced damage

conclusion

The tool achieved the results I hoped for during our contracted period, zero fatalities and improved productivity.

LINK: https://vibrotrim.com/about/

kg5consultancylimited@gmail.com

12. Machine Eye Technology - Machine Eye platform

centralised, 24/7 means of monitoring and controlling pedestrian-plant interface compliance across the terminal/ port site

the challenge

One of the most important tasks in keeping terminals, quaysides and operational areas safe, is the segregation of people and plant. Given the 24/7 nature of port operations, and the heavy use of mobile plant: employees, contractors and visitors are exposed to a high level of risk associated with collision or crush. These injuries are often severe or fatal.

the innovation

The project was a joint proof of concept between Belfast Harbour Commissioners (Port of Belfast) and an innovative SME, Machine Eye Technology with input from BT. In a unique arrangement, BHC provided the innovation challenge as well as access to the port and it's teams for the SME to develop the solution within the port. This is an innovative framework, which has fostered an agile development environment and a very close working relationship between developers and end users.

The Machine Eye platform provides a centralised, 24/7 means of monitoring and controlling pedestrian-plant interface compliance across the terminal/ port site. The technology uses Computer Vision AI to optically identify persons within the port, whether staff, visitor or otherwise and assess the level of risk they are exposed to by the plant or machine in question. Onboard the machine, operators are provided with improved visibility, and AI assisted interpretation of their surroundings. Should a pedestrian be at risk from the machine, the AI will generate alarms and warnings, allowing a pre-emptive action to be taken to remove risk to the pedestrian.

Outside the machine, where pedestrians are observed by the AI, the data is transmitted on the Harbour 5G network to allow further cloud analysis into compliance, trends and behaviours. This is analysed in the cloud and presented visibility to authorised personnel to assess trends and growing risks. Key to this is a heatmap, allowing graphical assessment of risk throughout the harbour.

how it was implemented

The Harbour provided a sandbox environment, and full access to its staff, resources and partner companies for the delivery of the proof of concept. The delivery was undertaken by the startup. A working group of key stakeholders from the habour – it's management, operations staff, stevedoor companies and machinery suppliers was brought together. Through this, each aspect of the implementation of AI was considered: practical problems, legislative frameworks and human concerns.

The startup led engagement with all stakeholders, and assured signficant buy in from all partners in the project. This was first delivered throughout the covid-19 lockdown, requiring new and innovative means of engagement to be adopted.

Following a period of design-thinking led engagement, technical and policy delveopment was delivered in parallel to engagement. The technology was implmented on a designated machine within a high traffic area of the harbour. Regular engagement was then held with the users, superviosrs and management to assess the impact and performance of the system, alongside development, in an interative, data and feedback led process.

The outcomes from this project were (and continue) to be shared with industry to ensure best practice from the project can be adopted by others, with the value and safety benefits being open to others.

result

The project was deemed to be highly successful in meeting the stated aims, and the collaborative innovation model employed was also a success. This is a model which can be used in a wider context to foster agile innovation in this environment.

During the period in which the system has been fitted to a specific high risk machine within Belfast Harbour, there have been no recorded incidents. Pedestrian interactions with the machine red zone have decreased 70% within 4 weeks of deployment, and there is a groundswell of awareness of these incidents amongst workforce, leading to positive behavioural change.

Feedback from operators is positive, with them enjoying the additional visibility and assistance it provides in day to day use. Management have increased visibility, and with this high resolution data, previously unavailable, trends have been identified in port operations. These trends have highlighted higher risk activities which have previously gone unnoticed. The result has been interventions being made at an early stage in the design and conduct of these operations, which have maintained produtivity, but increased safety within the port.

conclusion

This project has been a highly successful example of a large stakeholder (Belfast Harbour Commissioners) and a co-located SME (Machine Eye Technology) working together in an agile manner to implement innovative new technology. Both teams working together closely has yielded impressive results, significant workforce buy-in, and a clear pathway to safer port operations, as a result of a dynamic and unique innovation project. Since the launch of the project, there has been an increased awareness of transport safety within the port, and with the deployment of the perception systems, a notable increase in compliance and reduction in incidents raised/ reported. This has ultimately demonstrated the innovation outcomes of making the port a safer place to work.

LINK: https://www.machine-eye.com/

13. Maritime Training Institute, Karachi, Pakistan

full mission engine room plant and HV simulator training systems

the challenge

There was lack of training facilities in Marine Engineering in the region. Candidates typically had to travel overseas (e.g. Singapore and the UK) to undertake these courses. This was expensive and a limiting factor on the sustainable growth of local and regional skills development.

the innovation

The Karachi Maritime Training Institute took the initiative and acquired state of the Art Simulators which include:

- Engine Room Plant Simulator – Full Mission
- HV. High Voltage Simulator

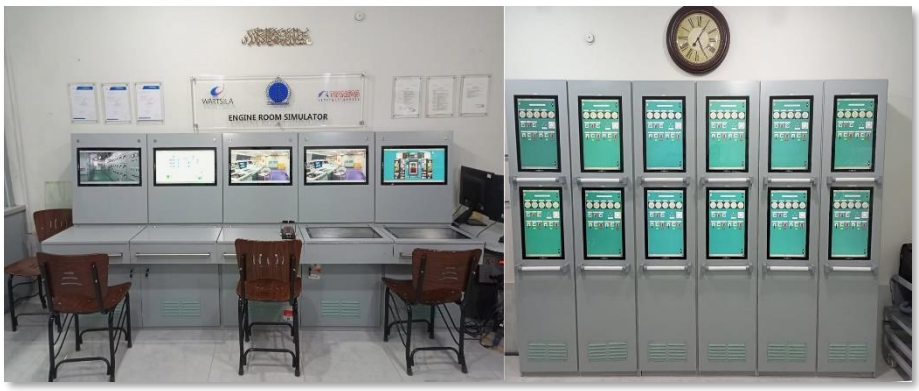
In parallel the Institute put into place train the trainer courses for our instructors so that they should be fully acquainted with the operation of the simulators. As a private institute this was a potentially risky investment with no guarantee of success. It required substantial work and belief in the outcome to create and drive through the business case and deliver the results to our students.

how it was implemented

We identified the system that would meet the learning needs of our candidates.

The next major task was to obtain approval for the spend from local Administration.

We designed a syllabus and training plan consistent with the learning outcomes of the appropriate International Maritme Organisation model standards and submitted them to local Administration. This was a complex process and we finally received approval at our third attempt. Once the simulator equipment was purchased, put in place and tested we commenced courses on our Engine Room Plant simulators ad High Voltage simulator.



result

It was results oriented and has increased access to learning. It has enabling candidates to develop skills and complete courses in their own home town/region rather than having to fund expensive and environmentally costly overseas travel, foreign exchange, visas, etc.

conclusion

We have improved learning and skills development opportunities for our candidates, enabling them to become qualified and providing them with career paths that might not otherwise have been available to them.

LINK: https://mti.edu.pk/

14. MEXO AS - Automated Legs for Swap Body Containers

automated legs that eliminate the current challenging tasks of swap body container placement

the challenge

Today's solutions for container legs are manual. These are placed underneath swap body containers and are attached during transport. It has been stated that the legs are inefficient to handle, and that the relating tasks can cause injuries. Injuries that occur as a result of today's manual handling are back, shoulder and neck problems, crushing injuries, people have in the worst cases become disabled and deaths have occurred. Drivers often experience that debris and ice must be removed before placing the legs on the ground. Removal is done by using sledgehammers which can be problematical in circumstances with extreme weather conditions. Considering rough surroundings and handling of the legs, the lifespan is considered being short and unsustainable.

the innovation

Mexo has designed automated legs that eliminate the current challenging tasks of swap body container placement. The company's goal is to produce a safe and durable alternative to the existing manual leg solution, in terms of mechatronic technology. Usage of our legs result in improved efficiency, safety and sustainability. We have used a self-designed cylinder with a 4-dimensional groove that, together with the motor, causes the legs to move in the perfect position for transport and unloading. The solution has been presented to Norway's largest transport company, which recognizes that the solution will work

how it was implemented

The solution is still under development and a prototype has been presented to key players. We are currently working on a letter of intent for the delivery of the product. We have received financial support from innovation Norway and won an innovation award for the solution we have developed

result

Mexo has an intention of developing future solutions that can improve work environments, based on the needs in such industries.

conclusion

Mexo has an intention of developing future solutions that can improve work environments, based on the needs in such industries.

LINK: https://www.linkedin.com/company/mexo-as/?originalSubdomain=no

15. OMC International - TransitAnalyst

identify behaviours, patterns and trends in pilotage prior to incidents occurring, creating the opportunity to intervene to avoid accidents

the challenge

A 2020 report by the International Group of P&I Clubs concluded that there is, on average, an incident involving vessels under pilotage every week with a cost per incident of approximately US$1.74m. Moreso than the economic impact, the potential for injury and loss of life, as well as environmental damage resulting from maritime incidents is significant.

Marine pilotage is one of only six issues on New Zealand's Transport Accident Investigation Commission Watchlist, noting their solution states: 'Safe conduct of a ship through pilotage waters depends on high standards of passage planning. Pilots and the bridge team must share an understanding of the navigation plan, and know where the ship is allowed to go.' Similarly, the ATSB states in their SafetyWatch brief on Marine Pilotage that a pre-passage information exchange should always include:

- the courses or tracks to be followed
- speeds at critical points during the pilotage
- limits in relation to planned tracks and speeds.

There are excellent and well proven tools and systems available to investigate incidents after they happen. However, what if it was possible to identify behaviours, patterns, and trends prior to incidents occurring, perhaps creating the opportunity to intervene to avoid accidents? This is what TransitAnalyst was created to do.

the innovation

TransitAnalyst interface showing a range of vessels and swept path

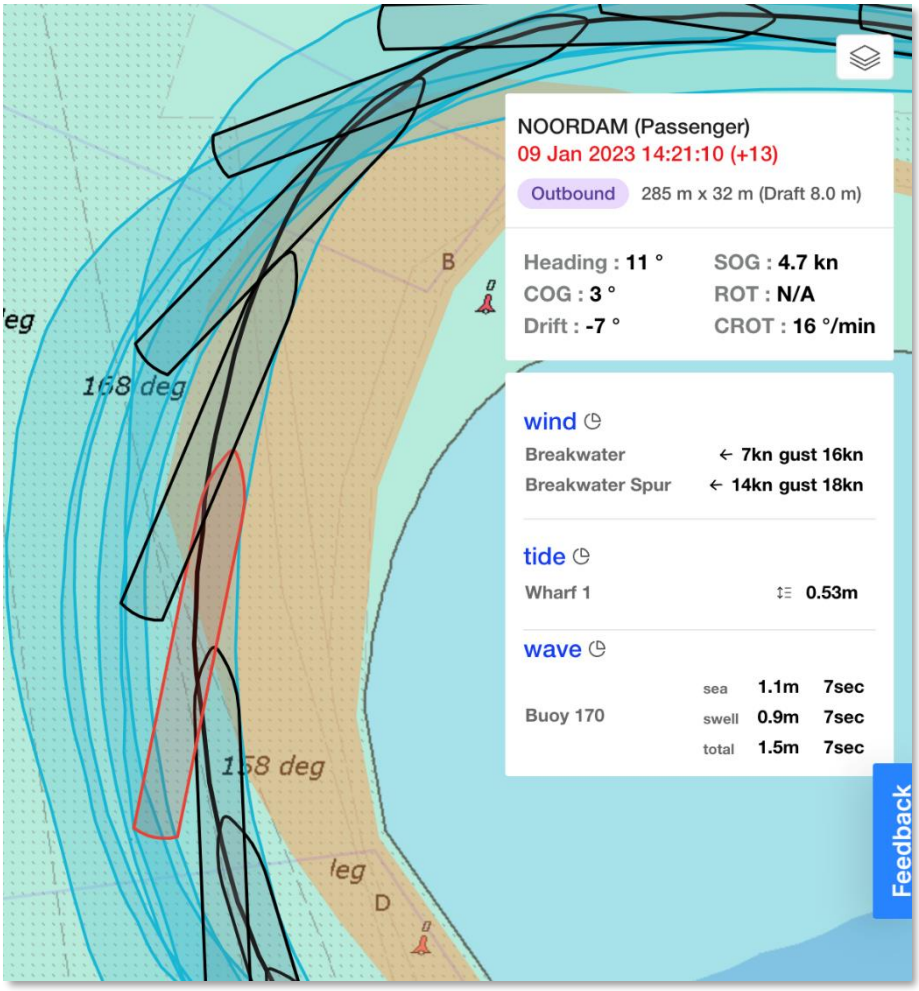
TransitAnalyst uses big data and AI to create actionable intelligence and full visibility of pilotage operations. Integrating AIS and measured environmental data, it provides simple yet

powerful analytical tools that allow users to inspect, visualise, and report transit results against user defined performance and safety standards.

Using the concept of Critical Navigation Elements from Antonio Di Lieto's book Diligent Pilotage, TransitAnalyst can be configured to monitor what is important for each specific port. Transits that deviate from their plan can be automated tagged for review.

Automated reporting can be configured to allow for immediate feedback.

Additionally, TransitAnalyst users can easily search for previous transits based on a range of criteria such as vessel type and size, and the prevailing environmental conditions. This allows a pilot to prepare for an upcoming job by reviewing previous transits of similar vessels undertaken during similar conditions.



Highlighting examples of vessels' swept paths encroaching on safety corridors

The ability for users to enter comments against transits provides for learnings to be shared across the organisation.

Since being commercially released this year, the use cases for TransitAnalyst have been varied, including reviewing vessel speeds, swept paths, berthing manoeuvres, drift angles,

rates of turn, training of new pilots, assessing environmental limits, preparing for new vessel classes, and improving simulator models.

how it was implemented

TransitAnalyst was developed in response to the request from a port that wanted to understand whether their existing operational thresholds (e.g. current and wind limits for different vessel types and sizes) were appropriate.

The port had PPU data, but this was only useful for analysing individual transits in isolation.

They also had AIS data which could be used to review a range of transits, but this approach presented several issues.

For instance, the AIS data was not linked with met-ocean data, it only provided antennae location and not swept paths, and the data quality could not be verified.

Ultimately, the development of TransitAnalyst resolved all these issues. AIS data undergoes rigorous quality assurance, and can be corrected where appropriate. All measured met-ocean data is stored alongside the transit information so that the exact conditions can be recalled for the entire transit. TransitAnalyst also produces swept paths, allowing users to identify exactly the position of the entire vessel at every stage of the transit.

The implementation of each TransitAnalyst system commences with a workshop between the client stakeholders (typically Harbour Master, Pilots, Marine Mangers, etc.) and OMC International's Pilotage Advisor.

The discussion focuses on the key challenges the port faces in terms on navigation, and the desired outcomes from the implementation of TransitAnalyst.

Following the workshop, the system is configured with the Critical Navigation Elements discussed, and the client is provided with comprehensive training.

Some clients then manage the system themselves, whilst others have requested that OMC provide monthly analysis and reporting.

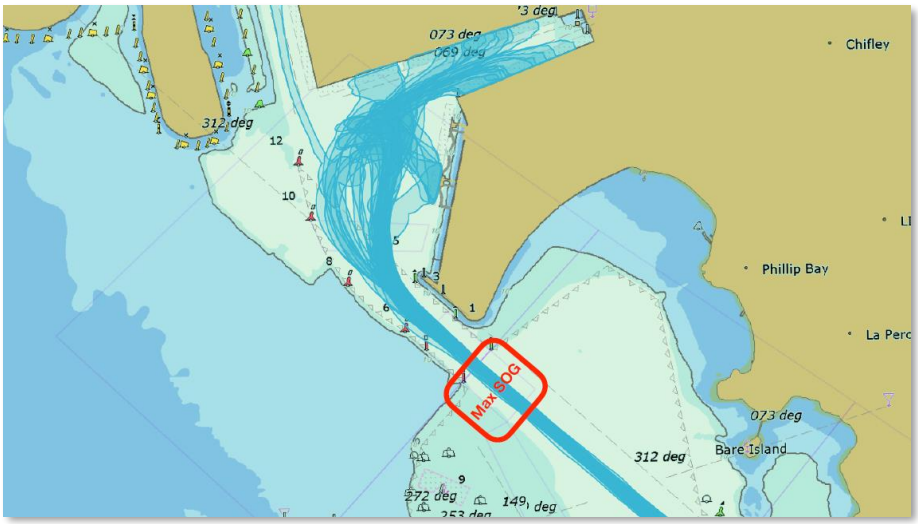
result

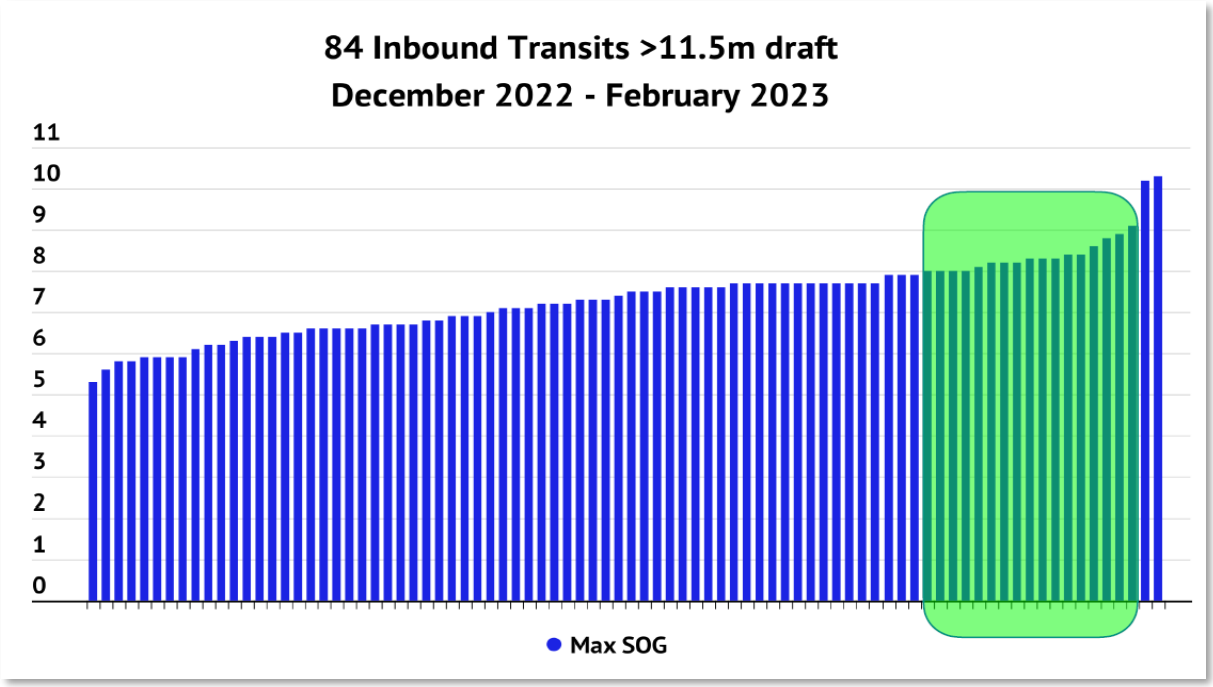
The adoption of TransitAnalyst has been overwhelmingly positive. Some feedback from users is below:

"TransitAnalyst was initially introduced to support the evaluation of the pilotage risks of accepting a new class of vessel at the port. However, we have learned that through its ongoing use in our daily operations that its most powerful aspect is that it is a tool for us, as professionals, to use. As individuals we can debrief each transit that we conduct; but we can also observe the transits of other pilots within the team. We have learned that the analysis of

optimal transits, either our own or those of our teammates, is as valuable as the analysis of the outliers.

TransitAnalyst gives us the ability to dive down and into the detail of day-to-day operations





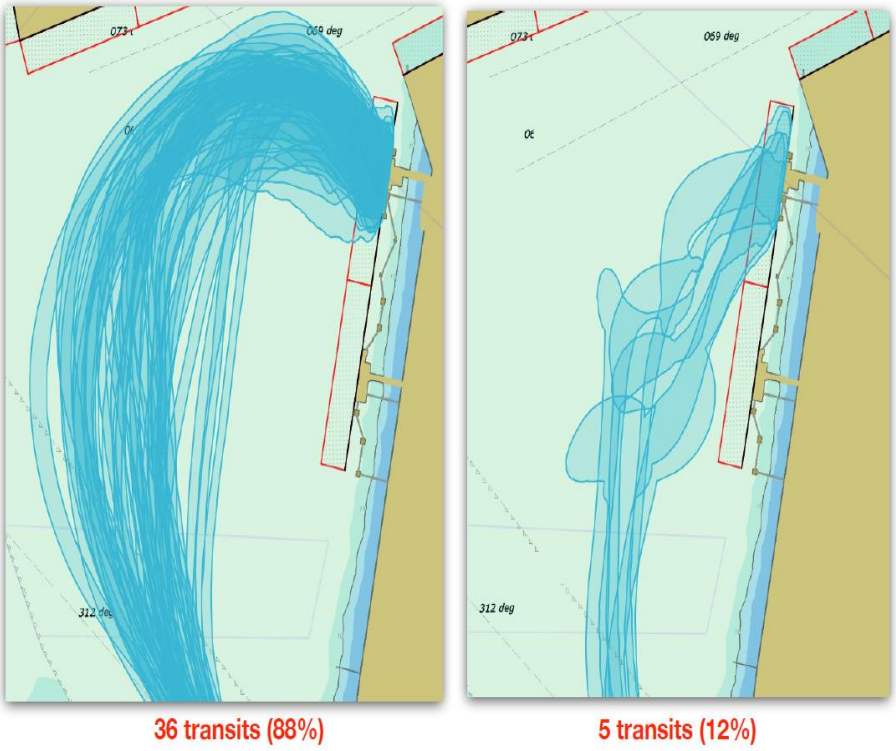
Analysis of Speed Over Ground results from 3 months of data

and facilitates technical conversations within the team. But the cultural change we have experienced through these conversations is allowing us to look up and out at other influencing factors." Matt Conyers, Specialist Pilot, Port Nelson.

"As a Pilot training for my third port, I have found TransitAnalyst to be an invaluable tool. Rather than be in a position to watch then essentially 'wing it' for the first time on/off a berth, TransitAnalyst allows for a more detailed and structured approach to training. It provides me

with the ability to search then scrutinise all previous arrivals/departures from the port including on/off all berths and in all weather and tide conditions. So rather than 'wing it' I can be as prepared as possible.

After the job is completed, TransitAnalyst then provides me with my vessel position, swept path, speeds and actual weather/tide information during the transit. This allows for a comprehensive de-brief using actual data rather than relying on the memories of myself and the training pilot. Over a period of time, I can look back through my training history and identify patterns of good piloting, but also areas where improvement is needed. TransitAnalyst has ensured a targeted and enjoyable training experience, ensuring that every training job completed is used to maximum value." Colin Sellars, Pilot, Port of Tauranga Limited



TransitAnalyst used to highlight the different approaches to manoeuvring into berth. This analysis was used to start a discussion within the marine team as to why there were different approaches

"Any port authority that does not have a TransitAnalyst in 2023 needs to get their head read. I thought I knew what was going on in [name of port removed], but I'm seeing things that the Harbour Master is not aware of, and just wouldn't believe." Senior Pilot, Australia (anonymized at their request).

"Use of [TransitAnalyst] provides an opportunity for critical review and continuous improvement across multiple facets of Port Operations. The technology assists with assurance and training outcomes to be met in a real time and continual basis". Myron Fernandes, Harbour Master, Sydney.

"Port Phillip Sea Pilots have implemented using the Transit Analyst software across our operations within Port Phillip Bay. It also forms part of a major project we are undertaking to establish shared passage plans and joint validation and verification of pilotage tasks. The systemic improvement across our business has led to safety improvements which benefit all of our customers and in return all Victorians." Capt Damian Laughlin, Port Phillip Sea Pilots

conclusion

Professor Sidney Dekker, renowned safety researcher states that the absence of incidents is not evidence of safety. TransitAnalyst is providing the tools to visualise and understand exactly what is happening in the absence of incidents, and creating transparent, data oriented pilotage operations which drive safety outcomes.

TransitAnalyst can be viewed with suspicion; as big brother watching every move, ready to criticise any mistake. The reality is that with global AIS coverage, anyone can already access transit data with a little effort. Furthermore, following an incident, there will absolutely be those looking for errors and eager to assign blame.

Organizations that have implemented TransitAnalyst have done so with a culture of transparency, openness, and continuous improvement. The aim is to use the available data to prevent incidents from occurring. This is achieved through identifying what is actually happening, and having evidence based discussions about best practices.

LINK: https://omcinternational.com/

16. Port Skills and Safety - Annual Innovation Workshops

bringing ports and technology innovators together to understand what safety innovations are possible and how they might be adapted to work in ports

the challenge

PSS is a membership organisation focussed on collaboration to improve port safety and the skills of port employees. We hold regular events for safety and skills professionals to share ideas and learning around safety. We noted that there was a gap between those with knowledge of working in ports and those with knowledge of new technologies. PSS launched a yearly meeting – now in its fourth year – bringing together these two groups of people to discuss what safety innovations are possible and how they might be adapted to work in the port environment.

These meetings include presentations from tech companies demonstrating how their technology is used in other sectors with an opportunity for port people to feed into adaptations to enable them to work for the port sector and hands-on sessions for port people to understand how the technology works. There is also an opportunity for ports who have introduced new technology to demonstrate them in practise and share their development learnings. Finally, a round table open discussion is hosted where the two groups can bring their expertise to adapt the products and services to improve safety in ports.

the innovation

PSS's role in the innovation is the conversation! Lots of products already exists which could potentially make ports safer, but the port environment is not like any other workplace. Therefore, collaboration is needed to ensure that port people understand how new technology can make ports safer and tech companies need to understand this unique environment. PSS is the enabler of this collaboration.

First Innovation Event

By bringing together tech people and port people, innovation has been able to thrive. PSS has introduced many ports to new products, and often for much less cost than they initially expected, and has also enabled innovative companies, especially small tech start-ups to get in front of the people they need to for the development of their products.

Advances already made have included technology from the warehousing sector which mounts cameras trailers which use real time imagining to recognise when people may be too close to moving machinery but also creating space for discussion on the positioning of these cameras so that they work when the trailer enters a ship and the movement of people is more restricted.

Second Innovation Event

how it was implemented

PSS has held three such days so far, the first focussing on innovation for improving RoRo safety, the second for innovation specifically for large and container ports and the third for innovation in port skills and training.

result

Many products that were discussed at these meetings have now come to market, including cameras incorporating AI mounted on to tugs and incident dashboard which uses AI to give better analysis of incidents and make recommendations for safety improvements.

conclusion

Although this may not be the typical innovation in safety entry PSS believes that we have made a real and significant difference to the use and adoption of new technology in UK ports.

Third Innovation Event

LINK: www.portskillsandsafety.co.uk

17. Proaxxion Servicios Profesionales - Remote Twistlock System

eliminating the need for the driver to leave the cab to open/close twistlocks on semi-trailers

the challenge

Every time a container is loaded or unloaded from a truck, it implies that the driver must get out of the cab to release or fix the twistlocks that are distributed around the truck semi-trailer.

This routine activity poses a huge risk for drivers as they are exposed to

- struck by vehicles or handling equipment because of proximity to continuous transit of vehicles and large-scale machinery, particularly in blind-spot areas of the truck/trailer
- hand and upper body injuries - twistlocks are often not in good condition and the action of opening or closing requires considerable effort that can give rise to strains, sprains and strikes

A significant portion of container trips on trucks in ports and terminals are made with twistlocks open or unsecured.

the innovation

Our solution completely eliminates the need for the driver to leave the cab to open or close the twistlocks. The required activity can be done from the safety of the cab.

This innovation takes advantage of the air already present in the truck and uses it to perform all the movements necessary for these lashing activities. It secures and tightens the twistlocks avoiding vertical movement of the container during travel.

Trucks fitted with this system are able to close twistlocks immediately, without the need for interactions between the terminal personnel and drivers, ensuring the cargo is secured at all points even in the transfer.

how it was implemented

After three years of development, this system has been implemented in 3 vehicles in Chile, with more than 24 months of operation, which has allowed us to generate relevant improvements from the point of view of the operation of the automatic system, to the safety of the elements that compose it.

result

The results of the implementation of this system have been spectacular, achieving very positive feedback from users.

conclusion

The high exposure and accident rate of truck drivers whilst closing/opening twistlocks has existed for many years, and without any real solution. This development is a real opportunity to implement a solution to this very real risk.

In addition, it has allowed drivers with reduced mobility to be able to drive a truck again

thanks to the automation of this part of the activity.

LINK: pablo.cortes@proaxxion.cl

18. RightPORT Risk Solutions - RightPORT

robust, automated assessment of incoming *vessels, enhancing safety at every level of port operations*

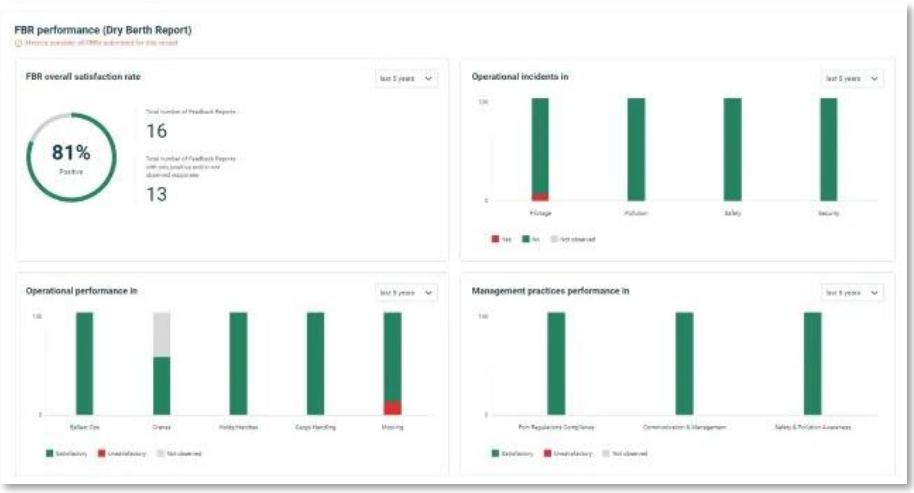
the challenge

Port operations inherently carry significant safety challenges, including the risk associated with incoming vessels. Traditional risk assessment processes can be time-consuming and prone to human error, potentially jeopardising safety. RightPORT was developed by RightPORT Risk Solutions to address these challenges by offering a robust, automated solution for assessing incoming vessels, enhancing safety at every level of port operations.

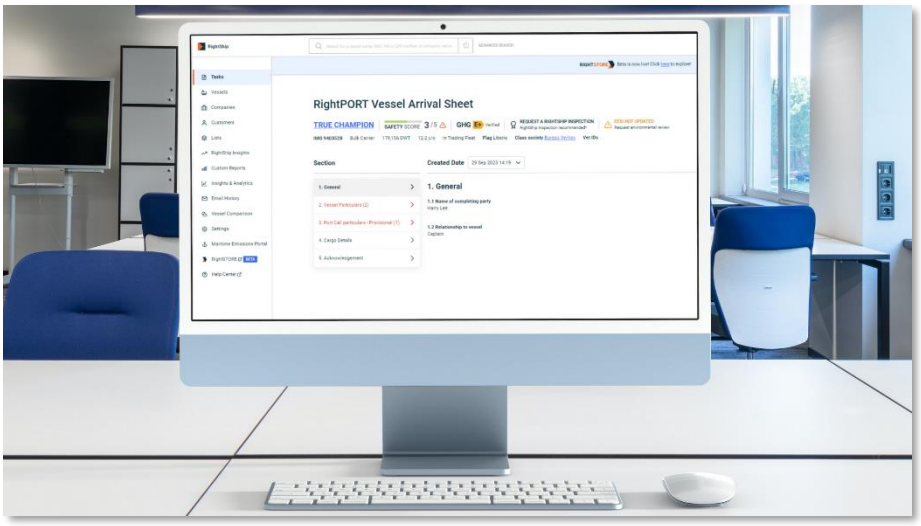
the innovation

RightPORT represents an innovative solution crafted to automate and enhance the risk assessment of incoming vessels at ports. It harnesses an extensive dataset to assess vessels based on diverse safety parameters, compliance standards, and historical incident data, enabling in-depth analysis of risk insights. RightPORT offers a comprehensive risk assessment report that supports port authorities, operators, and other stakeholders in making informed decisions and mitigating potential risks. Through this automation, it streamlines operations, heightens safety standards, and ensures the efficient allocation of resources.

RightPORT also provides a very efficient tool to keep a record of the 'port call performance' of the vessel via (FBR) Feedback Reports. Safety or operational related issues can be reported via FBR to RightShip to be actioned. Data is kept completely confidential in the Rightship system and followed up with the vessel managers to ensure sufficient and appropriate action is taken to deliver improvement. A Port or Terminal can see a vessel's FBR scoring and keep a record of port call performance KPIs. FBR is a easy to use tool, with RightSHIP maritime experts assessing the root cause of problems during port call and evaluating the solutions implemented by the ship. This improves safety for ships and ports, without any additional work.



FBR can also be used as a data sharing platform between terminals if they wish to share information to improve safety.



how it was implemented

The implementation of RightPORT was a meticulously executed process, characterized by a series of crucial steps:

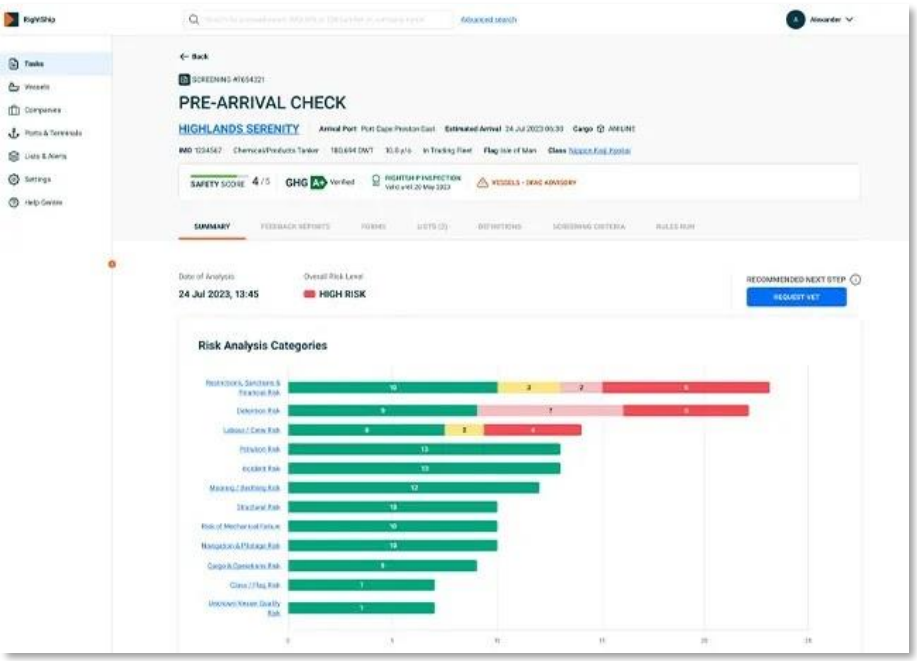
Data Integration: RightPORT amalgamated a wide array of data sources, including AIS data, vessel compliance records, incident reports, historical data, and performance reviews from an extensive network of ports and terminals. This integration was fundamental in creating a comprehensive database.

Data Analysis Model: A sophisticated algorithm was crafted to analyse this amalgamated data, culminating in the development of a model with the capability to provide leading risk indicators and insights into incidents related to incoming vessels and ship operators.

User Interface: An intuitively designed, user-friendly interface was developed, providing port authorities and operators with effortless access to RightPORT 's insights and risk assessment reports, ensuring a seamless experience.

result

Various ports started to use RightPORT as a ‘pre-arrival’ vessel risk assessment tool which enabled them to be proactive to the risks coming to their ports or terminals. Rather than being reactive to the incidents after they happen.



conclusion

RightPORT stands as a paradigm shift in the realm of port safety management. Its proficiency in automating risk assessment and delivering profound insights within minutes has ushered in a new era for the maritime industry. This product's impact transcends safety enhancement; it extends to operational optimization, cost reduction, and the elevation of decision-making processes.

We firmly believe that RightPORT is an epitome of unwavering dedication to safety and innovation within the maritime domain. Its transformative potential is poised to reshape safety protocols at ports on a global scale, ushering in a realm of reduced incidents and the assurance of safer, more streamlined operations.

LINK: www.rightship.com

19. Road Sense Kenya - Road Safety Campaign

Twitter campaign to reduce road traffic accidents

the challenge

Safety challenges that RSK addresses include:

- Road Traffic Crashes (RTCs)
- Poor Road Infrastructure
- Distracted and Impaired Driving
- Pedestrian and Child Safety
- Speeding and Reckless Driving
- Seat Belt and Helmet Use
- Advocacy for Policy Changes

the innovation

We employ innovation in road safety solutions to tackle challenges such as road traffic crashes, poor infrastructure, distracted driving, pedestrian safety, and speeding via our Twitter handle @roadsensekenya

how it was implemented

Through our Twitter advocacy, the NTSA, under the Ministry of Transport, has diligently executed our safety recommendations. This has been achieved by stringent law enforcement and improving road infrastructure for a comprehensive solution.

A screenshot showcasing one of the innovative designs we utilize on the Road Sense Twitter handle (@roadsensekenya) to raise awareness and educate the public about road safety.

result

The positive reception of the results can be attributed to the prevailing high level of concern for road safety in Kenya. This is further reinforced by the fact that our safety advocacy is underpinned by thorough research and adheres to international best practices.

conclusion

Our evidence-based road safety initiatives, in line with global safety standards, receive strong support and adoption by our government, reinforcing our commitment and effectiveness.

LINK: https://twitter.com/roadsensekenya

20. RoboK - SiteLens

employing AI for real-time analysis of CCTV to pre-emptively detect and alert on hazards

the challenge

The freight industry, a cornerstone of the global economy, is driven by an unrelenting demand for the movement of goods. Key processes such as loading, unloading, and transport present substantial safety risks due to the interaction between workers and machinery. The sector is afflicted by incidents of near-misses, unsafe working at heights, speeding plant vehicles, restricted zone breaches, PPE non-compliance and so on.

These safety concerns are particularly pressing in areas where compliance is critical, such as the access points for loading and unloading where precision, coordination, and strict adherence to operational guidelines are essential. Ensuring the well-being of workers in these high-stakes environments is of utmost importance and requires constant vigilance and adherence to safety standards.

Statistics from International Labour Organization (ILO), which estimates that around 2.3 million people die from work-related accidents each year globally. Additionally, industrial sites in the EU reported 30.5% of non-fatal work accidents and 23.2% of fatal work accidents in 2020 were due to losing control of machinery, tools, or transport/handling equipment. In the UK alone, UK HSE data shows 11 fatal and 28,000 non-fatal injuries in 2019/20, relating to vehicle incidents and falls.

Challenges with conventional approaches to safety implementation have limitations such as:

- Passive and reactive safety surveillance: Traditional approaches heavily rely on manual oversight and passive surveillance, often reacting to incidents/breaches rather than proactively implementing measures to prevent them.
- Lack of timely and structured information: Obtaining timely and structured information for managing large, dynamic logistics sites can be challenging and can lead to various safety failures.
- Manual approaches to situation based safety training: In the absence of video data illustrating real-life safety scenarios, workers may not fully grasp the training, which can lead to an incomplete understanding of the risks involved and the necessary precautions to prevent accidents.

the innovation

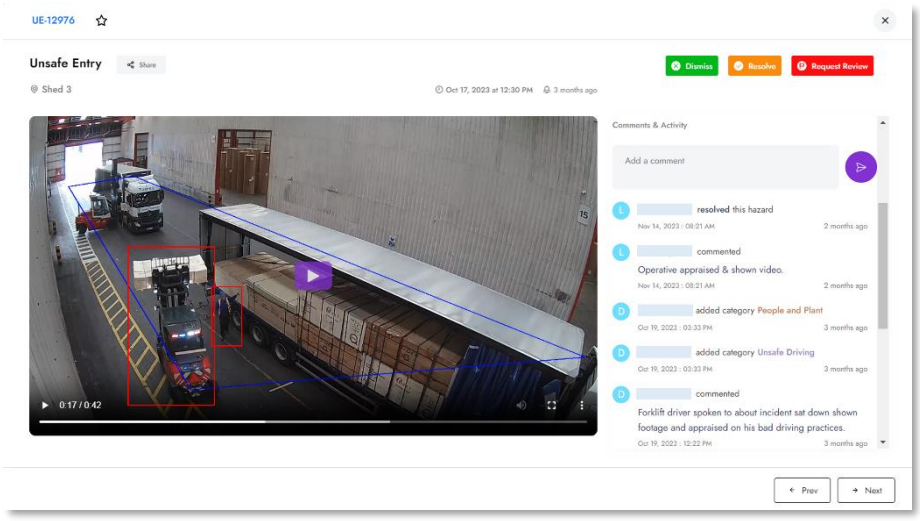
SiteLens by RoboK introduces an innovative safety paradigm in logistics environments, employing AI for the real-time analysis of CCTV to pre-emptively detect and alert on hazards. It redefines monitoring, moving from passive to proactive, and is attuned to the nuances of human-machine interactions and compliance with safety protocols. This system not only alerts but also learns and adapts, providing a user-centric platform that empowers logistics personnel with actionable intelligence, contributing to a culture of safety and enhanced

operational decision-making. SiteLens exemplifies the shift towards continuous, intelligent monitoring systems that prioritize human safety in complex industrial settings.

Innovation features:

SiteLens core innovation approach lies in its real-time AI-driven analysis of multiple camera feeds in transport & logistics environments. The solution captures intricate details including personnel, vehicle and assets movements, equipment dynamics, and behavioural analysis within these sites enabling actions and root cause analysis.

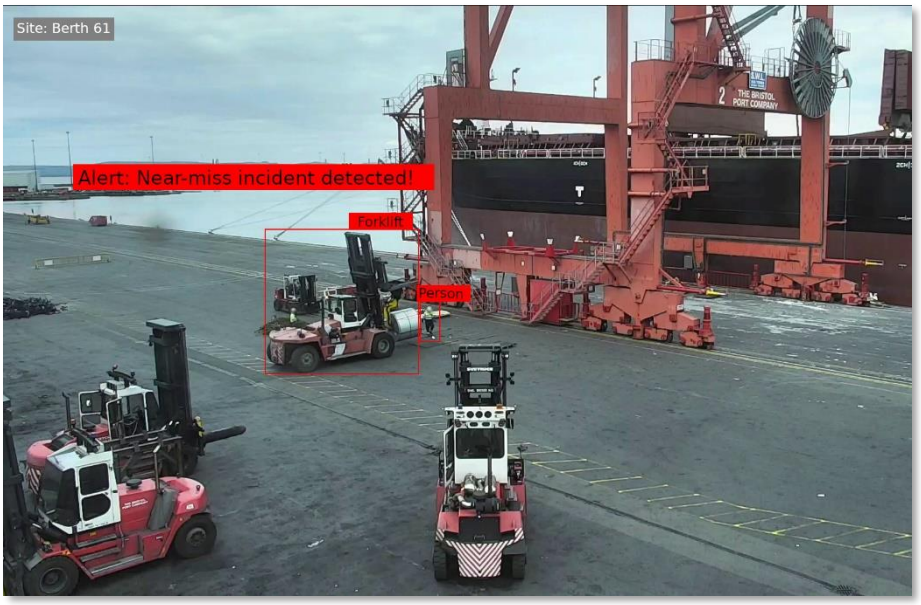
- AI-powered analytics: SiteLens transcends traditional, reactive safety methods by integrating AI with current CCTV infrastructure. This combination ensures automated, proactive site oversight, promptly identifying potential hazards and providing immediate, actionable alerts and comprehensive preventative insights.



- Always-on monitoring: SiteLens operates as a full-spectrum, vigilant platform, working in tandem with on-site CCTV cameras around the clock. It diminishes the need for manual oversight by autonomously generating real-time alerts and highlighting otherwise overlooked hazards.
- Human centricity: SiteLens is engineered with a focus on the user experience, tailored to assist and empower those overseeing logistics operations. It delivers pertinent and actionable information to staff managing multiple tasks in fast-paced environments.

how it was implemented

In a strategic partnership with the Bristol Port Company, RoboK's innovative cloud based AI-driven software solution, SiteLens, was deployed to transform their safety oversight. Merging effortlessly with the port's existing CCTV network, SiteLens provided a comprehensive view of operations, detecting safety hazards in real-time. It became a narrative of change, from passive monitoring to proactive prevention.

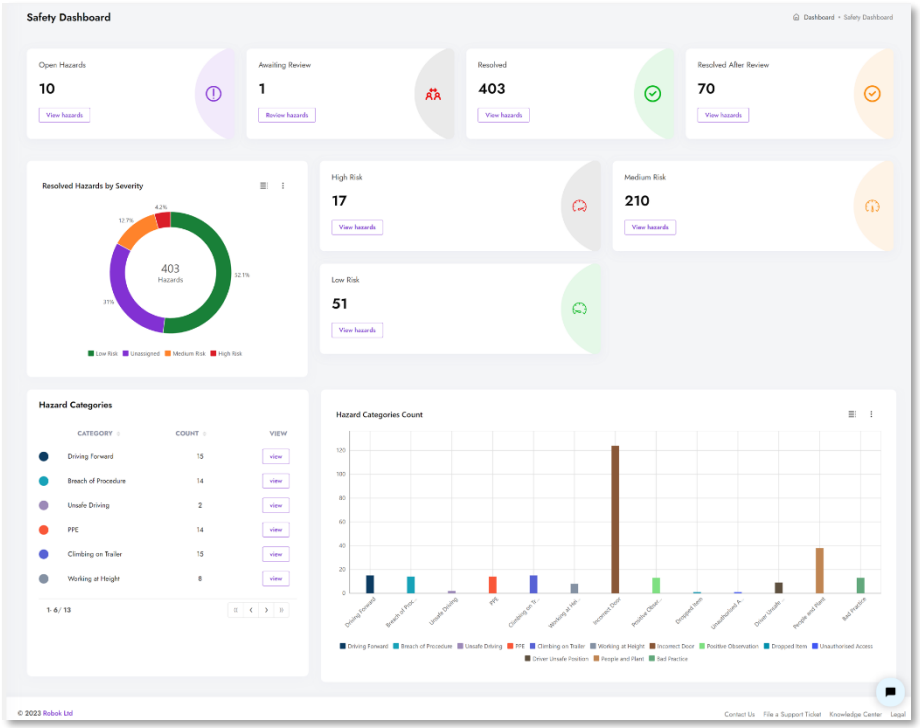


A series of workshops led by RoboK's experts helped the port's staff familiarize themselves with the intuitive interface, where incidents were not only recorded but also evaluated and addressed through a collaborative platform. This approach fostered a communal sense of responsibility towards safety, as each recorded incident spurred collective analysis and action.

The platform has become an instrumental part of daily safety briefings. Prior to the commencement of shifts, managers review outstanding incidents, providing incident severity and initiating escalation procedures when necessary. The capability to download incident clips enhanced the training department's ability to create situational awareness programs, embedding real-world scenarios into safety drills.

A key feature of SiteLens is its comprehensive reporting tool, offering a panoramic view of safety metrics, trend analyses, and the status of issues—whether open or resolved. This functionality not only improved visibility across the site but also underpinned decision-making with robust data.

By integrating SiteLens, Bristol Port Company took a significant step towards reinforcing its commitment to safety. The platform's ability to distil vast streams of video data into actionable intelligence has not only strengthened safety procedures but has also fostered a more informed and vigilant workforce.



result

The implementation of SiteLens at the Bristol Port Company yielded transformative results including:

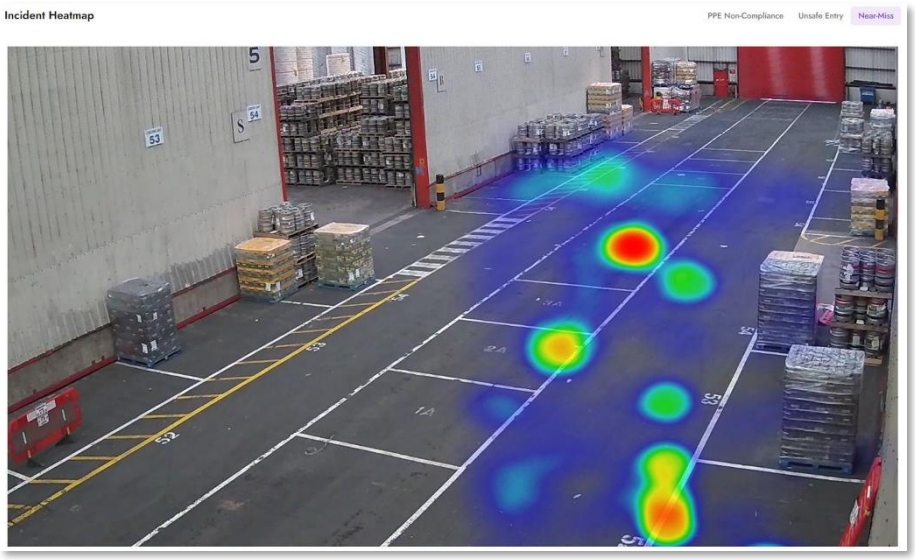
- The deployment of RoboK's SiteLens at Bristol Port Company marked a significant advancement in workplace safety management. The AI-powered system, which seamlessly integrated with existing CCTV setups, enabled a profound reduction in safety breaches—by a remarkable 90% reduction within the first quarter of its operation. This impressive outcome underscores the system's capacity to detect and pre-empt safety hazards effectively.
- Beyond the direct impact on incident numbers, SiteLens has been instrumental in enhancing safety training protocols. The system's ability to provide real-time footage and analysis has enriched situational awareness among employees, ensuring that

safety training is rooted in practical, real-world scenarios. The interactive platform has become a conduit for continuous learning and safety education, demonstrating the power of integrating technology with human-centric training methods.

- A pivotal aspect of this success story is the fostering of a people-first safety culture. SiteLens has promoted an environment where the welfare of individuals is paramount, influencing a shift in mindset towards preventive measures and collective safety consciousness.
- Furthermore, the platform has catalysed a collaborative synergy between the operations, safety, and training departments. By utilising the shared platform, cross-departmental teams have been able to communicate more effectively, coordinate safety efforts, and streamline responses to potential hazards.
- The visibility provided by SiteLens into daily operations has not only facilitated immediate responses to emerging hazards but also enabled comprehensive root cause analyses. These insights into user behaviour and operational dynamics have been invaluable in developing targeted strategies to mitigate risks, illustrating the transformative potential of AI in enhancing occupational safety.

Reflecting on the profound impact of SiteLens, David Brown, CEO of the Bristol Port Company, shares his insights:

"*Operatives on the next shift are more alert to keeping themselves and each other safe. I am impressed by how much useful detail we have gained through RoboK's AI platform*."



conclusion

The strategic deployment of RoboK's SiteLens technology across various sectors is gaining momentum, with exploratory projects underway, like the current initiative at the Port of

Tyne, National Highways, Trasport for Wales and Network Rail. This expansion indicates a growing recognition of the value that such advanced monitoring systems bring to operational safety and efficiency.

As we move forward, there is a concerted effort to not only extend the reach of this technology but also to enhance its capabilities. Upcoming feature enhancements are set to include a range of additional monitoring use cases such as lone worker safety, manual handling practices, seat-belt usage, non-smoking compliance in critical zones, and meticulous tracking of vehicle trajectories.

This commitment to continuous innovation ensures that the solution remains dynamic and responsive to the evolving needs of the freight industry. It's a testament to the adaptability of the technology and its potential to redefine safety standards across various environments. With this forward-thinking approach, RoboK is poised to keep setting new benchmarks for safety and operational excellence in the industry.

LINK: https://robok.ai/

21. Samson Pallet Stability (Samuel Grant Group/Samuel Grant Packaging) - Samson Nano Slingshot

horizontal pallet load security testing system

the challenge

In today's fast-paced industrial landscape, ensuring the health and safety of employees and road users is paramount. One often overlooked aspect of workplace safety is pallet stability. With the recent focus on removing single use plastics from our supply chain, the impetus has been to reduce the amount of film per pallet to a tiny amount. Unfortunately, this has created unstable loads in our supply chain. Badly wrapped pallets can pose significant risks to workers, leading to accidents and injuries on our road, and life changing or threatening injuries in our workplace. Pallet stability refers to the ability of a pallet to maintain its structural integrity when loaded with goods. An unstable pallet can displace in transit, or fall over completely, leading to goods falling from the vehicle when doors or curtains are opened. This can lead to significant financial losses for businesses. By conducting thorough pallet stability testing, companies can identify potential issues and take corrective measures to prevent accidents and ensure the well-being of their employees, their customers and all road users. EUMOS is the European Safe Logistics Association, of which Samson Pallet Stability are proud members. EUMOS are aiming to reduce the number of fatalities to Zero by 2050 instilling safer working practices throughout the supply chain and have created standards which are industry recognized to achieve this. Samson Pallet Stability embraced this standard as a 'safety passport' by which all goods should be measured against. Physics can't lie.

the innovation

In 2020 Samson Pallet Stability launched the Samson Nano Slingshot, which made their pallet testing laboratory the only EUMOS certified centre for horizontal pallet load security testing in the UK.

This type of pallet stability testing machinery is already making an impact in Mainland Europe, but the Slingshot is the first of its kind to be installed in the UK and unique to Samson Pallet Stability. The Samson Nano Slingshot replicates the inertia of a vehicle and whether the load will potentially displace. The machine can initially test at 0.1G and work up to the EUMOS standard of 0.8G. From the pallet data entered, the maximum deformation of the load is calculated to create a pass or fail and 475 frames of how the pallet will behave in transit are captured for analysis and improvements.

Revered in the transit packaging industry for their own pallet wrap system the Samson Nano, for which the company received a Queen's Award for Innovation in 2018, the investment in the Slingshot machine seemed an obvious progression for the company. Pallet stability and safety are crucial to manufacturers and logistics companies, who not only want their goods to reach their destination in perfect condition, but also need to keep their warehouse teams, logistics operations and the wider public safe from displaced loads.

how it was implemented

To launch the Slingshot, Samson Pallet Stability partnered with various bodies such as the CILT and PPMA, as well as launching it through logistics company Stillers, who were able to promote it to their clients. Using the results from the pallet stability testing, the Samson Pallet Stability team are able to advise on best practice, using their expertise garnered from many years of developing the Samson Nano Pallet wrapping system.

The system can be set to specific pallet sizes and types, and pre-set to avoid human intervention. Its unique fixed-price-per-wrapped pallet costing system means companies never have to worry about pallet wrapping costs or wrap pattern safety. Having tested their pallets on the Slingshot, Samson Pallet Stablity's experts can work out exactly how much film to use to get the goods to their destination in perfect condition, ensuring health and safety of workers, and stable pallets in transit.

The machine has been showcased at the PPMA show and at Intralogistex and has been well received by the industry. By using the Samson Nano Slingshot, Samson Pallet Stability can guarantee compliance with the EUMOS:40509 2020 safety standards on the Samson Nano Stretchwrapping System. The Slingshot provides the highest safety testing possible to clients. Not only does this offer peace of mind in getting goods delivered in an 'as despatched' condition, but also helps logistics companies and manufacturers avoid the cost and damage to reputation associated with claims or governing body investigations if loads are shed or damaged, or workers are injured.

result

A leading manufacturer and distributor of flammable content (hydrocarbons) aerosols was referred to Samson Pallet Stability to improve their pallet wrapping process of goods, exported globally.

They were having major issues with products being damaged in transit. The weight and value per pallet was considerable. It was unclear to their dispatch team how to ensure load security and get the goods to their destination in perfect condition, for H&S reasons, and because the cost to replace damaged shipments, and cost of clean up operations and claims would be significant.

The company had outdated pallet wrapping machines which they had purchased. Samson Pallet Stability conducted a full analysis of their operation. Pallets were wrapped on the Samson Nano wrapping system and each of their five different pallet configurations tested to ensure pallets would be stable in transit. After several hours of testing each pallet type, we were able to recommend a wrap pattern, and certify each to EUMOS standards. The aerosol distribution company installed the Samson Nano stretchwrapping system for a trial period to ensure the results could be measured. The programs were fully locked so prevented 'fiddle factor' and the guaranteed performance of the wrap pattern already certified to pass the

EUMOS standard could then be achieved pallet after pallet. This gave the business peace of mind that the goods would arrive safely, regardless of their destination and transit cycle. The trials were successful, so much so, that the business had 2 further machines installed and removed their old machinery

conclusion

For more information, watch our video: https://www.youtube.com/watch?v=m-JQJwAJsBM&t=73s or visit www.samuelgrant.co.uk/test

And our Samson Nano wrapping system; Samson Nano Pallet Wrapping Machine - Samuel Grant Group Ltd

22. Shipmove - Shipmove Mooring Analysis

a method of determining the required number of moorings for commercial ships

the challenge

There are no simple tools that allow a Ships officer, Line Handling Supervisor, Terminal Operator, Pilot or Harbour Authority to simply, quickly, and cost effectively assess the number of moorings a ship should deploy to ensure a safe mooring outcome.

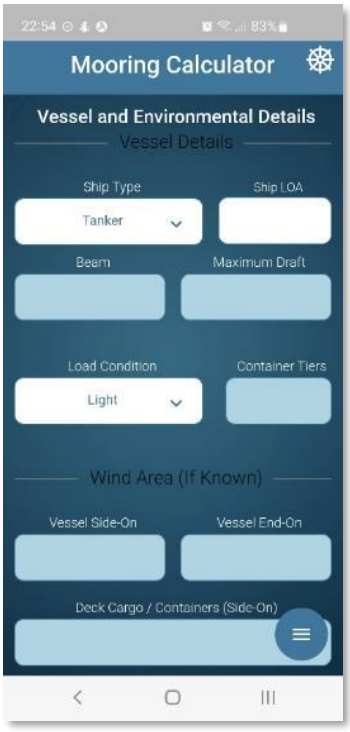
the innovation

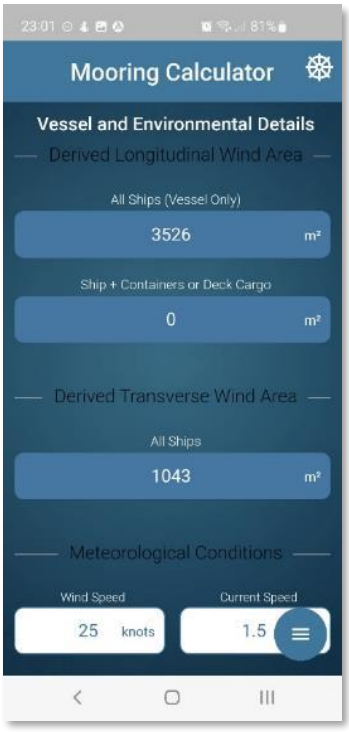
Shipmove Mooring Analysis is a method of determining the required number of moorings for commercial ships.

Using the principal dimension of a vessel (LOA - length overall) Shipmove has established a verifiable and reliable method to determine; the transverse and longitudinal area of the vessel above the water line exposed to wind, and the transverse area below the water line exposed to current. This is on a ship type basis.

More importantly it allows the application to determine the upper limits or bounds of such areas, and their likely disposition; so that calculations can be made on the maximum forces experienced by the vessel. The application then calculates the number of mooring lines required to restrain such forces.

At each step of the calculation, an evaluation is made of the worst likely conditions. Such evaluations (which include some assumptions) include a reasonable safety margin at each step so are predominantly cumulative.





This, reinforced by favourable comparison of sample outputs from the application against industry standard mooring programs, provides significant confidence in the results of the app.

The ability to send (by email) the results of any individual analysis, is an important record-keeping tool, and can be used as part of a vessels ISM or shore Safety Management System procedures to document compliance and as evidence of the decision making process.

how it was implemented

Hundreds of ships were selected, many thousands of data fields downloaded, cross section areas measured with Autocad. This data was plotted and analysed.

Reliable correlation, as well as accurate interpolation and extrapolation was then established using a series of complex quadratic equations. This to determine cross sectional area, wind and current forces and lines required. A further refinement is that using the already established cross sectional area allows a ships equipment number to be determined and so the likely strength of the vessels ropes.

Initially the tool was a spread sheet, however it was recognised that a tablet or smartphone applcation would be more useable and also more able to protect the source calculations.

The app was developed in-house and is now available on both Apple and Android devices.

result

The app can, using only the following five (readily available) pieces of data, determine a suitable number of moorings to deploy.

- LOA - Length Overall
- Vessel Type*
- Load Condition (Light, Part, Loaded)
- Wind Strength
- Current Strength

* Presently choice of 3 vessel types, covering 75% of the worlds fleet.

The entire calculation including data input takes only one minute. This evidenced by the video shot in real time and without missing any steps, available here on you tube.

https://www.youtube.com/watch?v=Oi6khW_fhQY

conclusion

The app costs £10. That's it. No further costs, it can then be used as many times on as many different ships as the user wishes.

It is self-contained, so it can, once installed on a phone, be used in areas with no internet coverage.

Further information on the app is available on shipmove's website; https://www.shipmove.uk/Mooring_App

And on this 5 minute video

https://www.youtube.com/watch?v=VnroKqCIaYI&t=37s

23. Synervention - solid state trailer curtain

curtain sided trailer curtain replaced with a solid state system fixed, top and bottom, to the trailer at all times

the challenge

Opening of curtain sided trailers come with inherent risk for the haulier from slips and strains pulling the curtain to the difficulties experienced in high winds when the curtain, with the tensioning pole attached to the end, can become a sail with many metal components along its length. Added to this the ease of corruption this is a challenge that needs to be resolved.

Although it is difficult to assess the quantity of injuries incurred from operating the current system it is, from anecdotal evidence gathered, a major issue for the health and safety of drivers in the haulage industry. From a security point of view, which adds stress to the driver when thinking about where to park etc. NaVCIS have published figures where year on year theft from curtain sided trailers presents the single biggest risk with overall thefts from haulage vehicles being nearly £200m per annum in the UK alone.

Our patented OMNILOK system means that the curtain is replaced with a solid state system that would be fixed, top and bottom, to the trailer at all times. For the driver the risk of the curtain billowing in high winds is removed. The system will be opened by one single pushing motion, not many tugs, and will be secured using one single locking point not many latches applied currently.

This will be further enhanced in the future with an automated system operated from the cab further protecting the driver when loading and unloading by remaining in the cab.

the innovation

Our Patented OMNILOK system is a set of interlocking vertical ‘fins’ that will create the trailer side. As these ‘fins’ will be seen as solid they will create a trailer that has all the accessibility and flexibility of a curtain sided trailer but with the security of a rigid trailer.

The interlock and fin system together means that when closed the whole system is completely encased and cannot be slashed or prised open as is currently the situation that occurs with curtain sided trailers.

When unlocked the OMNILOK system offers a one push opening mechanism with all the fins working in an interlocked fashion to all pivot and stack against one another on opening.

The fin system is designed to run as a cassette meaning that should damage occur on one or more of the fins these can be taken out and quickly replaced. In terms of load accessibility on opening, the system meets or exceeds that currently in place with the curtain side.

how it was implemented

At this time we are still at the protyping stage but the innovation has been granted an European unitary patent covering 19 countries in all.

We have full engineering design of the system in-line with the patent granted and the deisgn will ensure that full trailer fit out and testing will comply with EN12642-XL standards.

Although still an innovation, the positive feedback from many quarters received to date has been great and proven that when we get to market implementing the system will not be difficult.

We have hauliers, fleet managers and trailer manufacturers all interested in working with us on taking this product to market and with further endorsements recived from the insurance markets and underwriters we have spoken to to date we do believe we have a truly gamechanging innovation for haulage. This is both from a health & safety and load security viewpoint which can also be a major cause of stress on the driver which can impact and impair their ability to work safely in a number of ways.

Further down the line, we will be implementing the system on shipping containers given the conversations we have had with drivers and fleet owners around the difficulties working safely on these load vessels. We do believe this will be relatively straightforward to implement following the same design strategy

Result

We are still at the point of prototype build but we have all the engineering appraisals, feasibility studies and drawings in place to know that when the prototype build happens it will be minor alterations that will have to be made as we fully prove out the concept and design build.

conclusion

This patented OMNILOK system will truly change the haulage of goods using curtain sides, a system that has remained largely unchanged for 50 years or more.

There appears to have been a status quo for over 50 years where the drivers have to operate the curtain sides despite the risks and dangers involved as there has been no viable alternatives available until now and their employers have had to take into account the risks to both person and load when using the curtains side trailers. This can change with OMNILOK system.

LINK: pete@ddriggs.com

24. TEGnology Aps - SensEver HSI hot surface indicator

autonomous self-powered temperature indicator alerting its surrounding by a blinking light when the surface exceeds a threshold of 60°C.

the challenge

Contact burns in production:

Contact burns in the process industry mean a significant disruption of production efficiency and the work environment with consequences as follows:

- Injured workers need medical attention
- Downtime and decreased productivity
- Risk for contact burns can create a tense atmosphere, reducing employee morale and focus
- As a consequence of contact burns stringent safety protocols and training become necessary, further impacting the workflow
- History of contact burns in a workplace can cause struggle to attract and retain skilled workers

While many dangerous parts of the equipment are insulated or protected, parts of the process equipment cannot be protected due to space constrains or cost. In addition to that especially the food and pharma industry runs regular cleaning processes (CIP), where the production pipes are flooded with hot water or steam or cleaning solvents. At those occasions also the otherwise colder system pipes are at dangerously elevated temperatures. Employees touching pipes while cleaning or reaching out to manual valves or simply touching the area accidentally while passing through are not uncommon in those industries.

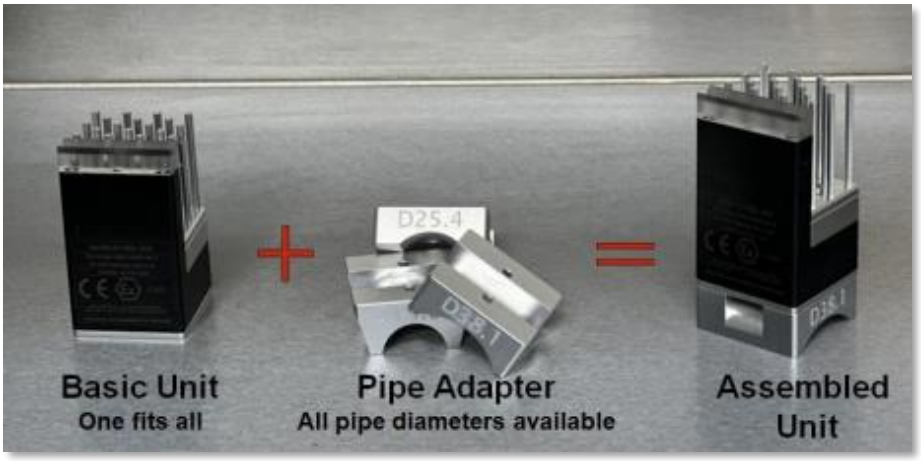
Installation of cabled sensors is cost intensive and so are battery driven systems which have reliability issues at elevated temperature and require periodic maintenance for changing batteries.

TEGnology addressed this issue with an autonomous self-powered temperature indicator alerting its surrounding by a blinking light when the surface exceeds a threshold of 60°C.

the innovation

The SensEver HSI hot surface indicator is an autonomous and thus maintenance free preventive safety device that can easily be installed on surfaces or pipes by a standard pipe hose. The SensEver HSI is battery and cable free because it generates its own supply power by converting the temperature difference between the surface and its surrounding air into electrical energy using thermal energy harvesting.

The internal power management reads out a temperature sensor and triggers a flashing LED light when a preset threshold value is reached. This value can be set during production. Thus, the device can also be used as a process monitoring device indicating that a process has reached a certain temperature.



The product consists of a base unit and an adapter that can be exchanged with different sizes matching different pipe dimensions. The device is ATEX Zone 2 certified and can thus be applied in critical environment containing explosive gases. It is also IP65 waterproof and can be cleaned with standard industrial cleaning processes.

how it was implemented

The device has been introduced to the market in August this year and is operating at Novo Nordisk, Novozymes, Bavarian Nordic and is under validation at a large international process equipment producer for being implemented into manufacturing equipment for the food industry. Also, a large industrial distributor headquartered in Germany is validating whether the SensEver HSI should be integrated to their product portfolio. Besides the functional value for their customer the reason for that interest is in the simplicity of the product and its application. It is not getting more “Plug&Play” then that.

result

Despite the rather short period where the product is on the market there has been only positive feedback.

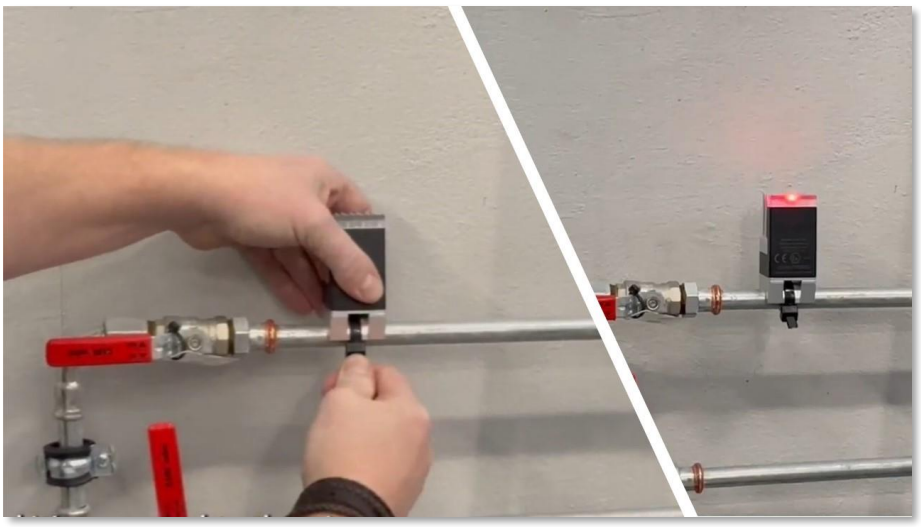
No contact burn has been reported so far at the sites our product has been installed. In addition to that, it has been reported that the product increases in general the people's awareness that they are entering a dangerous area. Thus, the people entering the area have a general increased attention to their surrounding and how they move within the specific area. It has also been reported that the staff appreciated the additional effort that has been made to increase safety in their working environment. A welcome side effect, which has been recognized by responsible management.

Our recent participation at a maritime event in Denmark opened up a couple of leads who see potential also in the maritime, where safety enjoys increasing attention and where narrow spaces and periodically hot processes seem to be as common as in other industries.

conclusion

There has been very positive feedback after introducing this product to the market, also because it is so simple to install and small in size. Furthermore, it has been a business enabler

for coming products based on thermal energy harvesting as there are autonomous IoT applications and process monitoring in general that greatly suffer from high installation costs for cabling or operational maintenance cost for battery solutions.



The currently biggest challenge for TEGnology is to reach a wider audience and generate the required market awareness for this technology. By entering this award we aim to raise the profile of the risk of contact burns and the technology which can help to eliminate or reduce that risk.

LINK: https://tegnology.dk/

25. Trendsetter Vulcan Offshore - Janus Monitoring System

detect and predict risk of a vessel entering parametric or resonant roll instability that could result in capsize or container loss

the challenge

Protecting the marine environment is a priority for the maritime industry. However, spills and incidents continue to occur. These events can not only have a devastating impact on the aquatic ecosystem, they can also jeopardize mariner safety. Incidents at sea also can be costly, disrupting the global supply chain and requiring enormous capital to repair/replace damaged assets.

In 2022, 38 vessels were lost; 10 were cargo ships. The data show container ships are particularly at risk. The Allianz "Safety and Shipping Review 2023" states: "Container losses at sea have spiked in recent years. More than 3,100 containers were lost on average annually during 2020 and 2021—four times the total reported in the previous period—and incidents have continued."

To reduce the likelihood of incidents that can lead to container or vessel loss or injury to the crew, TVO developed a system to monitor container stack and vessel stability, predict and detect unsafe conditions, and provide the vessel captain with advance notice that enables evasive action to be taken.

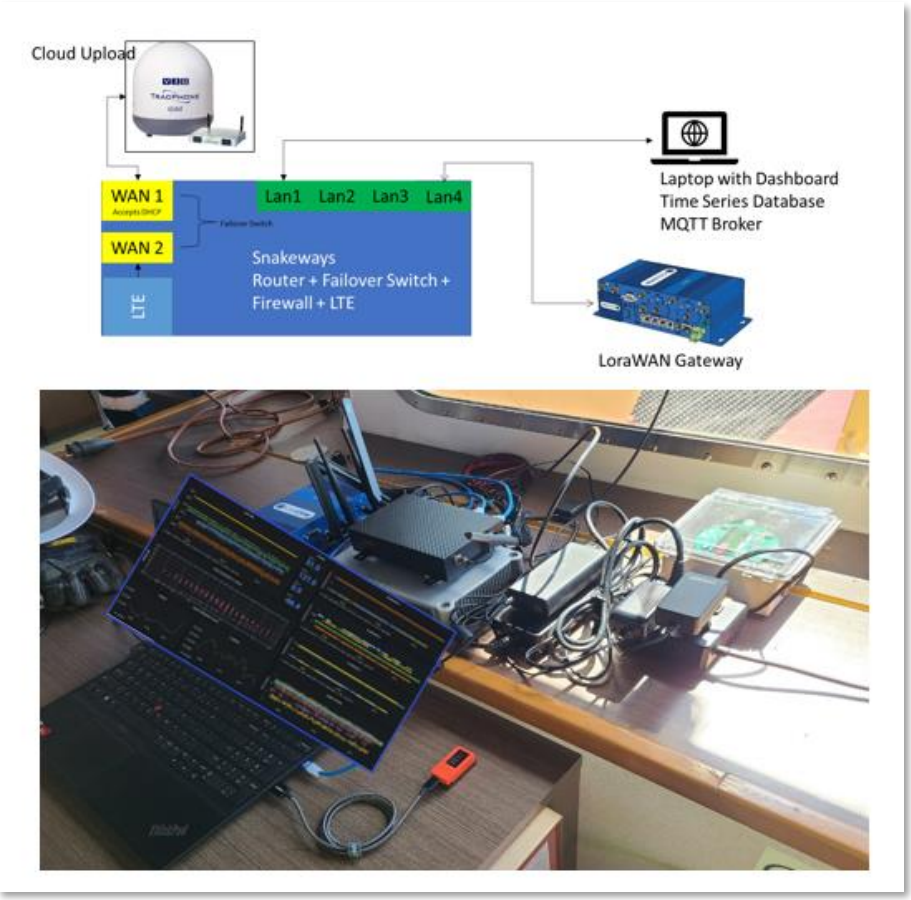
This system utilizes its own sensors installed on container stacks and the bridge, its own communication network for data collection and transmission, and provides a user-friendly dashboard for displaying results.

TVO applied existing technologies in a novel way to address multiple challenges, including:

- Vessel instrumentation
- Contending with signal Interference
- Preventing signal loss
- Overcoming bandwidth limitations
- Inputting collected data to an algorithm developed by TT
- Detecting risk of parametric roll
- Detecting excessive stack vibrations
- Developing a simple graphical user interface with real-time alarms.

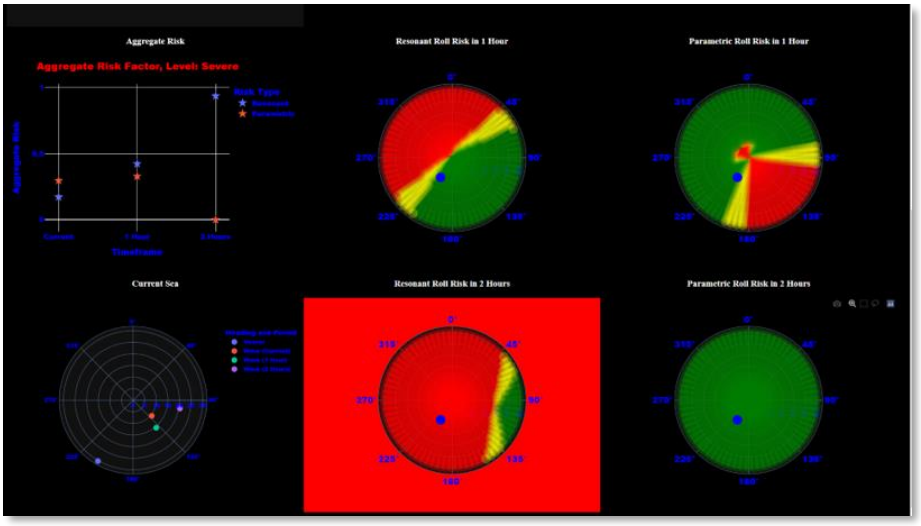
the innovation

TVO's Janus monitoring system works to detect and predict a vessel's risk of entering into either parametric or resonant roll—a condition where a confluence of factors push the vessel into instability, causing extremely high roll angles, potentially resulting in capsizing.



The system uses the vessel's heading and speed, its measured roll period from TVO's sensors, and the sea state (gathered from a third party) as input parameters to Top Tier's prediction algorithm.

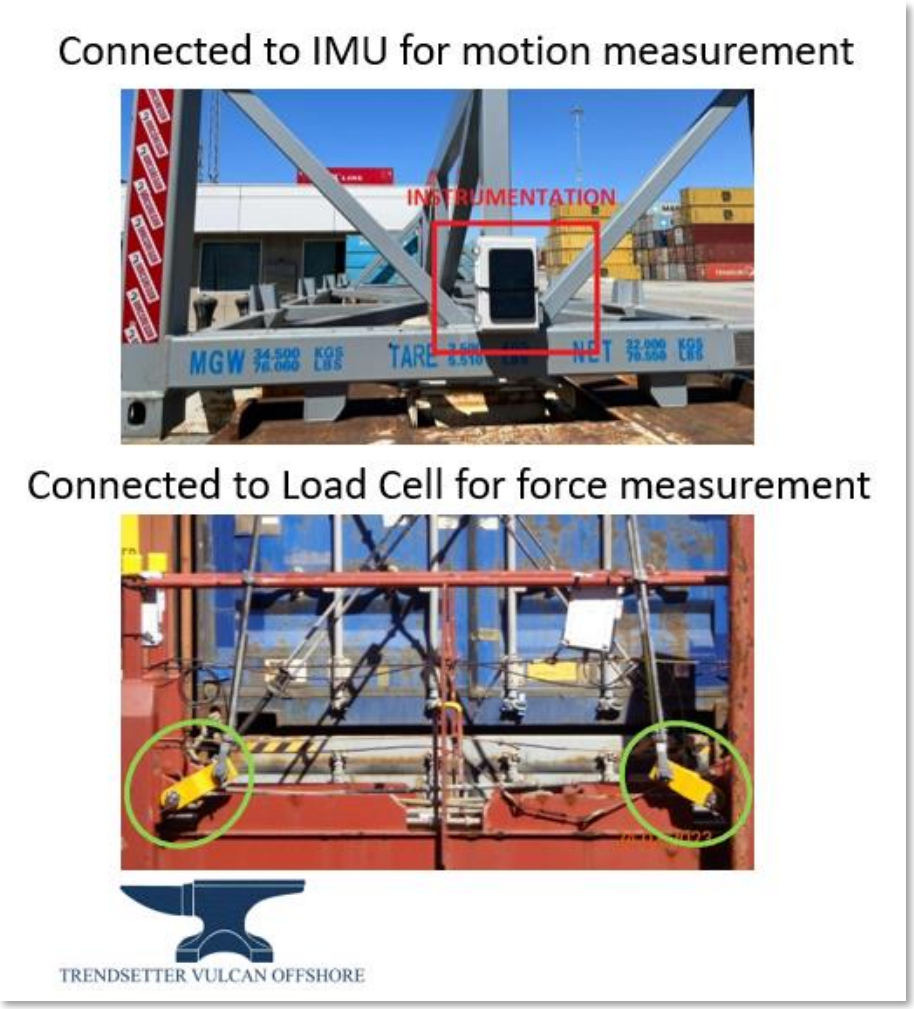
The wireless monitoring system uses Long-Range Wide Area Network (LoRaWAN) technology to communicate information gathered by onboard sensors to the vessel's bridge. The continuous data feed allows potentially dangerous conditions to be detected and alerts the captain up to 200 seconds before an event occurs, allowing sufficient time for evasive action



to be taken to avoid a situation that could compromise vessel stability. Every 5 minutes, essential statistics are transmitted to the cloud for display on a web-based dashboard

The Janus system, which can be monitored onboard or remotely, can be integrated with TVO's proprietary Next Generation Lashing system—which uses technology adapted from a system used for oil and gas applications in subsea environments to arrest blowout preventor motions—to monitor tether tensions and stack dynamics, delivering an additional level of confidence to container retention.

Until now, no solution has addressed this challenge, leaving vessels, millions of tons of cargo, and maritime crews at risk.



how it was implemented

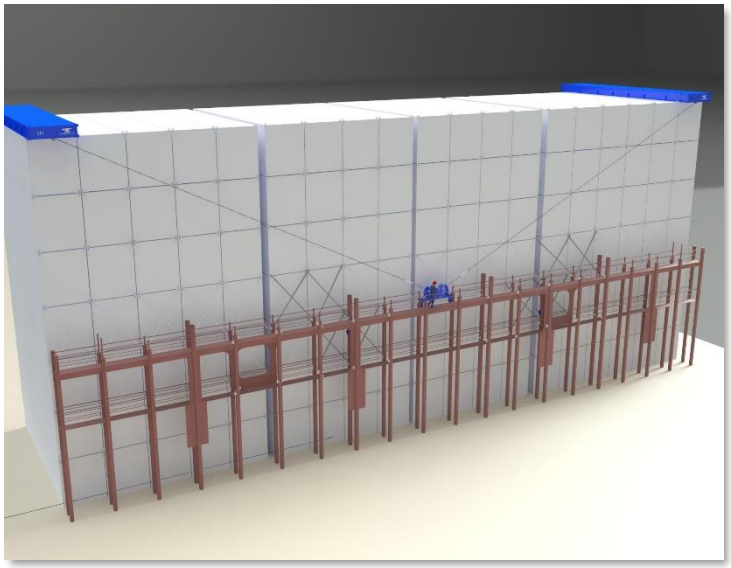
The first onboard evaluation of the Janus system was a communications test in June 2022, which proved a long-range (LoRa) communication network could consistently transmit data onboard a vessel. A second communications test using the same system was carried out on a vessel instrumented with sensors to test that the LoRa system could transmit data in real time.

In September 2022, the monitoring system was installed on a vessel making a Pacific crossing, during which data from load cells and accelerometers were communicated via LoRa to the

bridge. In March 2023, a similar test was performed using a LoRaWAN communication system to determine its ability to consistently transmit sensor data in real time.

A final sea trial, in June/July 2023, integrated the Janus system with TVO's Next Generation Lashing (NGL) system on a 13,700 TEU vessel traveling from Oman to Malaysia. The NGL test bay and the adjacent bay were instrumented to measure tension loads through the conventional lashings to compare NGL performance to a conventional lashing system and accelerations via the stack top accelerometers.

Load cell sensors measured the tension in the ship's lashings and tracked load changes and tension variations. Motion sensors on the deck plate and container stack tops tracked the vessel's motion and container stack dynamics. A sensor measuring accelerations, angular velocities, roll and pitch was installed on the bridge as a reference for vessel motions. The system uses inertial measurement units, pivotal devices that integrate multiple sensors to track and measure motion, to monitor container stack dynamics and movements and track vessel motions (such as roll and pitch[3]).



Next Generation Lashing System - NGL 1.0

result

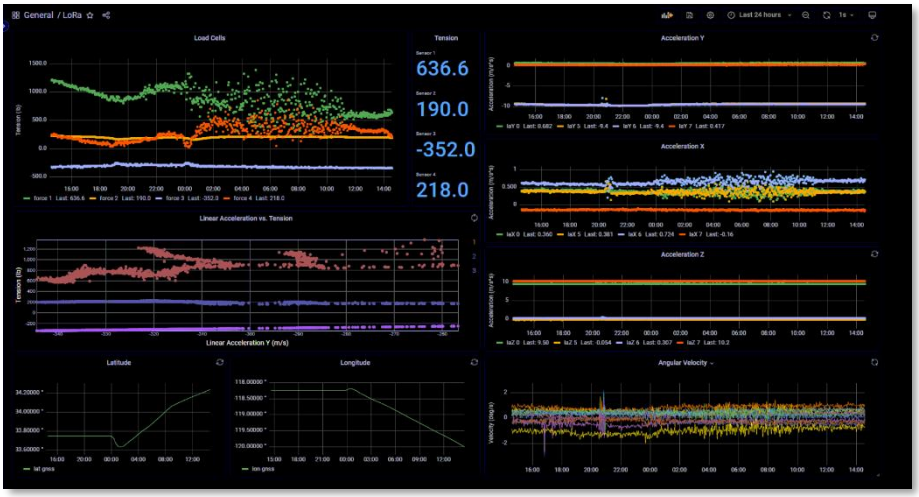
The initial LoRa communication system trial results demonstrated its appropriateness for use on a large vessel with long distances between sensors and receivers as well as those with large obstructions in the communication path. The following test showed its ability to consistently transmit data from the sensors to the onboard PC. The first sea trial in 2022 using a fully instrumented vessel proved the Janus system works as designed and allowed the web-based dashboard to be evaluated and enhanced, while the second successful sea trial enabled additional monitoring data to be gathered.

[3] Roll and pitch are derived from accelerations and angular velocities using advanced Kalman filtering.

The June/July 2023 trial, in which the Janus system was integrated with the NGL, yielded useful results. The data transmitted and analysed by the Janus monitoring system indicate TVO's NGL system is a practical solution for reducing instances of container overboarding and has the potential to enable higher container stacks without compromising vessel or crew safety.

Because of the mild sea conditions, it was not possible for the Janus system to gather and assess the influence of stack dynamic changes and reductions. Although the system was not tested in these exacting conditions, the Janus sytem functioned as anticipated, and the data gathered provide indications of the NGL system's potential efficacy, with evidence suggesting it can both absorb and dissipate energy originating from ship motions and external forces.

The data gathered from sea trials can be fed into the finite element analysis (FEA) model to better visualize the responses of the vessel and container stack to understand the stresses on the system and where failures would be most likely.



conclusion

The Janus monitoring system uses LoRaWAN communication to consistently transmit critical data from strategically placed devices to help identify changes in the vessel's state that could impact its stability. The system is designed to detect potential risks with the vessel's roll and alert users of those potential risks. The system comes with a user-friendly dashboard that can be accessed at any time either onboard or via a web portal.

Real-world tests have been carried out to display the viability of this system. The goal is to take this novel system to the next level, increasing reliability and expanding the operational window to help the maritime industry improve safety and reduce the risk of accidents and injuries.

Using the Janus system with the NGL expands the value of the monitoring system. The International Maritime Organization estimates 20% of 1,500 maritime accidents resulting in injuries each year involve containerships. More than 3,100 containers were lost on average annually in 2020 and 2021—four times the total reported in the previous period.

Containerships are particularly at risk; so improving the ability to secure tall container stacks and monitor the tethering system has the potential to save both money and lives.

As the Janus Monitoring System is installed on more vessels, performance data will be compiled and analysed to generate useful correlations among the sea state, and vessel motions, to allow the system to forecast potentially adverse events more rapidly and precisely.

LINK: https://www.trendsettervulcanoffshore.com/

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