

Transnet seeks OEM collaborations

Transnet Port Terminals (TPT), South Africa's state-owned port operator, wants to change its relationship with equipment OEMs towards "long-term collaboration".

Announcing its new strategy, TPT said that infrastructure and equipment are vital to its business, but the company faces continued "challenges with equipment reliability and availability, as well as the overall performance of assets". These challenges include high maintenance costs, the use of both OEM and non-OEM parts and service providers, and long lead times for critical components and OEM support.

TPT believes it has "limited interactions" with OEMs over the life of its equipment and there is "no incentive for OEMs to invest in developing local product

support because of the piecemeal award of equipment acquisitions and supporting works".

To change this situation, TPT has issued a Request for Proposals (RFP) for the "design, manufacture, delivery, erection, testing, commissioning and asset life cycle management [ALCM] support for container and breakbulk handling equipment for a period of 10 years (acquisition) and up to 20 years (ALCM)".

TPT wants to appoint OEMs for each of nine categories of port equipment, including STS cranes, MHCs, RMGs, RTGs, straddle carriers, reach stackers, terminal tractors and different classes of FLT. The intention is to appoint one OEM for 10 years for the 'acquisition phase' and 10 to 20 years for the ALCM requirements.

Furthermore, TPT has set out very specific requirements for consumables, such as lubricants, filters and so on, to be sourced in Africa, and for suppliers to work with Transnet Engineering (TE) to increase the percentage of components that can be produced in its own workshops. It also said that it wants OEMs to provide "the correct level of intellectual property to TE for fabrication purposes" and to update TPT with "the latest designs and technology in the future generations of the equipment".

One of the most difficult conditions of the RFP is that prices for certain equipment types must be fixed in South African Rand for five years. A representative from one OEM attending the RFP information session called the

five-year requirement "impossible" and asked for it to be waived.

Another made a more forceful argument. "Directly stated, the requirement of a five-year fixed price commitment is a show-stopper," he said. "The high-inflationary environment in recent years has taught us that long pricing commitments are not good business, even with moderate inflation increases annually. No OEM can predict what the cost of producing these machines will be in five years or even in two years. The intention of TPT is understandable, but fixed pricing for a long period comes with too many risks these days." The supplier requested that firm prices be required for a first order only, "because the prices for orders, thereafter, are only sophisticated guesses, at best".



Transnet is looking for long-term equipment contracts with fixed pricing

TPT, however, did not agree.

As difficult as the process seems, OEMs have a major incentive to find ways to meet TPT's requirements as the port operator said it plans to purchase some 700 pieces of equipment over the next

five years, of which 40% needs to be delivered over the next two years. The first purchase planned is for new RTGs, for which TPT wants to see a long-term contract agreement in place by September this year. (Also see p12).

Autonomous vehicles in the slow lane

Autonomous terminal tractors for horizontal transport at port and intermodal container terminals are taking longer to emerge as a viable alternative to 'automated' equipment, such as AGVs and automated straddle carriers, that follow fixed navigation paths in closed zones than some sectors of the industry expected.

At one point, autonomous

vehicles looked set to transform horizontal transport in these applications. Companies, such as Volvo Group, which had long supplied engines for some tractor OEMs, saw an opportunity to use container terminal logistics to develop both autonomous technology and enter a new market by providing transport as a service – essen-

tially driving their own vehicles.

That opportunity has proved difficult to realise. In late 2019, Volvo Trucks announced that its new "electric, connected and autonomous vehicle, Vera, will form part of an integrated solution to transport goods from a logistics centre to a port terminal in Gothenburg, Sweden. The assignment is a result of a new collabora-

tion between Volvo Trucks and the ferry and logistics company, DFDS". The project included NVIDIA, the autonomous driving company that Volvo Cars has been working with since 2016.

While the project initially included Volvo's Vera autonomous terminal tractor concept, this was replaced by a vehicle based on Volvo's road truck range, before the project was then discontinued.

In a statement to *WorldCargo News*, Volvo said: "In November 2022, Volvo Autonomous Solutions [VAS], together with NVIDIA, decided to discontinue activities related to the autonomous container transport project in the Port of Gothenburg. The decision to discontinue it was based on increasing uncertainty in economic outlook and pressure on timelines. VAS and NVIDIA have made the decision jointly and in a partnership manner. Both parties remain

connected and will consider future cooperation opportunities.

"Discontinuing the project in the Port of Gothenburg does not mean that VAS will be exiting the segment – VAS still considers ports and logistics centres to be well-suited for autonomy and will continue to work to better understand customers' needs. The lessons from the project have been very valuable in deepening the understanding and development of autonomous solutions for the Volvo Group."

While Volvo has paused, other companies are continuing to develop autonomous technology for container logistics. In the US, Outrider recently raised US\$555M to continue developing its autonomous platform for trailer logistics.

In Europe, Terberg and autonomous vehicle technology company Fernride are collaborating to develop an autonomous, CE-certified, tractor for commercial production. Fernride is backed by investors that are major operators

of fleets of Terberg equipment, including HHLA and Deutsche Bahn. The target is to start series production in 2024 of terminal tractors that are delivered "ready for gradual autonomy", said Terberg.

At the same time, Konecranes is now working to add a degree of 'autonomous' operation to its well-known AGVs, enabling them to venture out from a closed container yard into areas where they will operate in a mixed traffic flow environment with manned machines. In doing so, Konecranes is looking to leverage the advantage it already has of well-developed software for AGV navigation and fleet management, while layering new autonomous features that meet requirements in respect of standard and certification that customers require. (See p17 for further details).

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More ZPMC AutoStrads

Another two ZPMC automated straddle carriers have been sent to APM Terminals' facility in Aarhus, Denmark. In 2021, APM Terminals signed an Alliance Memorandum of Understanding with ZPMC covering the joint development and deployment of a wide range of automated solutions, including automated container handling equipment.

APM Terminals had earlier taken delivery of a ZPMC automated straddle carrier at Aarhus, which it is known to be testing in a closed area. The first machine

will now be joined by the two units pictured. It is believed the machines include automation systems developed by Westwell Lab, the Chinese AI company.

It is not known whether APM Terminals intends to introduce automated straddle carriers at Aarhus, but it is currently in the midst of a major roll-out of automated straddle carriers at Pier 400 in Los Angeles. There, the automated straddle fleet numbers over 130 machines, all of which were supplied by Kalmar.

The two ZPMC automated straddle carriers departing Shanghai



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Automation progress for Patrick Ops Factor launches Ops Academy

Patrick Terminals in Australia continues to develop automation technology at its terminals in Brisbane and Sydney.

At Fisherman Island in Brisbane, Patrick recently introduced Automated Truck Handling (ATH) on the Kalmar AutoStrads for the landside gate operation.

Patrick operates 35 Kalmar AutoStrads at Brisbane, which was the first terminal in the world to introduce automated straddle carriers. For a long time at Brisbane, every truck move in the landside interchange zone was performed by a remote operator on the ground with a teleoperation controller.

ATH was developed by Kalmar to enable containers to be loaded and unloaded to and from road trucks automatically. With ATH, the automation system handles the move, with a remote operator in another location handling any exceptions where the automation system cannot complete the job.

Matt Hollamby, Patrick Terminals' Brisbane manager, said



Gate moves at Brisbane are now handled by the Kalmar automation system

that ATH has been a success. "We're very pleased with it, and it has profoundly changed the way we do business as a stevedore. Originally, putting a box in a load scenario onto a truck was

more difficult, and we cracked that about 12 months ago," he said, speaking in May. He added that "the vast majority" of trucks in Brisbane are now handled by the automation system.

Also in Brisbane, Patrick has commissioned a new 'semi-automated' STS crane from Liebherr. The new crane, which is the first of its kind for Patrick Terminals, features a semi-automated crane cycle and a remote control operator's station. Liebherr worked with Patrick to commission the crane and train operators and 'super users' on the new remote operating method. Patrick said the crane "meets our safety standards and operational needs" and it deemed the project a success.

In Sydney, Patrick has constructed and commissioned a new AutoStrad refuelling and checking bay. The covered structure is located close to the berth, to allow for faster refuelling, checking and maintenance, and helping to reduce straddle downtime.

Control room design and operator solutions specialist Ops Factor, part of the Dubbeldam Group, has launched the 'Ops Academy', a new online learning platform, dedicated to facilitating and optimising the operational process.

"Sharing knowledge is part of the mission of Ops Factor – to integrate the operations factor in automation projects and to bring synergy between technology, people and process," said Ops Factor. "With over 30 years of experience in control room and operator solutions, Ops Factor has developed an online platform to connect stakeholders, share our control room design expertise and in-

novative control room solutions, supporting the operational process and optimising the efficiency, safety and reliability of your operations."

The online learning platform has been developed for operators, operational managers, automation managers, engineers, project managers and technical service engineers. It will include webinars and videos on pertinent topics, "practical consultancy tools for connecting technology, processes and people, training modules and manuals and specifications for Ops Factor's control room products", the company added.

At TOC Europe 2023 in Rot-

terdam this month, Ops Factor will launch another development, the 'Ops Data Integration' solution. This brings together different data sources for smart information presentation and selection.

"The Ops Data Integration solution connects different data inputs with remote operator desks, integrated operator workstations and video wall solutions," said Ops Factor. "Creating smart workplaces and central video wall presentation connects teams and operators, whether they are working in one central control room or remotely, from different terminals, offices or outdoor locations."

Malmedie goes lightweight

German coupling specialist Malmedie has developed a new Evolution Torque Safety Coupling, which it will display to the industry for the first time at TOC Europe 2023, being held

this month at Rotterdam Ahoy.

The Evolution Torque Safety Coupling is designed to work with the Snag Overload System (SOS) to protect crane drive components in a snag event, while helping terminal operators to reduce energy consumption and save costs.

A feature of the SOS system is the use of a resettable safety coupling in the main hoist drive. In a snag event, this trips to separate the motion and inertia in the hoist motor from the gearbox and rope system, protecting the drive and the crane structure from overload forces. The new Evolution Torque Safety Coupling achieves this with a significantly lighter component.

"Compared with previous designs, the company was able to reduce inertia of this technology by more than 45% and mass by about 20%," said Malmedie. A lower weight reduces inertia in the drivetrain and saves energy. "Acceleration and deceleration of inertia are proportional to power consumption in drivetrains. Safety coupling is accelerated to top speed and decelerated to a full stop twice for each container being moved. Energy savings are thus significant," added Malmedie.

Reducing inertia of the cou-

pling means that all components in the powertrain will see smaller mechanical loads and can be smaller sized, helping to further lower the initial investment cost and increase inertia-related energy savings.

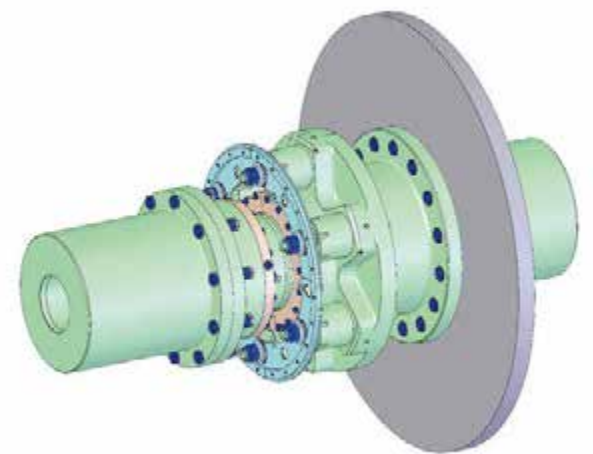
"We looked at aviation to inspire our lightweight designs," said Dr André Voßnacke, head of technology at Malmedie. "We challenged our assumptions on what customer value means. The team is proud of the result."

Additional benefits of the Evolution Torque Safety Coupling include easy access for maintenance and a low wear part count and cost. The system needs to be serviced once every two years.

In operation, the Evolution Torque Safety Coupling provides overload protection from an ultra-fast mechanical system, without the need for hydraulics or electric circuitry.

"Alternative snag-prevention systems rely on signal analysis and processing and, therefore, need an order of magnitude longer to react. In a world of increasing automation, a mechanical snag-prevention system is an important contribution to ensure safety while humans are supervising loading operations from afar, or not at all," concluded Malmedie.

The Evolution Torque Safety Coupling works with the SOS to protect crane drive components in a snag event, while also reducing energy consumption



Liebherr for Teesport

Teesport has taken delivery of two electrically powered (electric over hydraulic) rail-mounted portal cranes from Liebherr, representing an investment of £8.6M by PD Ports. The cranes are the LPS 550 model. This is the same as the LHM 550 – Liebherr's most popular mobile harbour crane – from the slew ring upwards, and the portal is adaptable to the crane rail span at the customer's terminal.

They have been supplied in

four-rope configuration for bulk handling operations at Teesport Bulks Terminal, which was opened in 2020.

Frans Calje, CEO of PD Ports, said: "I am delighted to see the new cranes in operation at Tees Dock. As a business, we are committed to driving positive change and building a more sustainable future. This investment signifies that, whilst also ensuring we can uphold the highest operating standards."



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Konecranes electric straddle in Antwerp

MSC PSA European Terminal (MPET) has officially launched a new Konecranes fully electric straddle carrier, which it is calling the 'e-straddle carrier', at its terminal in the Port of Antwerp, as part of the joint Green Straddle Carrier Program initiated by Antwerp Terminal Services (ATS), MPET and PSA Antwerp (PSAA).

MPET referred to the e-straddle carrier as "the first-of-its-kind in mainland Europe". Kalmar has previously installed a battery-electric Shuttle Carrier with its FastCharge system at a port in the UK, but it is not known if it is still operating. Konecranes has gone in another direction with its electric machine. Rather than relying on opportunity charging, the battery system is designed and sized for four-plus hours of continuous operation "without any dip in performance", stressed MPET. Maximum speed is 26 kph and charging time is 90-120 minutes.

The e-straddle can connect to the charger without requiring any manual labour. The recharging station is located in the straddle parking area, housed in a shipping container with an extendable charging plug protruding from one bottom corner. The straddle carrier stops in the correct position by driving against a wheel guide, allowing the plug to extend from the container into the receptacle on the straddle carrier to make the connection for recharging (as pictured).

MPET emphasised that the e-straddle is in line with its sustainability goals, but there is still work to be done to evaluate the machine's performance and consider how a fleet of electric machines can be implemented.

"In line with the UN Paris Climate Agreement and the EU Green Deal, ATS, MPET and PSAA aim to reduce their carbon emissions by 50% in 2030, against a 2019 baseline, and achieve net-zero emissions for all their terminals by 2050," stated MPET. "As part of their plan to reach these objectives, the e-straddle carrier, which runs 100% on batteries and takes approximately 90 minutes to fully recharge, can play an important role in the long run by helping to reduce terminal greenhouse gas emissions. Currently, all electricity purchased by MPET and the PSA terminals in Belgium is generated solely from renewable sources, thus there will not be any greenhouse gases emitted while producing energy to power the e-straddle carrier."

"Over the coming months, MPET will evaluate the e-straddle carrier's performance in live operations. During this trial period, ATS will assess how the equipment can be improved and examine other factors that are necessary to scale up this new technology, including how to optimise the recharging of a larger fleet and the possibility of safely and effectively progressing to full-scale operations."

One of the main issues to be considered is whether Konecranes has struck the right balance between the size of the battery pack, the charging time and the operation time on a single charge. Some terminal operators were known to be looking for a full-shift operation on a single charge, but this is probably unrealistic in a straddle carrier application. MPET said that the Konecranes e-straddle offers four hours, but some operators might be concerned about the charging period of 90-120 minutes. At the terminal, MPET will need to consider the physical area needed for the charging stations and the overall power supply requirements if the fleet is expanded.

The pilot project at MPET will allow these issues to be considered in an operational context. Johan Van Daele, CEO of MPET, is enthusiastic about the new e-straddle carrier. "The energy transition from fossil fuels to more sustainable alternatives is in full swing and we are taking a leading role at our terminals," he said. "Although we still have many obstacles to clear before scaling up our e-straddle carrier programme, having a working prototype is an important first

step to a zero-emissions straddle carrier fleet."

MPET noted that the e-straddle carrier feasibility study "is part of the joint Green Straddle Carrier Program, in which the terminal operators are holistically evaluating four major technological pathways to significantly reduce these vehicles' carbon emissions in their actual working environment – full electrification, hydrogen, hybrid battery/diesel and biofuel".

Hydrogen is being tested in a dual-fuel straddle carrier that has been developed jointly with CMB.TECH, the cleantech arm of Compagnie Maritime Belge (CMB). MPET said the results of the study "will determine which tech-

nology will be scaled up to meet future energy needs".

Francis De Ruytter, regional head of sustainability at PSA Europe, Mediterranean and the Americas, said: "Straddle carriers are crucial in maintaining highly productive operations at our terminals, but at the same time, they are responsible for approximately 90% of our direct emissions in Belgium. We are examining alternatives, while concurrently investing in our Green Straddle Carrier Program that explores various technological options and partners to make these vehicles more sustainable in the near term."

The e-straddle carrier connecting to the charging station



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Westwell launches E-Truck

Autonomous driving and AI specialist Westwell of China has launched a new version of its Qomolo Q-Truck that can operate in manual mode and then be converted to autonomous operation.

The vehicle is called E-Truck, which stands for 'Electric Intelligent Connected Terminal Tractor'. Whereas the initial Q-Truck is an autonomous only vehicle with no driver cab, E-Truck is designed to support a pathway to driverless operation.

"E-Truck is the world's first electric intelligent terminal tractor upgradable to autonomous driving," the company said. "It is a distinctive and innovative solution that answers to the ever-

pressing need for electrification of commercial vehicles in maritime ports, logistics parks and other semi-public areas. E-Truck is designed with an upgrade to autonomous driving in mind. It shares the same drive-by-wire system and chassis as Q-Truck, the electric autonomous heavy-duty truck of Qomolo, and, therefore, can be easily upgraded to have full autonomous driving capability."

The E-Truck has the same battery-electric drive as the Q-Truck and is compatible with the PowerOnair system that Qomolo has developed, which allows for battery swapping in less than five minutes, as well as the WellFMS fleet management sys-

tem. "Other than remote monitoring and smart scheduling of tasks, which Q-Truck also benefits from, WellFMS offers a smart driving experience for E-Truck. Drivers are well-informed of the scheduled tasks and are presented with the most optimal routing through the HMI display. Being the newest member of Qomolo, Westwell's AI-driven autonomous driving solutions, E-Truck further expands the horizon of sustainability and better operational efficiency in commercial and industrial scenes," said Qomolo.

The new E-Truck features an operator cabin with side door access. Access to the fifth wheel through a rear cabin door is not



The cab on the E-Truck is designed to be removed and replaced with the 'Q-Truck' system for autonomous operation

possible because of the large swappable battery situated behind the cabin. Qomolo has designed the machine with an adjustable fifth wheel coupling with what it

referred to as an "automated drop and hook experience".

Other specifications include a 400 HP drive with an automated manual transmission supporting

a maximum payload of 75t. The battery is a 282 kWh unit with a 150 km range, according to Qomolo. Charging time with a dual-port DC fast-charging system is 1.5 hours, if the vehicle is charged directly rather than swapping batteries.

The controls in the cab are connected to the E-Truck through a drive-by-wire system. For autonomous operation the cab is removed and the Qomolo Q-Truck system is installed for autonomous driving.

Other equipment OEMs and autonomous vehicle companies are looking at a different migration path, whereby a conventional tractor can switch backwards and forwards from manned to autonomous operation without any modifications.

Europeans lose out in Russia

Petrolport (PLP), part of Global Ports International (GPI) in the Big Port of Saint Petersburg, has put into operation two new reach stackers from Sany. PLP now operates 13 reach stackers, but these are the first from China.

In the past, this order would most likely have gone to Kalmar or Konecranes Lift Trucks, but

both Cargotec and Konecranes pulled out of the Russian market after Moscow attacked Ukraine.

PLP plans to acquire three more reach stackers this year.

Separately, in the Russian Far East, GPI's VSC Vostochny terminal has put into service two Liebherr 550 mobile harbour cranes (MHCs). The cranes were ordered in late 2021/early 2022,

before the invasion of Ukraine, and have just gone into service. The cranes were shipped as sub-assemblies and parts, but when they were shipped is unknown. Nor is it known when the cranes were erected and commissioned, and it is not clear who undertook that work. A lead time of around 15 months is overly long for MHCs.

Sales of port equipment to Russia are not covered by EU sanctions (latest European Council data, April 2023). Some of Liebherr Group's products and services are subject to sanctions. In March 2022, the group stated that it supports the sanctions imposed on Russia and was implementing the extensive sanction measures. In January 2023, Liebherr was named by *SWI swissinfo.ch* as one of four Swiss companies still doing business in Russia.

Heavy duo delivered by Kalmar

Kalmar has produced two exceptionally heavy machines in recent months. One is a special FLT, designed and built in Ljungby, Sweden, with an SWL of 85t at 2,300mm load centre. This has been shipped to Protruck A/S in Denmark, which will deliver it to the end-user, for handling wind farm components in a Danish port.

Meanwhile, a Kalmar Super Gloria reach stacker designed to handle containers from barges coming through the Mittelland Canal has been shipped to the customer, Entwicklungsgesellschaft Güterverkehrszentrum Wolfsburg GmbH. No further information has been provided on either of these giant machines.



Pictured is one of the first 'Charger' RTGs manufactured by Kuenz for the Norfolk Southern railroad. The Charger is a low-height, narrow-span RTG designed specifically for working long intermodal container trains at US terminals. The Charger features hybrid drive with a diesel genset with optimised fuel consumption and a battery. The gantry travelling gear features highly efficient electrical drives for reduced energy consumption, and slewing gears for axle rotation. Norfolk Southern has ordered 10 Kuenz Charger RTGs for three different terminals.

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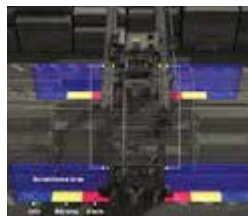


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27 rows for TiL

France's Haropa Port has announced that Terminal Investment Limited (TiL), a subsidiary of Mediterranean Shipping Company (MSC), has ordered nine ship-to-shore cranes with a massive 27-row outreach for its TPO/TNMSC container terminals at the Port of Le Havre.

Ordered from ZPMC, the cranes are part of the first phase expansion at Le Havre, where TiL/MSC are investing €900M – an increase on the €700M announced earlier.

Haropa Port said that the first phase of the project is valued at €200M and includes the "Port 2000 quayside electrification programme", which will see the port provide electricity for shore power and for 20 new yard gantry cranes.

"Manufactured in China by ZPMC, the gantry cranes will have an outreach across 27 rows of containers and will be able to handle the largest container ships in the world (24,000 TEU)," Haropa Port said in a statement.

With a 27-row outreach, the cranes are likely to have a boom length of over 80m. The new ZPMC cranes for APM Terminals' MedPort Tanger facility in Morocco have an 82m outreach, which the terminal operator said is sufficient for "cargo vessels of 26 containers in width, or up to 24,000 TEU in terms of container capacity".



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Automation milestone in Rotterdam

APM Terminals' Maasvlakte II (MVII) terminal is continuing to set records for 'port moves per hour' (PMPH), the productivity statistic that Maersk Line and APM Terminals use to measure productivity over the duration of a vessel call. It is calculated as the average of the gross moves per hour for each call.

Earlier this year, MVII set a new record when it handled 6,851 containers off and on the 20,568 TEU MUNICH MAERSK in 28 hours, achieving a PMPH of 234.4.

In April, MVII topped that performance, handling 256 PMPH on the MONACO MAERSK while exchanging 9,233 containers in just over 36 hours. A short video from the operation shows that tandem 40ft container operations were deployed, something that APM Terminals had earlier said it was making greater use of at Rotterdam.

MVII is certainly not the first terminal to demonstrate that STS cranes can go this fast, so to speak, but it needs to be remembered that the STS cranes at the terminal are automated and remotely controlled, with the ABB automation system. When they were introduced, there was a lot of doubt that remotely controlled STS cranes could support this level of productivity.

Furthermore, the yard at MVII uses Konecranes Gottwald Lift-AGVs for the horizontal transport and Kuenz ASCs (again with ABB drives and automation) for the yard stacking. Supporting a 9,233 container exchange in 36 hours says something about the ability of an automated yard to 'keep up' with high rates of berth productivity.

Topping 250 PMPH is important in



APM Terminals MVII has achieved 250+ PMPH

another respect – in 2011, Eivind Kolding, the then CEO of Maersk Line, said that the carrier's new Triple-E class 18,000 TEU vessels would require ports to be able to deliver productivity of 6,000 moves in 24 hours, which requires berth productivity of 250 moves per hour.

At the time, this seemed like a requirement from another paradigm – terminals were still handling mainline vessels with three or four STS cranes and productivity rates of 150 berth moves per hour was a top performance. Asked by *WorldCargo News* how terminals could bridge the gap, Kolding said that new concepts were needed, such as the FastNet STS crane system, which could put STS cranes on adjacent bays of a vessel, allowing more cranes to be deployed.

APM Terminals decided not to implement the FastNet system at MVII in Rotterdam. As noted above, it has got

to the target of 250-plus containers per hour using a combination of tandem 40ft handling and equipment automation. It could be said that this is not exactly the same as the 250 'moves' that Kolding presented in 2011, but he was talking in the context of each move being one container or two 20ft boxes, *WorldCargo News* believes. If in 2011 Eivind Kolding had been offered a terminal that could handle a call exchange of 9,233 containers in 36 hours, he would probably have taken it.

Over the years, it has emerged that the real key to meeting the 6,000 move challenge is not peak speed but consistency. It might have taken longer than Maersk or APM Terminals expected when the terminal was designed, but MVII is showing that it can be done.

APM Terminals is expanding its MVII facility in Rotterdam, as reported on p35 of this edition of *WorldCargo News*.

New pier for Mar del Plata

The Buenos Aires Ministry of the Environment has given the go-ahead for tenders to be issued in respect of construction of Pier 9 at the Port of Mar del Plata. According to Gabriel Felizia, president of the Regional Port Consortium, this will boost berthing capacity at the port, which is something that should have been done 60 years earlier.

The pier, which will be built inside the Southern Breakwater (Escollera Sur), will take 24 months to complete and allow Mar del Plata to pitch for new business. Funding for the US\$17.34M project has not yet been identified, although it is expected to come from national credit agencies. This will be preceded by a public participation stage, where any objections to the project can be made and any necessary changes undertaken to the environmental impact assessment.

In terms of engineering, Pier 9 will be built using 168 perforated reinforced concrete piles, spaced every 6.76m. Each will be surrounded by a 1.2cm-thick metal 'jacket'. These, in turn, will be linked by means of beams and slabs to form a reinforced concrete gantry structure.

In total, the pier, which will be located 70m from Pier 10 and 300m from Pier 7, will cover a surface area of 6,631 m². On the adjacent Southern Breakwater, there will be an additional 4,620 m² of operational area, where buildings and service facilities will be located. Access will be via the port's interior road network. According to the port authority, it will also have on-shore electricity, pressurised drinking water, fuel lines, security islands, a lighting system, a fire prevention system, a lifeguard office and beacons.

Mar del Plata is looking to diversify from predominantly being a fishing port



Ust-Luga legal hearings

St Petersburg's Smolninskoye District Court has cleared Valery Izraylit, the former chairman of JSC Ust-Luga Company (KUL) – the long-time main developer of Russia's largest Baltic seaport – of two of the three criminal charges brought against him. Izraylit was arrested in December 2016, and a year later was accused of grand fraud, money laundering and illegal withdrawal of funds out of Russia. The first two charges have been dropped, as the respective statute of limitation periods have expired. The third charge has not been dismissed and, if found guilty, Izraylit could face five to 10 years' imprisonment and/or a fine of up to RUB1M (US\$13,000).

The court said Izraylit would remain under house arrest (where he has been since March 2020), in order to "prevent his escape from the country". According to the judges, absconding is a strong possibility, as he has relatives living abroad, owns property in the UK and has foreign bank accounts and shares in foreign companies.

According to the prosecution's overall conclusions, Izraylit embezzled and si-

phoned off funds earmarked for the development of Ust-Luga port's infrastructure. In addition, Transneft, Russia's state-run oil pipeline operator, has filed an additional suit for RUB3.5B (US\$44M) for alleged supplies of used pipes instead of new ones, when constructing an oil terminal at the port. However, according to local media, Transneft's top executives could not have been unaware of the fraud, if indeed it took place.

Izraylit is largely credited with attracting substantial investment and ensuring that Ust-Luga port was built to European standards. He was director general and then chairman of KUL from 1999 and 2005, respectively. Established as a 100% state-owned company in 1992, KUL developed the port on the principles of public-private partnerships and was authorised to take financial, project design, building and operational decisions.

KUL's controlling stake now belongs to Novotrans, a major Russian transport group, which is developing the 24 Mtpa Lugaport multipurpose terminal.

Wärtsilä and Singapore's MPA sign MoU

The Maritime and Port Authority of Singapore (MPA) and Helsinki-based Wärtsilä, one of Finland's leading technology groups, have signed a Memorandum of Understanding (MoU) that will result in them cooperating on several fronts in the areas of decarbonisation and digitalisation. Specifically, the MoU calls for research into the development and introduction of next-generation renewable fuels, on optimising digital solutions for port operations, and on nurturing future talent.

When it comes to new fuels, the MoU allows the partners to forge partnerships with various companies that can contribute to the development of new 'green fuel' safety concepts and procedures that will enable such fuels to be processed, handled and then used safely. MPA and Wärtsilä hope that their initiative will help lead to a global standard for maritime fuel safety being adopted.

Meanwhile, the two parties will seek to make port operations more efficient through developing what they said would be "reliable, secure and cost-effective data

exchanges between vessels and port operations".

In a statement, MPA and Wärtsilä said: "Sharing of data at scale, including real-time data, has the potential to optimise port and vessel operations, such as just-in-time planning. It can also greatly enhance data-based value generation, including the development of new capabilities and operational processes. The development of an operational concept for vessels and harbour craft utilising AI-based monitoring, tracking and incident response, is also planned."

The parties' digitalisation initiative will rely extensively on data from Wärtsilä's Navi-Port system, MPA's various digital platforms, and other relevant sources.

Crucially, the MoU also includes collaboration on cyber security issues, which are becoming increasingly common and more damaging in the ports and shipping industries. In particular, the parties will assess threats and risks to shipboard systems, ship-to-shore communications systems and, specifically, MPA's digital platforms.

On the labour front, the MoU is struc-

tured to ensure that future employees in the maritime sector have the necessary skills and access to the right training programmes to work effectively and competently with new digital solutions and fuels as they come on stream. The parties said that they could work with the Tripartite Advisory Panel under the Alliance for Future Maritime Talent to co-create enhanced training programmes, for example.

MPA is determined to maintain Singapore's status as a hub for innovation and its role as a leading bunkering port, and it views the MoU as important in this regard. "As a major bunkering and a maritime hub port supported by a robust R&D and start-up ecosystem, Singapore is at the heart of marintech innovation and is at an exciting phase for the potential introduction of maritime fuels such as methanol, hydrogen and its derivatives, such as ammonia," said Kenneth Lim, assistant CEO (Industry and Transformation) at MPA. "We look forward to our partnership with Wärtsilä to unlock our collective potentials and develop solutions that can be scaled to benefit global maritime community."

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GTOs faced difficult Q1

Earnings at the world's major terminal operating companies continued to decline in Q1 2023. A combination of slowing trade volumes and reduced levels of congestion, which cut container dwell times in many ports and hence income from storage charges, were the main factors involved. Moreover, rising costs – largely caused by high inflation affecting energy prices and labour rates – ate into most operators' profit margins.

Drewry, the London-based maritime research and consultancy firm, expects these pressures to ease as the year elapses. In the company's latest *Global Container Terminal Revenue Index* report, which is published within its regular quarterly *Ports and Terminals Insight* publication, analysts wrote: "Looking ahead, while weakening container traffic will depress total revenues, the impact on per-unit revenues will be partially offset by inflation-linked annual tariff increases."

In terms of individual results, the biggest revenue slides were registered by APM Terminals (APMT) and Hamburg-based HHLA with declines of 22.6% and 5.9%, respectively. While the number of containers processed at APMT's facilities dropped by 9.5% compared with the corresponding period of 2022, those at HHLA fell almost 19% to 1.4M TEU. HHLA's operating profit crashed by 33% to US\$66M.

HHLA has been severely impacted by Russia's war in Ukraine and the sanctions imposed on Russia by the European Union, as most of its throughput is generated by its facilities in Hamburg. Moreover, maritime operations at the company's Ukrainian terminal in Odessa have been suspended since Russia's full-scale invasion. This was one of the main reasons for traffic volumes at HHLA's international (outside of Germany) operations falling from 112,000 TEU in Q1 2022 to 56,000 TEU this year.

"As we expected, container throughput and transport volumes in the first quarter of the year were weak," explained Angela Titzrath, CEO of HHLA. "Despite the challenging times, HHLA continues to implement its strategy based on sustainability and profitable growth." She expects an improved performance in Q2 2023.

DP World does not publish quarterly financial results, but on the basis of throughput volumes was, along with Manila-based ICTSI, one of the few to buck the trend. In Q1 2023, the company's throughput volumes rose 1.4% to 19.5M TEU on a reported basis and an even better 3.7% on a like-for-like basis. ICTSI scored an even better result with a volume increase of 9.5%, up to 3.1M TEU. Its turnover increased to US\$572M, a rise of 8.3% on the same period of 2022.

Commenting on DP World's operating performance, the group's chairman and CEO, Sultan Ahmed Bin Sulayem, said: "Our portfolio had an encouraging start to the year with container volume growth of 3.7%, once again ahead of the market, which is estimated to be down by 6.3%. This outperformance continues to demonstrate that we are in the right locations, and our strategy to offer integrated supply chain solutions to beneficial cargo owners is driving value for our stakeholders."

He expects a consistent performance for the remainder of the year. "Looking ahead, the near-term outlook remains somewhat uncertain, given the geopolitical backdrop, high inflation and currency fluctuations," he said. "However, we expect our portfolio to deliver a stable performance in 2023 as we remain focused on driving revenue synergies from our recent acquisitions while managing costs and growth capex."

Similar sentiments were expressed by Enrique K. Razon, chairman and president of ICTSI. "Looking ahead, whilst we remain cautious of continued uncertainty, ICTSI is a strong and agile business, differentiated by our strategy in origin and destination gateway terminals, as well as an experienced team with a sharp focus on operational discipline, which positions us well for future growth," he said.



Despite the global slowdown, ICTSI saw throughput at its terminals increase 9.5% to 3.1M TEU in Q1 2023. Its Basra Gateway Terminal at the Port of Umm Qasr in Iraq notched a milestone in May when it crossed the 4M TEU mark after nine years of operation

Loan guarantees for Leixões access work

In Portugal, APDL, the port authority that oversees operations at the northern ports of Leixões and Viana do Castelo, as well as navigation of the Douro River, is in negotiations with the European Investment Bank for a €60M loan. This is needed to extend the existing breakwater and improve maritime access to Leixões.

The country's minister of finance noted that the Portuguese state will assume the role of guarantor for the subsequent transaction.

The project involves both the extension of the breakwater and deepening of the available draught. When it first surfaced,

it was costed in the region of €131M. However, global inflation brought about by Russia's war in Ukraine, has increased the cost to an estimated €181M.

APDL has long argued that this work is vital if Leixões is to continue attracting ever larger vessels, which it points out is very much the trend in the container business at present. However, its own ability to fund the work has diminished in recent times. The pandemic undermined revenue across the board, particularly that generated by the cruise industry. In addition, the closure of the Petrogal refinery also cut its profits.

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RWG presses ahead with truck booking fee

Rotterdam World Gateway (RWG) is on a collision course with the Dutch container trucking sector over its introduction of a controversial 'peak hours surcharge' for gate appointments.

Truckers are to pay €15 excluding VAT per call – pick-up or delivery – made between 06.00 and 17.59 hours on weekdays. RWG hopes to enforce a more even spread of work between day and night. The road transport operators need to agree to RWG's new conditions to be able to book a time slot. Agreement is also required for bookings outside the daytime 'peak' period.

Booking fees, peak hour fees and other infrastructure charges

for landside service are becoming increasingly common in the industry, particularly at large container ports, where the challenge of finding the right container in the yard is difficult to manage without a monetary incentive to spread bookings out across the day.

Introducing new fees, however, is never popular with the trucking community. Even in markets where landside access fees are near universal, such as Australia and San Pedro Bay in southern California, trucker groups have continued to lobby against them long after introduction.

In Rotterdam, multimodal operator Contargo has given in and



RWG is charging €15 plus VAT for daytime appointments

announced that it will pass the fee on to its customers. "We at Contargo are directly affected by this so-called peak surcharge, because we are practically always forced to call at RWG during peak hours," stated Contargo. "For this reason,

from 24 April 2023, we shall unfortunately have to pass on to our customers this peak surcharge levied by RWG – including resulting costs – in the amount of €17.50 for all container trucking transports to and from RWG."

Traffic returning to Port of Long Beach

The Port of Long Beach (POLB) handled 656,049 TEU in April 2023. While this was down 20.1% from April 2022, POLB executive director Mario Cordero noted that April 2023 was the port's best month since October 2022.

Furthermore, the rate of decline in the year-on-year comparisons is slowing – numbers were down 30% in March, 20% in April, and the forecast for May is 15%. Cordero emphasised that this "is a positive trend. It brings optimism that we will continue to see some growth in the remainder of the year". His 'best case' forecast for 2023 is 9.3M TEU, which would

be a 2% increase on 2022 and a 22% increase on the 7.6M TEU recorded in 2019.

Along the way, POLB expects it will regain its position as the second largest container port in the US. "Port of New York/New Jersey [NY/NJ] overtook us in 2022, but we will climb back to the number two spot soon," said Cordero. Long Beach actually handled 7,659 TEU more than NY/NJ in April, but the east coast port still holds a lead in year-to-date figures for 2023. Cordero does not expect this to last. "We will soon have our numbers for May – then we will wait and see," he said.

Poor performance at Indian ports in 2022

Indian ports handled 19.7M TEU in 2022, up less than 1% on the previous year's throughput, as the global economic slowdown, ongoing effects from the pandemic and rampant inflation depressed cargo volumes. Container traffic is expected to pick up this year, with analysts expecting most ports to register much stronger rates of growth.

In 2022, privately controlled ports tended to achieve higher rates of growth than those in the public sector, with Pipavav (owned by APM Terminals), Ennore (facilities controlled by Adani Ports & Special Economic Zone - APSEZ) and Kattupalli (APSEZ) registering growth rates of 21%, 15% and 58%, respectively.

Mundra, however, which is APSEZ's biggest port asset and

the largest commercial port in India, suffered a 5% loss in its container traffic during the year. Its volume of containerised freight totalled 6.2M TEU, down from 6.5M TEU in 2021.

Overall, though, APSEZ's trading performance was robust in 2022. "The improvement in cargo volumes is testimony to the faith that our customers have in us," said Karan Adani, chief executive and whole time director of APSEZ, in a statement accompanying the release of the company's annual results for financial year 2022-23, which ended on 31 March 2023.

"It shows our commitment to using improved efficiencies and technological integrations to drive and achieve customer satisfaction. APSEZ's flagship port, Mundra,

is outpacing all its closest rivals and continues to be the nation's largest port in terms of volumes handled. Mundra's infrastructure meets world standards and provides service levels on a par with those of its global competitors, making it India's gateway for container goods."

Of the major (government-controlled) ports, Nhava Sheva was among the best performing. All of the port's five container terminals are privately run and competition among the facilities has resulted in improved levels of efficiency and productivity. In 2022, almost 6M TEU was processed, a record level for the port and up 5.5% on the previous year (see table).

"Last year was phenomenal for Jawaharlal Nehru Port Author-

ity [JNPA] as we achieved the milestone of handling the highest ever traffic at the port," said Shri Sanjay Sethi, chairman of JNPA. "The performance of all our terminal operators is noteworthy. Besides this, in 2022, we became India's best-performing port, the first 100% landlord major port, and were acclaimed with various prestigious awards."

"Our achievement is a result of the port's consistent efforts and commitment to providing the best services to our clients. I would like to thank all the stakeholders and employees for their relentless support and efforts to better our port's performance."

JNPA is also optimistic about the future, with plans in place to increase its container handling capacity up to 10M TEU

Container throughput at ports in India (2021-22)

Port	2021	2022	Change
Mundra	6,515	6,203	-4.8%
Jawaharlal Nehru Port	5,683	5,993	5.5%
Chennai	1,595	1,470	-7.8%
Pipavav	630	764	21.3%
VO Chidambaram (Tuticorin)	779	733	-5.9%
Kochi	736	695	-5.6%
Kattupalli	435	686	57.7%
Kolkata	730	675	-7.5%
Hazira	627	616	-1.8%
Ennore	480	550	14.6%
Visakhapatnam	512	527	2.9%
Sub total	18,722	18,912	1.0%
Others	805	840	-4.2%
Total	19,562	19,717	0.8%

Notes: data in ,000 TEU unless otherwise stated. Sources: Ports and WorldCargo News data

a year by 2026. Earlier this year, Nhava Sheva Freeport Terminal (NSFT), which is a joint venture of JM Baxi Ports & Logistics Ltd and CMA Terminals, took over as the new concessionaire of the JNPCT facility.

NSFT is modernising and expanding container handling capacity at the terminal by installing new equipment and systems in a capital investment programme that is expected to be completed by the end of 2024.




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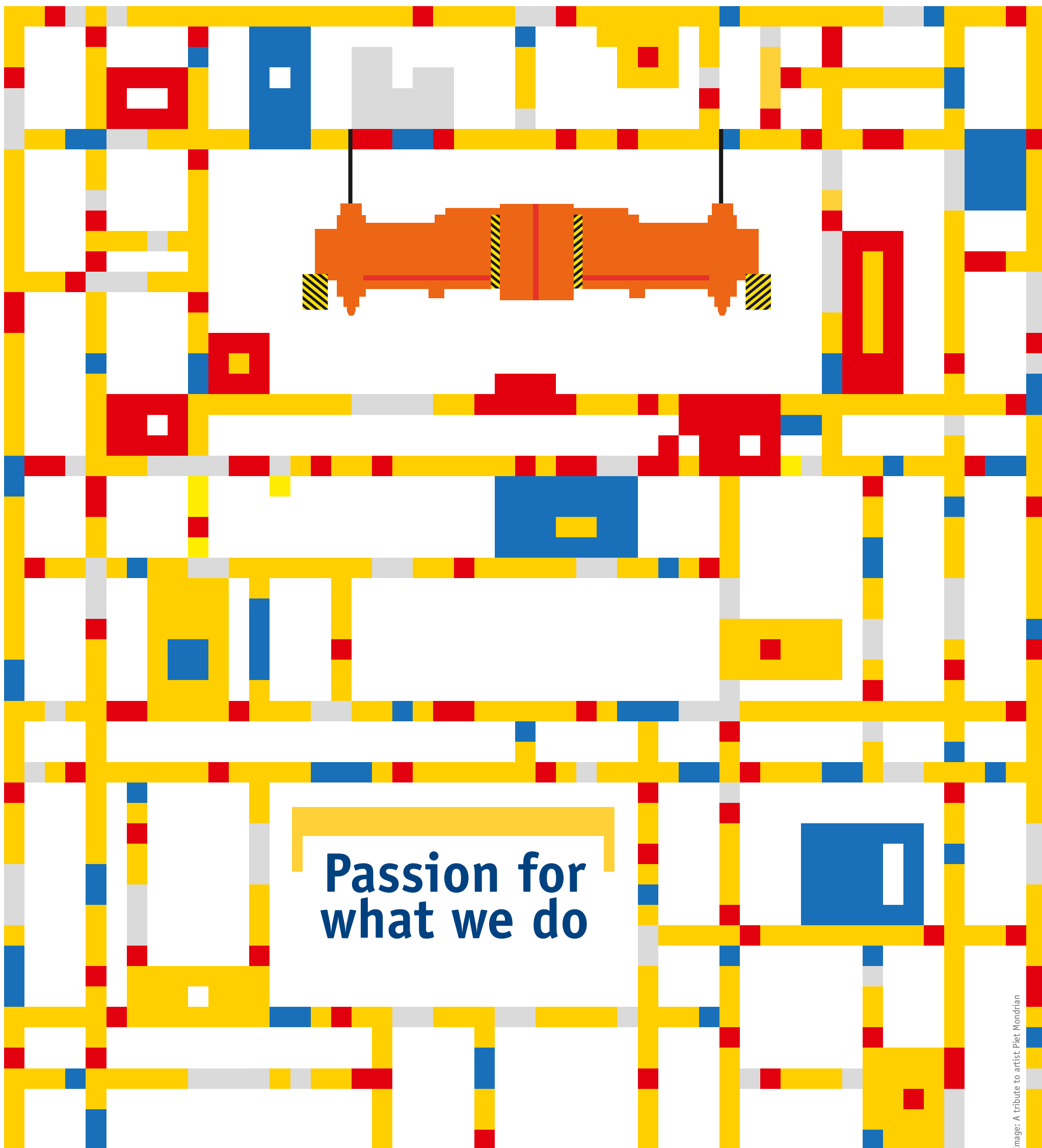


Image: A tribute to artist Piet Mondrian

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China's container ports up 3.5% in Q1 2023

Data recently published by China's Ministry of Transport reveal that container traffic handled by the country's main sea and river ports rose by 3.5% in Q1 2023 to 69.74M TEU. Overall tonnage increased by a much higher 6.2% to 3.9 Bt, with growing volumes of trade with its Asian neighbours more than compensating for the decline in the nation's trading activity with Europe and the US.

There were significant variations in ports' individual handling performances, with Shanghai continuing to struggle from the coronavirus pandemic-related lockdowns and the slow reopening of the Chinese economy at the end of 2022. The world's largest port saw its box traffic soften by 6.5% in the opening quarter of the year to 11.47M TEU (see table). The only other port posting a fall in its container throughput was the southern China port of Shenzhen, where traffic was down almost 5% to 6.17M TEU.

In contrast, many ports in northern China posted very strong increases in their container volumes, with Dalian, Qingdao, Yingkou and Lianyungang all posting double-digit rates of growth in the first quarter (see table).

The highly automated Beibu Gulf Port in southern China's Guangxi Zhuang Autonomous Region also registered a strong result, with the 1.6M TEU handled up 14.7% on the corresponding period of 2022. With the port having phased into operation new handling equipment and implemented a variety of new operating regimes, ships are being turned around much faster and productivity levels have increased, it is claimed. The net result has been a rise in the number of ocean carriers that have included the port in their schedules.

Guangxi's Beibu Gulf Port also serves as an important transit point in the New International Land-Sea Trade Corridor, a trade

'Millionaire' container ports' performance in China (Q1 2022-23)

Port	Q1 2023	Change vs. Q1 2022
Shanghai	11.47	-6.5%
Ningbo-Zhoushan	8.19	3.5%
Qingdao	6.62	12.2%
Shenzhen	6.17	-4.9%
Guangzhou	5.61	2.4%
Tianjin	5.05	9.0%
Xiamen	2.90	0.7%
Suzhou	2.08	1.5%
Beibu Gulf	1.61	14.7%
Rizhao	1.50	15.8%
Lianyungang	1.46	15.9%
Qin Zhou	1.23	13.9%
Yingkou	1.20	16.9%
Yantai	1.15	18.6%
Dalian	1.12	20.4%
Sub total	57.36	5.9%
Others	12.38	11.2%
Total	69.74	3.5%

Notes: all numbers in M TEU unless specified. Sources: China's Ministry of Transport and WorldCargo News data

and logistics passage jointly developed by western Chinese provincial regions and Singapore, including PSA Cargo Solutions, which was recently rebranded as PSA BDP. Traffic moving along this corridor is now post-

ing consistent rates of growth, and with trade between China and the ASEAN trading bloc set for very strong rates of growth in the coming years, the port is well positioned and equipped to take advantage of this.

The International Development Finance Corporation (DFC), an agency of the US federal government, has agreed a loan of US\$150M to fund the continuing expansion of Yilport's activities at Ecuador's Puerto Bolivar. This will be used to complete the expansion of existing infrastructure. JPMorgan Chase Bank has been mandated to oversee the transaction.

The loan forms part of the Partnership for Global Infrastructure and Investment (PGII) initiative, which is backed by the G7 group of nations. DFC said it supports this by providing financing and other support for transparent, high-standard, value-based infrastructure projects in emerging markets.

In Ecuador, the expansion of Puerto Bolivar is projected to create US\$750M in foreign direct investment. It will additionally generate more than US\$100M in income transfers to the local municipality, as well as improve Ecuador's overall trade balance.

Yilport, which took over op-



Yilport is continuing to expand at Puerto Bolivar in Ecuador

erations at the port in 2016, said that it aims to continue developing Puerto Bolivar into the largest, safest and most technically advanced terminal on the Pacific coast of Latin America.

The investment from DFC is aimed at expanding the port's export volumes to more than 500,000 containers per year. In addition, by building warehouses and cold storage facilities for reefer cargo, the cost of shipping this type of container, in particular, is expected to be reduced, with a concomitant increase in revenue for exporters.

Offshore terminal for A Coruña

In Spain, nine business groups have put forward proposals for the right to establish industrial centres in A Coruña's Outer Harbour to manufacture offshore wind power components. The port authority's Board of Directors will now evaluate the proposals according to criteria of port interest, efficiency, maturity, compatibility and impact on the economic development of the metropolitan area.

The port authority is backing the creation of an industrial and marine energy hub at Punta Lan-

gosteira, with an eye to exporting materials to Northern Europe.

Known bids have come from Moncobra (Cobra Group), Candieira Offshore Wind (Saitec Group), Fistera Energy (Blackstone), Armonia Green Galicia (Ignis), Inditex and Enerfin. These would generate several hundred millions of euros in private investment and be major job creators.

Another component of the so-called 'Green Port' initiative is the generation, storage and distribution of green hydrogen and am-

monia. Formal applications have already been submitted by several companies interested in this area too.

A Coruña is an ideal location for companies involved in these specialities, since it has large areas of open land and draughts of up to 20m alongside the quays. The Outer Harbour is also connected to a high-capacity road network, a key factor, given that many offshore wind components can individually be up to 100m in length. Many engineering materials need to be brought in by land, while



A Coruña wants to add offshore wind to its general cargo business

completed sections have to be exported by sea.

The port authority has also

issued a tender for technical assistance in the definition and drafting of projects for the works

that will be necessary to bring the southern area of Punta Langosteira into commercial operation. The €937,000 contract will be carried out over a four-year period, and will look into all aspects of the project, including maritime works and terrestrial connections.

Traffic at A Coruña in the first quarter of this year grew by 31.78%, making it the biggest increase of any Spanish port. In 2022, traffic grew by 25.75%, making it Spain's fastest growing port. Behind this growth is the use of the Outer Harbour development as a hub for the exchange of goods between different continents.



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Fresh start for Transnet after loco debacle

South African transport utility Transnet is seeking to move on from the scandals of recent years, and adapt to the more competitive rail sector that the government is keen to create.

Transnet was caught up in wide-ranging investigations into the country's infamous 'state capture' crisis involving the Gupta family, with irregularities found in ZAR41B (US\$2.1B) worth of Transnet contracts.

In 2014, Transnet signed contracts with four manufacturers – General Electric, China North Rail, China South Rail and Bombardier Transportation – for a total of 1,064 locomotives, consisting of 465 diesel-powered and 599 electric engines. It received 595 of the contracted locomotives before the deals were halted when irregular payments came to light.

Last year, Transnet reached agreement over the cancelled contracts with Chinese state-owned firm CRRC e-Loco, which was created out of the merger of China North Rail and China South Rail.

However, it has been unable to secure spare parts and maintenance services for the 95 x Class 20C and 100 x Class 21E electric locomotives that had been supplied by CRRC's predecessor companies in 2012 and 2014, respectively, leaving 161 of the engines out of use early this year. Alongside widespread vandalism of rail infrastructure by organised crime gangs, the lack of locomotives has severely curtailed rail cargo operations in South Africa.

Transnet said in January that talks over a new contract with CRRC e-Loco had reached an impasse and it would issue an open tender for a contract to repair the locomotives. It has also started legal proceedings to force CRRC e-Loco to make the necessary spare parts available and undertake the contracted maintenance work.

In May, South Africa changed tack and the minister of public enterprises, Pravin Gordhan, flew to Beijing for talks with CRRC e-Loco. In a statement, the Department of Public Enterprises said: "Minis-

ter Gordhan is hopeful that talks with his Chinese counterparts will yield positive results in the interest of both state-owned companies and in particular to ensure effective and efficient South African logistics and network services for the benefit of the country's economy."

Even if a new contract is concluded, it remains to be seen whether it will be limited to supporting the operation of the locomotives that have already been delivered, or extended to include supplying new engines. A tender for a contract to supply locomotives may be launched with or without a deal with CRRC e-Loco. Given the impact of widespread cable theft on the operation of electric engines, it is possible that diesel-powered locomotives could be preferred.

Transnet is also making internal changes to prepare for a planned increase in domestic competition, as the government has asked it to reduce the 'barriers' to new train operating companies entering the market. In particular, the

key Durban-Johannesburg railway container corridor is to be opened up to third-party operators.

In April, one of Transnet's divisions, Transnet Engineering, announced plans to set up a rolling stock leasing company to supply both locomotives and wagons to third-party operators. It issued a Request for Proposals, which will close on 30 June 2023, from private-sector companies interested in operating the new leasing firm as a joint venture.

The new company will acquire capital assets, develop rolling stock and port equipment leasing capabilities in South Africa, maintain the locomotives and wagons, and seek to expand into other countries. In a statement, Transnet said: "Leasing is an effective and sustainable global trend among global rail and port operators and aims to grow and diversify Transnet Engineering's revenue sources, while driving demand for its core business of manufacturing, remanufacturing, maintenance and engineering services."

Hydrogen concepts...

At last month's Transport Logistic fair in Munich, Rhenus Group and its trimodal logistics affiliate Contargo presented their concepts for a new fleet of low-emissions inland waterway vessels on the Rhine. Two push-barge combinations, each comprising one motorised vessel and as many as three barges, are under development.

"The 'Rhenus Mannheim I-II' and the 'Rhenus Ludwigshafen', which is now being planned as well, have a fuel cell that uses hydrogen from the outset," Rhenus explained. "The 'Rhenus Wörth I-II' is 'H2-ready' and its engines can be refitted to operate on hydrogen fuel at any time. This means that the emissions limits of the Stage VI engines, which have been installed, are far below those of the Stage V technology that is normally used for inland waterway shipping."

Rhenus has so far not disclosed its technical partners for these projects. It is not known how much hydrogen will be transported on board, but it will have to be stored as a gas in high-pressure (350 bar) tanks. Hydrogen bunkering facilities are planned at key inland ports on the Rhine as well



Rhenus Group/Contargo are focused on clean sailing and navigability in shallow water

as in Rotterdam and Antwerp.

The other advantage of the new push-barge combinations is that they are designed with low water during dry periods firmly in mind. By distributing the weight and using the new propulsion concept, the new vessels will have a good floating position and can be deployed if the water level is just 1.2m deep.

"We can map our trimodal supply chains in a climate-friendly manner with these innovative new inland waterway vessels – through electric trucks, railway services operated using green electricity and low-emissions inland waterway vessels," said Marcel Hulsker, deputy CEO of Contargo.

...HGK deal with ADM

HGK Dry Shipping, part of Hafen und Güterverkehr Köln AG, and food group ADM (Archer-Daniels-Midland) have signed a charter agreement for what they described as a 'ground-breaking' inland waterway vessel.

Optimised to operate in shallow waters with a diesel-electric propulsion system and solar panels, the newbuilding marks the next stage of development in dry cargo shipping on European waterways, according to HGK.

"With this barge, HGK Shipping is continuing to pursue its strategic programme of new vessels to provide innovative and sustainable inland waterway shipping, and is extending this from

tanker shipping to the dry bulk commodity sector," said HGK.

It continued: "Thanks to its diesel-electric drive system, the new dry cargo inland waterway vessel can save around 30% in CO₂ emissions compared with current benchmarks. The solar panels, which are attached to hatchways, generate up to 90 MWh of electricity and can, therefore, reduce CO₂E by as much as an extra 70t per year."

This ship is also designed to be 'future-fuel-ready', like all the new vessels made for HGK Shipping, and it is, therefore, equipped to use future fuels and drive technologies such as hydrogen, as soon as they can be used on a wide scale.

HGK Dry Shipping is currently building the new vessel for ADM



DP World launches double-stack train service in India

DP World has started a double-stack train service linking India's northwestern port of Mundra, where it operates Mundra International Container Terminal Pte Ltd, and its inland rail yard at Ahmedabad in Gujarat province.

The Ahmedabad facility is located about 40 km from the city centre and is well connected to the nation's highway and rail networks. It can process up to 100,000 TEU a year.

With double-stack train services regularly operating out of the Port of Pipavav, DP World has been keen to improve its own connectivity with the hinterland, while at the same time helping reduce beneficial cargo owners' logistics costs and reduce emissions.

Speaking at the launch of the new service in April, Adhendra Jain, CEO of DP World Mundra, said: "Robust infrastructure and efficient logistics are crucial for boosting India's economic growth and exports. We are committed to strengthening our supply chain and enabling seamless connectivity to help our customers move their goods quickly and reliably to global and domestic markets."

DP World believes the new double-stack train service will help boost cargo volumes handled both at the Port of Mundra and at its terminal in Ahmedabad, where it also offers a full range of warehousing, consolidation and distribution services.

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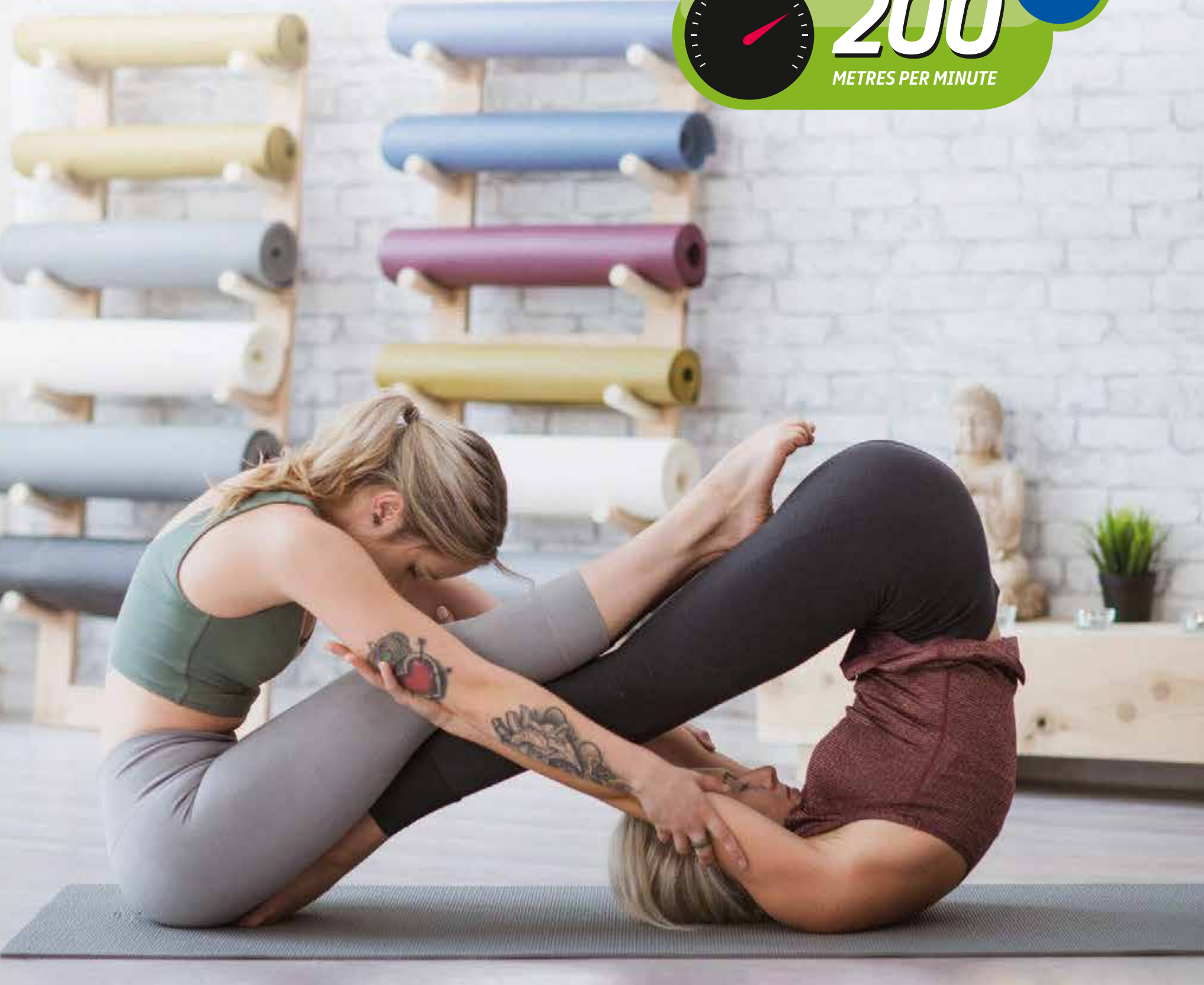
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Yet more litigation surrounds FESCO



FESCO Shipping has effectively been nationalised

The Moscow Arbitration Court has upheld a claim made by Russia's Far-Eastern Shipping Company (DVMP), the parent company of FESCO Transportation Group, against Ziyavudin Magomedov, its imprisoned former principal shareholder, and five firms registered in Cyprus, the Cayman and Virgin Islands associated with him.

The court ruled that Magomedov, along with SGS Universal Investment Holdings Ltd, Felix LP, Maple Ridge Ltd, Smartilicious Consulting Ltd and Enviarta Consulting Ltd, have to compensate FESCO for losses exceeding RUB80.1B (US\$1B).

DVMP stated that, in September 2020, it ordered a forensic audit, which was completed last year and revealed several debts formed in the interests of the five offshore firms and their beneficiaries. It claimed that Magomedov and his associates borrowed money from the company to repay their debts on the purchase of FESCO's shares, but did not service those debt obligations.

DVMP filed its lawsuit with the court last October. In January this year, the court declined a request from the Russian Prosecutor General's Office either to suspend the case or let it intervene as a third party.

However, also in January, Moscow's Khamovniki District Court ruled that the 92.4% stake in FESCO held by Magomedov (32.5%) and three other stockholders, Mikhail Rabinovich (26.5%), Andrey Severilov (the transport group's current board chairman - 23.8%) and Sergey Bazylev (9.6%), should be nationalised.

DVMP immediately appealed that decision in a higher court, the Moscow City Court. Last month, that court rejected the appeal and upheld the Khamovniki court's decision. So, as things stand, the state owns DVMP and its affiliates trading as FESCO Shipping, VMTP (Commercial Port of Vladivostok), rail operators Transgarant and Dalretrans, flat car operator Russkaya Troyka, and various rail terminals along the trans-Siberian Magistral.

Drought hits water levels in Panama Canal

Due to a drought that is impacting the level of Gatun Lake in Panama, the Panama Canal Authority (ACP) has been making repeated adjustments to the maximum authorised draught for vessels transiting the neo-Panamax locks in 2023. Adjustments are generally made in 15.2cm (6-inch) increments.

In March 2023, the maximum permissible draught was revised to 15.09m, (49.5ft). After several further adjustments, the ACP advised in early May that the maximum draught would fall to 13.41m (44ft) by 30 May. Vessels exceeding this may be allowed to transit if the level of the Gatun Lake allows, but otherwise they are required to trim or offload cargo before transiting.

Carriers have responded with weight limits on some container types and increased Panama Canal surcharges, in CMA CGM's case to US\$300 per TEU.

By the end of May, the maximum draught through the neo-Panamax locks will reach 13.41m



New vessels for Lake Tanganyika

The government of Tanzania has announced that it will sign contracts for the construction of two new vessels to operate on Lake Tanganyika, fulfilling a pledge made by President Samia Suluhu Hassan shortly after she came to power in March 2021. Alongside the MV LIEMBA, which is to be renovated, the new cargo and passenger ships will be used to move freight between Tanzania, Burundi, the Democratic Republic of Congo (DRC) and Zambia.

Cargo services are being significantly upgraded on lakes Tanganyika and Victoria to take advantage of Tanzania's new standard gauge railway (SGR), which is being built from the country's main

port, Dar es Salaam, to the northwest of the country and on into Rwanda, Burundi and possibly Uganda and DRC. Spur lines will run to the port cities of Mwanza on Lake Victoria and Kigoma on Lake Tanganyika by 2026.

These are already connected to Dar es Salaam by the colonial era Central Line, but this is very slow and it is usually quicker to transport freight by road. The government has already sanctioned the construction of the US\$46M MV MWANZA HAPA KAZI TU, which will have the capacity to carry 400t of cargo and 1,200 passengers, operating between Tanzania, Uganda and Kenya on Lake Victoria. Under construction for several years,

the vessel was floated in February, when it was claimed to be 82% complete.

The two Kigoma ports are Ujiji and Kibirizi – the latter of which has already been refurbished and handled 103,000t of cargo in financial year 2021-22, almost double the target set by Tanzania Ports Authority (TPA). The 28 smaller ports and landing places operated by the TPA on the Tanzanian shoreline of the lake, such as Kabwe, are also to be upgraded. Sailing times between Kabwe and Kalemie on the DRC side of the long, thin lake are six to seven hours, in comparison with several days to move goods around the lake by road.

Cosco to deploy battery-powered ships on China's Yangtze River

Cosco Shipping Yangzhou has now commenced construction of two highly innovative electrically powered container ships for its sister company Cosco Shipping. The vessels will be delivered by the end of 2023 and deployed within Cosco's Yangtze River service network, probably ferrying containers to/from Shanghai.

The ships, which have a 10,000 dwt and can load up to 700 TEU, feature a length of 120m, beam of 23.5m and draught of 5.5m. Each vessel will be powered by two 900 kWh motors. Although it is unclear how many batteries Cosco will need to support the operation, China's largest liner shipping company is putting the logistics

network in place to support the service. A number of ports and depots along the river system have been earmarked by the company and will be used to charge and exchange the batteries.

According to Cosco, its new electrically powered ships will save the equivalent of 32t of CO₂ emissions every day, compared with conventional tonnage deployed on the Yangtze River.

Cosco also highlighted the intelligent ship platform and so-called advanced situational awareness systems that will be installed on the ships, claiming these will improve their operating performance, manoeuvrability and safety.

Cosco's plans form part of the Chinese government's plans to decarbonise the economy and implement an electrification programme for the Yangtze River region. Already, several electrically powered cruise ships are in service, mainly in the upper river area around the Three Gorges Dam.

The new river vessels will have a capacity to carry 700 TEU



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Folding box and Actuator ZIM adds door sensor for reefer monitoring



The GenFlat design being folded with the Actuator attachment on a top handler

US-based GenFlat has launched a new folding container design. Folding container concepts are well-known in the market, but the GenFlat design introduces a new concept that has not been presented before, as far as *WorldCargo News* is aware.

The design features walls that 'fold inwards' in the middle after the door and end wall panels are folded inwards and upwards to the roof of the container. To collapse the container, GenFlat has developed an 'Actuator' attachment that connects to a standard spreader in the 20ft position.

The GenFlat 40ft container design has three pairs of corner castings, with an extra pair in the middle. To engage these, the Actuator attachment has six twistlocks to lift the container. Before a container is lifted, latching pins are disengaged to allow the container to fold. Arms on the Actuator platform then push the door and end sections upwards and inwards. The roof is

then lowered until the container is flat and secured in the new position with latching pins. According to GenFlat, this process takes just 80 seconds.

Weighing less than 2t, the Actuator attachment is hydraulically powered with electrical controls. It is not designed to lift containers beyond what is required for collapsing and expanding the box.

Once collapsed, four GenFlat containers can be stacked, stowed and transported in the space of one ISO container. A 40ft GenFlat container has the same internal dimensions as a standard 40ft dry box. It weighs 5,353kg and has a maximum gross weight of 30,48t, yielding a payload of 25,127kg. GenFlat said the design is "ISO tested and certified". The company has partnered with China's CIMC to manufacture the containers, with the first four units now in service with Fast Lane Transportation in California.

ZIM Integrated Shipping Services has announced an order for 1,000 Star Cool reefers from Maersk Container Industry (MCI) with Sekstant Door sensors. The shipping line is also retrofitting a similar number of its existing Star Cool reefers with Sekstant Door sensors.

ZIM is collaborating with MCI to upgrade its own ZIMonitor system for managing its remotely monitored reefer containers. When ZIMonitor was initially launched, most of ZIM's reefer fleet had Carrier reefer machinery, with ZIM adding its first 500 Star cool reefers from MCI in 2019.

ZIM's reefer fleet composition has changed dramatically since then, revealed MCI and ZIM. In a joint statement, they said: "The Star Cool population with ZIM has rapidly grown, now covering approximately one-third of the reefer fleet. ZIM has invested in MCI's complete reefer package, including the Star Cool Integrated and the Sekstant gateway for reefer connectivity."

"The Sekstant Door sensor is a wireless door-opening surveillance system that has been co-developed by ZIM, a pioneer in this field. The Sekstant solution creates the tracking and data needed to deliver ZIM's commercial reefer tracking product, ZIMonitor."

A door sensor adds another layer of data to the Sekstant remote reefer monitoring system, capturing a data point each time the container door is opened or closed. The sensor is a battery-powered wireless device that connects to the reefer controller via Bluetooth. The battery design life is 10-plus years.

"The door events are registered in

the Sekstant cloud and are visible in the Sekstant user interface," said MCI. "The Sekstant digital ecosystem enables access to real-time reefer information, monitoring, reporting, and seamless fleet management from anywhere in the world. The door sensor data are consolidated with the remaining reefer control data including time stamp and GPS coordinates. It comes as a factory-mounted option or can be retrofitted on every Sekstant-equipped reefer."

"The wireless sensor connects to the reefer controller, and door events are even captured while the reefer is powered off, making it possible to document if a door event has deviated from the planned timeline, and trigger an alert."

ZIM's fleet also includes containers fitted with MCI's Star Cool CA (controlled atmosphere) system. "Energy efficiency and product reliability are keys to success and, therefore, ZIM has placed its trust in MCI's Star Cool

CA system, which has over 10 years of proven performance and reliability in the market. ZIM's latest investment in Sekstant Door sensors and MCI's complete reefer package demonstrates its ongoing commitment to the growth of the shipping industry and its customers," said MCI.

ZIM first ordered Star Cool reefers with CA in 2020 and took delivery of new Star Cool CA reefers in March 2023.

Gil Lehmann, head of Global Logistics and Equipment at ZIM, said: "We are committed to providing the highest level of service and reliability to our customers, and our investment in the Sekstant gateways and door sensors for our Star Cool reefers is just one example of that commitment. With the Sekstant solution, we can better track and monitor our reefer fleet, and provide our customers with real-time information about their cargo, ensuring the safe and timely delivery of their products."

ZIM is adding a door sensor to its new reefer containers and some existing ones



Clean boxes avoid trouble

Around two years ago, the Cargo Integrity Group (CIG) – then consisting of five organisations, ICHCA, TT Club, WSC, GSF and COA, and since joined by BIC and FIATA – called on everyone

in the supply chain to reduce the risk of pest transference through international cargo movements. The CIG highlighted the threat of invasive pests to natural resources around the world and the urgen-

cy of devising risk-reduction measures.

One of the obvious measures is to make sure that containers are clean, inside and outside, prior to loading and thus take time to carry out proper visual inspections.

Two years on, and the problem is not going away and, if anything, has got

worse. TT Club has published two short visual animations. These draw attention to 'mud and vegetation' harbouring invasive species, which readily fall off containers during transport by truck or rail and in ports of loading and discharge.

The recent supply chain crisis saw EC

stacks filling up in depots and ports that have made-up surfaces and this led to many containers being stored on unmade ground outside ports. In addition, many EC depots around the world are reluctant to invest in made-up surfaces as there is so little money in 'storing air'.

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Challenges on the pathway to autonomy

Despite much anticipation, fleets of autonomous trucks have yet to make much of an impact on horizontal transport in container terminals. Konecranes, meanwhile, is preparing to introduce autonomous vehicles for limited applications.

Casting back to TOC Europe 2017, there was much anticipation on the exhibition floor as Terberg and Gaussin unveiled new autonomous vehicles, the AutoTUG and Autonomous Prime Mover, respectively. Combined with other companies, including Airdrivers and DG Robotics, which were working on retrofitting autonomous systems to terminal tractors, the industry seemed poised for a new generation of autonomous horizontal transport options. An executive at one of the large global terminal operators remarked to *WorldCargo News* that this was a welcome development as the industry needed more cost-effective alternatives to AGVs for automated horizontal transport.

Heading into TOC Europe 2023 this month, it is fair to say that autonomous vehicles have not yet delivered on their promise. Apart from Hutchison Ports' Laem Chabang terminal in Thailand and a handful of applications in China, there are no known fleets of autonomous tractors navigating freely around container terminals in a mixed traffic environment.

Speaking to *WorldCargo News*, Ralf Konnerth, director of Business Line Automated Horizontal Transport, Port Solutions at Konecranes, said that there is a gap between expectation and the reality of what the market can deliver. Autonomous trucks are being tested on some public roads, but there is still a supervisor in the cab, which is not what terminal operators are looking for.

The autonomous tractors at Laem Chabang operate in mixed traffic, including driving into a designated area where people are waiting to remove the twistlocks, but the regulatory requirements in that market are different to Europe and other jurisdictions.

As far as it is known, none of the companies offering autonomous tractors are able to deliver the certifications for the automation and safety systems that terminal operators in Europe and elsewhere require.

Outside the zone

AGVs and automated straddle carriers operate in a closed, fenced-in zone, where there are no manned machines or people on the ground. In a European setting, the automation systems that control this environment must meet the requirements of the European Machinery Directive and relevant harmonised standards. In addition, other local rules and regulations may be required.

The AGV systems that Konecranes has supplied for APMT MVII and RWG at Rotterdam were certified by a third party and have a type approval issued by a formal authorised state body.

Autonomous vehicles are being developed on a different pathway. At this point, most of the pilot projects in container terminal applications involve a single machine operating in isolation. The initial focus is on controlling the machine's navigation with the precision required to drive underneath cranes and/or park a trailer while avoiding other vehicles.

The automotive industry is working towards Level Five in SAE J3016 Recommended Prac-

Autonomous trucks have not had much of an impact on horizontal transport in container terminals

tice: Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles. This means fully autonomous operation, where the vehicle has no steering wheel or manual controls.

For container terminal applications, "AGVs are already there", said Konnerth, while at the same time meeting the requirements of the European Machinery Directive. Terminal operators, however, want to take things further and see driverless vehicles move out of the controlled safety zone for applications such as moving containers from a stacking yard to a rail interchange.

Konnerth said that Konecranes recognises that terminal operators need this flexibility, and the challenge for the Finnish firm as a supplier is how to develop standards-compliant and certified systems that allow driverless machines to operate in a mixed machine environment. To meet this need, Konecranes is testing a terminal tractor that uses a transponder-based navigation system with collision-avoidance technology that can be deployed in a mixed traffic environment.

Beyond the fence

As has been noted previously by *WorldCargo News*, Konecranes has partnered with Terberg to develop an automated terminal tractor, with the latter company supplying a tractor with drive and steer by wire, and Konecranes developing the autonomous system.

Konnerth explained that this is fundamentally different to the automated systems Konecranes has for AGVs. With AGVs, the equipment control system (ECS) knows the direction, travel path, speed and other factors for all the machines. Outside of the safety zone where there are other vehicles outside the system and possibly people, systems on the vehicle must be able to detect presence, direction and speed of other vehicles and obstacles as it navigates and take appropriate action.

To achieve this, Konecranes has developed a collision-avoidance system (CAS) that achieves a 360-degree sensor view with a detection range of up to 100m. The type of configuration depends on the application, and can include 3D LiDAR, laser scanners and radar sensors. The system detects object position and motion and then 'considers' that motion when making decisions. It prevents collisions with obstacles in the vehicle's path while observing traffic rules when turning and passing.

Importantly, Konecranes is working through the process of achieving a certification for the CAS from DGUV. The different CAS functions are certified as a 'sensor-based solution for mixed traffic of automated and manual driven vehicles' that meet Performance Level D as defined by ISO 13849 for a control system. At the time of writing, all base safety functions have been certified for driving in mixed operations. The certification process is currently under way for additionally required special traffic situations. When this process is complete, Konecranes will have a certified CAS for operating an automated vehicle – which could be an AGV, a terminal tractor or other vehicle types – in a mixed traffic environment.

Konecranes is now looking for customers for the first pilot installations at container terminals. While this is a big step forwards, Konnerth does not see it as opening the door for container terminals to replace 'automated' machines, such as AGVs, with a fleet of autonomous tractors.

Supporting the quay-to-stack transfer on the apron at the quayside is a different application to having a small number of autonomous vehicles performing a specific drayage task, such as moving containers to a rail yard. AGVs operating on defined paths controlled by a central ECS can travel very close together.

No interaction

By contrast, independent autonomous machines do not know the travel path of other equipment and will slow their speed around other equipment. Crossing and passing are necessarily much slower. "This negative impact on terminal performance is the other key reason that we have not got autonomous vehicles operating today," added Konnerth.

The counter argument is that autonomous vehicles will rely on artificial intelligence and machine learning to operate with intelligence at the machine level, and central control systems, such as the ECS, will be replaced by a combination of intelligent vehicle systems and extended TOS functionality.

Konnerth believes this is an oversimplification, as there are too many system element parts of fleet control, including sequencing the arrival of different vehicles in turn at a location under a crane, to replicate fully at the machine level.

While there are still many challenges ahead in deploying a fleet of autonomous vehicles, the global population of AGVs in container terminals is set to increase significantly. As has been noted elsewhere in this edition of *WorldCargo News*, APM Terminals has said it is continuing with an AGV system as it extends its Maasvlakte II terminal. Elsewhere, Eurogate

has decided to convert its Container Terminal Wilhelmshaven terminal to an ASC and AGV yard system, after conducting a pilot project with four Kalmar AutoStrads over a number of years. There is a whisper in the industry that Eurogate is not alone, and other new terminals in Europe will also use AGVs. □

Konecranes' CAS being tested on a terminal tractor



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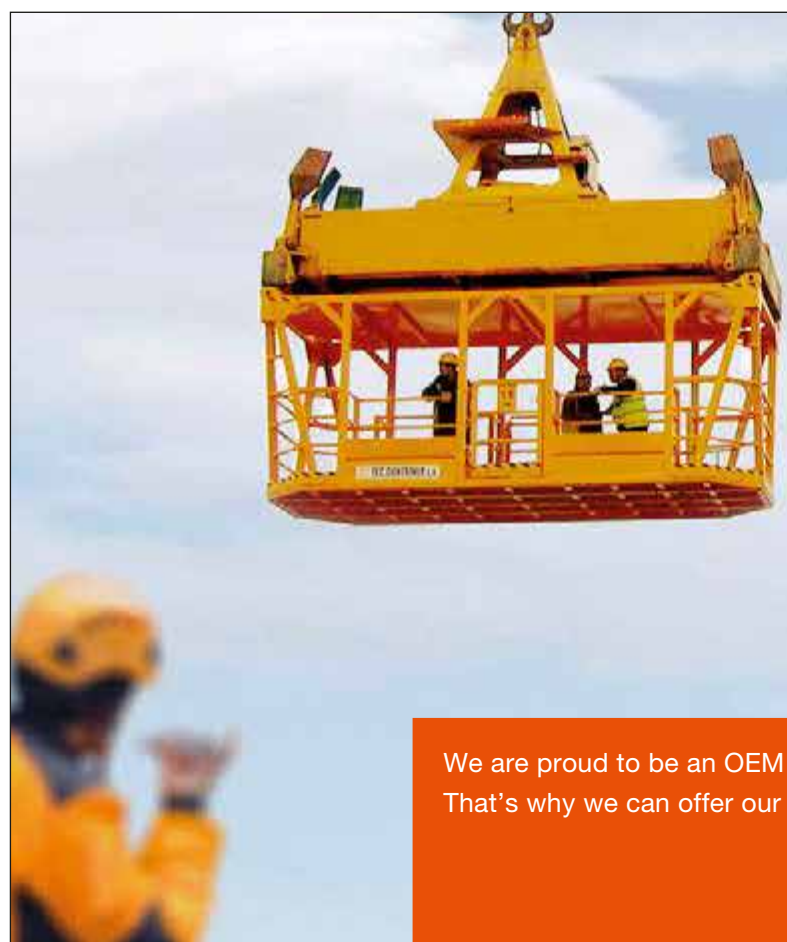
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Automation and multilayer sensor tech

Port automation stands to benefit from the extensive research and development taking place in the area of 3D sensor technology for autonomous vehicles and other applications. For LASE, a leading supplier of laser measuring equipment for the port industry, the potential of this technology is such that it is “currently rethinking the world”, said Lars Ambrosy, the company’s managing director. “With the added third-dimension, measurement systems are becoming multifunctional and new applications have been developed.”

Measuring in 3D

Legacy laser scanners generate data from a single 2D plane. New multilayer laser scanners in the market today can measure and generate data on 16, 32, 64 or 128 scan planes. They scan 360 degrees horizontally and have a vertical field of view of 16 to 90 degrees, depending on the sensor manufacturer.

Ambrosy stressed that more

According to LASE, multilayer laser scanner technology deserves to be called ‘disruptive’

data are not always better. As powerful as new sensors are, they need to be tailored to the application. “It is always important to consider the following parameters when selecting the appropriate sensor for an application – range, resolution [dot spacing in the scanning planes], resolution [spacing between the scanning planes], laser dot sizes, number of scanning planes, and vertical field of view.

“In the case of applications, a distinction must be made between detection and/or area monitoring solutions and tasks for the exact position measurement of objects [containers, straddle carriers, trucks, and so on]. The multilayer laser scanners are particularly suitable for detection and/or area monitoring solutions.”

In the port sector, LASE is excited about the potential for

multilayer scanners to improve collision prevention systems by detecting objects in a larger area. Looking at gantry collision prevention – a typical application for 2D laser scanners previously – the 2D scanners were mounted above the crane bogies to monitor the area in front of the track for objects and people.

“In this case, the 2D scanning plane was at a height of approximately 1m-1.5m. If there were objects above or below, they were not seen by the laser scanner and a collision could still occur,” explained Ambrosy. “If 3D multilayer laser scanners are used instead, the area in front of the landing gear is monitored three-dimensionally. This means that everything in the volume space in front of the chassis is detected.”

Prevention of chassis/truck lift-

ing is another application where using a multilayer laser scanner can produce good benefits. In this case, multilayer laser scanners can support multiple functions by detecting whether the chassis/trailer is moving upwards as a container is hoisted (because the twistlock pins have not been disengaged), the presence of people around the truck, the position of the truck cab, and the position of the truck and trailer in the lane. “So, four functions instead of one,” noted Ambrosy.

This multifunctionality means that the same sensors for the anti-lifting system can supply data for the truck positioning system. “Exact position measurement is required for the positioning of trucks underneath the cranes [STS, RMG or RTG]. Here, the 3D multilayer laser scanner cuts the chassis through many scan planes. This allows any trailer structure, especially the guide plates on the trailer, to be reliably detected and measured,” said Ambrosy.



Detecting a person in an unsafe position beside a road truck under a crane

LASE is now incorporating multilayer sensors into its products for container terminal automation, including its latest LaseASTO (area surveillance truck operation) system. This monitors the area below the crane to ensure that an automated crane does not handle a container from a manually driven truck if the driver leaves the cabin. If the system detects any movement around the truck, the handling of the load is stopped. Again, using a multilayer sensor allows the same system to become multifunctional measuring the position of the truck and the cabin for other purposes.

Clear advantage

While laser sensor technology continues to develop, the multifunctionality that is available today is a decisive advantage in port applications, Ambrosy believes.

“Whereas in the past, one or more sensors were used for each function, a multilayer scanner can cover multiple requirements. Furthermore, detection reliability is increased and made seamless in some collision monitoring solutions. Objects are measured three-dimensionally, an additional axis is added, and the position of the object is also determined.”

To take advantage of multilayer technology, LASE has signed a multi-year supply agreement with Ouster, the US-based sensor specialist. LASE will incorporate Ouster 3D LiDAR sensors into its systems, and the agreement includes a commitment for several hundred Ouster OS sensors through 2025. Ouster recently merged with Velodyne, whose puck LiDAR sensor has been used in several autonomous terminal tractor pilot projects. □



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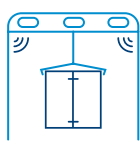
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New Evergreen auto terminal under way in Kaohsiung port

Taiwan International Ports Corporation (TIPC) has announced that the “Port of Kaohsiung’s long-awaited 7th Container Terminal formally commenced operations on 1 May 2023”.

The terminal is operated by Evergreen, which is the largest carrier by volume at Kaohsiung, moving over 3M TEU a year through the port. Evergreen leases wharves S1 to S5 at the 7th terminal, which gives it five berths on 2,415m of quay with 149-ha of yard space, providing over 4M TEU/year of capacity. The terminal is designed to handle Evergreen’s new 24,000 TEU vessels.

“Phase one of the lease, covering wharves S3B-S5 and the adjacent land, is slated to begin normal operations on 1 May following the final delivery of essential cargo handling facilities in January,” TIPC said in advance of the official opening. “The entry of these wharves into commercial service will mark the first step in solidifying the Port of Kaohsiung as one of East Asia’s most-important container ports.”

Operational control over the phase one area was turned over to Evergreen Marine on 22 June

2022. Since then, Evergreen has been installing and testing the equipment and systems. Equipment for phase one includes 11 remotely controlled STS cranes and 34 ASCs, all from ZPMC. The phase two berths (S1-S3A) and adjacent container yards are scheduled to be turned over to Evergreen in June. Evergreen will then install a further eight STS cranes and 22 ASCs, giving the terminal a full complement of 19 STS cranes and 56 ASCs.

On a visit to the terminal, TIPC chairman Hsien-yi Lee remarked that the 7th Container Terminal is home to “Taiwan’s first automated container handling wharves”.

He continued: “The UAVs [unmanned aerial vehicles], remote control technologies and AI systems already installed will noticeably increase operational efficiencies at the terminal’s container yards while significantly upgrading the quality of the port’s working environment.”

Other terminals in Kaohsiung already operate ASCs, and it is believed that his reference to ‘first automated container handling wharves’ refers to the STS cranes with automation and remote control.

A 24,000 TEU vessel conducting a test berthing at the new terminal



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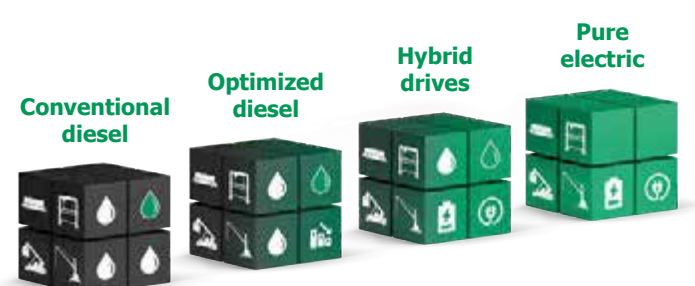
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Automation hiding in plain sight

It is often said that automation has only a limited impact on the container terminal sector today. When asked how many automated ports there are in the world, Google delivered the following result: "In 2020, the United Nations Conference on Trade Development stated that there were 939 container ports in the world. Yet, last year, according to a report by the International Transport Forum, only around 53 were automated, representing 4% of the total global container terminal capacity." A very similar statistic is repeated in so many studies and articles that it has become 'accepted wisdom'.

In an article entitled *Container terminal automation: revealing distinctive terminal characteristics and operating parameters* published in the *Journal of Maritime Economics & Logistics* in July 2022, Geraldine Knatz, Theo Notteboom and Athanasios A. Pallis took a more detailed look at the number of terminals. Using "extant literature and port and terminal company information", the authors identified "63 container terminals worldwide that were fully or partially [semi] automated. At the beginning of 2022, 62 automated terminals were in operation, with

Kalmar A-RTGs at DFT in Ireland



The extent to which container terminals are implementing automated handling equipment is greater than some studies and reports state

one more planned to be operational in 2024".

The list of 63 terminals includes facilities where part of the terminal operates an automated yard handling system, such as TraPac in Los Angeles, Global Container Terminals in New York/New Jersey, and DP World in Dubai. However, it appears to exclude all inland facilities, terminals that operate automated RTGs, and some terminals that have implemented automation in a limited number of machines.

Counting cranes

The study by Knatz, Notteboom and Pallis focused on 'where, when, under which conditions, and to what extent container terminals were automated, and who is responsible for implementing terminal automation' and, with one exception, looked at completed projects only.

WorldCargo News believes that a deeper insight into how terminal automation is unfolding can be gained by looking more closely at the container handling equipment industry as an early indicator of how terminals are thinking about automation. The annual *WorldCargo News* yard crane survey for the year 2022 identified that 143 of the RMGs scheduled for delivery in 2022 were automated cranes. Of the 334 RMGs for delivery in 2023 and beyond,

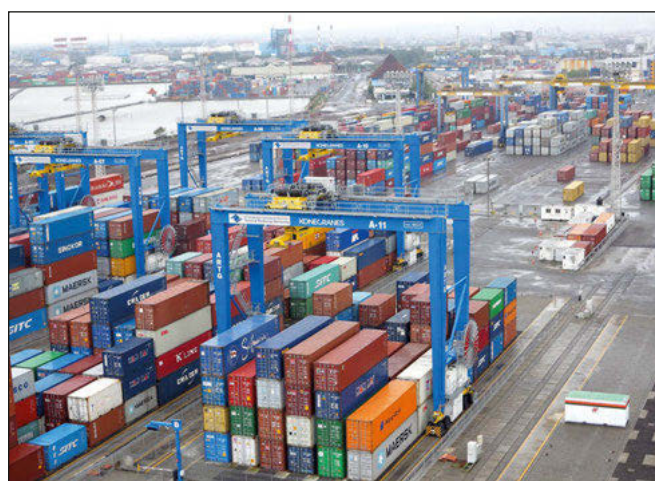
291 units feature automation.

These orders include some very large automated terminals, such as Evergreen's new facility in Kaohsiung, Colombo East in Sri Lanka, and Chinese terminal developments in Yongzhou, Guangdong, Beibu and Taicang. Also omitted in the figure of 63 automated terminals are smaller developments, such as Qube's Moorebank terminal in Australia, Union Pacific's rail terminal in Chicago, East-West Terminal in Hungary, the Yara terminal in Oslo, and TGN's containerised bulk terminal in Chile, all of which feature automated stacking cranes.

On rubber tyres

Measuring the footprint of terminal automation in the port industry is further complicated by the growing number of small projects involving a small number of cranes. Big automation projects, such as LBCT in the US and MVII and RWG in Rotterdam, are milestones for the industry. In all three cases, they represent terminal operators building completely new terminals, surveying the technology landscape and deciding to proceed with high levels of equipment automation.

The majority of the world's container terminals, however, will have to 'walk a different path' when it comes to automation, finding ways to transition their



Some of the Konecranes automated RTGs at TPKS Semarang in Central Java. Most studies on terminal automation do not count this type of facility when tabulating the number of automated terminals in the world

existing terminal while continuing to operate. *WorldCargo News* has reported on terminals converting part of their RTG yards to automation, including Dublin Ferry Terminal (DFT) in Ireland with Kalmar, and TPKS Semarang in Central Java (operated by PT Pelabuhan Indonesia III) with Konecranes.

A lot more terminals are converting part of their yard or installing automated RTGs as they undertake yard expansions. ZPMC is supplying such machines to terminals at Ningbo, Xiamen and Yantian in China, Hutchison Ports for its Laem Chabang facility in Thailand, Itapoa in Brazil and Saudi Global Ports in Saudi Arabia. At Itapoa, the port is implementing 10 hybrid remote-controlled RTGs that will operate in a yard expansion area next to the terminal's existing 17 RTG cranes. When Itapoa placed its order earlier this year, ZPMC said it was the 27th terminal globally to order remotely controlled RTGs from the company.

In another project, this time at

the Baltic Hub in Gdansk, Konecranes is installing 10 new 'semi-automated' RTGs that will be operated by remote control and retrofitting remote-control systems to 15 existing RTGs.

RTG automation is also happening in Japan, where Mitsubishi Logisnext is supplying two automated RTGs to Kamigumi Port, while MES has larger RTG projects in the ports of Nagoya and Shimizu involving 37 automated RTGs in total. Another development is a greenfield terminal at Duqm in Oman, where Liebherr is supplying four STS cranes and 12 RTGs, all operated by automation and remote control systems.

Testing, testing

At the same time, lots of testing is going on with RTG automation. In Hong Kong, Mitsubishi Heavy Industries is working with HIT on an RTG automation retrofit project at CT-9. Separately, COSCO-HIT, which operates Terminal 8 (East) at Kwai Chung, is progressively convert-

ing its RTGs to automation.

While the first phase of the COSCO-HIT project involved 15 RTGs, other terminals are starting with just one or two machines. DP World opened its Yarmouk terminal in Turkey in 2016 with manned RTGs from Konecranes and four STS cranes featuring ABB's crane automation and remote control system. However, the RTGs were equipped with Konecranes Auto-Steering, Auto-Truck Guiding, Auto-Positioning, Auto-TOS Reporting, Truck-Lift Prevention, Stack Collision Prevention and Real-Time RTG Positioning systems. Later that year, Konecranes announced that it was sending two remote control desks for RTGs to Yarmouk, and two of the cranes would be upgraded to remote control.

This type of automation is much harder to track and measure. Some terminals are starting their journeys with just one or two cranes, not all the initiatives are announced publicly, and some are stopped for various reasons.

What is clear, however, is that there are lots more than 63 terminals globally operating some type of automated handling equipment. As noted above, ZPMC said that it has delivered RTGs that feature automation and remote control to 27 different terminals. Of the total number of 1,077 RTGs that were identified for delivery in 2022, 2023 and beyond in the *WorldCargo News* November 2022 market survey, 207 units, almost 20%, were listed as featuring a combination of automation and remote control.

Depending on how many of those terminals are operating the cranes in this mode, the number of terminals worldwide with some level of equipment automation could be as high as 100 or 120 terminals. □

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ChatGPT on terminal automation

Asked to write an 'essay' on container terminal automation including the number of automated container terminals in the world, ChatGPT produced a bland piece that quoted an IAPH study of the number of terminals (60) while stating that the benefits of automation included "speed, efficiency and sustainability".

When asked to rework the essay, it found examples of terminal automation to discuss, but its standard disclaimer that 'ChatGPT may produce inaccurate information about people, places or facts' certainly applies. In one reworking, it declared that there have been "several high-profile failures in the industry, such as the fully automated terminal at the Port of Hamburg. The terminal experienced significant operational problems shortly after opening in 2019, including frequent system breakdowns and delays in container handling. These issues ultimately led to the terminal being shut down and significant financial losses for the port and shipping companies".

Even with repeated reworking, ChatGPT was unable to stop sensationalising its view of the subject. Perhaps the best result was produced by asking ChatGPT to write a 'story' on container terminal automation, with no specific instructions to cover examples or specific issues. Although it cannot seem to resist extreme comparisons, such as "twice the cargo in half the time", readers will recognise some of the events in the story below.

ChatGPT's story reads as follows: "Once upon a time, in a world that was rapidly changing and advancing, there was a race to build the most automated container terminal. Countries across the world were investing millions of dollars into the development of these terminals, as they promised faster and more efficient shipping, which in turn would boost their economies.

"The first automated container terminal was built in Europe, in the bustling port city of Rotterdam. The terminal was a marvel of engineering, with state-of-the-art technology that allowed for fully automated container handling. The terminal was able to handle twice the amount of cargo in half the time it would take a traditional terminal to do the same job. It quickly became the envy of the world, and soon, countries across the globe were looking to build their own automated terminals.

"In Asia, the race was on to build the most technologically advanced container terminal. China, Japan, and South Korea were all vying for the top spot, and soon, their efforts paid off. China built the largest automated container terminal in the world, with a capacity to handle over 30M containers per year. Japan, on the other hand, built the most efficient terminal, with a turnaround time of just 12 minutes per container. South Korea focused on developing eco-friendly terminals, with solar panels and wind turbines powering their facilities.

"In the US, the race to build an automated terminal was a slow one. Many experts believed that the country's ageing infrastructure and labour laws would hinder the development of fully automated terminals. However, one company decided to take on the challenge. It built a small automated terminal on the east coast, and despite initial setbacks, the terminal proved to be a success. It was able to handle 20% more cargo than a traditional terminal and was twice as fast. The success of this terminal led to the development of several others, and soon, the US had caught up with the rest of the world.

"As the number of automated container terminals grew, so did the concerns of workers who feared for their jobs. With machines taking over the work that was once done by people, many workers were left unemployed. Governments around the world were forced to address these concerns, with some offering retraining programmes and others providing financial support to affected workers.

"Despite the concerns, the number of automated container terminals continued to grow. They were now a common sight in ports across the world, and shipping had never been faster or more efficient.

The terminals were also eco-friendlier, as they used less energy and emitted fewer pollutants.

"However, the race to build the most advanced terminal was not without its risks. In one instance, a newly built terminal in Europe experienced a system failure that caused chaos in the port. Containers were left stranded on the docks, and ships were unable to dock or unload their cargo. The incident led to massive financial losses for the port and the companies that used it.

"As the world continued to advance, the importance of automated container terminals only grew. They were no longer a luxury but a necessity in a world where speed and efficiency were paramount.

Companies and governments continued to invest in their development, ensuring that the terminals remained at the forefront of technology.

"In conclusion, the number of automated container terminals in the world has grown significantly in recent years, with countries across the globe investing millions of dollars in their development. While they have brought about significant improvements in the speed and efficiency of shipping, they have also led to concerns about unemployment and system failures. Nonetheless, the development of these terminals has become a necessity in the modern world and shows no signs of slowing down anytime soon," ended ChatGPT's 'story'. □



Pictured are six ZPMC A-RTGs for delivery to Jeddah South Port, where the Saudi Ports Authority and DP World are expanding and redeveloping the South Container Terminal. DP World ordered 17 RTGs for the first phase of the project. Also onboard the ZHEN HUA 27 are a 3,000 tph grab unloader destined for Dunkirk, and two '3E Plus' double-trolley STS cranes for APMT in Morocco. While the main trolley on the STS cranes has an operator cabin, ZPMC says both trolleys are 'fully automated'.

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Improving LPR sensors

Germany's Symeo continues to develop its patented LPR (local positioning radar) sensor technology for accurate real-time distance measurement.

Symeo's LPR-1DHP-291 sensor now offers real-time distance measurement up to 50m with a single sensor and up to 500m with multiple sensors. The LPR-1DHP-291 is a robust, maintenance-free and wear-free sensor system that is unaffected by dirt, extreme dust, vibrations, bright sunlight, fog or precipitation.

"With a measurement accuracy in the millimetre range, the industrial radar system with integrated directional antenna is suitable for the development of applications in the areas of crane positioning, collision avoidance, goods tracking, process monitoring and automation, object detection or as radar barriers," stated Symeo.

LPR-1DHP-291 is based on a proven 60 GHz radar technology and achieves different measurement accuracies, distances and repetition rates in different bandwidth and installation modes. The

measurement distance depends on the radar cross-section (RCS) of the target.

"For a single sensor, the measurement range is typically 1m to 50m and the accuracy is ± 5 mm in 2 GHz bandwidth mode and at a measurement rate of 350 Hz," continued Symeo. "The high sampling rate enables its use for dynamic monitoring tasks. By combining several sensors, even very large distances can be monitored when the technology is used in ports or container handling areas, for example."

As a replacement for ultrasonic sensors that are highly sensitive to wind, weather and dirt in applications, such as collision avoidance, Symeo recommends its new entry-level LPR-1DHP-350. This sensor operates in the frequency range of 120 GHz for high precision. Its dimensions of 90mm x 90mm x 35mm enable installation in applications that a radar system would not have fitted previously.

"The LPR-1DHP-350 radar system performs 1D distance measurements for short and medium ranges with high accuracy," said



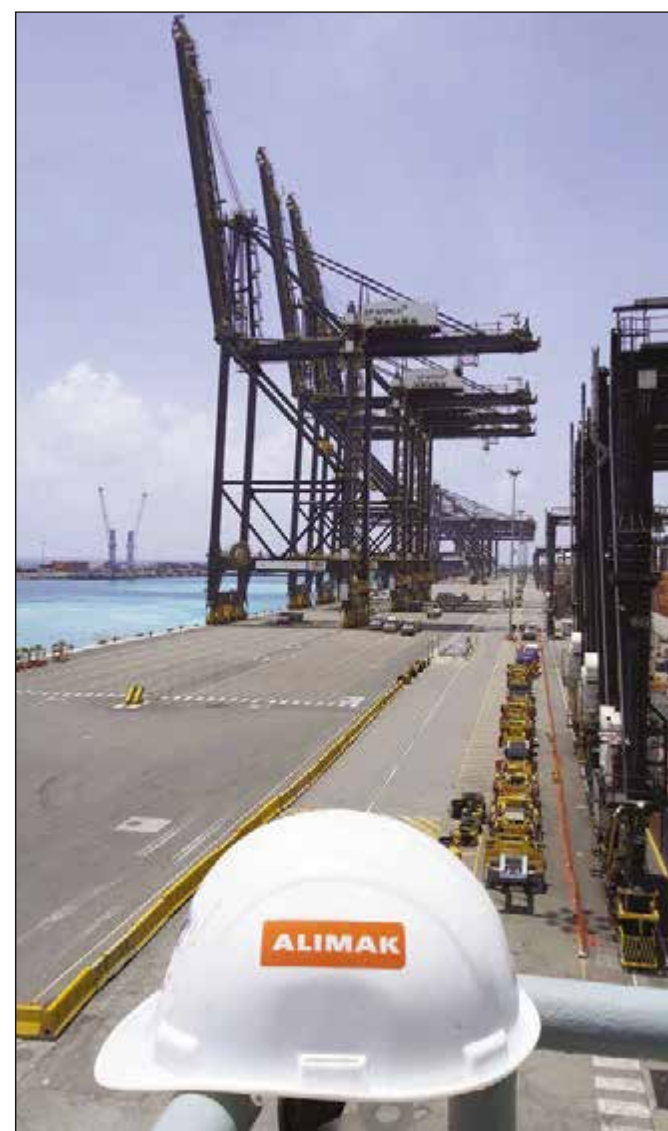
The Symeo LPR-1DHP-291 (top) and the new entry-level LPR-1DHP-350

Symeo. "Based on primary or secondary – cooperative pair of devices – radar measurements, the LPR-1DHP-350 can detect the position and speed of objects, such as cranes or rail-based transport systems, in real time and make the data available via the device interfaces.

"The sensors are easy to install and put into operation with the aid of a web-based interface. A directional antenna is integrated into the housing. The device features the latest millimetre-wave technology for highly precise measurements. Even under the harshest environmental conditions, the maintenance-free and wear-and-tear-free wireless technology operates reliably with a high degree of availability, indoors and outdoors."

In primary radar mode, a single LPR-1DHP-350 measures the distance and speed to a reflective object, typically a metal item or specific corner reflector. The range is up to 40m depending on the RCS of the target. The primary radar mode features high update rates and enables cost-effective installation in applications including positioning of smaller cranes, presence surveillance, level probing and detection of objects.

"In secondary radar mode, two LPR-1DHP-350 sensors measure the distance and speed between each other. The secondary radar mode features medium ranges of up to 100m and measurement rates of up to 110 Hz," concluded Symeo.



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ZIM backs automotive logistics technology start-up Spinframe

ZIM Integrated Shipping Services has announced its participation in an US\$8M financing round for Spinframe. Based in Israel and founded in 2020, Spinframe develops vehicle inspection systems based on artificial intelligence computer vision and machine-learning technologies, which create 'digital twins' for vehicles throughout the supply chain and detect anomalies from the assembly line throughout the vehicle's journey to the dealership and end-customer.

The investment dovetails with ZIM's intention to expand its automotive logistics operations in an effort to diversify its business from container shipping. Earlier this year, ZIM said that it plans to increase its fleet of car carrying vessels from 11 to 16 ships by mid 2023.

Spinframe offers a way to automate damage inspection at automotive terminals. "Spinframe's

innovative system 'documents' vehicles and uses artificial intelligence to quickly identify any defects and external damage," the carrier stated. "The platform is capable of overseeing a large number of vehicles without human intervention in various locations, such as seaports, transportation and logistics hubs, parking lots, agency facilities, rental branches and service centres. The combination of advanced image processing, damage classification, and data cloud storage allows for immediate vehicle visualisation and status sharing at any stage, via a unified interface."

ZIM said that the investment funds will be utilised by Spinframe to further develop its platform and "deliver a robust pipeline" for implementation. "In particular, the company aims to expand its activities throughout the vehicle maritime transport segment. Recently, Spinframe won an Ashdod

Port tender, which will now use its offering to monitor vehicle disembarkation at the port," said ZIM. Ashdod is understood to have tested a containerised inspection portal that vehicles drive through to be scanned.

Eli Glickman, president and CEO of ZIM, said: "After conducting successful proof of concepts, we have identified the immense potential of Spinframe's technology and its applicability to our industry. As part of our overall approach and strategy, we actively seek out and invest in promising young companies as growth engines."

"This investment represents another successful partnership with a start-up that specialises in digital automation solutions for the benefit of our customers. We take pride in supporting and enabling promising companies to flourish and achieve their full potential."

Gate RFID for ICTSI Manila

ICTSI's flagship Manila International Container Terminal (MICT) has inked an agreement with Intelligent E-Processes Technologies Corp (IETC), the subsidiary of San Miguel Corporation (SMC) that manages Autosweep RFID.

Many of the roads and highways in the Philippines are built and operated as toll roads by private companies on a concession basis. Most of the toll roads are covered by two RFID-based networks and payment systems, Autosweep and Easytrip, and there is some interconnectivity between the two systems. Partnering with IETC will allow ICTSI to install its RFID readers in the gate system at MICT.

ICTSI said that RFID tags will improve the existing gate automation process at MICT. "Our investment in RFID technology is part of our constant effort to optimise the flow of cargo to and from the terminal," said Reynaldo Mark Cruz Jr, MICT's director of information technology systems and services. "Over the years, one of the challenges we have experi-

enced with our automated gates was the low success rate of our licence plate recognition cameras due to the poor condition of the plates mounted on some trucks. There were even trucks that just used laminated paper to display their MV file numbers.

"Using Autosweep's RFID tags as a second alternative to identifying trucks addresses this problem and speeds up our gate operations."

IETC is deploying personnel at

MICT during May to offer free Autosweep tag installation for trucks that call at the terminal. "The hassle-free enrolment also enables customers to immediately use RFID lanes at SMC-operated toll roads, namely the South Luzon Expressway, Skyway, NAIA Expressway, Southern Tagalog Arterial Road Tollway and Tarlac-Pangasinan-La Union Expressway for faster travel time," stated ICTSI.

ICTSI is adding RFID readers to the gate process at MICT



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Weigh-in-motion for IY rail terminals

Intercomp, the US-based weighing technology system supplier, has installed its weigh-in-motion scales at a US intermodal rail terminal.

For port applications, Intercomp offers its Low-Speed Weigh-In-Motion Axle Scales (LS-WIM), which are recessed into the gate lanes to weigh a complete truck as part of the gate process. Subtracting the weight of the truck and trailer allows the weight of the container(s) to be calculated.

Intercomp has supplied WIM systems to Remprex for integration into an automated gate system for a US Class I railroad at a terminal handling up to 12 fully laden 8,000ft intermodal trains and 1,900 gate moves per day.

The automated gate system captures the container number and other data as trucks enter and exit the terminal. To enable the railroad to easily identify overweight containers in the traffic flow, Remprex implemented weigh-in-motion scales.

Previously, the railroad was relying on bills of lading data for container weights, or weighing a suspect container with a weigh scale or a crane-based system. "Without the ability to efficiently and effectively weigh every container truck entering the yard, these decisions fell upon on-site personnel to subjectively identify and manually validate potential overweight, underweight or shifted loads, often creating bottlenecks and delays, as well as lost revenues and increased safety concerns. According to Remprex, yard hostlers were encountering containers as much as 30% overweight," said Intercomp.

Accurate weight information is important for rail operations as the number of locomotives on a train varies by the weight of its rail cars. Furthermore, railroads charge for heavy and overweight containers, so unless they are identified, revenue opportunities can be lost.

Before implementing fixed scales, the railroad conducted a pilot study using Intercomp's LS630-WIM portable scale to evaluate the benefits of integrating weigh-in-motion technology into their new automated gates, which feature Camco

hardware and Remprex's Visibility Gate software.

The WIM system captures data on axle weights, gross vehicle weight, axle spacing and speed, including data from trucks with an empty chassis, and bobtail trucks (those with no chassis). "This allows Remprex to build profiles of specific equipment, either by axle spacing or by unique markings, such as truck number or licence plate. Remprex calculates estimated gross container weight from the gross vehicle weight by subtracting the tractor and chassis weight through our database of tractor and chassis weights," explained Remprex. All data processing is performed on the Visibility Gate servers, which also manage the exceptions process.

A full installation followed subsequently, with pairs of Intercomp sensors installed in the pavement in three-inch-wide channels. The WIM sensors are OIML R134-certified and can be sized up to 13ft (4m)-wide to accommodate oversized vehicles. According to Intercomp, the technology is "largely maintenance free" compared with other weighing systems.

Remprex now offers WIM scales as part of its gate systems offering. "The technology that Remprex develops and integrates into operations provides visibility into all functions inside a terminal, helping us with compliance and fluidity," said Tim Ash, chief solutions officer at Remprex. "Everything we do at Remprex



Intercomp's weigh-in-motion scales have been integrated with Remprex's Visibility Gate software into the gate system that also features Camco equipment

is designed to improve the throughput of the supply chain, and incorporating technology through good partnerships ena-

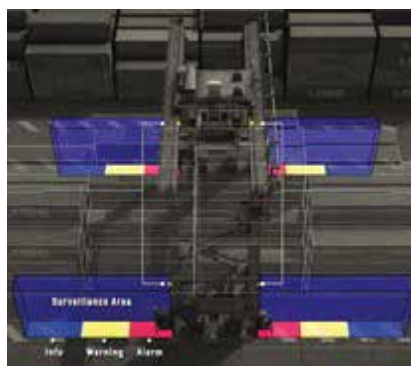
bles us to evolve intermodal through our solutions. The Intercomp WIM solution is a key piece of that evolution."

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LaseTLP-ML TRUCK LIFT PREVENTION MULTILAYER

The LaseTLP-ML measuring system prevents a truck-trailer combination from being lifted by twistlocks that are still locked during container lifting.



LaseGCP-3D GANTRY COLLISION PREVENTION

The LaseGCP-3D is a driver assistance system that helps crane operators of Harbour Cranes, RTG, RMG, STS or Jib Harbour cranes to avoid collisions and thus increase crane availability.



LaseTPS-ML BOOM COLLISION PREVENTION

The LaseTPS-ML is a 3D laser measurement system for accurate truck positioning. It was developed for RTG, RMG and STS cranes, automatic trucks, and AGV positioning.

VBS for Solent Stevedores

A new Vehicle Booking System (VBS) at Solent Stevedores' empty container (EC) depot at London Gateway is claimed to have increased efficiency by 88%.

The VBS was supplied by Intermodal Manager, part of Bankside Systems Ltd. As well as improving turnaround times, the VBS has enabled more containers to be handled. In January this year, Solent Stevedores' EC storage yard saw a throughput of just over 12,000 containers, compared with 8,500 in the same period last year, an increase of 47%.

Hauliers are now seeing peak waiting times of 30 minutes compared with up to four hours before the VBS was introduced. The eight-acre site can store up to 3,500 TEU stacked seven-high, with more than 200 hauliers visiting each month.

Working closely with the team at Solent Stevedores, the existing Intermodal Manager TOS was enhanced with the addition of a fully integrated VBS module. This deep integration brings significant advantages over using a standalone VBS.

Mike Mustoe, operations manager at Solent Stevedores in London Gateway, said: "We strive to ensure we continuously improve and upgrade our systems for maximum efficiency. We asked Intermodal Manager to work closely with our on-site team to design a system to deliver a seamless experience for our customers, and the results speak for themselves."

Graeme Miller, sales director at Intermodal Manager, said: "We've worked with Solent Stevedores on several projects to further enhance and streamline its systems and to see the impact the VBS is having in London Gateway is hugely gratifying. We anticipate that other companies will be looking to implement the solution."



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TMEIC integrates with Orbita

After acquiring Orbita Ports and Terminals in 2022, the companies have been busy integrating Orbita into what is now TMEIC Port Technologies.

In an interview with *WorldCargo News*, TMEIC sales manager Rodrigo Garro Umbert said that after the acquisition, the two companies set to work aligning their engineering roadmaps. Orbita had developed OCR for STS cranes but was less experienced with yard crane OCR. TMEIC, by contrast, has a very large number of crane control and automation systems on ASCs.

TMEIC Port Technologies is now optimising an OCR system for ASC applications. One of the first tasks is to include seal detection in an OCR system for ASCs.

"We are using a new technique, a state-of-the-art object detection model that can efficiently perform this task using deep-learning techniques," said Umbert. "It works by dividing the image into a grid of cells and predicting the probability of each cell

containing an object – the seal. "It also predicts the coordinates of the bounding box that encloses the object and the class of the object, a seal in this case. Initial results show an impressive improvement over the existing method, and it works for all our OCR detections – gate, STS, yard crane, rail, and so on."

Work also continues in STS crane OCR, where TMEIC Port Technologies has designed a new detection method to take better quality pictures of containers under the crane. Rather than relying on the crane PLC to indicate the position of the trolley to trigger a camera, an independent system triggers the cameras at the correct moment. This avoids issues where the container is not travelling directly under the trolley due to the inertia of the load or sway. Umbert said that this system is an improvement for a standalone TMEIC OCR system, "but if TMEIC's Maxview system is included in the crane system, these two systems can work together to

predict the spreader location, giving the best performance with the most cost-effective solution".

Having the former Orbita products and Maxview under joint ownership allows integration to be developed and tested in advance of installation. Umbert said an OCR system needs some data from the crane PLC, which can require "some small modifications to the control system", which the crane or drive manufacturer may not want a third party to perform. This problem is now avoided.

"With TMEIC OCR and Maxspeed combined in the overall crane system design, the crane cycle is considered in the design process, so the OCR system continues to perform independently of the spreader path," said Umbert.

As the integration moves forward Umbert sees potential to further optimise the number and position of cameras in the OCR system, and there are also savings in system hardware. "When TMEIC is providing the PLC and the crane management sys-



An image captured with TMEIC's new machine-learning object detection technique, used to detect container seals

tem [CMS], there is no need for the OCR system to include any kind of gateway PLC and, more importantly, there is no need to install a dedicated workstation to do the OCR exceptions," he said. These can be handled from the same equipment that manages the CMS. "These two advantages alone should provide noticeable cost-savings for our customers," added Umbert.

As the industry moves forwards with STS crane automation, one of the key issues to consider is how to capture and verify container num-

bers under the crane, and in particular how to resolve exceptions in this process without slowing down the crane operation. One option is for remote operators to resolve exceptions themselves, where possible. In this case, the OCR exceptions handling software can be incorporated in the operator console and crane control station.

Integrating the OCR system with the Maxview software suite also allows real-time validation of stowage plan execution. The combination of Maxview plus

OCR will detect if a container is not placed in the correct position. There may be some cases where a terminal would prefer to allow operations to proceed for some incorrect moves – such as placing an empty container in the adjacent row to the planned move – that create an exception that slows down the operation. At this point, TMEIC has opted to create an exception that is referred to the crane operator or a clerk to accept or reject, rather than having any 'discretion' in the crane control system.

4.9G for Puerto Bahía

Nokia and local network provider Claro have deployed what they say is "the first industrial-grade private 4.9G wireless network in a maritime terminal in Colombia".

The system is deployed at Sociedad Portuaria Puerto Bahía in Cartagena, a multipurpose terminal that handles liquid cargo, vehicles and general cargo. The wireless network is a 4.9G system delivering high bandwidth and low latency using the Nokia Digital Automation Cloud (DAC), including Nokia MX Industrial Edge.

Nokia said that the network will provide connectivity between the personnel and the TOS, and between "cranes in docks and yards to optimise operations". The terminal handles vessels on

a finger pier, which is connected to the yard via a bridge. Most of its traffic is automobiles handled from ro-ro vessels, and at peak times, there are up to 20,000 vehicles in the yard.

"Innovation is at the heart of Puerto Bahía," said Rodrigo Torras, president of Puerto Bahía. "Our aim as a company is to implement technological tools that help us position ourselves as a Smart Port 4.0. With Claro and Nokia deploying an industrial-grade network, we are undoubtedly setting a great scenario for the optimisation of our logistics and the development of various use cases that will lead us to a more effective operation and benefit our customers, suppliers and collaborators."

Nokia has installed another private wireless network in a marine terminal, this time at Sociedad Portuaria Puerto Bahía in Cartagena



Kuehne+Nagel adds container tracking data

Kuehne+Nagel (K+N) has added real-time container tracking data to its myKN online platform.

K+N said the new service "platform harnesses data of a geo system cloud solution to allow customers to track all their containers in real time. In addition, it reduces manual effort in identifying milestones and current deviations from the planned schedule. It not only increases accuracy and productivity by eliminating previous white spots in supply chain transparency, but also enables early preventive measures for the cargo".

While there are containers in service with its livery, K+N does not own or operate containers, and the company confirmed to *WorldCargo News* that it is not planning to change this strategy. For ocean freight, the tracking data in the new Container Dashboard comes from shipping lines that move containers for K+N. A growing number of containers are being fitted with IoT devices that enable them to be tracked and monitored directly.

In comments to *WorldCargo News*, K+N said that the growth

of telematics will contribute to enhanced data accuracy and enable the provision of data beyond location alone, including temperature, door status and shocks. These data will be visible on myKN as it becomes available, but until the global container fleet is fully covered with IoT devices, the Container Dashboard "adds great value to our customers in terms of container level security".

Notifications are available at key points, including pick-up or departure, to improve the trans-

parency of the customer's door-to-door transport chain. "This includes pre-carriage and on-carriage, demurrage and detention, as well as transshipments," stated K+N. "A new user interface lists container flows and dwell times and highlights deviations from the initial carrier schedule. Long-term analytics allows customers to reorganise routes that consistently exceed dwell times. The underlying real-time geo system collects and includes telemetry and multiple internal and external industry data sources."

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Kaleris presents latest evolution of Navis N4 terminal operating system

Kaleris continues to develop the core Navis N4 TOS. The latest version, N4 4.0, offers improvements in optimisation solutions, a new intelligence module, and an improved end-user experience for control room staff.

N4 4.0 supports a continuous delivery method where new functionality can be deployed as it is released without requiring a full TOS upgrade. Rolling upgrades offer the option to upgrade a terminal's N4 version, one server at a time, without needing to stop the TOS.

"This enables terminals to upgrade and implement changes in the TOS at their own pace and with minimal risk/impact on operations. Through 'rolling upgrades', we reduce downtime and also offer faster system start-up times," said Floris Vernooij, director of product management, TOS, at Kaleris.

Other new features include Single Sign On (SSO) across all apps in the N4 ecosystem (XPS, ECN4, N4, and Smart Apps), and security improvements that comply with industry standards, including OAuth2 enabling multi-factor authentication. This covers increased third-party audit checks, an open-source library to respond faster to threats, and a distributed architecture to protect N4 data from the internet. All data are now encrypted at rest and when shared between N4 and other Navis products, as well as externally with partners and customers.

Kaleris recently hosted the Navis Europe User Group Conference where, said Vernooij, one of the key issues discussed was retrofitting automation to existing terminals, and to equipment. "The challenge we hear from a lot of terminals is uncertainty around these being high-cost, and potentially lengthy, projects that could disrupt their existing operations during implementation. The question we often hear is 'how can we de-risk rolling out automation?' and it's an entirely reasonable question from both a technology perspective as well as a human change-management perspective," said Vernooij. "In the end, it's not only the equipment that will be changed but the staff in the terminal will also need to manage their terminal in a different way."

To support terminals with the transition, N4 4.0 provides both easy-to-use user interfaces, as well as functionality to enable the roll-out of automation on one automated piece of equipment at a time, while maintaining existing operations.

"This is especially important when a terminal is retrofitting existing equipment with automated capabilities," continued Vernooij. "For example, the terminal can implement and test automation on a specific piece of equipment during a smaller window, such as at night when there's less activity, and return to a manned operation during the day while they continue to ramp up automation."

"The TOS supports a smooth automation roll-out with the literal push of a button – indicate which equipment is automated and N4 will figure out all the required workflow and integration changes needed to support it."

The other big challenge, particularly over the past two years, is how terminals can better manage dwell times and the flow of containers through the terminal, particularly when volumes surge and pressure on the container supply chain increases yard utilisation levels and dwell times. Kaleris is investing in three main areas to help support terminals, as follows:

- Completely revamping the user experience to help dispatchers and operations monitoring, with a focus on preventing problems before they happen. "This is achieved by simplifying, through the TOS, both the data and tools presented to the dispatcher. The system reduces the amount of noise, showing the dispatcher both the potential problem and how to solve it. Often, this means that a problem doesn't even reach a dispatcher – N4 proactively solves it," said Vernooij.
- Revamping optimisation engines for both equipment and truck scheduling to "ensure the right decisions are made

and re-evaluated as operational reality happens. The engines build upon our automated terminal solutions and can be used with them, but they are specifically designed for manned terminals to help them bring their operations to the next level", said Vernooij.

• Data integration through the Kaleris Execution and Visibility platform (EVP). The EVP now offers more than 20 APIs for data sharing.

To help terminals look at their operation holistically, Kaleris has developed an AI platform that can take both TOS data and external source data from the EVP to

support making tactical decisions, such as whether to handle another vessel, and improve visibility into future operational metrics, such as yard capacity.

"We're working to take this to the next level by leveraging predictive insights to enhance our new optimisation engines, resulting in improved automated decision-making, automatically fine-tuning decision-making factors, supporting terminals in spotting potential delays before they arise, and providing insight into causes of inefficiency – all of which were often hidden in the data before now," concluded Vernooij.

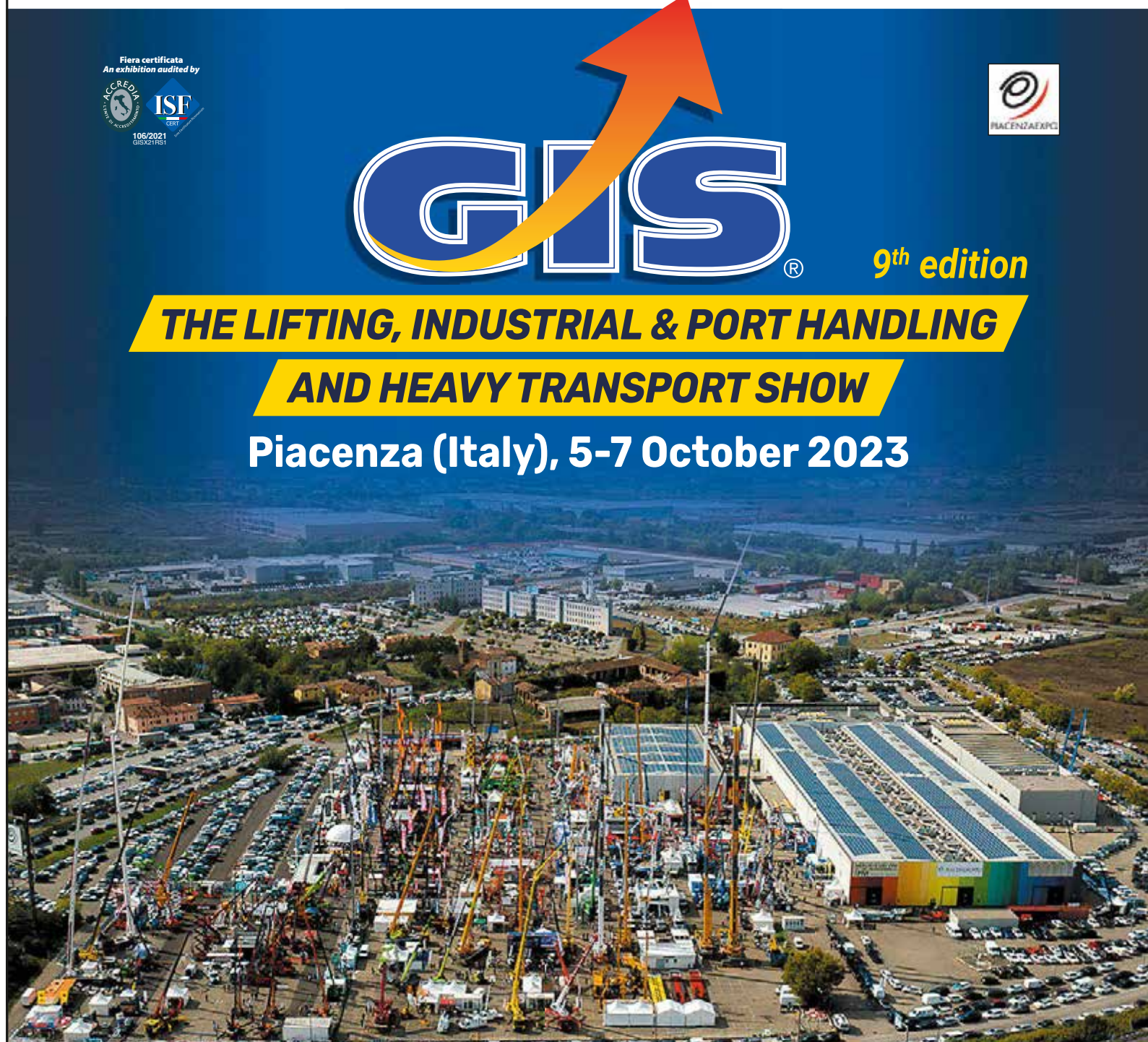
Drones are increasingly used in ports for inspection and security purposes. Nokia claims to be the first to offer a "CE-certified, turnkey drone-in-a-box solution that meets the requirements of the European Union and connects over public and private 4G/LTE and 5G networks".

It elaborated: "The solution is manufactured in Europe and comprises Nokia drones, docking station, dual gimbal camera and edge cloud processing using Nokia MX Industrial Edge (MXIE). By connecting over public and private 4G/LTE and 5G networks, customers will benefit from the highest reliability. Using cellular connectivity technologies also offers higher data rates and lower latency, enabling more data to be streamed

than over WiFi. Beyond visual line of sight [BVLOS], operations with real-time kinetic [RTK] positioning improve situational awareness. Dual modem connectivity allows Nokia drones to simultaneously connect to multiple networks, complying with the system redundancy that is commonly required by aviation regulatory bodies."

As well as remote operation, the Nokia Drone Networks solution can be programmed to manage regular autonomous flights for equipment inspection. Used in conjunction with Nokia MXIE, data from Nokia drones can be collected and processed in real time on the edge cloud. Nokia offers an open API framework for integration with third-party applications.

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Supply chain opportunities for GTOs

DP World, PSA International (PSAI) and AD Ports Group (ADPG) are among the global terminal operators (GTOs) that have acquired logistics groups and are pursuing strategies to increase their involvement in this sector of the container business.

DP World has led the way, with data recently published by fDi Intelligence, a division of the *Financial Times*, revealing that the world's fifth largest GTO has invested over US\$10B in the global logistics sector since 2012, spending over US\$320M in 2022. The group's acquisitions have included South Africa-based Imperial Logistics, Syncreon Holdings, headquartered in the US, India's Continental Warehousing Corp, Peru-domiciled Cosmos Agencia Maritima SAC and J&J Group, based in Mozambique.

The port group has also entered into a number of partnership agreements, including with Americold, the cold chain specialist. "We are committed to leading global trade into a more resilient, efficient and sustainable future," explained Sultan Ahmed Bin Sulayem, group chairman and CEO of DP World. "Our partnership with Americold has the potential to help us spread the benefits of trade to

Increasingly, GTOs are investing in marine services and logistics firms as they seek closer relationships with both suppliers and beneficial cargo owners, deeper involvement in international supply chains and broader revenue streams

new people and new places, to push our sector to a more sustainable future and to provide the global food industry with the world-class solutions it deserves."

Elsewhere, recent transactions have included:

- ADPG purchasing a 70% stake in Cairo-based International Associated Cargo Carrier (IACC) for AED514M (US\$140M). IACC owns Transmar, a leading regional container line, Safina Shipping Services, a ship agency and marine services company, Transcargo International, which specialises in the provision of stevedoring, warehousing and port services, and IACC Logistics, an integrated logistics services business.
- ADPG spending US\$680M to acquire Noatum, the Spanish freight transport

and ports group. It covers all of the group's activities, apart from the container terminals in Valencia and Bilbao and some rail terminals that were sold to Cosco Shipping Ports (CSP) in 2017.

- PSAI, through its subsidiary PSA-BDP Turkey Supply Chain Solutions Pte Ltd, signing an initial agreement to purchase a 75% shareholding in Istanbul-based Alisan Logistics AS. The near 40-year-old family-controlled business is active in some of Turkey's fastest-growing business sectors, including the consumer goods, agricultural, chemicals and automotive industries. Once the transaction has been completed, Alisan will be fully consolidated into PSAI's cargo solutions arm, which has recently been reorganised.

- PSAI taking a 45% shareholding in Panama-based Meyer's Tugs SA. The acquisition was channelled through PSAI's subsidiary PSA Marine Americas (Pte) Ltd.

Merging ports/logistics

In March, the PSA Group took the decision to merge PSAI's operating unit, PSA Cargo Solutions, with BDP International, a global supply chain solutions company that PSA acquired in April 2022. The new unit now trades as PSA BDP, with Mike Andaloro serving as its CEO.

Tan Chong Meng, CEO of the PSA Group, explained that PSA BDP leverages the group's investment in ports, especially its strategic hubs, to expand its range of value-added terminal services, multi-modal transport solutions that increasingly focus on reducing carbon emissions,

mid-mile logistics activities, and the use of digital applications to streamline documentary and compliance processes.

The reorganisation is already having a positive impact, with several new clients signed up. These include Paris-based Automotive Cells Company (ACC) which has appointed the group to manage its contract logistics and hinterland transport needs to/from its gigafactory in Billy-Berclau, France. The operation will be coordinated through PSA BDP's 22,000 m² specialised warehouse in the Port of Dunkirk. According to PSA BDP, the facility is BREEAM-certified and meets the highest standards for the sustainable handling of batteries for electrical vehicles (EVs).

While ACC, which comprises a joint venture between Saft, a developer and producer of new technologies for batteries, and car manufacturers Stellantis NV and Mercedes-Benz, is expanding its EV battery business aggressively, PSA BDP is positioning itself to be a major player in this fast-growing sector of the automotive industry. It believes its long-term experience in providing bespoke and sustainable supply chain solutions in the high-care and high-tech cargo sectors stands in good stead for the EV sector.

Vincent Ng, CEO of Enterprise Growth at PSA BDP, explained: "The EV vertical is poised for explosive growth in Europe and PSA BDP is well-positioned to become one of the key logistics service providers for this burgeoning industry. This partnership with ACC allows us to collaborate with one of the premier EV players and with key stakeholders in the Hauts-de-France logistics ecosystem to co-create innovative supply chain solutions."

Terminals focus

But such moves into supply chain management and logistics services do not mean that capital is not being used by GTOs to invest in new terminals, modernise and expand existing facilities, and bid for new operating concessions.

GTOs generally believe that long-term trading prospects in the container sector are strong, that the potential for the container to penetrate other cargo sec-

tors remains significant, and that more well-equipped and efficient terminals are needed for the new and larger tonnage being delivered to ocean carriers.

Highly significant for Terminal Investment Limited (TiL) is its partnership with Baltimore-based Tradepoint Atlantic to develop a new container terminal in the US east coast port of Baltimore on Sparrows Point, the site of a former Bethlehem Steel mill. The deal will strengthen TiL's operating presence on the Atlantic seaboard of North America and provide affiliate MSC with another gateway into the Midwest region.

The move will also allow Tradepoint and TiL to capitalise on the increasing flows of traffic between the US east coast and the Asia-Pacific region. The ongoing transfer of manufacturing production west from China to the Asean trading bloc (including Indonesia, Thailand and Vietnam) and South Asia (Bangladesh and India) will result in ocean carriers routing more of their mega ships via the Suez Canal to deep-draught (50ft alongside the berths) container terminals such as Sparrows Point. The new terminal will feature an on-dock rail yard and have the capacity to handle at least 1.5M TEU a year.

"This is one of the most important and consequential announcements we have made since setting out with our initial plans to redevelop the former Sparrows Point steel mill site," explained Kerry Doyle, managing director of Tradepoint Atlantic. He stressed that the terminal would provide much-needed additional container handling capacity in the Port of Baltimore while enhancing its competitiveness against other ports along the east coast.

Elsewhere in the US, TiL is working with Ports America, the state of Louisiana and the Port of New Orleans on the development of a new container terminal on the lower reaches of the Mississippi river. The planned three-berth Louisiana International Terminal will cost an estimated US\$1.8B to develop and have the capacity to handle 2M TEU a year. Construction of the new facility is expected to

APM Terminals has teamed up with Vietnam's Hateco group to develop two new deepwater berths at Lach Huyen port in the city of Haiphong, Vietnam (artist's impression)



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start in 2025, with the first berth opening three years later.

APMT spreads out

APM Terminals (APMT) is also investing in established ports, agreeing terms with the Port of Rotterdam Authority to expand its Maasvlakte II terminal. The expanded terminal will feature 1 km of additional quay and 47.5-ha of land and raise the facility's handling capacity by about 2M TEU a year. It is scheduled to become operational during 2026 (see p35).

"Our decision to invest further and expand in Maasvlakte II is a confirmation of Rotterdam's importance for global supply chains and for our global network," said Keith Svendsen, CEO of APMT.

Other key investment projects for APMT include the modernisation and expansion of several of its existing facilities, including at Callao in Peru and Poti in Georgia, and the development of new terminals, such as at Lach Huyen port, near Haiphong, in northern Vietnam.

At Poti, APMT is in the latter stages of a US\$170M spending programme that involves improving the port's infrastructure and buying new equipment. According to APMT, these investments are targeted at boosting Poti's cargo handling capacity, increasing its operating efficiency, raising safety standards and cutting the port's environmental footprint.

APMT recently purchased two 12 m³ grabs, two 40 m³ hydraulic bulk discharge hoppers, built and phased into service two conventional hoppers and bought 80 Rotainers.

APMT has had an operating presence in southern Vietnam (Cai Mep) since 2007, but this will be its first venture in the northern part of the country, a region that it believes offers immense trading potential, given its proximity to China and the nation's capital city, Hanoi.

"We are very pleased to partner with Hateco Group Joint Stock Corporation on this important project, further unlocking one of the rapidly growing and high-potential markets in Southeast Asia," said Martijn van Dongen, head of investment at APMT. "This involvement naturally underpins our ambition to grow where it benefits our customers, and that is clearly the case in Vietnam. We also believe in the win-win partnership with Hateco, which will create synergies between local expertise and our global capabilities."

Hateco is developing the Hateco Haiphong International Container Terminal (HHICT) and its strategic arrangements with APMT, which will offer the project financial, operational and technical support, and its sister firm Maersk Line, which will use the facility as its northern Vietnam gateway, will give the terminal credibility and a useful cargo base.

HHICT will feature two 450m berths with a depth alongside sufficient to accommodate fully loaded 18,000 TEU capacity ships. The first phase of the terminal is scheduled to open during Q1 2025 and it will be equipped with five STS cranes and 14 RTGs. Its annual handling capacity will be in the 1.2M-1.5M TEU range.

Staying by the water

The much smaller GTO, Manila-based ICTSI, has its investment strategy firmly focused on ports. This means improving its existing portfolio of facilities – specifically implementing plans, equipment/software purchases and infrastructure upgrades so that more cargo can be processed efficiently and larger vessels can be accommodated – and bidding for new development and operating concessions.

At its flagship Manila International Container Terminal (MICT), ICTSI is developing its eighth berth. It will have a draught alongside of 15m and be capable of handling ULCV tonnage. Currently, the largest vessels that MICT can accommodate at MICT are neo-Panamax class ships (at berths 6 and 7). The new 400m berth will open in 2025 and will increase MICT's handling capacity by 200,000 TEU a year to 3.5M TEU.

"We are optimistic of the prospect of welcoming ULCVs at the Port of Manila and are preparing to accommodate the added volume that these more efficient ships will bring," said Christian R. Gon-

zalez, executive vice president of ICTSI. "With these developments, our goal is to outpace demand and ensure the efficient flow of trade from the port to the local supply chain."

ICTSI hopes to pursue a similar strategy in Australia. It is keen to work with the Melbourne Port Authority on developing the Webb Dock North Container Terminal and integrating this into its existing operation at Victoria International Container Terminal (VICT). The operator has indicated it is prepared to invest A\$500M in the project and has already conducted technical and economic/com-

Terminal Investment Limited has partnered with Baltimore-based Tradeport Atlantic to develop a new container terminal in the Port of Baltimore on Sparrows Point, the site of a former Bethlehem Steel mill




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mercial feasibility studies to support the project.

"We are keen to solidify our partnership with the Port of Melbourne to deliver the lowest cost, most efficient and environmentally sustainable solution to expanding the port's container handling capacity and facilitating the growth of Victoria's economy," said Gonzalez.

Should a deal be concluded between ICTSI and the Port of Melbourne, VICT's expanded complex would comprise four berths, all of them capable of accommo-

dating neo-Panamax vessels up to 367m in length, and would increase the facility's throughput capacity to about 3.7M TEU a year. Currently, VICT can handle just over 1M TEU a year.

Elsewhere, ICTSI has carried out works at its Contecon Guayaquil SA facility in Ecuador so that shipping lines can use bigger ships and/or load smaller vessels with more cargo, thereby improving their economies of scale. In April, the terminal serviced the MAERSK CAMDEN (15,143 TEU), its largest vessel to date.

In Papua New Guinea, ICTSI has invested in cranes at its facilities in Port Lae and Port Moresby to raise cargo handling productivity levels and allow operators to call with gearless vessels, thus reducing ship turnaround times.

Last year, ICTSI's South Pacific International Container Terminal (SPICT) in Port Lae took delivery of two STS cranes – the first in Papua New Guinea – with the capacity to handle post-Panamax ships loading up to 6,000 TEU. ICTSI believes that SPICT now has the infrastructure and equip-

ment to act as a regional hub for the Pacific Islands region.

Meanwhile, at the company's Motukea International Terminal (MIT) in Port Moresby, two mobile harbour cranes have recently been installed, with the facility handling its first gearless vessel, MERATUS SAMARINDA (526 TEU), in April.

Emerging markets

Hong Kong-headquartered Hutchison Ports' main projects are in emerging markets, with Egypt being particularly important. The group is investing over US\$1.5B in designing, building and then operating terminals in the Red Sea port of Sokhna and the Mediterranean ports of El Dekheila and Alexandria.

In the case of Sokhna and El Dekheila, Hutchison is working in partnership with Ocean Alliance members CMA CGM and Cosco Shipping, together with CSP. It is hoped that the various companies will support the Egyptian government in its drive to establish an efficient landbridge rail connection and logistics axis between the country's Mediterranean and Red Sea coastlines, potentially as a 'safeguarding' and alternative transport option for those cargo owners not wanting to use the Suez Canal.

In terms of the terminals, the one in Sokhna will have a 2,600m quay, 1.6M m² of storage yard and the ability to process 1.7M TEU a year. The terminal in Dekheila will have a 1,200m wharf, a yard area of 800,000 m² and the capacity to handle at least 900,000 TEU a year. In both cases, ULCVs capable of loading 24,000 TEU and drawing 18m of water will be able to call.

Abu Dhabi's ADPG is also expanding its presence in Egypt, having recently signed a 30-year concession agreement with the country's Red Sea Ports Authority (RSPA) to develop and operate a multipurpose terminal in the Port of Safage. The group is investing about US\$200M in the project and hopes to open the facility in Q2 2025.

The new terminal, which will feature a continuous quay line of approximately 1km, will be designed to handle up to 5 Mtpa of dry bulk and general cargo, 1 Mtpa of liquid bulk, 450,000 TEU of containerised cargo, and the equivalent of 50,000 CEU/year of ro-ro traffic.



ICTSI's container terminals in Port Lae and Port Moresby can both service gearless vessels

In addition, ADPG has signed a deal with the General Authority for the Suez Canal Economic Zone to develop and operate specialised terminals for the handling of cement in the ports of Al Arish and West Port Said. The 15-year concessions involve ADPG investing over AED120M (US\$32.7M) to build a 60,000t capacity storage silo and associated infrastructure in Al Arish and a smaller 30,000t capacity unit in West Port Said, and then operate the two facilities. The new silos, which are expected to become fully operational by the end of 2023, will raise the two ports' annual handling capacity for cement to 1 Mtpa and 1.5 Mtpa, respectively, and "help Egypt double its export of cement", according to ADPG.

In addition, ADPG has arrangements in place to improve and expand facilities for serving tourists in several ports across Egypt. Specifically, initial agreements have been signed between the port group and the RSPA for the development, management and operation of cruise terminals in Hurghada and the resort city of Sharm El-Sheik.

"Our expertise as facilitators of global trade, as well as developers and operators of strategic port infrastructure projects, combined with Safage Port's strategic location on the Red Sea, means that we are uniquely positioned to deliver activities from managing port and logistics operations to providing tourists with access to Egypt's fascinating history and culture," said Saif Al Mazroui, CEO of ADPG's Ports Cluster. "This will lend support to and promote the growth and diversification of the Egyptian economy."

Elsewhere in Africa, ADPG is involved in projects in Kenya and, more recently, the Republic of Congo, where the group is in discussions with the government to develop and manage a new multipurpose cargo handling facility in Pointe Noire.

The so-called New Mole Port would be built and equipped to handle a wide range of cargoes, including containers and break-bulk, with ADPG also providing the new port with digital services and technological solutions.

To date, ADPG and the government have signed a 'Heads of Terms' agreement for the project, and this is valid until April 2024, during which time a concession agreement could be concluded between the parties.

In other developments, ADPG has used Maqta Gateway, its digital trading solutions unit, to acquire Barbados-based TTEK Inc, a company that specialises in the development of technologies and software for optimising border control and customs systems. The deal is worth an estimated US\$26.7M and will, according to ADPG, "bring us near-term and sustained synergistic benefits, including fast time-to-market delivery and significant sector expertise".

Mohamed Juma Al Shamisi, managing director and group CEO of ADPG, elaborated: "The comprehensive custom Single Window solution provided

through this acquisition has high demand in international markets, including Central Asia. TTEK's existing trade expertise in the Middle East supports the group's ambition to widen its digital trade solutions within the region. The near-term pipeline includes international markets that are strategically important to the group."

On the sidelines

China's two main port operating companies, CSP and China Merchants Port Holdings Co (CMP), have been relatively quiet on the investment front over the past 12 months. While each group has earmarked some capital for the development of logistics and distribution facilities, to date they have not bought directly into supply chain service providers. But this could change.

Recently, CSP has acquired a 56% shareholding in Xiamen Haicang Free Trade Port Zone Investment and Construction Management Co Ltd (XHFTPZ) and a 30% stake in Xiamen Ocean Gate Container Terminal Co Ltd (XOGCT) in a move aimed at increasing its presence in the southeast region of China and offering its customers a broader range of services.

While XHFTPZ owns various warehouses, depots and logistical assets, including cold stores, and has an interest in rail services to Europe, XOGCT's main business is operating Haicang port. It is the main container port in the region and one of the smartest in the country, with 5G-enabled communication technologies in operation.

CMP expects to spend most of its capital this year on the third phase of its development programme in the Shantou Guang'ao Port Zone, construction of a logistics park in Djibouti, the refurbishment of its Terminal de Contêineres de Paranaguá facility in the southern Brazilian port of Paranaguá, and on a new integrated commercial and logistics complex in Sri Lanka.

The South Asia Commercial and Logistics Hub in Colombo will entail expenditure of about US\$2B, with CMP taking a 70% stake in the project. Its partners comprise the Sri Lanka Ports Authority and Access Engineering PLC, a local construction company, each with a 15% shareholding. The new complex, which will occupy an area of more than 465,999 m² with covered storage capacity of approximately 530 m³, is due to open in late 2025.

CMP believes the development will boost Colombo's status as a regional container hub and result in more cargo being handled, including over its Colombo International Container Terminals facility. The terminal handled 3.22M TEU in 2022, up 5.1% on the previous year (3.06M TEU).

In addition, traffic volumes at the Hambantota International Port Group, which handles mainly dry bulk and automobiles, could benefit from the new logistics zone. In 2022, while the volume of cars handled increased by 4.2% to 560,000 vehicles, dry bulk traffic declined almost 17% to 1.29 Mt. □

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Are Benelux ports better together?

On the face of it, the creation in 2018 of North Sea Port (NSP) from a collection of relatively small ports spanning the Dutch/Belgian border appears to have been a success. The same goes for last year's merger of the ports of Antwerp and Zeebrugge, which became Port of Antwerp-Bruges, although it is still early days. The latter port is still in its transition phase, with processes and systems being evaluated on a continual basis and the new authority admitting to still having to face many technical, operational and personnel challenges in the future.

"Our merged port is a world port that is ensuring sustainable growth and economic prosperity," said Annick De Ridder, port alderwoman of the City of Antwerp and chairwoman of the Board of Directors of the Port of Antwerp-Bruges. "It harbours great ambitions while facing great challenges. We have successfully faced those challenges together in the 'birth year' with resilience and agility. Meanwhile, the merger of the highly complementary port platforms is proving its added-value in practice. Our merged port is the economic engine of Flanders. That engine keeps running due to the hard work of all the employees, both on the Antwerp and Zeebrugge port platforms."

Cargo volumes in both complexes have held up well despite challenging global economic and geopolitical situations, and investment in new projects is strong. Moreover, the ports are making considerable progress when it comes to reducing their carbon footprints and running sustainable operations, securing EU funding and state support in several cases.

De Ridder also pointed to the unification of the two ports as significantly accelerating the already existing innovation and energy ambitions of both port authorities and to the increased scale that has brought with it increased political and economic clout.

The port authority stressed how its role in the LNG supply chain had increased over the past year. "Today, 15% of the total

A year on from the merger of the ports of Antwerp and Zeebrugge, and five years after the creation of North Sea Port, WorldCargo News assesses the impact of both developments

supply of LNG and natural gas to Europe arrives via the Zeebrugge port platform, and this is up from 8% a year ago," said a spokesperson. "This makes Antwerp-Bruges one of the main access routes for gas into the European hinterland."

Box traffic slows

Antwerp-Bruges is also a main gateway for Europe's container traffic, and the merger has helped consolidate its role in this sector. Last year, Antwerp was facing some difficulties in efficiently processing its expanding container traffic. By successfully working with its customers, it has transferred some traffic to Zeebrugge. In the process, the port complex has maintained its overall share of northern Europe's container market.

Nonetheless, this sector of the port's business has proved challenging, with both annual volumes and Q1 2023 traffic numbers falling. Whereas in 2022, the number of containers handled declined by 5.2%, in the first quarter of this year, traffic had dipped by a slightly higher 5.7% (to 3.1M TEU), compared with the same period of 2022. Total tonnage also declined, with the 286.9 Mt handled in calendar year 2022 down 0.7% on 2021's level, and the Q1 2023 total of 68.7 Mt being 4.5% lower than in the corresponding period of last year. These declines, however, were less severe than those posted in Rotterdam, whose container throughput in the first quarter of 2023 fell more than 11% to 3.2M TEU.

"Despite these disappointing figures, the outlook for 2023 remains positive," said Jacques Vandermeiren, CEO of Port of Antwerp-Bruges. "These results show

that the world port is at the centre of a continuously challenging geopolitical and macroeconomic context, but with falling energy prices, an improving Chinese economy and signs that the liner market is also picking up, there are reasons to be confident about the future."

His level of confidence is reflected in the number of projects in place to increase container handling capacity at the port.

Europa revamp

One of the most important projects is refurbishing and strengthening the 1,200m quay at the Europa Terminal so that the latest generation of ULCV tonnage (24,000-plus TEU capacity) can be accommodated. The work, which will be undertaken over three phases and will take nine years to complete, will increase the facility's throughput capacity by at least 700,000 TEU a year.

The project involves expenditure of at least €335M and entails:

- Reorientation of the quay to allow a safe distance between berthed ships and those in the main access channel, and to offer better protection to the nearby nature reserve at Galgenschuur.
- Dredging of the channel alongside the facility so that vessels with a 16.5m draught can berth. This compares with ships of up to 13.5m currently.
- The provision of infrastructure, such as wind turbines, so that more renewable energy can be used in the terminal. The aim is to cut CO₂ emissions per container by 50%.

"As a world-class port, it is essential that we continue to play at the highest level and are able to accommodate the



Three very large STS cranes arriving at DP World Antwerp. These feature an outreach of 71m for a 26-row vessel stow, a 30.48m rail gauge and a lift height above rail of 52m. The smaller crane is destined for Yilport's terminal in Oslo, Norway

biggest ships," said Vandermeiren. "We are, however, aware of the impact of our activities on the surrounding area and local residents. That is why we are committed to reducing mooring emissions, among other things. With a new, efficient and sustainable terminal, we are building the port infrastructure of the future."

Trio of new cranes

DP World is also investing over €200M in its Antwerp Gateway Terminal. Recently, the terminal operator installed three new cranes with the ability to handle vessels stowing containers 26-across on with the weather deck.

The port authority is also making progress on the redevelopment of its NextGen district, an 88-ha site formerly occupied by a General Motors factory. The port authority is issuing operating concessions to companies engaged in the circular economy that use new technologies and innovative manufacturing systems to ensure sustainability and lower emissions. Earlier this year, PureCycle, a US company based in Ohio that recycles polypropylene, agreed terms with Antwerp-Bruges to develop a factory capable of outputting 59,000t of product a year, with the potential to increase this to 240,000t a year.

This development will complete phase one of the NextGen project, where opera-

tions are being established by a variety of companies, such as Plug, which is investing in a green hydrogen (H₂) plant, and Bolder Industries, which will recycle car tyres.

These companies will be helped by PSA Breakbulk's initiative to invest heavily in a modern project/heavy lift facility at the nearby Churchill Dock. This will also offer a full range of logistics and support services to satisfy the industrial needs of companies at NextGen (see box story, p32).

Emissions reduction

A key factor driving the port authority's own investment programme is the desire to cut emissions from its fleet of marine services vessels. These account for an estimated 85% of the port's total emissions.

Rob Smeets, COO of Antwerp-Bruges, elaborated: "We have a fleet of 20 tugs and dredgers and barges. We need them to be fit for the future," he said. "We are looking at greener tugs and looking to renew our own tugs to reduce emissions with energy-efficient vessels. Our ambition is to reduce CO₂ by 35% by 2025, compared with 2005 levels, and by 55% by 2030."

To date, Antwerp-Bruges has purchased two hybrid-electric-powered patrol boats, replaced three of its oldest and conventionally designed tugs with more efficient stern-drive systems, and trialled the use of

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alternative fuels, including hydrogen and methanol, for its tugs.

It also wants its terminal operators to invest in cleaner handling equipment and is supporting them in several projects. In March, Antwerp Terminal Services (ATS), which is a joint venture between MSC PSA Europe Terminal (MPET) and PSA Antwerp, took delivery of the world's first dual-fuel H2 straddle carrier (pictured). Developed in conjunction with Antwerp-based CMB.TECH, a 'cleantech' company that specialises in developing and building hydrogen and ammonia-powered large marine and industrial machines, it is being deployed in PSA Antwerp's Noordzee Terminal. The new straddle carrier cuts diesel consumption by up to 70% compared with the operator's existing machines.

The use of more inland waterway ship/barge and rail services to move cargo to/from the port is also viewed as an integral part of Antwerp-Bruges's sustainability strategy. In this respect, it was a hugely significant decision by Antwerp-Bruges, Railport Antwerp, Lineas and Infrabel to work together to ensure the automatic shunting facility, also referred to as the hump yard, at the Antwerp-North Marshalling Yard is operated neutrally and available to all rail operators on equal terms in the port.

The new operating regime became effective on 1 April 2023, with the parties claiming that freight trains can be assem-

bled up to six times faster and in a more efficient manner. The country's rail regulator controls the pricing for shunting services, which, along with planning and capacity allocation in the yard, are the responsibility of Lineas.

Antwerp-Bruges and Infrabel are finalising the development of software so that customers using the yard will be able to monitor easily and quickly the status of their freight train and/or wagons in real time. By 2030, Antwerp-Bruges aims to double the amount of cargo moving to/from the port by rail, and initiatives such as this will help it achieve that.

North Sea Port

After several years of consistent growth in cargo traffic, NSP also saw a drop in tonnage in Q1 2023. The 14 Mt handled was down 4% on the same period of 2022, the full year of which proved to be a record trading performance for NSP, which was created in 2018 from the merger of Zeeland Sea Ports (Vlissingen and Terneuzen) in the Netherlands and the Belgian Port of Ghent. A total of 138.1 Mt of cargo was handled, up from 129.1 Mt in 2021, a rise of 7%.

The port's management attributed the recent quarterly fall in tonnage handled to "the EU's sanctions against Russia becoming more evident". In particular, these affected the port's liquid bulk business,

PSA Breakbulk launches Antwerp PCE

PSA Breakbulk has created what it refers to as a 'Project Cargo Ecosystem' (PCE) at its South Churchill Terminal (SCT) in the Port of Antwerp. Approximately €11M has been invested in equipment, including a new crane with an SWL of 750t, and basic infrastructure, such as strengthened yard paving, that will enable the operator to offer shippers of large-scale project cargo and industrial modules a full suite of loading/discharging, storage, consolidation, assembly and distribution services.

The move by PSA Breakbulk is important as the facility is located close to the NextGen district, where various international companies involved in the circular economy are establishing their operations and where the need to import heavy plant and industrial equipment is increasing.

But PSA Breakbulk also sees huge opportunities in handling cargo and providing specialised turnkey and support services for the region's burgeoning renewable energy and industrial chemicals sectors. It believes its investment in the terminal will allow Antwerp to compete more effectively for this business.

PSA Breakbulk was established in June 2021 as a joint venture between PSA International, breakbulk logistics group Haeger & Schmidt Logistics, and Felbermayr, a specialist in supplying heavy lift transport equipment. Since then, the company has repurposed SCT and invested in equipment to handle more out-of-gauge and heavy lift cargo. The terminal operating company is also investing in its North Churchill Terminal (NCT), which handles mainly steel products. The response from customers has been positive, with cargo volumes increasing. In 2022, a record volume of steel (5 Mt) was handled at NCT and several new cargoes were attracted, including rubber. Further investments are planned. PSA Breakbulk has confirmed invest-

ments of €2M in SCT for construction work and installing equipment specifically to handle sensitive, high-value cargo, and €1.5M at NCT for ongoing repair and maintenance work and for relocating the administrative gate.

The operator's prospects also appear encouraging, with the giant chemicals company Ineos selecting PSA Breakbulk as its discharge and distribution centre for its Project One development in the port. This involves Ineos investing at least €4B in the construction of a new, more energy-efficient ethane cracker for the production of ethylene. It is due to open in 2026.

Commenting on the PCE initiative, Dennis Verbeeck, general manager of PSA Breakbulk, said: "We strongly believe in the added value of this Project Cargo Ecosystem for the industry in and around the Port of Antwerp and for the development of the port and the Flanders region itself. By offering a one-stop-shop concept, we make the entire process more transparent, visible and convenient for our customers."

It was a point also stressed by Annick De Ridder, port alderwoman of the City of Antwerp and chairwoman of the Board of Directors of the Port of Antwerp-Bruges. "With this very first Project Cargo Ecosystem in Antwerp, PSA Breakbulk

has launched a very innovative one-stop-shop breakbulk terminal facility," she said. "Strategically located near the NextGen district, this PCE offers infrastructure, equipment and value-added services for industrial partners within one dedicated location. This innovative state-of-the-art project makes an important contribution to the main ambition of our port, which is sustainable growth."

The SCT facility features a 550m quay with a draught alongside of 13m and a 140,000 m² storage yard. As well as the new 750t heavy lift crane mentioned above, SCT's cargo handling equipment includes various self-propelled modular transporters with up to 40 axle lines to move heavy and out-of-gauge cargo. Future investments include the construction of a 20,000 m² industrial goods packaging centre and the installation of a new TOS which, according to PSA Breakbulk, will improve efficiency levels and help diversify the terminal's cargo base further.

Meanwhile, as part of a drive to operate the terminal more sustainably and with fewer emissions, a wind turbine is being installed so that the facility's equipment can be converted to using electricity from renewable sources. This is due to become operational in 2025.

PSA Breakbulk is investing in the project cargo sector



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which declined by 13.5%. In contrast, the handling of dry bulk commodities, which included some Ukrainian grain and oil-seeds moved by rail via Poland, increased by 1% to 9.5 Mt.

Elsewhere, the port's total tonnage of containers fell by 5.7% to 500,000t. The volume of general and ro-ro cargo handled also slipped, declining by 4.1% (to 2.5 Mt) and 8.5% (to 900,000t), respectively, compared with the corresponding period of 2022.

NSP is hoping that a new service started by DFDS and Lineas in March will help revive NSP's container and ro-ro traffic. It involves cargo being shipped on DFDS's six-times-a-week service between Gothenburg and the carrier's terminal at Mercator-dok in the NSP-owned port of Ghent, and then being relayed by rail to the Port Edouard Herriot facility in Lyon, France. The rail service is provided by Lineas five times a week.

The hope is that the new multimodal transport option will attract more cargo. Bernard Gustin, executive chairman of Lineas, certainly thinks so. "Shifting this freight from road to rail between Ghent and the important industrial region of Lyon will require 450 trains per year and 8,000 trailers/containers," he said. "Such a choice means nine times less CO₂ emissions."

Aspirations

Daan Schalck, CEO of NSP, stressed that the new option fully supports the port's aspirations to become a more important multimodal and logistics gateway and a greener port. "Low-emission rail freight is one of the ways in which North Sea Port continues to build a sustainable future," he said. "With the combined transport between Gothenburg, Ghent and Lyon, North Sea Port is further strengthening its position as a multimodal port in Western Europe."

But it is in the energy sector and the so-called circular economy where NSP is focusing its resources and investments as the port and its various stakeholders, including the giant ArcelorMittal Belgium industrial group, commit to delivering a 'climate-neutral' port by 2050.

According to Schalck, critical to this target being met is the successful development of the North-C Circular industrial estate on a 150-ha parcel of land on the right bank of the Ghent-Terneuzen Canal in Ghent. The project is a joint initiative of NSP and ArcelorMittal Belgium. Once ground works have been completed and utilities put in place, businesses that are focused on reducing their CO₂ emissions will be encouraged to establish their operations in the zone.

Schalck elaborated: "By 2025 the port wants to have 150-ha of land ready for circular projects, and we also want to attract 10 circular activities with innovative technologies or processes that can enable sectors, such as chemicals and steel, to make the transition to a climate-neutral port."

In addition, the port is investing in equipment and a series of projects that will result in the reduction, capture, storage and transport of CO₂ from its various cargo handling facilities.

Green corridor

In other developments, the Port of Ghent has teamed up with Gothenburg and agreed to establish a green corridor whereby ships plying the route between the two ports will use alternatives to the marine diesel oil and low-sulphur oil currently being used. It is hoped that the corridor will be in place by 2025. Already, the two ports are adapting their infrastructure for the corridor and offering increased discounts on port dues to owners/operators of ships using cleaner fuels, such as LNG, biofuel, methanol and ammonia.

In Schalck's view, the merger has helped NSP establish itself as the biggest hub for hydrogen in the Benelux region, with the potential to become the largest in Europe.

The Port of Amsterdam is also investing in fuels of the future. Recently, the port approved a deal between Australia-domiciled Electriq Global, a specialist in the development of innovative hydrogen solutions, and Zenith Energy Terminals, a company that stores and processes fuels and operates a facility in the port, to build a hydrogen powder plant on the site. The plant, which will be the first of its type in the world, will produce hydrogen powder from green hydrogen produced from

renewables. When mixed with water, the powder can be converted into electricity using generators.

"The arrival of this plant is a great example of the ongoing energy transition taking place at our port, where we are working towards achieving a sustainable fuel hub," said Koen Overtoom, CEO of the Port of Amsterdam. "We are happy to welcome emerging technologies that operate in line with this transition, such as this plant. In doing so, we are facilitating more intensive use of our location and collaborations between different parties operating in the port area."

Meanwhile, the port authority is continuing to make greater use of wind and solar power. Earlier this year, the installation of 4,911 solar panels, which amounts to a generating capacity of approximately 2 MW, on the roof of Kopraweg 3, was completed.

The Port of Amsterdam now has 260,000 m² of solar panels installed across various buildings and warehouses of its own, as well as those of its stakeholders, a target that it had set itself to reach in 2024. Consequently, the plan is being expanded.

Roon van Maanen, head of Energy & Circular Industry at the Port of Amsterdam, said: "We have decided to scale up our solar panel programme to 350,000 m² with a total capacity of 63 MW peak, by the end of 2024. By doing this, the Port of Amsterdam will be responsible for 20% of the municipal objective of 300 MW peak by 2025." □

Train loading at the Sifferdok in Ghent. Lineas and ferry operator DFDS have launched an intermodal rail shuttle between the Port of Ghent, part of North Sea Port, and Lyon in France



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Facing the cost of securing the supply chain

The problem of shipping containers being used to smuggle drugs, particularly cocaine, into Europe has reached such a level that both the Belgian and Dutch governments are considering measures that will add costs to the whole container supply chain.

As a direct consequence of narcotics smuggling, government agencies are now considering requiring shipping lines to fit a 'smart' seal, costing up to US\$200 apiece, to every container shipped from Central America to Belgium and the Netherlands. These and many other preventive measures are the subject of consultations by joint working groups made up of shipping lines and various Belgian and Dutch government agencies.

Fitting, monitoring and responding to alerts generated by smart seals will add costs and complexity to supply chains, including processes at container ports. The pressure is growing, however, for governments to do something at the regulatory level to secure both

Politicians in the Netherlands and Belgium are looking to the shipping industry to help fund new security measures to clamp down on the narcotics trade

the physical containers in the supply chain and the digital supply chain from both external interference and corruption from within. Time and again, it seems, in both countries, shipping agency and stevedoring staff and customs officers with the right 'capabilities' are being sentenced for complicity in drugs smuggling through the two main ports.

Must try harder

The Hague and Brussels both say that much more effort will be needed. As reported by *World-Cargo News Online*, in February, meetings held between Belgian/Dutch authorities and the five major lines operating between Central/South America and the North

Sea area produced the top level 'Declaration on the fight against cross-border organised drug crime'. The declaration sets out a broad spectrum of tools to tackle the trafficking of drugs, particularly cocaine, into the Dutch and Belgian ports, including on liner services that call at smaller ports in Latin America, mainly related to fruit shipments.

The declaration was signed in February in Antwerp by no fewer than five cabinet ministers and one deputy minister. These included Belgium's prime minister, finance minister and justice minister, along with the Dutch justice minister, transport minister and deputy minister for customs. The other signatories were the mayors

of Antwerp and Rotterdam, as well as MSC, Maersk, CMA CGM, Hapag-Lloyd and Seatrade.

Smart container seals are high on the agenda as the working group seeks ways to improve security. "We have seen official documents that suggest equipping every container with a smart seal," Tom Demolder, Hapag-Lloyd's director for Belgium and the Netherlands, told *WorldCargo News*.

A smart seal is generally understood to be a device that transmits container status data, such as whether the container is in motion, the door status and sudden changes in internal temperature. But Demolder questioned what is "doable and feasible".

"They can cost up to US\$200," he said. "Some shipping lines are already testing them on a small scale, which is very useful, as there are many interpretations as to what defines a smart seal. One challenge is how to filter true illegal tampering from the many data transmitted. Customs may want to open the container for inspection,



1.5t of cocaine, valued at €100M, seized in Rotterdam (photo: Douane Rotterdam)

or there might be a need to do so on board. How will we deactivate the seal without alarms going off elsewhere?

"E-seals, however, might be a middle road. They can be read at any gate or critical waypoint and will cost only about two dollars. Yes, they are more prone to counterfeiting. Given the many systems on the market, it is best to first find out what customs and police authorities expect from the various techniques."

Exploring options

Hapag-Lloyd's Benelux offices are participating in the various group meetings that are exploring the prevention and detection measures defined in the ministerial declaration.

Measures under consideration include smart containers and other digital tools, limiting the number of staff allowed access to container information, improving staff screening/training and better information sharing.

The latter is a focus on risk analysis, including new methods used by criminal organisations, risks in transit countries and other

factors, such as data exchanged both among carriers and with the authorities.

Hapag-Lloyd's Antwerp/Rotterdam staff have already attended seven theme-based working group discussions since the declaration was signed in February. "These meetings have a very hands-on structure," noted Demolder. "They range from one-on-one meetings between us and local customs or police in Antwerp or Rotterdam, to broad-based sessions that include all five carriers and different authorities from either country, or sometimes even both together, and anything in between."

"The emphasis lies on the entire Central and South American west coast, including Ecuador, Peru and Chile. With the US's DEA stationed in Colombia, most cocaine shipments have diverted from the Atlantic side to the west coast."

"Sharpening the blocking of information about containers to a minimum need-to-know only level is one of the instruments raised in the joint declaration. The usual pin code pick-up reference to release a box in the port of destination is sensitive to fraud and is

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An arrest of cocaine pickers by Rotterdam customs' SWAT team (photo: Douane Rotterdam)

While cocaine seizures in Rotterdam decreased from 70t in 2021 to 47t in 2022, those in Antwerp went up from 89.5t in 2021 to 110t in 2022. The Belgian port is on target for a similar haul in 2023, with 22.8t seized in Q1 2023, compared with 19.8t in Q1 2022. The Port of Rotterdam declined to provide Q1 2023 figures on the basis that "not all busts are made public [though most are], on the grounds of ongoing investigations".

While a bomb threat that subjected the MSC LORENA to a wait of several days at anchor off the Port of Antwerp in December last year turned out to be a hoax, the vessel – notably, arriving from Senegal – turned out to be carrying 2,400kg of cocaine. Two Dutch nationals have been arrested for telephoning the bomb threat. The Belgian government plans to increase the complement of Antwerp's harbour police from 116 to 312 by 2025.

Law enforcement agencies in both ports are reporting a trend towards smaller 'shipments', often of less than 100kg, whereas in 2021, Rotterdam seized four consignments in excess of 4,000kg. One useful lead to

'hot' containers are the 'pickers', mostly young males enlisted by the 'Mocro Maffia' drug gangs, who trespass into container terminals at night to retrieve cocaine from stacked boxes.

There are multiple drugs busts and arrests of pickers each week in both countries' main ports. Sometimes they are smuggled into the ports in empty containers, provisioned to stay there for several days while waiting for a vessel to arrive in port. In 2022, an eight-strong team of pickers was apprehended when they became concerned about suffocating and sought to be freed by banging on the inside walls of the container. Their fee for successfully getting goods past customs authorities is said to be as high as €2,000 per kg, while the street value is said to tip the €75,000/kg mark.

In January 2023 alone, law enforcement in Rotterdam arrested 50 such pickers – the youngest being just 14 years of age – compared with 241 during the whole of 2022 and around 400 in 2021. Following a Dutch legislative amendment, the penalty went from a fine of €91 to a maximum jail sentence of one year.

Expansions at Maasvlakte II

Having secured the final investment decision (FID) for the second and final phase of its Maasvlakte II (MVII) container terminal – a ‘hub’ in Maersk Line’s strategy – APM Terminals (APMT) has moved into high gear to get it built.

Speaking to *WorldCargo News* during the signing ceremony for the new quay wall lease on 31 March 2023, APMT confirmed its desire to release tenders or even conclude the first contracts during this summer. The €1B-plus, 2M TEU expansion programme will double the terminal’s handling capacity.

Equipment requirements include nine new STS cranes, 62 ASCs and

three cranes for handling barges. It is understood that APMT is considering an autonomous vehicle, instead of a standard ‘automated’ AGV, for transport between the landside stacks and the on-dock rail facility.

Hans Jongejan, project director for the APMT MVII expansion, expects a full two-year lead time for the nine STS cranes. At the signing ceremony, hosted with the Port of Rotterdam, APMT officials confirmed plans to commission phase two at some point in 2026. The port authority plans to deliver the final stretch of the new 1,000m quay wall in mid 2024. Behind the quayside, the total 47.5-ha expansion will accommodate 31



Quay wall expansion in progress at APM Terminals’ MVII (on the right) and RWG (photo: Port of Rotterdam)

stacking modules. APMT’s final ‘shape’ at the Maasvlakte II Amaliahaven facility will feature 2,000m of deepsea quay wall (19 STS cranes) and 500m of barge/feeder quay line with six cranes.

“In principle we’ll just copy phase one, so that both phases will deploy the current TOS. There will not be another concept,” said Jongejan. “One possible retrofit into phase one might involve improved crane automation if that comes with the new cranes.

“Furthermore, we’re eyeing a different battery technology for the AGVs. Our current machines require an eight-hour charging time for an eight-hour operation. Newer battery packs have a two-hour charging time for eight hours of continuous operation. Our charging stations can already handle this faster charging.”

Once the two phases have been amalgamated into a single 19-crane operation and the new equipment passes any possible teething problems, APMT MVII is

targeting productivity levels of 300 port moves per hour (PMPH), Igor van den Essen, managing director Europe/Africa Region at APMT, and Jan Buijze, the outgoing terminal director, told *WorldCargo News*. Just days before the signing ceremony for the new quay wall, the phase one operation set a new record of 256 PMPH.

The total 2,400m of additional quay wall that the Port of Rotterdam is building in Amaliahaven includes an additional 800m at Rotterdam World Gateway (RWG) to add to its current 1,150m. The port authority aims to have this section completed in August 2024. RWG is operated by DP World, which declined to comment on its own FID process and the timing of its phase two expansion at this point.

due for replacement by considerably more secure digital tools and/or biometric inspection.

“We [Hapag-Lloyd] have switched to the solution of digital rights in both Antwerp and Rotterdam. We now deploy unique blockchain-borne tokens that are generated automatically via Secure Container Lease, on which our staff lack any view whatsoever.”

Access to data

The human resources realm is another key aspect in the bilateral declaration. One area involves improving the ability of liner agency and other office staff to recognise suspicious behaviour or suspect containers, up to restricting who is allowed access to data.

Addressing the security of processes and access to data needs to start with recruitment. Dutch law enforcement agencies have already noticed young people with criminal associates enrolling at vocational shipping training institutions, presumed to be for nefarious purposes. Belgium is extending its ISPS-related Maritime Security Law to include the screening of shipping office staff, and the Hapag-Lloyd interviewees noted that the Netherlands is ramping up security too.

The Port of Rotterdam Authority confirmed to *WorldCargo News* that, together with the Dutch Justice Department, it is launching a pilot programme for better screening of shipping and transport personnel. The companies participating in the pilot will take the initiative to request that their staff and/or applicants, blue and white collar, apply for a Certificate of Conduct.

A special port-adapted screening profile will be used by the Justice Department. For potential and current staff in key functions, the screening process will be toughened up through an unprecedented loop via AIVD, the Dutch general intelligence and security service.

World problem

Demolder said that intelligence also needs to be addressed by the World Shipping Council. “For maximum effectiveness, it is, of course, vital that both the countries of origin and the transit countries get their intelligence and enforcement on a par. One of the means to achieve this, is to incorporate the ramped-up approach into the ISPS (International ship and port facility security code – a SOLAS amendment) and in global codes of conduct at the World Shipping Council level. Belgium and the Netherlands have already announced that they will table an ISPS extension with the IMO. The United States is said to already be backing the package. On the other hand, everyone is realistic enough to realise that there is no single panacea. Drugs trafficking is a mutating many-headed monster,” Demolder and Hapag-Lloyd’s security officer said in comments to *WorldCargo News*.

They added that the measures currently under consideration will entail additional costs, which the shipping industry is expected to bear. “Anti-monopoly regulation bars the lines from mutual communication about what to, possibly, pass on to the market,” they said.

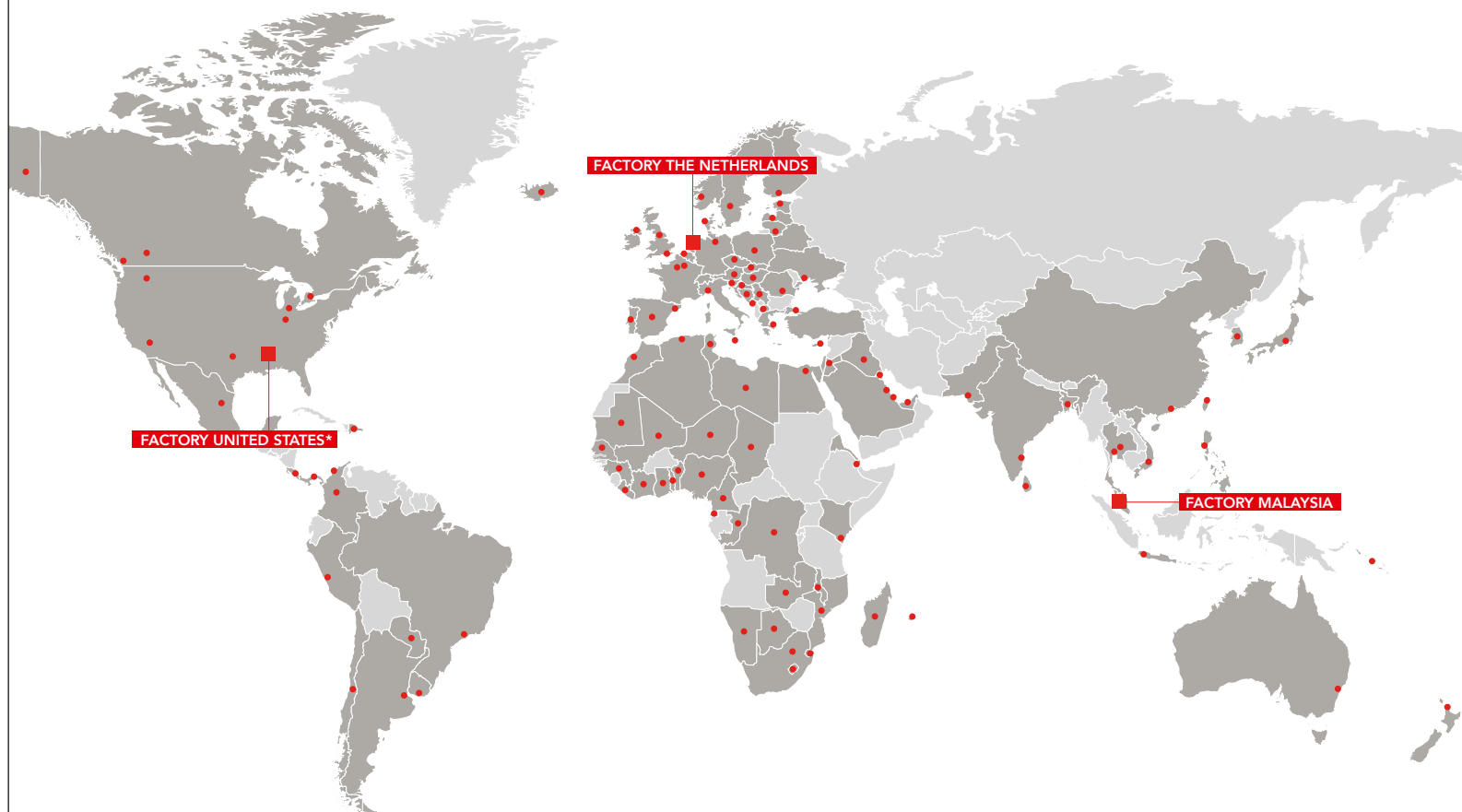
“We have understood that the governments’ train of thought is that the actual measures to be implemented will cost everyone money, without there being any talk of financial compensation. On the contrary, at the February summit, Belgium’s prime minister pleaded for financial contributions from the shipping lines.” □



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Clamping down on brake maintenance

Despite the slowdown in container throughput at ports in 2023, brake manufacturers report business in this sector continues at a high level. There are various large ASC projects under way, some of which require a large number of cranes to be delivered in 2023 and 2024.

Brake OEMs have seen this coming. Speaking for Germany's Sibre, head of sales Michael Scheidt said the company has made large investments in recent years to increase output, including doubling the capacity of its machining plant in Haiger between 2019 and 2021. The first phase of an expansion of the assembly plant in Eschenburg was finished recently and the second phase will start later this year. Both plants are in Hessen, Germany.

Scheidt said that the new capacity makes it possible to offer short lead times for its products, while the high level of automation in production "allows us to offer reasonable prices while still manufacturing in Germany". Sibre has recently secured some very large orders, including brakes for the 34 ASCs for DP World in Antwerp and for a total of 14 STS cranes for Georgia Ports Authority (GPA) in Savannah, both through Konecranes. Sibre is also supplying brakes for two large ASC projects to Kuenz, 20 ASCs for Baltic Gateway in Poland and 24 cranes for PSA Antwerp in Belgium.

Mega port ARMGs

In Singapore, Sibre has supplied brakes for 12 ARMGs being built for the new Tuas Port by China's HDHM. In Singapore, PSA requires that spare parts be stocked in very close proximity to the port. A few years ago, Sibre founded Sibre Brakes (S.E.A.) Pte Ltd in Singapore, and can supply major spares from this facility within a few hours. It also has another branch at Gelang Patah in Johor, Malaysia, where it can do brake repairs, testing and small modification work.

Other recent references for Sibre include brakes to Liebherr for two STS cranes for Eurogate in Wilhelmshaven and for RTGs for another terminal. With ZPMC, Sibre has supplied brakes for STS cranes in Poland, Oman, Barcelona, Las Palmas and Dammam. Sibre's Snag Load Protection system is included on STS cranes for APM Terminals in Salalah (10 units) and Barcelona (three units), as well as the 14 STS cranes that Konecranes is delivering to the GPA in Savannah.

Growing share

Sibre's reference list indicates that it is growing its market share. According to Scheidt, the company's turnover in 2022 was two and a half times higher than in 2016, and Sibre expects further growth in 2023. He added that this success is being driven by the port business, where Sibre has been engaged in long-term product development and has expanded the Sibre Group to 13 international subsidiaries so it is present on all continents and can offer local service. The measure of success is that "leading OEMs, such as ZPMC, Liebherr and Konecranes, are now using our products on most of their cranes for container handling", added Scheidt.

Over the past few years, brakes for wind turbines has probably been a faster-growing market in terms of size, but it is a more difficult market in some respects.

Brake manufacturers are focusing on ways to reduce maintenance costs, including using remote monitoring and self-contained brakes with fewer hydraulics

Scheidt noted that brakes for this application are technically much simpler than brakes for cranes, and most manufacturers use the same standardised design. Lots of new players have entered the market, causing a "massive drop" in prices, he said. "We at Sibre are now focusing on cranes, conveyors and some smaller niche markets where we see our strength. Only our subsidiary in Tianjin is still involved in the wind turbine market, as the situation in China is more beneficial."

Market needs

In the port sector, the growing number of automated cranes has increased the focus on low-maintenance brakes and remote monitoring systems. Sibre's USB5 type disc brakes have been designed for low maintenance, and the company offers a wide range of sensors for remote monitoring. These include temperature sensors in brake linings, load cells for the measurement of clamping force, and different linear position sensors. In some cases, Sibre supplies its own software to display and evaluate the data, while it also works closely with crane OEMs and system integrators to incorporate brake monitoring data into the crane monitoring system.

In another development, Sibre is currently testing prototypes of new storm brakes on its in-house test rig, where it can simulate forces of up to 1,500 kN. These include a rail clamp that holds the crane by clamping onto the side of the rail for high-speed ASCs, and a push-down type clamp with an integrated hydraulic power unit.

Scheidt said that in most cases, rail clamps are used to protect cranes against wind speeds of up to 20 m/s. Sibre's new rail clamp for fast-travelling cranes will have a special contactless guiding system that prevents any contact between the brake and rail during long travel to reduce wear, reduce downtime and increase the clamp's life cycle.

The new push-down clamp will have an integrated hydraulic power unit. Conventional rail clamps, said Scheidt, are released by hydraulic power packs in central position, with multiple clamps connected to the hydraulic power pack by long piping. This takes a lot of time to install and has a high risk of leakage. The new push-down clamp has an integrated hydraulic power unit, so no piping is needed.

Other companies are now offering all-electric rail clamps, where the clamp is released electrically (see below), but Sibre believes an all-electric design would be too big and expensive for the application. New products are expected to be launched in Q3 2023.

Dellner in R&D

The Dellner Group continues to expand its operations. In 2021, it acquired Hydratech Industries, the Danish global supplier of hydraulic systems, cylinders and accumulators for wind, offshore, marine and industry applications, including materials handling. At this point, Dellner Hydratech is mainly focused on hydraulic cylinders and power

packs for the wind turbine market, while crane brakes continue to be made by Dellner Bubenzer in Germany and Italy.

In the crane market, demand for brakes is strong as projects that were delayed due to the coronavirus pandemic are now moving ahead again, according to Daiel Hoffmans, global sales director Asia. The market picked up in 2022 and Hoffmans believes demand will continue to be high in 2023.

At the same time, Dellner Bubenzer has been busy with R&D for new products. Following on from the new SB19 28.5 thruster disc brake launched in 2022, the company has now launched the new SB17.3, an updated version of the SB17 spring-actuated magnetic return calliper disc brake that can be mounted on the back of an electric motor or between a motor and gearbox.

The new SB17.3 features a lighter design and an enhanced alignment system to keep the brake shoes in the parallel position. Dellner Bubenzer is also developing a motor-mounted brake with an internal encoder (with the current design, the encoder is on the outside), a new emergency brake, and is optimising its BOSS (Brake Only Snag System).

Monitoring

In the brake monitoring area, Dellner Bubenzer has had its CMB system – which sends all information to the main crane management system (CMS) via Profibus or Profinet – in the market for many years. Hoffmans said that demand for brake monitoring continues to grow, and Dellner Bubenzer has now developed a new I/O link. Hoffmans said that this is a "next generation" product and "we are going from analogue sensors to digital sensors".

Digital sensors will improve both diagnostic capabilities and safety. "For example, analogue

sensors for brake pad wear only tell you if the brake pads are worn out and need to be changed. Now, with digital sensors, we can tell the customer the percentage of wear of the brake pad. All data can be easily displayed on a dashboard for predictive maintenance," he said.

As well as being integrated

A Sibre USB5 thruster disc brake on an STS crane in Singapore



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with the CMS, data can be displayed in a 'CMB Box' mounted on the brake unit itself. With the latest CMB-3 version, multiple sensors from multiple brake units can be connected to one CMB-3 Box. While it is technically possible to send data from brake sensors back to Dellner Bubenzer over the internet, Hoffmans said that IT departments and policies at terminals prevent any data from live equipment leaving the facility.

Rather than remotely connecting to the brakes themselves, it seems that terminals want OEMs to provide online support to help their maintenance personnel to service and maintain brakes on site. Hoffmans said that since the beginning of the pandemic, Dellner Bubenzer has been providing online training and support using Teams and Zoom. This has now developed into 'true online tools' that include video calls, VR glasses and other resources. The VR glasses give the customer the ability to service and maintain brakes with the help of a live connection, where a remote Dellner Bubenzer service engi-

neer can see the brakes and the data from the brake monitoring system in real time, and provide guidance verbally as well as sending videos and documents to explain procedures.

Electric drive

Canadian brake manufacturer BrelX, part of the Portal Crane Group, is continuing to refine and expand its line of braking systems.

BrelX has developed electrically released retractable rail clamps and electrically released wheel brakes. The company continues to manufacture and develop hydraulically released brakes to ensure it can provide customers with such solutions where required, but Steve Robinson, general manager of Portal Crane Group, said a lot of older hydraulic release systems are expensive and time-consuming to maintain. BrelX developed electrically released brakes as a lower maintenance option. The BrelX range includes retractable rail clamps, where the clamping mechanism is lifted clear of the rail for long travel. Together with the electric

release mechanism, this makes the brakes almost maintenance free, according to BrelX.

As noted above, there is a view from some brake OEMs that electrically released brakes are not practical for large clamping applications, as the electrical release mechanism would be too big and expensive. Bret Bromhead, partner and co-owner of BrelX, disagrees with such an assessment. For crane retrofit applications, the electrical release motor is typically in the 5 to 7.5 hp range and can be housed in the same enclosure that was used for the hydraulic power unit. Furthermore, BrelX believes that electrically released brakes can be used for larger applications, such as wheel clamps for wagon rotators, which it is looking into now.

Robinson said that in North America, the number of container crane projects has slowed recently, but BrelX is still very busy in British Columbia. "We have had recent commissions of ZPMC cranes at DP World Center and Prince Rupert, GCT Vanterm, and there are

Dellner Bubenzer's new SB17.3 has a lighter design and an enhanced alignment system to keep the brake shoes in the parallel position

more new cranes in the pipeline for GCT Deltaport," he said. The company is also working on projects for new equipment in the bulk sector at both Neptune Terminals and Westshore Terminals in Vancouver. These include braking systems, as well as cable reels and festoons.

BrelX supplied retractable rail clamps on the eight Kuenz RMGs at GCT Deltaport's intermodal rail terminal at the Port of Vancouver in British Columbia, which has led to further business with Kuenz in Europe. To market and support its products in Europe, BrelX has formed a strategic alliance with Svendborg Brakes, which is now part of Regal Rexnord (see box story). The two companies are now working closely to develop a business alliance and identify reciprocal product opportunities. They will be exhibiting together at TOC Europe in Rotterdam this month. □



Ongoing consolidation

Earlier this year, Regal Rexnord completed its acquisition of Altra Industrial Motion, and in the process, brought together several companies in motion control, automation and power transmission products, including in the brake sector.

US-based Altra Industrial Motion includes Stromag, which it acquired from GKN Land Systems in 2017, Svendborg Brakes A/S and Twiflex of the UK, acquired in earlier deals.

Stromag's products include its well-known range of spring applied, electrically released brakes and the thruster and calliper brakes originally developed by Sime of France, which Stromag purchased in 2000.

Merging Altra with Regal Rexnord adds the Stearns brake range, which was part of Rexnord Process and Motion Control until it merged with Regal Beloit Corporation in 2021 to create what is now Regal Rexnord.

Announcing the completion of the deal, Regal Rexnord said that there are synergies in several areas. "This acquisition opens up many new avenues for profitable growth," said Louis Pinkham, CEO of Regal Rexnord. "In particular, Altra's Automation and Specialty platform transforms our existing automation portfolio – namely ModSort and Automation Solutions [formerly Arrowhead] –

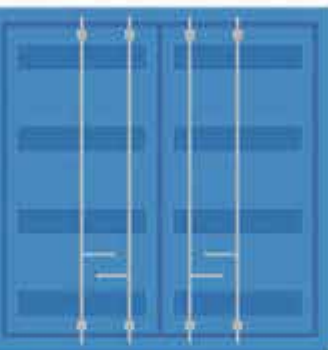
into a meaningful, global automation solutions provider. The automation business has highly attractive growth prospects and margins, serving many markets that have anticipated secular growth tailwinds, including factory automation, medical, aerospace, and warehousing/logistics.

"The transaction also significantly enhances our power transmission portfolio, in particular our industrial powertrain offering, by adding complementary products in brakes, gears and clutches, while extending the number of end markets in which we actively participate."

At this point, it is not known whether Regal Rexnord will continue to offer both the Stearns and the Stromag brake lines, which heavily overlap in motor-mounted brake applications. Scaling back brands and products to achieve economies of scale is not, however, how Regal Rexnord, or Altra Motion, have operated in the past.

The new group also includes Bauer Gear Motor, which produces a range including the BF Series Shaft mounted, BG Series helical and BJ Series Bevel geared motors for applications including hoists and long travel drives on cranes and materials handling equipment. Another group company, Regal Rexnord Kette in Germany, produces leaf chains for FLTs and container handlers.

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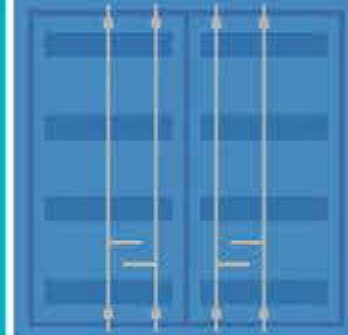
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It's a shore thing

To date, US-based Watts Marine, which is based in Kingston, Washington, has installed its shore power systems at the North American ports of Seattle, San Diego, San Francisco, Vancouver (British Columbia), Long Beach, Halifax and Brooklyn (New York). It currently operates 10 systems in North America and around 500 cruise ships, tugs and ferries a year connect to its equipment.

Watts Marine covers every step of the shore power process, from providing advice on regulatory requirements, through design, build, heavy equipment installation, and system operation and maintenance.

It is a turnkey solutions provider, covering switchgear, transformer and cable management systems. It also commissions, operates and maintains the systems. Earlier this year, the company introduced a mobile cable positioning device (CPD) to facilitate shore power connections by mov-

ing the cabling strategically to the ideal location on the quay.

"We work with ports, cruise, and freight lines at the start of the process on feasibility analyses, emissions reductions estimates, and negotiations with stakeholders," said Mike Watts, president and co-founder of Watts Marine. "We streamline permitting, coordinate with utilities, and develop specifications based on our designs, cutting engineering costs to a minimum."

Ports need to determine the mechanics of installing and managing shoreside systems, advises Watts Marine. There can be many challenges specific to each port, such as utility infrastructure availability, geography and general site conditions.

To expedite delivery and installation while the site is prepared, the system is shipped to the port in just a few pre-assembled sections, so that it can be installed, commissioned and functioning in weeks instead of months. Suf-



Watts Marine's first mobile cable positioning device in the Port of San Francisco

ficient funding is also required, often through grant opportuni-

ties, but ports must successfully navigate how to secure them.

Horses for courses?

Festoon systems have been mainstays of STS cranes for many years and installations can last for 15-20 years. When they have to be replaced, another festoon may be the only option, and this is certainly the case for older cranes with full machinery trolleys. The new system is delivered from the factory pre-assembled in trucks with removable roofs or hard top or tarpaulin-covered open-top containers, lifted by a mobile crane, aligned and rolled onto the crane main beam. Hence, retrofits are far quicker than with conductor rails and e-chains, particularly the latter, even allowing for 'plug and play'.

However, as cranes have got bigger and faster, festoons have become heavier, even allowing for the move away from hoist motors on the trolley, due to weight concerns. Motorising some of the cable trolleys – normally two or three loops – has helped reduce drag, but the cable loops still present a large wind profile, so cables get blown about and are subject to constant mechanical loads, which can accelerate wear. The cables and the trolleys are also exposed to UV light, fluctuating temperatures and saline air.

E-chains are heavy although, like conductor rails and contactless power supply (CPS), are altogether more compact than festoons and have very low wind profiles. E-chains match festoons with data transmission rates and low latency, as fibre-optic cables are immune to the growing problem of electro-

magnetic interference, and spare fibre-optic cables provide built-in redundancy. However, conductor rails and CPS, with high data transmission rates through SMGX (Vahle) or ProfiDAT (Conductix-Wampfler), are also popular choices. Both systems are said to be immune from radio and radar interference.

These three alternatives to festoons match the trolley speed and acceleration demands of modern cranes, and they can get faster still. However, festoons are very tolerant of poor quality crane beams and they can work in 'emergency' mode at low speed, so the operator does not have to shut the crane down right away.

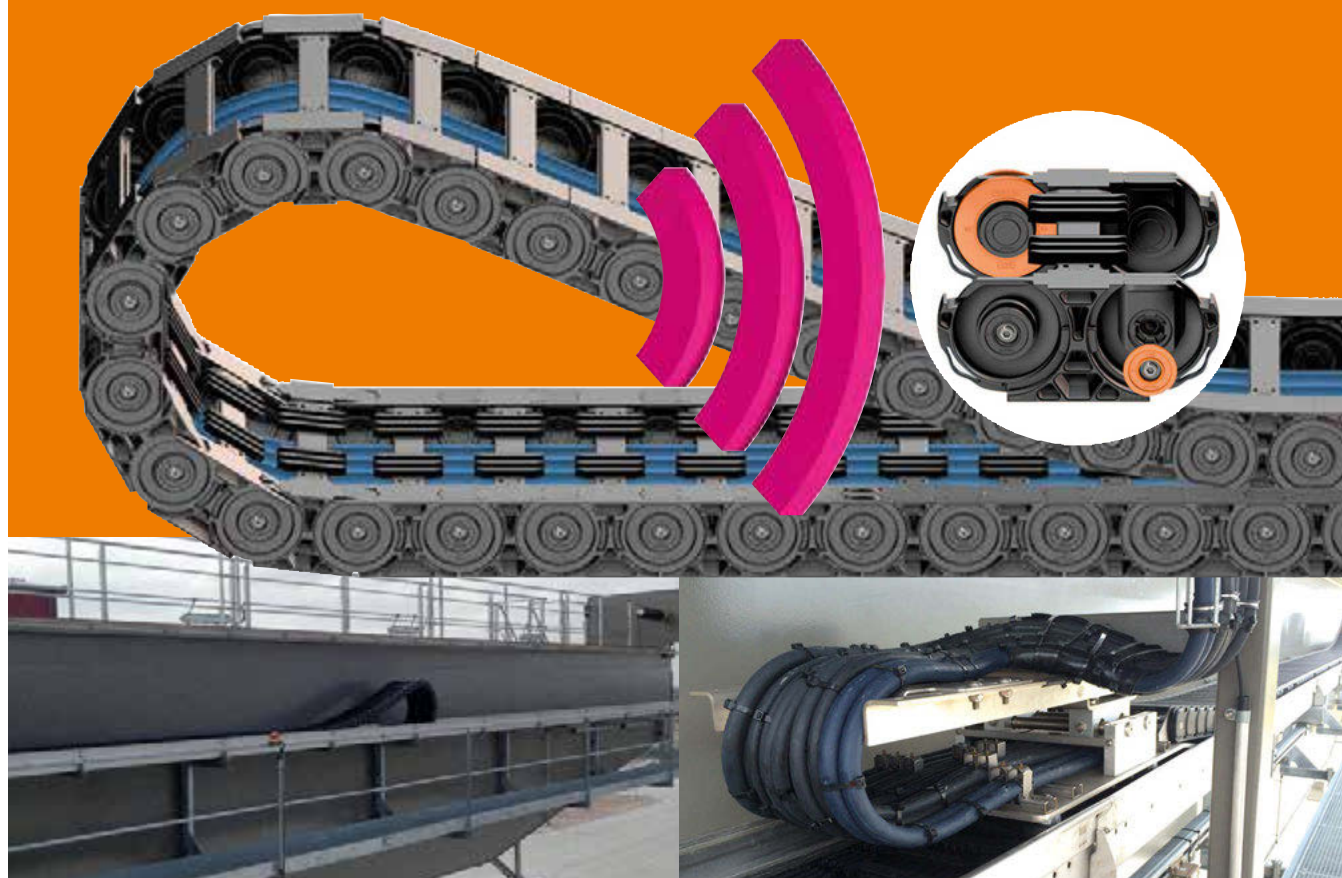
Conductix-Wampfler stated recently that it has installed more than 10,000 festoon systems worldwide, going back many years. It has also supplied more than 3M metres of 0813 conductor rail and 35 km of ProfiDAT, and those numbers are growing fast.

Conductix-Wampfler motorised festoon on a crane at CTB Hamburg



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ProfiDAT for automation

Conductix-Wampfler has supplied conductor rails with its ProfiDAT data transmission system for automated and remotely controlled RTGs at Yilport's Leixões Container Terminal in Porto, Portugal.

ProfiDAT supports a data transmission rate of 80 Mbit/s per crane to support the video and control signal needed for real-time operation with low data latency. Conductix-Wampfler also installed its autosteering system, which uses two sensors to measure the distance between

the crane and the conductor rail to prevent a collision occurring, and its gantry positioning system. This tracks the long travel position of the RTG and sends data to the TOS and the crane PLC for positioning the RTG at the correct bay in the stack.

In operations at Leixões, ProfiDAT has demonstrated that it can support remote operations with no latency, so remote operators do not 'feel' any difference between controlling one of the manned RMGs and the new ARTGs.

Heavy chain gang tested

Last year, after prolonged testing, Igus introduced its latest, heavy-duty P4HD.56R rol e-chain for trolley travel on STS cranes featuring very high traverse speeds and rates of acceleration. The chain is also designed to cope fully with these parameters, including the shock loads of short load cycles – frequent short movements forwards and backwards.

The new chain can readily handle speeds of 240 m/min and even up to 300 m/min, although nobody is likely to specify 5 m/sec on an STS crane trolley. Maximum length is 135m. (Separately, Igus has come up with the 'drive-chain 2.0' concept for ASCs with travel distances of up to 1,000m and very fast speeds).

Igus's P4 series chains in their various iterations have been installed on more than 1,800 STS cranes globally in all kinds of environmental and operating conditions, so all the feedback goes into improving the design for the latest generation of chains.

Notably, the P4HD.56R has been designed for a life of up to 15 years, which was not possible before. Even if the crane has a life of 30 years, the chain has to be replaced only once. This meets a key demand of crane operators. Replacing an installed chain *in situ*

is expensive, potentially dangerous and involves extensive downtime.

Furthermore, the new chain is dimensioned to fit into the existing trough runway and it does not weigh any more than the established P41.56R. This keeps the installation price down on retrofits. Igus has also received several orders for the chain for installing in new cranes, starting in Shanghai last year.

Another area where Igus is looking to steal a march is condition monitoring, to facilitate predictive maintenance and minimise unplanned downtimes. Its 'i.Sense' system comprises three different types of sensors for the e-chains and the cables. The force sensors (EC.P and CFP) are mounted on the e-chain's floating moving end and fixed ends, respectively, and measure tensile forces, while a polymer wire inserted into the e-chain acts as a breakage sensor. Data are transmitted to the i.Sense module, a box no bigger than a cigarette case mounted near the e-chain.

If the module determines that forces are outside the normal range, due to a loose trough or the presence of a foreign body, for example, an alarm message is immediately sent to the control system. The data can also be displayed on an online dashboard.

Tsubaki Kabelschlepp shiploader chains in Borneo

Roller-supported e-chains (RSC) from Tsubaki Kabelschlepp are installed at a private port owned by a fertiliser company on the island of Borneo, on the transverse axis of a shiploader/unloader. The decision to go with the RSC type was based on the travel length in combination with the associated cable package.

In the RSC system, the upper run of

the cable never touches the lower run, and runs on a guide profile with maintenance-free ball-bearing rollers. As this requires only low pull/push forces, wear within the bolt/hole connections of the cable carrier is reduced to a minimum, according to the company.

Unwanted expansion in the overall system is all but eliminated and no additional load is placed on the guided cables, while the low pull/push forces allow a significant reduction of the required drive power and, consequently, the output of the drives.

The cable carrier used in this application is the MC1300. Designed specifically for crane applications, it features aluminium stays that are resistant to sa-

line corrosion and ensure extremely high stability.

For applications in container ports, Tsubaki Kabelschlepp recommends the TKHD heavy-duty version of its RSC system for STS crane trolleys. With an inner height of 87mm, the width of the TKHD series can be adapted precisely as required, with aluminium stays that are adjustable in 1mm increments. For trolley power applications on RMGs, RTGs and ASCs, the company offers its Vario-Line M series with glide shoes, combined with cables from the Traxline 700 (PUR) or 1000 (TPE) series. For ease of maintenance, the glide shoes can be replaced with a standard screwdriver.

At the smaller end of the application

scale, Tsubaki Kabelschlepp has introduced a new generation of plastic cable carriers, the Uniflex Advanced (UA) 1250 and QuickTrax/EasyTrax 0250. The UA 1250 is suitable for cable management on industrial trucks, such as FLTs and reach stackers. The UA 0250 is a smaller chain series. The QuickTrax version features two-component crossbars with flexible film hinges, which open with a very light press on the unlocking mechanism, while the EasyTrax option uses flexible lamellas that allow cables and hoses to simply be pushed in.

Tsubaki Kabelschlepp roller-supported e-chain installed on shiploader/unloader in Borneo



Smart award for Vahle

Last year Vahle launched its 'Smart Collector', an 'intelligent' conductor system, for all its market segments, including ports. As previously discussed by *WorldCargo News*, the smart collector is designed to ensure higher system availability and productivity in automated conveying applications. Sensors collect numerous data across the entire conductor rail system. Evaluation of the data allows any anomalies in the track to be precisely assigned to a specific position and eliminated in a targeted manner. In this way, faults can be detected at an early stage and unplanned production downtimes avoided.

The Smart Collector has just been voted 'Product of the Year 2023' by readers of the German trade magazine *Materialfluss*, in the category of 'Conveyor Technology and Identification Technology', one of five award categories.

"This is a very nice award to receive and is a testament to the innovative strength of our company," said Achim Dries, CEO of the Vahle Group. The products for the awards are nominated in advance by an expert jury for participation in the competition. The key criteria in this context include innovation, marketability and user benefits. Readers then decide on the winners.

Dual purpose shore power in Karmsund

Last month Celebrity Cruises' CELEBRITY APEX became the first ship to be connected to shore power at Karmsund Havn's Haugesund Cruise Terminal in Norway. The high-voltage system was provided by PSW Power & Automation, with Zinus AS providing the cable management units. The technical solution and electrical infrastructure allow low-voltage connection by other vessels outside the cruise season.

PSW Power & Automation worked with main contractor Plug AS and Estonia-based cable management company ShoreLink to furnish shore power at several cruise terminals in Norway's Ålesund region. Two liners can be supplied simultaneously at the Prestebrygga and Stornespiren quays. They have a capacity of 9.8 MVA on 6.6 kV and 16 MVA on 11 kV at each supply pit – 50 or 60 Hz. (Cruise ships are usually 60 Hz and a frequency converter is required in Europe, where the grid is typically 50 Hz).

The shore power service is owned and operated by Plug Ålesund AS, part of Plug AS. Ship operators must book power, preferably at the same time as the berth booking and no later than four weeks prior to a call.

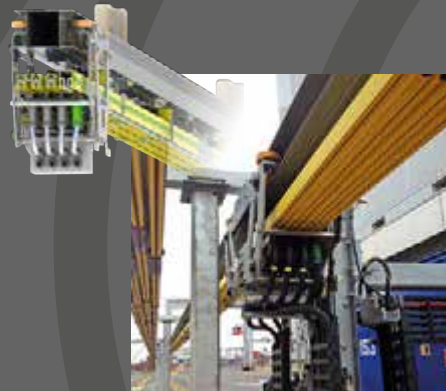
Enova, a Norwegian government enterprise, is currently supporting five new shore power projects in the country, worth NOK34M (US\$3.4M). The funding is a result of Enova's 13th call for investment support for shore power. Since 2016, Enova has provided support for a total of 119 shore power projects worth more than NOK842M.

Specifically, Molde and Romsdal Harbor IKS will receive NOK13.5M to proceed with the construction of shore power facilities at Tindekaia in Åndalsnes. Ålesund region's port authority, Stavangerregionen Havn IKS, Holmøy Maritime AS and Plug Bergen will each receive state support.



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Improving reliability in crane drives

SEW-EURODRIVE is well known for its portfolio of industrial gearboxes and gear motors for applications on STS cranes, yard gantry cranes and straddle carriers. Container cranes are challenging materials handling applications, where the equipment has a long life cycle and the loads on the drive components vary considerably. Furthermore, container crane drives do not operate continuously at a constant speed, and they are subject to very high overload factors due to emergency stops and wind loads.

While the operating environment is highly variable, customers in the ports sector are focused on the same performance criteria as in other industries. The push is for standardised, modular components that are cost-effective to mass produce and maintain. As well as very high uptime, terminal operators have an expectation that gearboxes will have a very long life cycle, in the best cases matching the full life cycle of the crane structure.

Standardisation

SEW-EURODRIVE is responding to these requirements with a comprehensive modular system of drives that can be easily configured for different crane applications. To reduce lead times, the company has followed a strategy of producing drives locally at different factories around the world. The European market, for example, can be supplied from Germany, Finland or the Czech Republic.

In an interview with *WorldCargo News*, Marcela Pereira, application engineer at SEW-EURODRIVE, said that there is a high level of standardisation in some crane applications today. The company is supplying standard drives and gearboxes for ASCs to leading crane OEMs numbering in the thousands of units per year, and hundreds of units for applications such as straddle carriers.

This scale supports mass production and enables the firm to stock a complete range of standard parts. With this

Drive technology specialist SEW-EURODRIVE is focused on making drives for container cranes easier to specify and maintain

modular system, a new or replacement gearbox can be assembled and delivered in between one and five working days, while a drive with an individual design (for example, a special shaft) that requires some engineering can be delivered in 15 working days. According to SEW-EURODRIVE, these delivery times are unique for industrial gear units.

The larger, more complicated gearboxes for the boom and main hoist on STS cranes are a different product. These are huge units designed for requirements, typically exceeding 300 kNm, and always involve some level of customisation.

To help terminal operators achieve their goals with respect to uptime and life cycle, SEW-EURODRIVE offers turnkey systems for gearbox monitoring and servicing. Pereira said that service offerings can be tailored to the size of the terminal and profile of its crane fleet.

SEW-EURODRIVE offers on-site inspections using endoscopy, vibration analysis and other testing methods to assess the condition of the units. Alternatively, a more detailed analysis of the gearboxes in the SEW-EURODRIVE workshop is also possible. Once the analysis is complete, it can produce new parts for its own and other brands of gearboxes to undertake repairs as required.

It also offers a full range of drive system components, including brakes and couplings from partner companies to address repairs in the whole drive system, including installing and realigning components as required. If a gearbox manufactured by another company cannot be repaired, or an overhaul is uneconomical, SEW-EURODRIVE can design and produce a drop-in replacement or a retrofit in order to deliver standard



The customer management and crane support team at SEW-EURODRIVE. (L-R) Marco Dittes, Marcela Pereira, and Jörg Bien

gearboxes from the modular system.

In recent years, SEW-EURODRIVE has focused on building up its local networks to provide better support to ports around the world. Pereira added that the company differentiates itself through a full-service offering. Instead of focusing only on the delivery of new gear units and drop-in solutions, it will assess any brand of gearbox and, where possible, 'fix' it in the field.

On the radar

To improve the maintenance process, the company offers DriveRadar, a condition monitoring and diagnostics platform that can be configured for every SEW-EURODRIVE gear unit, as well as for other brands. Sensors built into the gear units monitor and generate data on vibration, temperature, oil levels, oil viscosity and other parameters. The data are sent to an edge-processing unit, and from there to SEW-EURODRIVE's cloud-based platform.

Terminals have options as to how they receive and manage the data. These include SEW-EURODRIVE's own IoT

Suite Web application and app, where the customer can access an online overview of the condition of the gear unit and all components to implement a predictive maintenance schedule. Alternatively, data from the sensors can be sent to another control system, such as a crane management system, via OPC UA.

Pereira emphasised that SEW-EURODRIVE's DriveRadar IoT Suite helps support crane automation and remote control, where there are no operators in the cabin to provide their feedback on crane systems. The data enable customers to monitor wear in bearings and gears through vibration analysis. □

Data-driven gearbox sizing

Of all the applications for a gearbox on a container crane, the main hoist gearbox on an STS crane is the most challenging. As well as the hoist load and speed requirements, the weight of containers and the peak loads from emergency stops and snag load events vary considerably.

At the same time, the main hoist gearbox is one of the largest, heaviest and most expensive single components on a crane. Replacement is very difficult, often necessitating the removal of machinery house walls and requiring the use of an external crane. The downtime for replacing a gearbox is extensive and the lead time for a new unit is such that larger terminals carry at least one main hoist gearbox as a spare part.

Ideally, a main hoist gearbox would have a life cycle that matches that of the crane itself, but this is not easy to achieve. The loads on the gearbox need to be very well understood and defined to guarantee performance.

Marcela Pereira, application engineer at SEW-EURODRIVE, said that there are some challenges in this regard. The standards that are used to calculate torque loads on a gearbox are not always easy to interpret, and SEW-EURODRIVE often finds that information from customers is incomplete. Customers specify parameters, such as the maximum capacity and speed of the hoist, but not every crane OEM translates this into peak torque loads on the gearbox at points such as a snag load event in a consistent way, and sometimes no information beyond hoist load and speed is provided.

Pereira added that some of the differences lie in the way that main hoist gearboxes are specified. Some customers deliberately oversize them, while some crane OEMs are far more detailed and prescriptive about the loads and torque requirements.

Simply oversizing a gearbox is not optimal because it adds cost and weight. To avoid this, SEW-EURODRIVE works closely with crane OEMs to develop a detailed technical analysis of the specification, and with end-users to gain a better understanding of the application on site through condition monitoring.

SEW-EURODRIVE is now working with a leading terminal operator in Europe that has installed its DriveRadar condition monitoring system on an STS crane. The data generated will enable SEW-EURODRIVE to analyse the crane operation with a view to assessing how accurately the sizing process using standards reflects the actual operating parameters. This is a long-term project that will enable it to assess how continued operation influences the wear of gearbox components over time.

Data-driven gearbox sizing with continuous condition monitoring using systems, such as the DriveRadar IoT suite for industrial gears, will allow large terminals to avoid stocking a main hoist gearbox as a spare part, the company believes. It can help both SEW-EURODRIVE and its customers improve the life cycle and better manage maintenance of one of the most expensive components in the crane drive system.

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New design of pipe end connection

Pipe-to-gusset plate connections in pipes that experience significant fatigue, such as upper diagonals, have frequently experienced fatigue cracking on ship-to-shore cranes. The cracking at fracture-critical pipes has led to several catastrophic failures. There are several common design approaches to this connection, and all are susceptible to fatigue failure.

Liftech introduces a new approach that significantly increases

Liftech Consultants Inc. has developed a new structural detail for connecting a pipe member to the crane structure*

reliability by eliminating the centre gusset plate altogether by using two side gusset plates. The key element to this new approach is two gusset plates, one welded to each

side of the pipe, to transfer the load from the pipe to the crane structure. This also improves access to the connection for inspection and repair.

Background

The pipe-to-gusset plate connection, 'end connection', is one of the most common ways to connect a pipe member to the crane structure. Figure 1 shows two end connections – with and without a seal plate at the end of the gusset plate.

Both types are susceptible to cracking at the end connection, especially for the upper diagonal, as fluctuating fatigue stresses are large.

New design

If the centre gusset plate can be eliminated, the end connection and associated cracking can also be eliminated. To achieve this, Liftech has developed a concept using two side gusset plates rather than a centre gusset plate (see Figure 2).

The two side gussets serve as closure plates of typical conventional pipe end connections. However, in this new design, instead of terminating at the centre gusset plate, each side gusset plate is bent parallel to the gusset plate of the adjoining structure with a gap between them to provide sufficient space for welding and periodic MT and UT examination and repair, if necessary.

The side gusset plates at the connection to the diagonals are sloped 1:4 to reduce stress concentration and provide a gradual transition. The side gusset plates are connected to the single gusset plate on the crane structure with two pipe spacers. The portion shown in Figure 3

will be shop fabricated.

The end to the landside trolley girder support beam or the apex beam will have two pipe sections welded to it and will offer adjustability when the diagonal is installed onto the crane. If air tightness testing is required, then a hole can be made in the gusset plate to allow one test for both sides of the spacer.

FEA analysis

Liftech performed finite element analysis (FEA) for both the conventional pipe connection design and the new pipe connection design using the same load, pipe size, and modelling approach. We found that the weight of the new design is comparable with the conventional design. For the new design, we found the maximum first principal stresses are at locations that are either without welds or are inspectable. In contrast, the maximum first principal stresses of a conventional pipe connection are at the end connection, which is often concealed by a seal plate. Also, we found the maximum first principal stress of the new design is a little more than half of that of the maximum first principal stress of the conventional design. Fatigue life, or the time that fatigue cracking may appear, is related to stress cubed. We expect that the fatigue life of the new design will be nearly seven times that of the conventional design.

One concern with the design is that the transverse plate at the bend line may be inadvertently mislocated and will create an offset. Liftech performed another FEA to determine the stresses with a 10mm offset of the transverse plate. The results were similar to the connection results without the 10mm offset.

The FEA showed that the maximum first principal stresses do not increase significantly, so the fatigue life is only reduced slightly as well.

For the table of results shown in



Figure 1: Pipe-to-gusset plate connection, with seal plate (left) and without seal plate (right)

Table 1 the load applied is a 300t axial load.

Conclusion

The conventional pipe-to-gusset plate connections of the upper diagonal (as shown in Figure 4) have frequently experienced fatigue cracking on ship-to-shore cranes.

The new approach of eliminating the centre gusset plate altogether and using two side gusset plates has the following advantages over the conventional pipe-to-gusset plate connection:

- The high fatigue stress locations are inspectable and repairable.
- The fatigue life is expected to be

six to seven times that of the conventional connection.

- The weight is comparable.
- The longitudinal deflection is comparably small.

Based on the promising investigation, the next steps would be as follows:

- Discuss with a manufacturer how to best fabricate and weld the connection.
- Build a prototype or mock-up.

**This article is written by Kenton Lee, principal, senior structural engineer at Liftech Consultants. The views expressed are not necessarily shared by WorldCargo News.*

Figure 2: Side gusset plate design

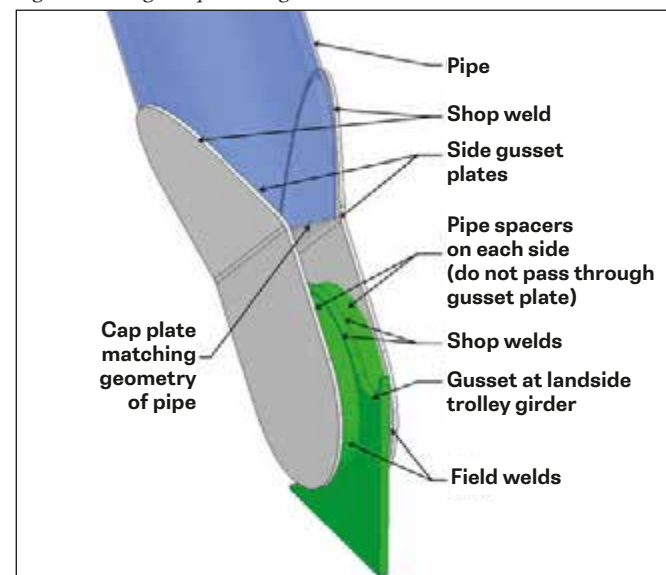


Figure 3: Shop fabricated portion

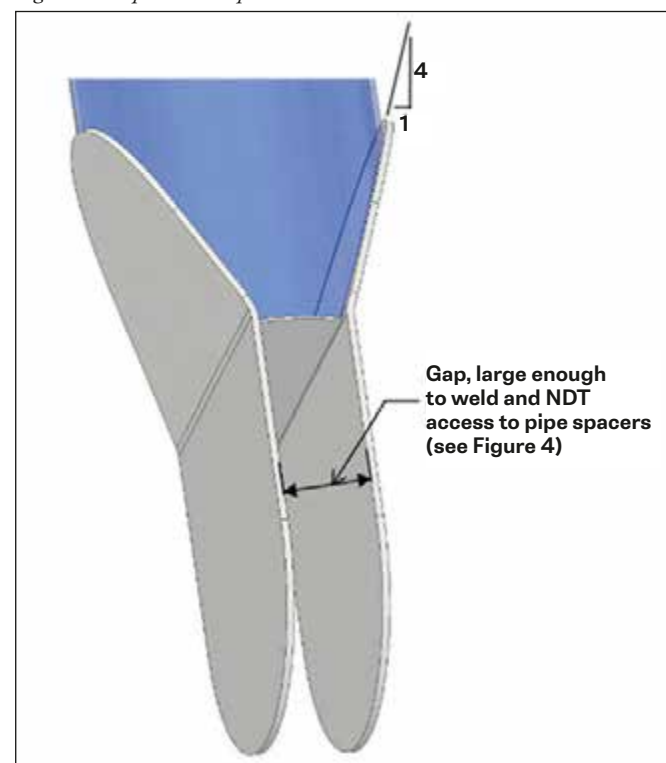


Figure 4: Conventional pipe connection

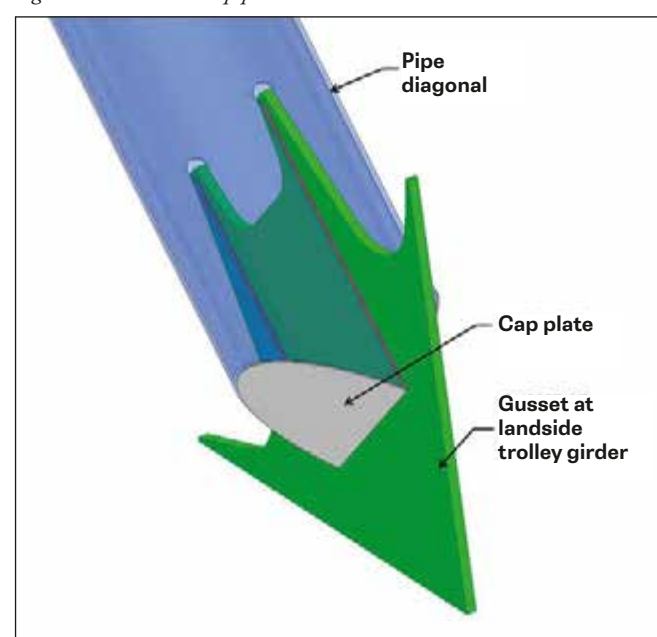


Table 1: FEA analysis results with 300t applied axial load

	Conventional Design	New Design	
Maximum Stress Location	End connection of gusset plate	No offset of transverse plate at bend line Bend line of transverse plate	10mm offset of transverse plate at bend line Same as 'no offset'
First Principal Stress, MPa	235	124	126
Fatigue Life Comparison	1.0	6.8	6.5
Longitudinal Deflection, mm	1.15	1.65	1.62

Source: Liftech Consultants Inc.

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BETTER TOGETHER

Heavy port equipment and electric power in action

Kalmar has handed over a fully electric reach stacker to long-term customer Cabooter Group following a six-month testing period. The reach stacker will continue operations at Cabooter Group's Greenport Venlo intermodal terminal in the southeast of the Netherlands. Cabooter already operates five Kalmar fuel-savings Eco reach stackers at Greenport Venlo and at its terminal in Kaldenkirchen, over the border with Germany.

The company has ambitious decarbonisation goals and signed an agreement with Kalmar in 2019 to become the pilot customer for the electric reach stacker during the product's initial development phase. The machine is also much quieter than an internal combustion engine.

Big commitment

Kalmar offers four options for the lithium-ion battery pack, depending on the customer's usage intensity, ranging from 245 kWh to 587 kWh. Cabooter does not have cranes at Greenport Venlo, so it is totally dependent on the reach stackers to turn around the trains in time for the train operator to make the designated slot on the rail network. Hence an electric reach stacker is a big commitment.

Accordingly, it is fitted with the biggest power pack, 587 kWh, which is sufficient to run the machine, a combi-handler, at full mission for 10 hours in all battery configurations. The expected 'first-life' of the batteries is 10 to 12 years.

The idea of battery-electric and perhaps fuel cell battery-electric heavy lift trucks is gradually gaining acceptance



Cabooter must have shift-long full mission operations from its reach stackers at Greenport Venlo as the terminal does not have cranes

Maurice Butin Bik, sales manager, Kalmar Mobile Equipment at Kalmar Netherlands BV, said that at present, reach stackers are Cabooter's best options to manage peaks and troughs as flexibly as possible, although the company will investigate acquiring RTGs. The energy consumption of the electric reach stacker at Greenport Venlo is between 48 kWh and 56 kWh, depending on the loads to be lifted and the driver. Butin Bik explained that the terminal has two 175 kW chargers, so charging capacity is 350 kW per hour in total and, when the battery charge level reaches 20%, it will be fully

recharged in 90 to 120 minutes. Until recently, Kalmar's electric FLT range topped out at 18t-900 load centre. It has now extended its electric offering to heavier machines, with the first order for a 33t-1,200 load centre coming from long-standing customer Innofreight Solutions GmbH in Austria. The machine is due for delivery before the end of this year. The lithium-ion battery pack is understood to be 392 kWh.

CARU number

Hyster has reported an order for an electric ECH mast truck from CARU Containers BV for use at

How clean is it going 'green'?

Questions need to be asked about the sustainability of electric vehicles (EVs). Not counting steel or aluminium, the average electric car contains 205kg of minerals including rare earth metals, compared with 36kg for a conventional car, which contains no rare earth elements. How does the carbon footprint of extracting, processing and shipping these far greater quantities of minerals compare with fossil fuel production and distribution?

The UK's Royal Institute of International Affairs (Chatham House) has expressed concern that the minerals mainly come from countries with low 'governance' scores or high emissions intensity. Currently, rare earth minerals used in lithium-ion batteries overwhelmingly come from China, because it has ramped up its mining capacity. It will take time to build up the mining of rare earth minerals elsewhere to reduce dependency on China, which is a strategic concern.

EV kerb weight is much greater than fossil fuel machines. This may be more of an issue for EV cars and commercial vehicles, since off-road plant is not built for speed and is very heavy anyway. However, it will impact all EVs' range before recharging and could cause problems for terminal surface wear and tyre life.

First and second

Lithium-ion battery 'first-life' in EVs can be up to 10 to 12 years, which compares well with diesel engines before they require an overhaul. For every 100 kWh of first-life storage capacity, as much as 80 kWh is available in the 'second-life' (assuming they

were not damaged in the first-life). After that, they must be recycled.

According to a study last year in *Science Direct*, second-life batteries have the potential to generate more than 200 GWh by 2030 in stationary systems that support power grids or renewable power generation, with a global value of US\$30B.

To grow the circular economy, governments are increasingly demanding that EV batteries are designed and manufactured to facilitate the recovery of their components. Considerable investment is going into recycling plants and already, recycling techniques allow up to 95% of the raw materials to be recovered.

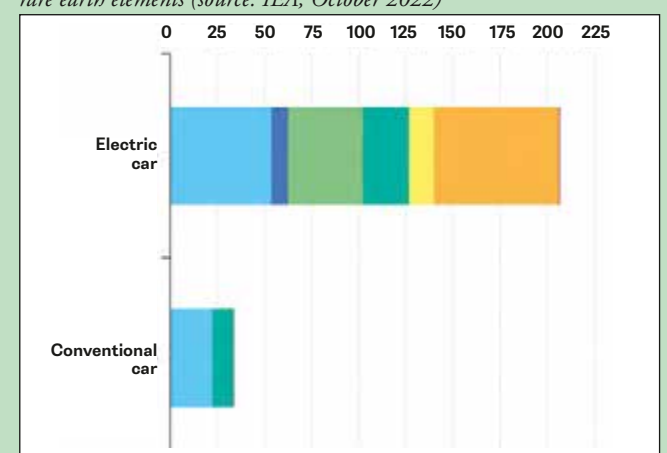
In the US, the Union of Concerned Scientists, an NPO/NGO, has stated that recycling is the key to making EVs greener. It has cited recent research showing that by 2050 recycled materials could supply 45%-52% of cobalt, 22%-

27% of lithium, and 40%-46% of nickel used in the US light-duty and heavy-duty vehicle fleet.

Nevertheless, the environmental costs and governance problems touched on above are not being properly considered in some jurisdictions, since their target dates for net-zero carbon emissions are overly ambitious.

On top of that, TRL 9 status (100% technology readiness level for commercial production) for most EV and fuel cell EV heavy off-road mobile plant is still some way off, and the recharging and hydrogen refuelling infrastructure at the scale required does not exist. According to *The Spectator* magazine, there is now a net-zero 'backlash' in the EU on the grounds of cost and technical feasibility. Although the main concern is car production and exports, this may filter through to decisions that port authorities make about their decarbonisation targets.

Minerals used in electric cars compared with conventional cars, in kg per vehicle, not counting steel and aluminium. The conventional car has mainly copper and manganese, with some zinc. The electric car has more of these three minerals, along with lithium, cobalt, graphite, nickel and rare earth elements (source: IEA, October 2022)



its depot in Rotterdam. The machine will be fitted with 650V lithium-ion batteries, with electricity sourced from solar panels on site at the CARU depot.

This is a very interesting project since the depot already has a 240 kWh capacity containerised 'second-life' battery pack that is recharged using solar energy. The battery pack will recharge the ECH for most of the year, supplemented with grid power when solar energy is less efficient during shorter winter days.

This solution is expected to supply sufficient charge to allow the ECH to complete the required five to six hours of work during a shift before being recharged overnight. Throughout the site, CARU has installed measuring devices to calculate what percentage of the energy used comes from solar. In any event, grid power is cheaper than diesel, so CARU's opex savings will shortly outweigh the extra capex of the electric ECH. The lift truck will be an electrical version of the Hyster H10XD-ECD8 double-container handler, capable of stacking two-over-six high.

Fuel cells

This battery electric ECH is the latest in a series of developments where Hyster is looking for alternatives to internal combustion engines. It is working on an ECH mast truck project for HHLA's Tollerort Terminal in Hamburg featuring an onboard hydrogen tank to replenish fuel cells that will provide the batteries with electricity.

For some time, Hyster has maintained that fuel cell battery-electric vehicles (EVs) are a better solution than battery EVs for lift trucks used in intensive operations over long periods. It takes around 15 minutes to fill an empty hydrogen tank – not much more than filling a diesel tank – to provide sufficient power for eight to 10 hours of continuous run time, without having to use very large batteries, or put up with downtime to recharge the batteries when the machine is supposed to be working, or install extra infrastructure for fast-charging 'top-ups'.

Hyster is currently testing what it said is the first real-world pilot of a hydrogen fuel cell-powered laden top pick at the Port of Los Angeles. It previously announced a pilot of a fuel cell-powered reach stacker at the Port of Valencia (EU H2PORTS project) and a partnership with Capacity Trucks to develop electric and hydrogen-powered terminal tractors. Staff from Valenciaport and MSC Terminal Valencia recently visited Nijmegen to 'test' the reach stacker. It is not known if it has now been delivered.

"Our mission is to provide the innovative technologies that our customers need to help meet their goals for emissions reduction and performance," said Willem van den Brand, global business development director for Hyster Big Trucks. "For some operations, lithium-ion power might be the answer, but for others, hydrogen is the right choice. The answer depends on so many factors, such as duty cycle, utility grid capacity and fuel availability. Our customers deserve choices that allow them to build the right solution based on their needs, not 'shoehorning' a single technology into their operation."

Points of view

Both Hyster and Kalmar have published 'white papers' setting out their respective positions on hydrogen fuel cells. As previously reported (*WorldCargo News*, March 2023, p22), Kalmar remains somewhat sceptical. At a truck level, the Finnish firm made the point that a charge of 100 kWh will result in 90 kWh of usable power, as losses in charging are just 10%. However, in the electrolysis process, for the same 100 kWh, 40-50 kWh is lost as heat.

Further losses occur when the fuel cells convert the hydrogen back to electricity for the batteries, so only 25-30 kWh is available for charging. However, power losses also occur when electricity is transmitted over power lines. In any event, Hyster is not alone in its thinking as Toyota is working on fuel cell battery-electric heavy FLTs.

Kalmar and Hyster may face a big challenge from Sany Europe in their 'home' markets. Sany said that it has already sold more than 100 Chinese-built electric ECH mast trucks and 40 electric reach stackers in China and Southeast Asia, and it is known to have supplied an electric reach stacker in New Zealand. These ma-

chines are capable of fast-charging during short breaks.

The company now has European Union approval for its electric reach stacker, designated SRSC45E5, which will be sold from the company's European headquarters in Bedburg, Germany. The machine made its European debut at last month's Transport Logistic fair in Munich.

Service challenge

A challenge faced by OEMs providing EVs is the service business. Cargotec has stated that the transition to electric equipment is challenging for OEMs on two main levels. First, the OEMs have to work closely with suppliers of components, including new vendors, to put together battery-electric and other zero-emissions options.

Just as importantly for the OEMs is how electric machines will impact the ser-

vice, support and spare parts side of the business. As well as establishing relationships with new suppliers, this requires different expertise and training.

Commenting to analysts earlier this year, Casimir Lindholm, president and CEO of Cargotec, said that electric equipment will reduce demand for spare parts, but could improve Cargotec's "capture rate" of the spare parts market overall. Compared with diesel equipment, the supply of spare parts for electric machines is "much more restrictive", said Lindholm.

On the service side, installation and maintenance of high-voltage equipment requires specific certifications. Overall, he believes that the value for the spare parts business will decline, but Cargotec will be able to secure a larger share of the value of service and maintenance work.

He stressed that this is not a transition

that is going to happen overnight. Kalmar has a huge installed base of machines with diesel engines that will take many years to transition to cleaner technology. It will take 10 years for the transition to electric machines to be "visible" in the spare parts market, said Lindholm.

Commenting on the growth of the service market in general, Lindholm noted that for Kalmar, there are more opportunities in the general industrial markets than in port applications. At ports, customers tend to be large companies with their own maintenance personnel, whereas customers in industrial sectors have a higher level of contract maintenance in their operations.

Indeed, some terminal operators may be reluctant to give up their in-house expertise of internal combustion engines, as they cannot control the costs associated with EVs and charging malfunctions. □



The electric ECH will be based on Hyster's H10XD-ECD8 double-container handler

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Towards clean diesel... and alternatives

Roger Brereton, head of sales at UK-based Pailton Engineering Ltd, the steering products manufacturer, has drawn attention to a breakthrough in diesel engine technology with significant implications for trucks and, by extension, for off-road plant.

Pailton supplies custom steering parts and full steering systems for a range of heavy vehicles. There is, therefore, no commercial interest from its side in terms of whether the 'Bunsen burner' work (discussed below) at Sandia National Laboratories (SNL) in the US is promoted or not – the company just likes putting out articles on promising technical developments.

Progressively in Europe, North America and Japan, steps have been taken to reduce pollutant emissions from diesel trucks and off-road mobile plant. Road and off-road vehicles are covered by

In the US, Sandia National Laboratories is working on ducted fuel injection for large diesel engines. Meanwhile, PERC has made new claims about the advantages of propane

different regulations, but they have converged, with the gap between them having now all but disappeared.

While some are set on overcoming the challenges of developing electric or hydrogen vehicles, others are focusing on making diesel cleaner. According to Pailton, it could take many years and huge infrastructure investments before heavy trucks and off-road plant powered by electric batteries or hydrogen fuel cells are seen in significant numbers. If diesel is here to stay, at least for the short

term, then anything that can reduce its emissions will make a big difference to the planet.

Thanks to regulations and engineering breakthroughs, a modern diesel engine is significantly cleaner in comparison with its predecessors. Key technological developments include advances in fuel injection technologies and systems for treating exhaust emissions. According to manufacturer DAF, the NOx emissions of a modern truck with a Euro 6 diesel engine are 95% lower than similar trucks from 25 to 30 years ago.

As Pailton stated, an ongoing dilemma is the trade-off between soot (PM) and NOx reduction. One approach to reducing NOx is EGR (exhaust gas recirculation), whereby spent, low-oxygen combustion gases from the previous engine cycle are routed back into the air intake. This reduces the temperature and oxygen concentrations in the fuel-air mixtures, thereby reducing the production of nitrogen oxides.

The drawback to this dilution strategy is that at these lower temperatures not all fuel is consumed, with what is left creating more particles of partially burned carbon, or PM. Engineers, therefore, need to find a way of burning the diesel as fully as possible, while keeping temperatures low enough to avoid excess NOx. Alternatively, if they optimise the burn temperature to reduce PM, more Adblue (DEF) is needed in the after-treatment to mitigate the high NOx emissions.

Ducted injection

Charles Mueller, a combustion scientist at SNL, believes he has found a solution to this problem. Drawing inspiration from a Bunsen burner, he proposes equipping diesel fuel injectors with tiny Bunsen burner chimney equivalents. These small metal tubes are installed a short distance from the injector nozzle hole and will align with the fuel stream.

Much like a Bunsen burner, when it burns blue, this will ensure that the fuel and air are more fully mixed and provide for better burning, but at the lower temperatures needed for NOx dilution. Mueller has called this approach ducted fuel injection (DFI), a patented technology that



The Mafi propane tractor at PNCT, New Jersey

is claimed to slash emissions of PM and NOx from diesel engines by about 80%.

This is like 'squaring the circle'. DFI can be retrofitted to existing engines and is also said to be compatible with biofuels. SNL was awarded a US Department of Energy (DOE) 'Technology Commercialization Fund' project in 2018 to advance DFI research. SNL is part of Sandia LLC, a wholly owned subsidiary of Honeywell International and a leading contractor for the DOE.

Mueller takes the view that the bigger and more powerful the engine, the more cost-prohibitive the switch to batteries or true ZE fuels will be. Testing of DFI is very encouraging and industry interest is growing. If hydrogen and electric trucks take longer to become commercial products than the optimists believe, DFI for diesel/biofuel engines might be an important bridge.

For propane

This is the same argument being put forward for propane (LPG) in the US by the Propane Education & Research Council (PERC). According to PERC, best-in-class propane FLT engines produce 97% fewer PM and NOx emissions when compared with

similarly sized diesel FLTs, without any drop-off in payload or power. Propane has been in widespread use in warehouse FLTs for many years. Now, yard tractors with a new generation of purpose-built propane engines are being commercialised (see, for example, *WorldCargo News*, October 2022, p33).

'99% cleaner'

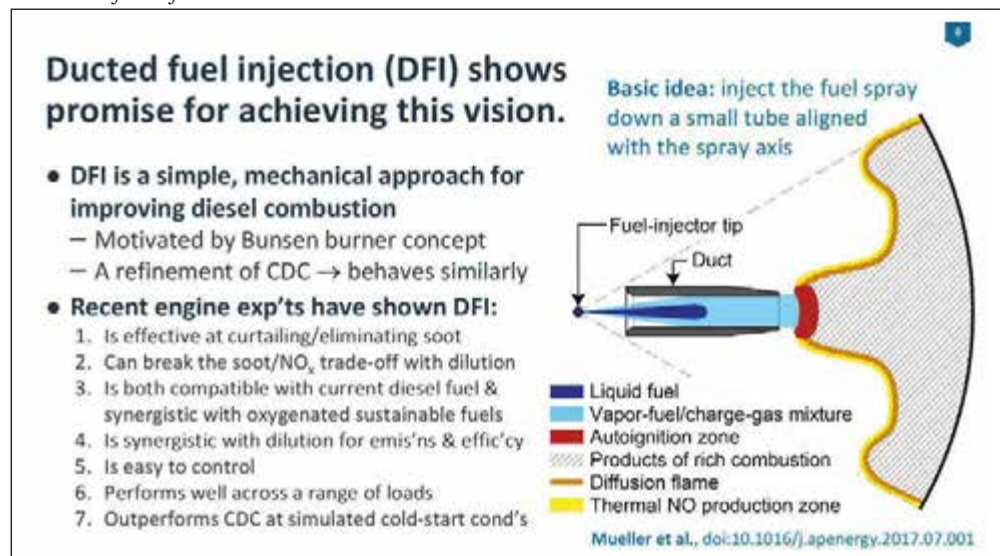
PERC has now published new data from Port Newark Container Terminal (PNCT), showing that propane-powered terminal tractors are significantly cleaner than their diesel counterparts in several key emissions reduction areas. In recent testing at PNCT, researchers collected emissions data from a Mafi propane-powered yard tractor and two Tier 4 diesel-powered tractors.

The propane tractor yielded 99% fewer NOx composite and idle emissions than either diesel tractor, along with 77.5% fewer HC (hydrocarbon) idle emissions, 14% fewer brake-specific CO₂E, and 75% fewer PM emissions.

The Mafi propane tractor at PNCT is fitted with a Power Solutions International (PSI) 8.8-litre propane engine, which is certified to the optional ultra-low NOx emissions standard as defined by the California Air Resources Board for heavy-duty engines with 0.02g NOx/bhp.

The propane engine competes with diesel on performance, providing 270 hp at 565 lb-ft of torque (201 kW at 766 Nm). On that basis, it is suitable for most terminal tractor applications, but perhaps not ro-ro duties. As PERC has previously reported, grant money for propane equipment is available in the US through the Diesel Emissions Reduction Act (DERA). □

Schematic of DFI from Sandia National Laboratories





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Dual-fuel hydrogen straddle carriers

It is not the engine that pollutes, but the diesel fuel. Greener fuels could be a better way forward than electric vehicles (EVs) or fuel cell EVs (FCEVs) at this point on the decarbonisation journey. This is the view of CMB.TECH, the technology arm of Belgian shipowner Compagnie Maritime Belge (CMB).

CMB.TECH has significant insight into alternative fuels, and it builds, designs, owns and operates large marine and industrial applications that run on hydrogen (H2) and ammonia. Over the past 10 years, it has placed more than 100 dual-fuel applications in the field, and the technology has matured to offer a robust, affordable and clean platform.

Hydrogen, ammonia

In January this year, CMB.TECH signed an agreement with Swiss marine power company WinGD on the development of ammonia-fuelled two-stroke, dual-fuel engines on a series of 10 x 210,000 dwt dry bulk carriers to be built at a Chinese shipyard for Bocimar, part of CMB.

"We believe that green ammonia is the most promising zero-carbon fuel for deep-sea vessels," said Alexander Saverys, CEO of CMB. "Our intention is to have dual-fuel ammonia/diesel engines on our dry bulk vessels, container ships and chemical tankers. Collaborating with WinGD is pioneering zero-emissions [ZE] in shipping."

CMB.TECH believes that green ammonia, which is more hydrogen-dense than H2 on its own, is the right solution for ships. They bunker relatively infrequently, and all parties involved in bunkering must follow strict protocols to ensure refuelling is carried out safely. However, the company's CTO, Roy Campe, said that for trucks and port equipment requiring refuelling every day or every other day, H2 is the right approach.

He acknowledged that ammonia is easier to transport as, unlike H2, it can be stored as a liquid at moderate pressures and temperatures. However, it is highly corrosive and potentially dangerous and requires very careful and skilled handling at all times, and this could never be guaranteed at the thousands of fuelling stations in the world's ports. Apart from the risks to human health (skin burn, lung burn, and so on), the clean-up and downtime costs would run into millions of dollars.

Hydrogen dual fuel

As reported by *WorldCargo News Online*, following two years of development work with Antwerp Terminal Services (ATS) – a joint venture between MSC PSA Europe Terminal (MPET) and PSA Antwerp (PSAA) – CMB.TECH has successfully commissioned a dual-fuel straddle carrier with a 70% green hydrogen (GH2) mix. This is a Terex Noell machine with an MTU engine, but the technology can be used on any engine and OEM brand.

The machine is now being used in regular operations at PSAA's Noordzee Terminal. During the next phase, the parties will evaluate ways to improve the design of the equipment, as well as other factors that are necessary to scale up this new technology, including the supply and storage of H2 for an entire fleet.

ATS has also now taken delivery of a new battery-electric straddle carrier from Konecranes Noell, for testing and evaluation at MPET in full mission operations. In addition, last autumn, Kalmar delivered 10 hybrid straddle carriers to MPET and five hybrid straddle carriers to PSAA. One of an H2 engine, battery-electric or hybrid design will be taken on at scale, when all three types have been thoroughly evaluated.

Constraints

As regards H2 injection, CMB.TECH has already built a 100% H2 injection engine for a truck and a genset, but the problem, explained Campe, lies with the infrastructure and operational constraints. Terminals have two diesel filling stations to ensure 'redundancy'. CMB.TECH built and commissioned an H2 filling station in the Port of Antwerp in 2021, but they are much more expensive to build, operate and maintain than diesel/petrol filling stations, and these costs would have to be replicated to provide the comfort of redundancy.

Not everyone is convinced that EVs, whether fuel cells or not, are the right way forward for heavy lifting and transport equipment, at least not yet, writes Vincent Champion

The dual-fuel straddle carrier at PSA Noordzee Terminal has been engineered to operate at full mission for a shift. It has 30kg of H2 on board, stored as a gas at 350 bar in six 5kg tanks.

As a modern diesel-electric machine, the straddle carrier would normally consume around 18 litres/hour and it was built with a 1,500-litre diesel tank. To replace

that autonomy with 100% H2 fuel would require around 420kg of onboard storage, which is not feasible, as there is insufficient space available for the tanks needed and they would add too much weight.

Another concern is the current availability of GH2. CMB group is securing its own supplies. Cleanergy Namibia is a joint venture of CMB.TECH and O&L Group

(Ohlthaver & List), one of Namibia's biggest private-sector companies, which will start delivering GH2 in 2024.

As noted, with a 70:30 injection mix, the straddle carrier should get through a full mission, with 2kg of H2 replacing >7 litres of diesel. So CO₂E should be reduced by 70% – a big payoff. GH2 is more expensive than diesel, but Campe pointed out that a carbon tax has to be factored into the comparisons, up to €100 per tonne of CO₂E. "Port operators must have a decarbonisation strategy today," he said.

As noted above, as things stand, an H2 monofuel solution is not possible as shift autonomy is not feasible and the fuel supplies are not available. The dual-fuel approach provides a bridge to ZE in the future, and also allows the operator to fall back on the diesel tank if the H2 tank empties during the shift.

All the aforementioned constraints apply to FCEVs. No EV uses power when idling, other than for auxiliaries (lighting, aircon), but the limitations of onboard hydrogen storage will still mean frequent visits to the fuelling station. In addition, power losses when hydrogen is converted back to electricity by the fuel cells need to be considered. Indeed, it looks as though ATS has ruled out FCEV straddle carriers as the pathway to ZE.

As CMB.TECH sees it, gradually, supplies of GH2 will become more abundant, prices will fall and matching it with proven combustion technology in ports – where it will be imported and even produced – is the natural and logical way forward. All the maintenance can be done in-house and spare parts are readily available. End-of-life recycling is simple and efficient. □

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