

PORT
TECHNOLOGY



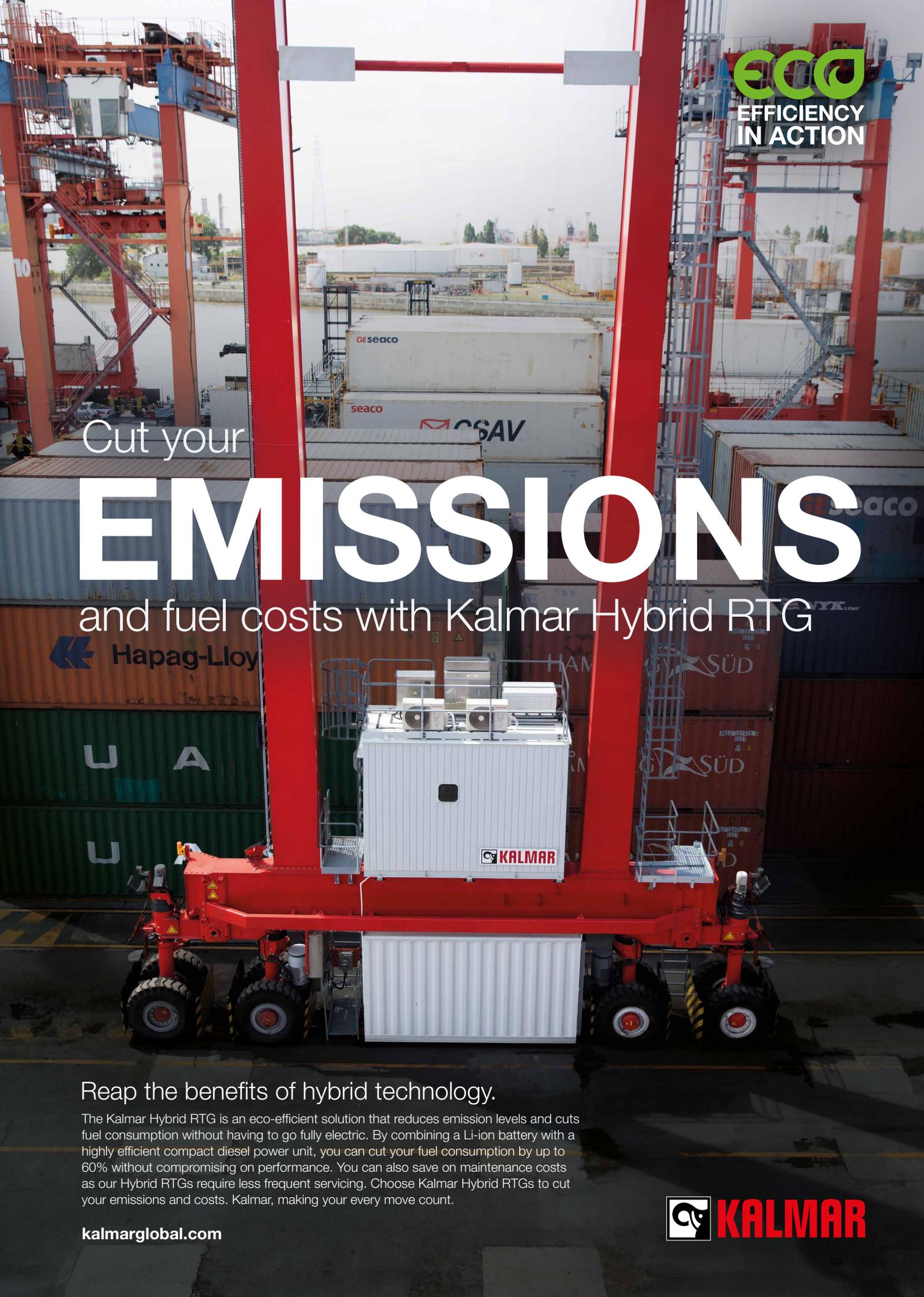
EDITION 105 - 2021

THE E-JOURNAL

OF PORTS AND TERMINALS



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FROM THE EDITOR

Environmental concerns continue to top the list of the World Economic Forum's Global Risks Report in terms of likelihood and impact for the next decade.

The 2021 report states that the highest likelihood risks over the next ten years will be extreme weather, a failure to fight climate change and human-led environmental damage.

Within the report's executive summary, the World Economic Forum says that a shift towards greener economies cannot be delayed until the shocks of the COVID-19 pandemic subside.

From speaking to those involved in the ports and terminals industry, sustainability and decarbonisation goals have not been pushed aside because of the impact of COVID-19 on the industry.

However, as noted by Thomas Jelenić, Vice President of the Pacific Merchant Shipping Association, in his article there may not be enough technology out there right now to meet all the targets demanded by various governmental stakeholders. Using California as an example, he notes that there are huge challenges to come with the transition to zero emissions equipment over the next 15 years.

This edition of the Journal explores how suppliers and ports are attempting to tackle climate change issues.

Alternative fuels are at the heart of a number of initiatives to drive down carbon emissions.

The Port of Tyne in the UK describes its efforts to become an all-electric port through a vast electrification programme. However, our interview with the Port of Tyne highlights several challenges that are still present as ports strive towards climate neutrality.

Meanwhile, at the Port of Amsterdam the focus has been on developing green energies through shore-power. Hydrogen is also on the agenda, and the Port is part of a project focussed on building a value chain for hydrogen transportation.

On the side of the equipment suppliers, Kalmar explains how smart design and driveline choices can enhance the eco-efficiency of rubber-tyred gantry (RTG) crane fleets.

Looking at artificial intelligence (AI), AIDrivers proposes AI-enabled autonomous solutions as an option for delivering green initiatives. With the efficiencies associated with AI-enabled autonomy comes energy-savings.

With so many new technologies being implemented it is important to keep sight of the ongoing IT operations at both ports and terminals. Navis talks in its latest paper about how IT departments are now at the centre of success for terminal operations.

Finally, ABB discusses how ports can cope with the demands they are facing today with fully realised automation.

Beth Maundrill

Editor

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ALL-ELECTRIC EFFORT AT THE PORT OF TYNE

Interview with Ged Bamford, Head of Maintenance, Port of Tyne

In early 2021 the Port of Tyne announced that it has completed a detailed modelling exercise and long-term analysis of its electricity network, as part of its decarbonisation and clean energy strategy.

This process enables the Port's leadership to understand both current and future energy requirements in line with Tyne 2050's ambitious net zero roadmaps for Port of Tyne to become carbon neutral by 2030 and an all-electric port by 2040.

Speaking to PTI, Ged Bamford, Head of Maintenance, Port of Tyne, described the electrification efforts to-date, what is next, and some of the challenges that are being faced during such a project.

Regarding the modeling exercise Bamford said, "We are also keen to become regarded as a test bed for green technology and innovation by 2025 and are actively looking to engage with new partners to help them test and enhance their innovations using our sites and access to natural resources."

ASSET ELECTRIFICATION

Currently Port of Tyne is working through an innovative asset electrification programme, which involves the conversion of legacy materials handling assets from diesel to low carbon electricity.

"Once completed this will include a first for a UK port - to have successfully converted an existing diesel powered Liebherr 550 mobile harbour crane to be fully electric. Three existing diesel powered Drax Hoppers used for bulk materials handling are also being electrified," Bamford said.

Regarding the Liebherr mobile harbour crane Bamford said it was purchased with the future in mind and is designed as dual power. The port is now in the process of physically implementing its high voltage (HV) electric infrastructure to facilitate 'plugging' the crane into the mains shore supply.

Infrastructure tasks are now complete and although the OEM will be involved in the final commissioning of the electrical input of the crane, the install is being com-

pleted by the Port's own HV electrical technicians, supported by a local HV contract company.

"These initiatives alone have reduced the port's diesel consumption by 260K litres and eliminated 700 tonnes of CO2 emissions - enough to power over 80 UK homes for a year," Bamford said.

"The port is progressively replacing gas oil fired equipment which cannot be converted with battery driven electrical/hybrid equipment as technology/reliability improves and CAPEX/OPEX costs become manageable. For gas oil equipment which cannot be cost effectively replaced by 2030, we are establishing a source of bio diesel/HVO (Hydrogenated Vegetable Oil)," Bamford explained.

Port of Tyne has also invested in a new fleet of four electric vehicles for internal and external use plus fitting the required battery charging infrastructure.

In addition, LED lighting is being installed in every building and asset, which is now 60% complete plus the port is in-

stalling smart energy monitoring meters. “We are also evaluating the potential for installing solar panels on warehouse buildings,” Bamford said.

“The switch to LED lighting alone across the port’s estate has saved over 2.5M kWh of energy. As further evidence of the port’s commitment to becoming a clean energy enterprise and innovation hub, Port of Tyne has also launched Tyne Clean Energy Park, to provide a convenient, versatile strategic base for the north east’s rapidly growing renewable energy sector.

“In the future we plan to gradually boost our existing on-site electrical capacity through renewables generation (eg solar/PV) to meet the increasing on site electrical demand and implement a “microgrid” system to manage the supply/demand imbalances.

“All these activities should get us very close to net zero CO2 and any remaining CO2 impacts can be eliminated through offsetting (eg tree planting or supporting carbon capture and storage schemes),” he added.

CHALLENGES AHEAD

As with all new projects there are a number of challenges to overcome in order to be successful and Bamford listed four key challenges the Port of Tyne has faced in its pursuit

Moving goalposts. All indications are that the pace of climate change is accelerating and hence the timeframe for implementation of low CO2 technology is continuously contracting. This is partly because of the way that Kyoto/Paris ac-

cord member states account for CO2 emissions. In the UK the actual CO2 emissions are being understated because of the use of biomass and all ports should be working towards net zero goals as a matter of real urgency.

Pace of technology. Development of low/no CO2 equipment is not keeping pace with demand e.g. battery capacity, battery life and reliability for electric vehicles is nowhere near good enough. Other technology such as Hydrogen generation and storage are still in their infancy. Technology needs to catch up to help adoption to continue accelerating.

Supply and demand. Where manufacturers can supply reliable and cost effective low/no CO2 equipment, the demand is huge and some manufacturers are finding it a challenge to meet levels of demand at present.

Cost. Unfortunately, low/no CO2 equipment is typically more expensive than conventional alternatives from both CAPEX and OPEX perspectives and careful calculations are needed, for instance, rechargeable batteries are expensive to purchase and have a limited lifespan - all this needs to be factored into investment decisions. Disposal of renewables/low CO2 tech is also an issue because batteries also present significant end of life disposal costs.

BUILDING UPON A VISION

“Traditionally, ports and maritime as a whole have been heavy users of fossil fuels and it’s clearly unsustainable,” Bamford explained.

“The port purchases its electrical energy from 100% renewables which is effectively carbon zero. Assuming the issues listed above can be addressed and renewable energy generation can expand to fill the supply/demand gap, we will continue to source carbon zero power. Currently 75% of the port’s energy demand comes from gas oil and 25% from electrical demand. Our plan is to convert or replace gas oil fired equipment to be electrically powered.

“At the same time, we have access to fantastic resources for generating our own renewable energy with offshore wind farms, solar and in the future, hydrogen.

“Port of Tyne’s vision is to be at the centre of the wind energy revolution, we have just launched the Tyne Clean Energy Park as a hub for green economy business innovation and to create a convenient, versatile strategic base for the region’s rapidly growing renewable energy sector,” Bamford said.

“We hope Tyne Clean Energy Park will play an important role in supporting the government’s goal to power every UK home with offshore wind electricity,” he concluded.

“IN THE FUTURE WE PLAN TO GRADUALLY BOOST OUR EXISTING ON-SITE ELECTRICAL CAPACITY THROUGH RENEWABLES GENERATION.”

ABOUT THE INTERVIEWEE

A highly experienced Mechanical Engineer and Workshop Manager, Ged joined the Port of Tyne after a long career in the Armed Forces. Now responsible for the maintenance activities across all four port sites, he leads the team that keeps them open 24/7 every day of the year. Ged’s capabilities include organising multi-trade discipline repair and inspection teams, overseeing production planning and control departments, internal and external technical training along with managing modification implementation programs.

ABOUT THE ORGANISATION

Port of Tyne is one of the UK’s major deep-sea ports – operating in bulk and conventional cargo, car terminals, cruise & ferry, port centric logistics and estates. Overall, the Port of Tyne adds some £618 million gross value added to the economy of North East England, supporting over 12,000 jobs directly and indirectly. Port of Tyne was recently awarded 2 Maritime UK 2020 Clean Energy Awards for Clean Energy Operator and Clean Energy Enabler.

The Port is the custodian of seventeen miles of the River Tyne which is home to an existing offshore cluster with partner organisations such as the UK renowned South Tyneside Marine College, A&P, Smulders and Shepherds, contributing to a well-established offshore energy supply chain.

During a decade of development, the Port of Tyne has invested over £130 million in diversifying its operations to handle a growing range of commodities.





SUSTAINABILITY IN MARITIME

DRIVING IMPACT THROUGH ACTION AND AI

Dr. Eva Savelsberg, Senior Vice President; Karsten Schumacher, Senior Consultant; Matthew Wittemeier, Senior Manager International Marketing and Customer Relations, INFORM's Logistics Division



INFORM

In 2019, INFORM undertook the ambitious step of embracing the United Nations Sustainable Development Goals (SDGs). The UN SDGs challenge companies to replace profit maximisation with a multifactor success model that adds "people" and "planet" to the traditional "profit" success factor. We were challenged to assess how we were, or could, contribute to the 17 SDGs. This challenge kicked off what has now been a two-year journey assessing our impact in the maritime sector.

In 2019, we launched our first diversity initiative. In 2020, we brought innovation to the intermodal industry to drive environmental impact and launched initiatives designed to help educate children as well as help foster gender equality in maritime.

And, as 2021 kicks off, we've completed research into understanding how four more of our AI-based optimisation modules drive environmental sustainability for terminal operators.

This paper will look at INFORM's sustainability work across four of the SDGs: **No. 4 – Quality Education, No. 5 – Gender Equality, No. 9 – Industry, Innovation, and Infrastructure, and No. 13 – Climate Action.** They are separated by the same headings, with the first three sections looking at various initiatives we've undertaken over the past two years. If you want to cut to the chase and understand how to reduce your costs while simultaneously driving down your carbon footprint, then jump to No. 13 – Climate Action; in it, we detail

how four more of our optimisers drive environmental sustainability.

NO. 4 – QUALITY EDUCATION

In 2020, challenged by the COVID-19 pandemic and a lack of products in supermarkets across the globe, we created our Logistics@Home self-learning pack to help children understand how the global supply chain worked. This learn-at-home resource has been made available in two languages with thousands of downloads to date, proving that interest in understanding the way goods are moved around the world is high. Our children are our future, and this initiative is helping children worldwide understand the logistics industry, of which maritime and intermodal operations serve a crucial role.

[CLICK HERE FOR INFORM'S LOGISTICS@HOME](#)

NO. 5 – GENDER EQUALITY

The fifth SDG focuses on gender equality. At INFORM, we have expanded this to a broader scope of diversity in all of its forms. In 2019, we kicked off the industry's first age diversity initiative, Millennials in Maritime, at TOC Europe. In it, we provided a platform for millennial-aged speakers to come together and contribute to the industry's knowledge base. We continued this programme in 2020 and are committed to bringing it back to this year's TOC Europe event again.

[READ: WHY GIVE MILLENNIALS A VOICE?](#)

In 2020, we also kicked off our gender diversity initiative, Women in Maritime, through a series of one-on-one interviews with women from across the maritime world. With voices from the terminal sector such as Katja Otten from AMP Terminals, Susan Gardner from the Georgia Port Authority, and Swantje Finke from Hamburger Hafen und Logistik AG (HHLA), as well as a host of guests from the broader maritime industry, including Anne Trolle from Danish Shipping, Jennifer Sommer from Hamburg Port Consulting (HPC), and Heidi Heseltine, founder of the Diversity Study Group. This initiative has reaffirmed our original decision to expand gender equality to diversity equality. We've also committed to expanding this programme with additional interviews being released monthly throughout 2021, a live conference event at TOC Europe, and industry partnerships.

[DELVE INTO WOMEN IN MARITIME HERE](#)

NO. 9 – INDUSTRY, INNOVATION, AND INFRASTRUCTURE

In January 2020, INFORM published its first paper, "Going Green with AI" (Port Technology Edition 90), on how our AI and optimisation software, specifically, our Train Load Optimizer (TLO), was driving environmental sustainability outcomes within the intermodal rail sector. In that paper, we highlighted one of our innovative algorithms that stood to drive significant cost savings and CO2 reductions for rail operators. On a single leg of the rail route from Los Angeles to Chicago, it was estimated that our TLO could save rail operators

€6,000 (\$6,500) and reduce CO2 by 22.2 tons. At face value, these numbers aren't impressive; however, when you scale that route up, it would equate to a reduction in CO2 of at least 6,925 tons.

[FURTHER READING: GOING GREEN WITH AI](#)

NO. 13 – CLIMATE ACTION

Optimisation software isn't new to the industry. After all, INFORM has been helping maritime operators reduce cost and drive-up efficiency for 25-plus years. What is comparatively new is our industry's focus on environmental sustainability. Throughout 2020, we've been busy conducting research into understanding how four of our industry-proven add-on AI optimisation modules contribute to climate action. We've compiled research on our Vehicle Optimizer (VO), Yard Optimizer (YO), Machine Learning (ML) module, and our Time Slot Management (TSM) system. All calculations are based on a "typical" maritime terminal, as outlined in Figure one.

VEHICLE OPTIMISATION

Vehicle Optimizer is a dynamic add-on module typically deployed to reduce empty travel at a terminal. When deployed to reduce empty travel in a straddle carrier fleet, on average, we see a 20% reduction in empty travel. In our typical terminal, this would result in an OPEX cost savings of €5.2 million (\$6.3 million) annually. From an environmental perspective, it would prevent 16,200 tons of CO2 from being produced.

YARD OPTIMISATION

The primary driver of implementing our Yard Optimizer is the desire to reduce costly rehandlers. We typically see a 45% re-

duction in yard rehandles when compared to a TOS-only planning strategy in straddle carrier yards. This drives an OPEX cost savings of €7.5 million (\$9.1 million) per annum. Again, from an environmental perspective, this drives a reduction of 1,580 tons of CO2 annually.

MACHINE LEARNING

Contemplated in 2019 and introduced into live operations at HHLA's Container Terminal Burchardkai (CTB) in Hamburg, Germany, our Machine Learning module's first implementation was designed to improve container data accuracy. Based on our original assessment and our experience at CTB, we expect that a typical terminal will see a further 10% reduction in rehandles. Annually, this would drive an additional OPEX cost savings of €1.7 million (\$2.1 million) in addition to our Yard Optimizer. This additional reduction in rehandles reduces the CO2 footprint of a terminal by an additional 350 tons annually.

In live operations, we have also observed a further reduction of vehicle travel as a flow-on benefit. In our typical terminal configuration, it is expected that vehicle travel would be reduced by a further 10%. This stacks up to an additional OPEX cost savings of €2.6 million (\$3.2 million) yearly. Environmentally speaking, this would drive down CO2 emissions by a further 8,100 tons per year.

TIME SLOT MANAGEMENT

Time slot management systems are implemented to reduce gate congestion and subsequent truck queue times. A typical terminal will see a reduction in truck waiting times of 75% when implementing TSM. While the cost-benefit is to the trucking companies in diesel fuel savings, it does add up over the year. Based on the cost of diesel fuel in Germany at the time of writ-

FIGURE 1.



ing, it would equate to €0.7 million (\$0.9 million). Environmentally, the reduction in diesel engines idling at a terminals gate would prevent 400 tons of CO₂ from being produced annually.

UNDERSTANDING CO₂ SAVINGS

To help you understand the impact of reducing CO₂, it is helpful to understand what preventing one ton of CO₂ equates to. According to the US Environmental Protection Agency (EPA), the "average" passenger vehicle emits about 250g CO₂/km (400g CO₂/mi). In other words, an average passenger vehicle in the US will produce one ton of CO₂ for every 4,000 km (2,500 mi) driven. Furthermore, the average passenger vehicle is driven 20,000 km (12,420 mi) annually, meaning a passenger vehicle in the US will produce five tons of CO₂ yearly, on average. In simple terms, every 1,000 tons of CO₂ you prevent from being produced is the equivalent of removing 200 cars from US roads each year. Figure 2 shows how many passenger vehicles are removed for each of the optimisation examples highlighted above.

While the environmental benefits of our AI optimisation software will certainly vary from terminal to terminal given their unique operating conditions, the end-results will remain – there are both cost savings and environmental benefits to software-based optimisation. The best step to understanding the impact on your terminal is to start a conversation with an INFORM optimisation specialist. Our team brings decades of experience and a proven simulation process designed to help terminal operators understand the benefits of optimisation – both financially and environmentally.

ADD-ON "SUSTAINABILITY"

Artificial Intelligence (AI) is seemingly popping up everywhere we look these days. As a niche AI system provider, INFORM has

been delivering AI solutions for just over two decades. Within the maritime sector, Optimization Modules deliver value across terminals. As decision-making is improved, efficiency is realised across the terminal in both the short- and long-term. Short-term savings often translate directly to the bottom line. Efficiencies such as reductions in vehicle travel, crane travel, and yard rehandles are the easiest to see and calculate.

Long-term savings, as well as potential revenue increases, can be harder to see, initially. Reductions in overall handling equipment as well as delaying or avoiding new equipment purchases happen slowly as operators adjust operational procedures to maximise the efficiency gains possible. Furthermore, increasing yard, truck, and rail handling capacities are intangible results that are the by-products of more efficient terminals. All of these long-term outcomes deliver significant value, and through these activities, there are also substantial environmental sustainability outcomes that can be achieved simultaneously.

INFORM's Optimization Modules do not replace an existing TOS, but rather work in conjunction with them to drive terminal efficiency. This "add-on" relationship allows terminals to implement the "green" power of Optimization Modules without significant changes. While deployment timeframes vary from case to case, it is measured in months, making it quick compared to a typical TOS implementation.

Sustainability at INFORM is not just a buzzword that we're jumping on to sell our products. In fact, it is an integral part of the culture at INFORM. By way of example, our team, while based in Germany, comes from over 30 different nations. From the top of our organisation to the bottom, we're committed to improving the "people" and "planet" outcomes directly and indirectly connected to our company and the industry we serve.

ABOUT THE AUTHORS

Dr. Eva Savelsberg is Senior Vice President of INFORM's Logistics Division. She specialises in Optimisation Software that renders a wide range of operational processes more productive, agile, and reliable. Eva is also lecturer at the University of Aachen (RWTH), where she received her PhD in Mechanical Engineering in 2002. Eva has published five books and over 40 papers on innovation in freight transportation.

Karsten Schumacher is a Senior Consultant for INFORM's Logistics Division where he's acquired over a decade of experience across various logistics projects as project lead. He holds a bachelor's degree in business studies from the university of Applied Science in Aachen. He is a specialist in implementing TOS systems at intermodal rail terminals, and is the Sustainability Manager for INFORM's Logistic division.

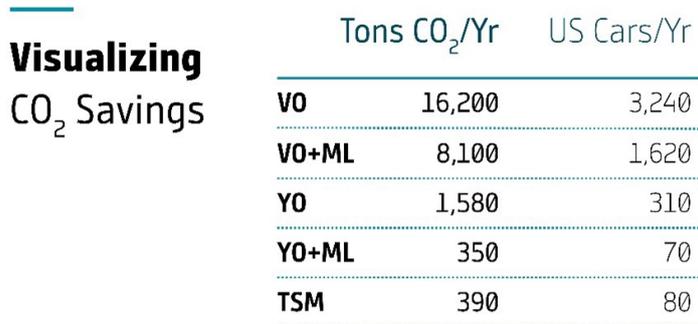
Matthew Witteimer is Senior Manager International Marketing and Customer Relations at INFORM's Logistics Division where he's become a thought-provoking contributor to many industry publications and conferences. He's co-author of the multi-award winning 2038: A Smart Port Story – a novella about the future of technology and the social challenges it may bring. In addition, he serves on the board of YoungShip Rotterdam, is an award-winning designer and member & judge at The Academy of Interactive and Visual Arts (AIVA), as well as the senior producer and host of the buzzITtalk podcast.

ABOUT THE ORGANIZATION

INFORM specialises in AI and optimization software to improve operational decision making. Based in Aachen, Germany, the company has been in the optimisation business for 50 years and serves a wide span of logistics industries including ports, maritime, and intermodal terminals. With a broad range of standalone and add-on software modules, INFORM's unique blend of algorithmic based software expertise, rich industry experience, and big world thinking delivers huge value for their customers.

More Info: <https://infrm.co/terminal>

FIGURE 2.





HAROPA DETAILS CARBON-CUTTING JOURNEY



Having joined the “Getting to Zero Coalition” in October 2020 the HAROPA Port of Le Havre is on a firm pathway to helping the maritime industry cut carbon emissions.

The “Getting to Zero Coalition” was launched at the United Nations Climate Action Summit 2019 and aims to reduce greenhouse gas (GHG) emissions by at least 50% by 2050, compared to 2008 levels.

Since joining the coalition, the Port has launched the Sea Cargo Charter, which is complementary to HAROPA’s Environmental Ship Index (ESI) charter.

“It allows climate considerations to be integrated into chartering decisions to promote climate-friendly shipping and thus allows leaders from various industry sectors to use their influence to drive change and promote the green transition of shipping. It brings together a group of the world’s largest energy, agriculture, mining and commodity trading companies,” a spokesperson from the HAROPA explained.

“Since October 2020, the coalition has organised online webinars, live exchanges with interesting presentations and studies conducted under the impetus of the Get-

ting to Zero Coalition. It’s very active and willing,” the spokesperson added.

This is just one of many steps the Port is taking in meeting its key targets which include becoming a carbon-neutral, positive-energy port by 2040.

It has said that ecological transition is at the heart of its strategic plans with two other objectives which include controlling the impacts of port activities, in favour of biodiversity, natural spaces and ecological features, and energy control with a 15% reduction in consumption, renewable energy production (50 MW) and access to low-carbon energy.

Additionally, it is also striving to be a smart port which it describes as “an innovative, efficient and sustainable port, a port that responds optimally to the economic and environmental challenges of today and tomorrow through innovation”.

With climate consideration now integrated into most strategic decision not only does the new technology serve the Port’s climate goals, but also the Smart Port City project, key for HAROPA’s ports, which natively integrates the green dimension.

SUPPORTING CUSTOMER EFFORTS

HAROPA Ports, which includes Le Havre, Parts and Rouen, has installed 14 water and electricity distribution terminals since 2018 in partnership with Voies navigables de France (VNF), the French navigation authority responsible for inland waterways.

There is now a project to deploy 78 new terminals by 2023 funded by the European Commission with €1.8 million granted by the Connecting Europe Facility’s (CEF) Transport 2019 call. This interoperable system provides users with between 40% and 60% savings compared to the cost of running a generator. It would save 5,300 tonnes per year of CO2 equivalent.

Regarding onshore power (OSP) the Port’s priority is to equip the crane terminal with three OSP units by 2023 at a cost of around €20 million. Following this, it will explore OSP with container traffic with a test on an autonomous power generation unit powered for instance by liquefied natural gas (LNG).

The HAROPA spokesperson said this type of unit seems suitable for other docks such as the Ro-Ro Terminal where the availability

of the necessary power is not guaranteed on the grid.

GREENER FLEETS

HAROPA is also supporting what it describes as the “greening” of transport fleets. This includes the AviCAFE (Low Emission Fuel Filling) project, launched in 2019 by HAROPA, which aims to identify technical solutions for motorisation and refuelling solutions; propose new refuelling solutions; draw up a reference document that will be the guideline for the deployment strategy of a supply chain for low-emission refuelling solutions in the Seine basin; and define a first concrete and targeted investment project.

This is intended to serve as a demonstrator and initial link in the alternative fuel supply chain. A feasibility study is set to be launched soon.

HAROPA is also involved in the development of LNG and other alternative fuels. HAROPA said it looks to determine the specific needs of each port to implement the most appropriate solution.

HAROPA ports of Rouen and Le Havre are supporting the LNG project to retrofit the engine of the Samuel de Champlain dredger. The engine is to be changed from marine gas oil (MGO) to a dual-fuel MGO/LNG engine system.

The lead of this project is Dragages-Ports which is supported by a consortium of 12 partners, including HAROPA.

Following a public tender for the conversion work in 2017 the contract was awarded to Damen Shiprepair & Conversion by Dra-

gages-Ports. The tender, worth €20.8 million, included a major phase for the replacement of gensets, the inboard installation of LNG tanks and networks, and an optional phase for the maintenance of the genset and associated equipment for a period of eight years.

The dual-fuel conversion was completed, and the vessel was launched by Damen in early 2019. It was the first French flag vessel to use LNG as a fuel and to have been funded by the EU.

More recently, HAROPA Port of Le Havre hosted one of the largest LNG-powered ships in the world, the CMA CGM Palais Royal for the first time on 4 January 2021. The vessel is the third of a 26-strong LNG-powered fleet to be commissioned by French shipping line CMA CGM. Of the 26 vessels, eight are 23,000 TEU in volume, the entire fleet of varying size is scheduled to be delivered to CMA CGM by 2022.

Finally, hydrogen is also on the agenda as HAROPA is part of the European H-2 Ship pr Ship project to study the deployment of hydrogen for ship propulsion on the Seine.

In addition, a green hydrogen plant (H2V Industry) is to be built on the industrial zone of Port of Rouen to supply the industrial area of Le Havre as well as vehicles, heavy goods or ships.

RENEWABLE ENERGY

Like many ports, HAROPA is supporting the development of offshore wind farms and from 2022 the Port of Le Havre will host Siemens Gamesa's wind turbine and pod manufacturing plant for offshore wind farms located in the North Sea Channel.

This will present a new opportunity for renewable energies, the spokesperson said.

The Siemens site will be the largest industrial project in the history of renewable energy in France in terms of size, ambition and innovation.

In 2019 the agreements were signed for a total period of 30 years on a total area of 36 hectares between the Joannès Couvert and Hermann du Pasquier quays in the Port of Le Havre.

In a statement, HAROPA said that this decisive step forward will enable the world leader in wind energy to build and operate its plant for manufacturing blades, nacelles and generators, as well as to carry out project installation activities the 30-year period.

Written by Beth Maundrill

“ECOLOGICAL TRANSITION IS AT THE HEART OF HAROPA’S STRATEGIC PLANS.”



ABOUT THE ORGANISATION

Enjoying an exceptional location on the west coast of Europe, HAROPA - Port of Le Havre, the #1 French port for foreign trade and the 5th ranking port on the North Europe range for container traffic, each year berths nearly 6,000 vessels including the largest containerships in the world. Accessible 24/7, it handles more than 70 million tonnes of goods each year and supplies nearly 40% of French crude oil imports. A member of HAROPA, the first French port system, alongside the ports of Rouen and Paris, Le Havre is a fast-shipping outlet to every continent for the world's shipping lines with nearly 600 ports of call. One of the largest port complexes in Europe, HAROPA has nearly 500 hectares of land available or suitable for conversion along the Seine corridor.



aidrivers

DELIVERING GREEN INITIATIVES WITH AI-ENABLED AUTONOMOUS SOLUTIONS TO BOOST PORT INDUSTRY

Dr Rafiq Swash, CEO and Founder, AIDrivers

As the US inaugurates its 46th president and re-joins the Paris Climate Agreement, the status of climate change will climb back up the global agenda and reignite the need to drive down global carbon emissions.

The US is the world's largest economy and the second biggest emitter of carbon so gives this cause true political heft. Joe Biden's decision to re-enter the accord will increase the importance of green issues and spotlight sustainability for other countries to follow suit. There is no better time to focus our attention on our efforts, planning and execution of greener goals.

CREATING SUSTAINABLE PORTS

AIDrivers is committed and fully aware of its role in creating sustainable ports for the future and embraces it wholeheartedly. The drive to innovatively solve for the needs of

the port industry is clearly overlaid with the responsibility to provide green, efficient and commercially viable technology to assist ports in sustainable automation as they strive to meet carbon reduction targets.

AIDrivers delivers artificial intelligence (AI) enabled autonomous mobility solutions to the port sector. The cutting-edge technology transforms current fleets of trucks and other port equipment into autonomous vehicles by retrofitting hardware and software onto the existing platforms to render them fully autonomous and self-managed.

COVID-19 has highlighted the need for automation to enable resilient operations to continue under conditions which can change at short notice. As a by-product of recent innovation it is clear that how AIDrivers achieves its advancements and the

solutions it delivers carry substantial green credentials and robust business operations.

One of the cornerstones of an AI enabled autonomous fleet is its operational efficiencies with energy saving vehicle scheduling, intelligent path planning for in-time operations as well as V2X for a self-aware connected environment to enable trucks, cranes, traffic lights, smart gates and fuel stations to interact and work together to deliver a common goal of job completion.

This means that vehicles are allocated tasks back-to-back with less wasted travelling between jobs meaning less fuel consumption and a consistent quality of service. The fully connected and self-aware systems understand the operation holistically to deliver increased efficiency and productivity.

AUTOMATION

AI-enabled autonomous automation also cuts fuel emissions due to hyper efficient, purposed equipment handling and usage. The fusion of 3D LIDAR, cameras and sensors overlaid with the AI enabled software algorithms means that vehicles optimise routes and manoeuvres due to the self-aware systems, which reduce unnecessary usage of equipment dynamics such as acceleration and braking. The energy efficient speed therefore results in improved fuel consumption. An adjunct to this is the more effective use of vehicle parts.

AI-enabled autonomous vehicles for ports are a vital part of the total port logistics chain. The uptick in efficiencies experienced from the optimisation of this aspect of the port transport system means that container ship unloading and loading times are dramatically reduced in turn meaning that quayside time for ships is cut and overall, the total logistics momentum is improved significantly which reduces the transshipment cost. The AI-enabled enhancement in the fluidity of the movements of goods portside cuts fuel consumption and idle time and sweats all assets to maximise lifespans of equipment. Using AI enabled autonomous equipment to maximise daily function time and to optimise the length of life cycles is critical to reduce carbon emissions and resource waste.

LIFE-CYCLE SUPPORT

This above point also applies specifically to the truck fleets themselves. The cradle to grave argument of using assets for the full duration of their usable lives rather than replacing them early means less carbon is used in the design and manufacture of new goods. Cutting short the life of a vehicle is costly not only in monetary terms but also for resource reasons.

Indeed, with the self-aware and self-diagnostic capabilities of AI-enabled autonomous vehicles, the life cycle of each vehicle is vastly improved. The intuitive technology can recognise issues as they arise meaning maintenance happens at the right time for the right issue. In turn, this cuts downtime dramatically.

Avoiding unnecessary maintenance cuts not just the use of time but more importantly cuts unnecessary replacement of parts reducing waste. Incrementally this cuts carbon emissions in the provision of needless engine parts. Reducing avoidable wear and tear means vehicles run much more optimally which also leads to less fuel consumption.

One key area often overlooked is the energy consumption used in the design of new products. By taking existing hardware technology and engineering innovative software to combine and upgrade, AIDrivers addresses green energy engineering for energy efficient and sustainable automation.



The starting point of autonomous mobility solutions was originally driven by ports needing quick, low-cost solutions to their transport challenges. The upshot is that AI-enabled autonomous technology is energy efficient and resource effective and much more attractive in cost terms for industrial operations. AIDrivers' technology also boosts operational resilience.

WIDER CONSIDERATIONS

Looking beyond the vehicles themselves, there are further green benefits for the terminal operators from the adoption of autonomous vehicles. Using existing fleets and adapting them to the current environments means that there are fewer, or in some circumstances, no changes made to the port terminals. Indeed, using the existing infrastructure to create self-aware environments rather than building new sites on greenfield plots is inarguably a more sustainable way to develop ports.

This would prevent the destruction of natural habitats, flora and fauna not only on land but in marine environments. Using the current brownfield sites means less unnecessary use of resources, less costs and less environmental impact. This will also prevent the possibility, in some geographies, of the further build out of coastlines into the sea to reclaim land which has been shown to have huge detrimental impact to marine environments.

Using the current port sites means that there has been a huge reduction in expenditure which means capital can be redirected into green initiatives. There is minimal cost involved in upgrading port terminals for the use of AI-enabled autonomous vehicles relative to building new terminals afresh. Therefore, this has to be a win-win situation that ports find themselves in thanks in part to solutions-driven organisations such as AIDrivers.

Cleverly developing methods to convert vehicles and other horizontal transport to driverless status, delivers an array of green solutions to an industry in need of a clean-up. Since January 2020 sulphur emission cuts have been legally enforced for ships. Over the last year the pandemic has propelled the need for greener actions across the port sector as data showed the rapid and substan-

tial cut to carbon dioxide emissions can be achieved. The statistics are clear, a greener future is attainable. The method to get there is what ports need help with and what AIDrivers can solve.

AIDrivers technology has revolutionised port settings globally with the introduction of cost effective, resource efficient and commercially practical mobility solutions which meet industry needs. Successful trials and roll outs in ports show the commitment of port operators to adopt new green strategies and that this aspect of asset development is highly valued.

Emerging from a perspective-changing 2020 pandemic and entering into a new geopolitical paradigm with a fresh US administration, gives the impetus we all need to tackle carbon emissions, reduce our waste and build an environmentally friendly future. AIDrivers is already well on the way to helping deliver AI enabled solutions for a greener port industry and embraces the challenge.

ABOUT THE AUTHOR

AIDrivers' founder Dr Rafiq Swash of Brunel University London contributes to international research in AI, visual information search and retrieval, computer vision, 3D sensors, predictive data analytics and automation. Professionally this has expanded into further international leading collaborations in connected robotics, AI enabled automation, sensor intelligence and fusion, digitisation and behaviour and pattern modelling.

ABOUT THE ORGANISATION

AIDrivers provide specialised AI enabled autonomous mobility solutions for port terminal automation that meet the needs of port operators. The company is working passionately to address industrial mobility challenges by optimising industrial operations and improving the quality of service towards a sustainable future.



SMART DESIGN AND DRIVELINE CHOICES HELP IN ENHANCING RTG ECO-EFFICIENCY

Marko Rasinen, Product Manager, RTG at Kalmar

As the drive to improve environmental performance at container terminals continues to gather pace, operators are faced with several choices when it comes to expanding or renewing their rubber-tired gantry (RTG) crane fleets in order to achieve sustainability gains. With smart choices on both the crane base design and energy systems, the crane's eco-efficiency can be improved considerably.

Before we start thinking about which RTG driveline is the optimal choice in terms of eco-efficient operations, there are several other design details that can help to achieve big gains in fuel efficiency.

"We have worked for decades to improve the eco-efficiency of cargo handling, and our RTG offering is a great example of this," says Marko Rasinen, Product Manager, RTG at Kalmar.

LIGHTER, SIMPLER AND EASIER TO MAINTAIN

Structural design, essentially the weight of the crane, makes a big difference when it comes to fuel consumption. By simplifying the design and optimising the structure with high-grade steel it is possible to save up to 0.5 litres of fuel per hour. Lowering the weight of the crane has some positive knock-on effects too, like reduced ground pressure, which reduces civil works costs.

The choice of all-electric versus hydraulic design is another important consideration. Hydraulic setups have traditionally been used for spreaders and for gantry-wheel turning and micromovements but switching to all-electric can cut fuel consumption by as much as two litres per hour, with the added bonus of reduced maintenance costs

because of fewer moving parts. Additionally, there will be no oil leaks in case the actuator breaks.

"The combined weight of the spreader/head block unit makes a big difference too, since this equipment is lifted and lowered twice every move. Minimising the weight here can deliver up to a litre of fuel savings per hour," Marko points out. "Even lighting can make a contribution, with energy-efficient LED lights offering a potential saving of 0.5 litres of fuel per hour," he continues.

Finally, there's the choice of variable speed generator (VSG) versus constant speed generator. By matching engine RPMs with the necessary power, a VSG can achieve potential fuel savings of as much as 2.5 litres per hour.

ONE SIZE DOESN'T FIT ALL

What's right for one terminal might not be right for another, no matter how similar their operational setups. Having a range of alternatives is therefore important. In terms of drivelines, with the Kalmar RTG there are plenty to choose from: the fully electric Kalmar Zero Emission RTG, the diesel-powered Kalmar SmartPower RTG and Kalmar Classic RTG, and the Kalmar Hybrid RTG, which uses lithium-ion (Li-ion) battery packs as its main source of energy.

This last variant has been a popular choice with terminal operators of all kinds around the world because of its huge potential for fuel and emission savings.

"The Li-ion batteries, which come with a five-year warranty, are combined with a smaller diesel power unit, which is not only highly fuel-efficient – consuming as much as 60% less fuel (typically around 6.5 litres per hour) than a conventionally powered RTG, with a corresponding reduction in CO₂ emissions – but also quieter and easier to maintain," Marko explains.

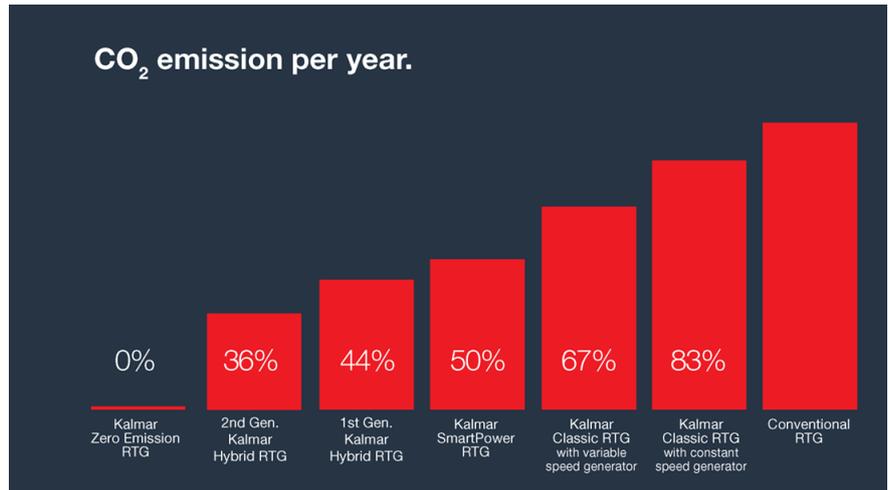
The diesel power unit's running hours are significantly reduced because it is not used to power any of the crane functions, only to charge the batteries – which take care of all the lifting, lowering and driving operations. Fewer engine running hours not only mean less fuel is consumed but also less component wear. And with the batteries doing all the work, noise emissions are also significantly reduced. "The batteries are also virtually maintenance-free, requiring only check-ups," Marko highlights. "Furthermore, they can store regenerative energy from lifting and lowering operations, which is an important factor in achieving such low fuel-consumption levels."

AN ATTRACTIVE OPTION WHERE FULL ELECTRIFICATION IS NOT POSSIBLE

While going fully electric is the preferable option from a sustainability perspective, in some locations it simply is not viable. Hybrid technologies are a particularly attractive alternative to fully electric drivelines in markets where the quality and reliability of the electricity supply may be poor, or at terminals where the existing infrastructure may not support a cable-reel or bus bar setup.

Hybrid RTG drivelines have developed significantly in recent years, offering even greater gains in fuel efficiency and reductions in emissions and noise. Kalmar's second-generation hybrid RTG is a highly fuel-efficient machine that makes no compromises on performance.

The new Kalmar Hybrid RTG builds on the proven, sustainable performance of the previous-generation model to deliver even greater savings in fuel efficiency, air-



borne and noise emissions, and maintenance costs.

The super-capacitor system of the previous model has been replaced by the latest lithium-ion (Li-ion) battery technology, which has a much higher energy-storage capacity. However, just like the previous-generation model, the new Kalmar Hybrid RTG features a regenerative energy system that stores energy generated by braking and spreader-lowering for later use.

The gains in terms of fuel efficiency and lower maintenance requirements can be explained in extremely simple terms: the power unit's running hours are significantly reduced because it is not used to power any of the crane functions, only to charge the Li-ion battery. Fewer engine running hours means less fuel consumed and less component wear. And with the battery doing all the work – powering the lifting and driving operations – noise emissions are also significantly reduced.

Over the years, our industry has made tremendous strides in developing the eco-efficiency of cargo and material handling through more efficient machines, optimisation of cargo flows, as well as intelligent equipment and automation. With its ability to cut the cost of every container move while also minimising environmental im-

pact, hybrid RTG technology is a highly attractive option for many terminals around the world. Smart design thinking and the right choice of driveline helps terminals improve their eco-efficiency by delivering impressive savings for operations in terms of fuel, emissions, maintenance and noise levels.

ABOUT THE AUTHOR

Marko has over 20 years of experience in product management, sales and engineering of Yard Cranes. Marko's vast experience in the customer interface as well as with Kalmar engineering teams has helped him form a comprehensive understanding of the customers' business environment as well as the technological capabilities that modern technology offers. Today Marko manages the Rubber Tyred Gantry Crane offering at Kalmar, working together with the customers, suppliers and internal engineering teams securing development of high-quality products matching the customer needs.

ABOUT THE ORGANISATION

Kalmar Global provides cargo handling solutions and services to ports, terminals, distribution centers and heavy industry around the globe. We are the industry forerunner in terminal automation and energy-efficient container handling, with one in four container moves around the globe being handled by a Kalmar solution. We improve the efficiency of your every move through our extensive product portfolio, global service network and solutions for seamless integration of terminal processes.





IS THIS LEADERSHIP?

Thomas Jelenić, Vice President, Pacific Merchant Shipping Association



PMSA
PACIFIC MERCHANT SHIPPING ASSOCIATION

California has adopted stringent zero-emission vehicle (ZEVs) requirements that seek to have ZEV sales increasing from 2% to 5% to 10% over a number of years. Much concern was raised about whether such requirements are feasible or sensible. But California considers itself a leader and is moving forward with the certainty that the right regulatory signals will force the technology into the marketplace. The year was 1990.

The 2% goal was to be achieved by 1998 and the 10% goal by 2031[1]. By the end of 2019, pure ZEV sales only made up 5.3% of the California market[2]. California now has a regulatory ZEV goal for 10% of new car purchases by 2025. Twenty-two years after the original deadline... was that leadership or has California become consumed by setting goals, rather than meeting them.

ANOTHER BROAD MANDATE

Demonstrating its belief that there is nothing to be learned from history, even recent history, California has once again issued a sweeping technology mandate before the needed technology has been proven.

The mandate bans the sale of internal combustion engine cars by 2035 and requires all heavy-duty trucks to be zero emission (ZE) by 2045, while calling out “drayage trucks” to complete the transition by 2035 (despite the fact there is no physical or operational difference between “trucks” and “drayage trucks”).

The order also called out off-road equipment, like cargo-handling equipment (CHE) used in ports, to complete the transition to 100% ZE by 2035 even though off-road equipment is more diverse, has more severe duty-cycles, and is produced in fewer numbers than on-road vehicles.

The most recent analyses by the ports of Long Beach and Los Angeles have determined that there are currently no feasible ZE heavy duty trucks[3] or CHE[4] available for deployment. Yet, CARB is already proposing to ban new trucks from serving California ports unless the trucks are ZE beginning in 2023[5] even though the technology needed to meet the ports’ needs does not yet exist. Certainly, it must only be a matter of the proper regulatory signals.

In any case, the ZE clock is now running. California’s port terminal operators must figure out how to transition to ZE equipment over the next 15 years. The challenges are not trivial.

REALITY OF THE SITUATION

First up, are the deadlines real? California has a history of setting audacious goals, then moving the finish line. That does not inspire confidence when a company must invest billions against an out-of-state competitor that does not have to make the same investment.

On the technological front, obstacles for heavy-duty equipment are more challenging than for passenger cars. By sales, it would seem that most Californians feel that electric vehicles do not meet their driving needs or their budget constraints.

Scale that up to equipment that must move 80,000 pounds over steep grades and long distances and the technology limitations become more daunting. Yet, despite some window dressing, California officials remain solely focused on battery electric technologies. Un-

“CALIFORNIA HAS ONCE AGAIN ISSUED A SWEEPING TECHNOLOGY MANDATE BEFORE THE NEEDED TECHNOLOGY HAS BEEN PROVEN.”



fortunately, the operational constraints of goods movement mean that all vying technologies have strengths and weaknesses.

Because of the years developing the passenger car market, battery technology has made significant progress. Still, it is limited by range. Worse, the cost of extended range for battery technology is linear. The more range needed; the larger the battery needed. With larger batteries, come higher costs and reduced load.

With hydrogen fuel cells, these challenges vanish, but new challenges emerge. While potentially more viable than battery electric, hydrogen is further behind in terms of technological development, with additional concerns regarding fuel supply and price.

However, the growing interest in ZE technologies has spurred investment into alternatives to battery electric.

ALTERNATIVE TECHNOLOGIES

There are a number of hydrogen demonstrations currently being conducted in the San Pedro Bay ports for both CHE and trucks.

Unlike battery-electric, extending the range of hydrogen-powered CHE comes at the marginal cost for larger tanks, while hydrogen has operational characteristics similar to today's existing operations that make it an attractive alternative. Hydrogen technologies may also have some attraction for port authorities.

The billions of dollars that will be needed to bring the necessary electrical infrastructure to marine terminals and installation of terminal charging infrastructure will stretch the budgets and construction capabilities of port authorities.

By comparison, the shore power infrastructure capital program took a decade to implement. Electrical infrastructure for battery-powered CHE will likely require infrastructure five times the scale of shore power.

Hydrogen-fuelled equipment will not need any of this infrastructure, instead utilising shared infrastructure similar to today's diesel infrastructure. There is one oth-

er way that hydrogen may be an interesting ZE alternative for port facilities. As ocean carriers consider solutions for future IMO mandates for greenhouse gas reductions, one possible solution being considered is ammonia[6,7].

Whether ammonia makes the cut as a vessel GHG solution is anyone's guess today, especially given concerns regarding ammonia toxicity. But the interesting element here is that ammonia is essentially a method of storing hydrogen[8].

Is it possible that both vessels and marine terminals that serve them move toward a mutual hydrogen economy to solve the question of reducing greenhouse gas emissions? Nobody today probably knows the answer.

In California, though, the question has been reduced to: do we have time to determine the answer? Unfortunately, a clock, set by political expediency, is ticking.

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“THE GROWING INTEREST IN ZE TECHNOLOGIES HAS SPURRED INVESTMENT INTO ALTERNATIVES TO BATTERY ELECTRIC.”

ABOUT THE AUTHOR

Thomas A. Jeleniç is Vice President for Pacific Merchant Shipping Association (PMSA), where he works with policy makers, regulators, and industry leaders to help ensure that sound science and industry issues are part of the discussion for the increased use of zero and near-zero emissions equipment at ports and throughout the goods movement industry.

ABOUT THE ORGANISATION

PMSA is an independent, not-for-profit shipping association. Its members are engaged in trade primarily between Asia and the US West Coast as well as Europe, the Mediterranean and South America. On behalf of its members, PMSA is engaged in community affairs and legislative and regulatory processes in California and Washington state.



 Port of Amsterdam
Port of partnerships

AMSTERDAM ACCELERATES GREEN INNOVATION

Processing greater cargo levels while simultaneously cutting emissions is one of the biggest challenges ports and terminals face today.

For many, this involves working closely with other ports, city authorities and stakeholders in the maritime supply chain to share information and develop new initiatives. It also entails ports utilising their place on regional and global supply chains to ensure the flow of cargo is clean.

The Port of Amsterdam's drive to decarbonise trade has focused on developing green energies as well as its position as a major inland and transshipment hub. It has also worked with its neighbouring ports to develop joint platforms that encourage shippers and other stakeholders to cut emissions.

PANDEMIC CAUSES UNCERTAINTY

Collaboration and technological innovation have become even more important during the COVID-19 pandemic. Ports across the maritime supply chain have seen trade volumes fluctuate.

After most suffered slumps in the early part of the year, the world's biggest gate-

ways have seen record traffic and/or equipment moves.

The Port of Amsterdam was badly affected during the height of the pandemic and saw its transshipment volume fall by 14% year-on-year (YoY).

Its traffic fell across the board, with containerised cargo falling by 13% YoY and liquid bulk by 7%; it did not welcome a single seagoing cruise ship throughout the year.

The volume instability resulted in congestion at many of the world's largest ports, but the Port said it has not been as badly affected as other ports that rely heavily on container traffic.

"The congestion seems to be more focussed on container terminals, as Amsterdam port we only play a relatively small role in container shipping compared to Rotterdam, Antwerp and Hamburg. So, congestion is not really an issue at the moment for the Amsterdam port," said Hendrik-Jan Oost, Program Manager Shore Power, Port of Amsterdam.

In response to the effects of the pandemic the Port has initiated a four-year strategy to accelerate energy transition through in-

vestment in environmentally friendly infrastructure and digitalisation and strengthen its position as a major European seaport.

This is in addition to the numerous projects it is already pursuing in its efforts to cut emissions, including alternative fuels and new power sources across cargo, passenger, inland and transshipment operations. It already has bunkering facilities for liquified natural gas (LNG)-powered vessels and inland barges.

Amsterdam acts as an example of how to work with multiple stakeholders to keep carbon emissions down.

Oost told PTI that the Port is involved in several projects concerning the development of clean fuels for shipping, both inland and seagoing.

One of these is the shore-power network with other ports, including Rotterdam, Antwerp and North Sea Port. Amsterdam and its fellow participants launched this project in October 2020 to cut emissions in intermodal and inland containerised goods transportation.

"We have started a joint tender with a number of major seaports in the Nether-

lands and Belgium to tender a joint sales platform," Oost said.

The main benefits of this platform, according to the Port, are possible lower costs due to economies of scale and continuous improvement of the platform by knowledge sharing- i.e., different parties sharing information to improve processes.

INTERMODAL SHORE-POWER

Shore-power, also known as cold ironing, is a concept which supplies vessels with electricity while its auxiliary engines are shut down.

It has been used with considerable success at many ports including the Port of Los Angeles, and there are numerous examples of container ports working closely with city governments to maintain operations and cut emissions.

Inland shipping is essential to cutting emissions in European-wide trade, said Oost. Cutting emissions has become even more important for container ports, especially as traffic has fluctuated since the beginning of 2020.

According to the Port of Amsterdam, intermodal transport, such as inland shipping and rail, directly helps lower carbon emissions. Utilising inland shipping is essential for the Port because it is on the Amsterdam-Rhine canal, which connects directly to the Rhine.

More than 50% of Amsterdam's hinterland transport goes by inland shipping and it is a vital mode of passenger transport as well.

Furthermore, the Port is also carrying out a feasibility study into shore power specifi-



cally for seagoing cruise vessels at its passenger terminal.

Currently, within the city centre all inland barges and river cruise vessels connect to a single shore power network.

The Port is looking to increase the number of shore power connections for river cruise vessels, as Amsterdam believes traffic will increase in the near future and electricity consumption will rise.

In addition, it will replace its current shore power boxes with so-called smart power boxes. These, the Port said, will have much more user-friendly connections and can be reset from a distance in the event of failure.

Its other projects include H2Ships - an EU-backed project focused on developing clean shipping fuels and building a value chain for hydrogen transportation.

As part of this initiative, the Port is working to develop a new hydrogen-powered and hydrogen-carrying vessel. This vessel will be ready to sail in 2021. It is also participating in a Dutch project to develop bio and synthetic methanol as a fuel for commercial shipping.

A major trend in the race to decarbonise port operations has been electricity-powered container handling and transportation equipment. However, the Port said it is focusing its investment on hydrogen (H₂)-based heavy equipment, but it can see the potential for electricity-powered transportation vehicles.

"Together with terminal operators and logistic companies we are working on the development of H₂ as a fuel for trucking and for on-terminal transport," Oost said.

"Electricity seems to be a difficult solution for heavy equipment, for that reason we focus on use of H₂ for that kind of equip-

ment and long distance and heavy trucks.

"For city distribution between port and city centre electric vehicles are a good solution. We also see that city distribution by smaller barges (electric and H₂) is being developed in the region."

Written by Max Schwerdtfeger

ABOUT THE ORGANISATION

Port of Amsterdam is Western Europe's fourth largest port and plays a major role in the transshipment and processing of energy products.

The North Sea Canal Area transhipped approximately 105 million tonnes of goods in 2019, with Port of Amsterdam accounting for approximately 86 million tonnes of this amount. A total of 68,000 people work in the port region either at companies in the port or at port-related companies. Approximately 31,000 of these people work in Amsterdam.

Port of Amsterdam is committed to being a smart port and to adding value for customers and the environment in a sustainable and innovative manner. It seeks to promote growth at companies, while still taking a careful approach to the available space and the quality of water, soil and air.

As 'Port of Partnerships', Port of Amsterdam works intensively with partners in the business community, city and region.

**“TOGETHER
WITH TERMINAL
OPERATORS AND
LOGISTIC COMPANIES
WE ARE WORKING ON
THE DEVELOPMENT
OF H₂ AS A FUEL
FOR TRUCKING AND
FOR ON-TERMINAL
TRANSPORT.”**



navis®

BUILDING HIGH-VALUE IT DEPARTMENTS IN TERMINAL OPERATIONS

Andy Clason, VP of Technical Services, Navis

As marine terminal technology advances and becomes more sophisticated, the demands on terminal IT departments have grown exponentially. IT infrastructure has always been mission-critical to marine terminals, but as terminals increasingly automate and optimize their IT systems, the IT departments find now more than ever that they are at the centre of the marine terminal's success.

In a recent Tech Validate survey "Leveraging Managed Services for Terminal Operations", 94% of N4 customers say the health of their N4 infrastructure is very important or mission-critical to the overall health of their terminal. However, nearly a third of these same respondents also stated that their current monitoring and diagnostics are not meeting their needs. There is clearly a disparity between the mission criticality of the systems these groups support and the tools and services they use to support them. Why does this disparity exist?

**THE TECH VALIDATE SURVEY
CAN BE FOUND [HERE](#)**

MOVING IT DEPARTMENTS FROM BASIC PLUMBING TO STRATEGIC WORK

From the same Tech Validate survey, 90% of respondents agreed that their IT teams should focus on providing strategic value to the terminal, rather than just supporting the basics. But 60% also agreed that the availability of their existing IT staff often holds them back on executing on their strategic IT plan. As in other industries, the focus on tactical day-to-day work competes with time required to build truly world-class solutions to common problems. While building such a solution is a strategic goal for many marine terminal IT teams, like other strategic goals, it is often thwarted due to time and resource constraints.

Following the example of other industries, IT departments within the container terminal industry have the opportunity to move towards the use of outside parties and managed services to deliver basic services like monitoring, diagnostics, database administration and other tactical IT tasks in order to focus their IT staff on strategic work. There are many areas that can easily be transferred to external managed services providers, freeing up IT departments to focus on strategic initiatives.

UPGRADE TESTING

Testing Navis software prior to a software upgrade is a significant undertaking which is critically important but should not require significant internal IT resources to manage. In the Tech Validate survey, 49% of Navis customers say they spend over 100 hours testing prior to each upgrade, and 38% of customers say they

“AVAILABILITY OF RESOURCES OFTEN HOLDS BACK MARINE TERMINAL IT DEPARTMENTS FROM EXECUTING ON THEIR STRATEGIC PLAN.”



spend over 200 hours. Yet 62% of customers have not automated any of their manual tests and only 5% have automated all of their tests. This manual testing represents a huge investment in time and resources and often the testing requires the best and the brightest, both from IT and from Operations.

Automation of manual tests remains a goal that never seems to get done, because local IT teams are busy just delivering the basics. By automating tests, marine terminals could save hundreds of hours of time each upgrade cycle. Some customers have worked with Navis 360 Managed Services Upgrade Testing Service, which not only automates manual tests, but shortens the cycle of fixing any issues found during that testing. The sooner a potential problem can be found and fixed, the less it costs to resolve.

MONITORING AND DIAGNOSTICS

A good monitoring and diagnostics programme can provide a similar benefit, by identifying IT Infrastructure issues before they become mission critical problems. Navis recently conducted a study of the root cause all Priority 1 (P1) cases reported in the past 12 months across the Navis customer base. P1 cases are defined as mission-critical problems in which the terminal systems are down and not operating, and the terminal is critically affected. The root cause analysis found that more than 50% of all P1 cases reported had their root cause ultimately not in Navis software, but instead in the surrounding IT Infrastructure -- the network, servers, databases, operating systems, and other critical IT systems that form the backbone of the terminal IT ecosystem.

Mission-critical issues have a huge impact on marine terminals, costing them both time and money. Monitoring and Diagnostic tools and services target the IT systems that are most likely to have issues and provide ways of proactively finding poten-

tial problems before they turn into mission critical issues. Identifying and preventing just one or two mission critical issues a year often provides a return on any managed services investment terminals would make for system monitoring and diagnostics.

The Navis Monitoring and Diagnostics Managed Services offering has been built based on real-world feedback from our more advanced N4 customers, and our diagnostics use a library across multiple customers to locate the most frequent symptoms and remedies across a wide variety of marine terminal situations. By outsourcing Monitoring and Diagnostics to Navis, marine terminals not only remove the time and focus it takes to build their own one-off monitoring and diagnostics solution, but also benefit from all of the lessons learned from the rest of the Navis customer base. As issues are found and resolved for one marine terminal, the resolution and related diagnosis is saved to Navis's master library so it can be used at all other terminals using the diagnostics services.

EDI MAINTENANCE

Navis Managed Services for Electronic Data Interchange (EDI) Maintenance provides similar leverage. EDI Maintenance is designed for customers with higher volumes of EDI where EDI can take 20 to 40 hours of dedicated time a week from a seasoned IT resource. Navis's service allows IT departments to offload the repetitive work of EDI error monitoring and resolution.

Similarly, with the Navis Extensions Maintenance Managed Services, customers can offload the time and effort required to maintain complex libraries of groovy extensions, including groovy written by the terminal itself or third parties. Beyond that Extensions Maintenance optimizes those libraries and assures that they are compatible with future release prior to upgrade.

SUMMARY

As marine terminals continue to get more and more sophisticated in their use of

technologies, their IT departments are becoming increasingly sophisticated in their approach to keeping up with increasing technical demand. No longer are IT departments in the business of simple maintenance and troubleshooting. To provide value to their terminals, they must constantly be on the lookout for new strategic ways of improving terminal performance. Using Navis Managed Services is one way they can help focus on these new goals.

ABOUT THE AUTHOR

Andy has been with Navis for over 20 years, working as a Project Manager, Director of Support, Director of Training, Director of Professional Services, and most recently as VP of Technical Services. With decades of experience on TOS implementation, training and support, Andy brings a wealth of real-world knowledge about the industry, about the challenges of training, and about the Navis TOS.

ABOUT THE ORGANISATION

Navis provides operational technologies that unlock greater performance and efficiency for our customers, the world's leading terminal operators. The Navis N4 terminal operating system (TOS) represents more than 27 years of experience and innovation that enables terminals to optimize their operations and move cargo smarter, faster and more efficiently.

As an industry leading technology, more than 270 container terminals worldwide, including some of the world's most advanced automated facilities, have partnered with Navis to improve performance, reduce costs and minimise risk.



PTI SPOKE TO:
Uno Bryfors, Senior Vice President,
ABB Ports



“DIGITALISATION IS NOW ACCELERATING AUTOMATION AND AUTOMATION NEEDS TO RESPOND TO THE HIGHER CUSTOMER EXPECTATIONS CREATED BY THE DIGITALISATION.”

REMAINING RELEVANT WITH AUTOMATION

WHAT HAVE BEEN THE BIGGEST CHANGES FOR PORT TERMINAL OPERATIONS TO DATE? HOW HAS ABB BEEN PART OF THESE CHANGES?

Between issue one and 100 of the Port Technology International Journal, container terminals have gone from manual operations with papers and handheld radios as means of communication to fully integrated and automated operation where information exchange is digitalised pretty much everywhere in the terminal. We have also seen how everything has increased in size, speed and functionality. ABB has been the source of several innovations enabling these technological advancements.

Automation of container handling equipment actually started with ship-to-shore (STS) cranes. In 1987 we introduced sway and path control, and the functionality has since then been refined and expanded with skew control, ship profiling, crane OCR, vehicle alignment/identification, automatic landing on vehicles and fully automated portal trolleys.

Yard automation took some major steps forward in Singapore and Hamburg between 1997 and 2001. From 2005 stacking crane automation really took off and has since then been spreading to all parts of the world with accelerating speed. Today well over 1,000 automated yard cranes equipped with ABB's automation systems are in operation or under delivery.

Remote operation is undoubtedly one of the biggest changes in terminal operations over the past 25 years. It has brought the human aspect of terminal operations into focus by providing safer and more ergonomic working environment for the crane operators. Since 2014 we even have completely cabinless STS cranes in operation in a number of terminals.

The remote operation of STS cranes rapidly became a standard feature in large, highspeed STS cranes since it was first introduced by ABB in 2010. Remote operation has also brought quay, yard and on-dock rail operations together and connected them to TOS and vehicle management systems, creating the fully integrated container terminal.

WHAT DO YOU EXPECT TO BE THE BIGGEST ADVANCEMENTS IN CONTAINER TERMINAL AUTOMATION TO BE GOING FORWARD, OVER THE NEXT FIVE TO TEN YEARS?

Lack of reliable data has been slowing down the evolution of automation for decades. With the current rapid digitalisation of our entire industry, this will soon be no concern. Digitalisation is now accelerating automation and automation needs to respond to the higher customer expectations created by the digitalisation.

On-line real time information, precise scheduling, flexible and fast delivery at competitive cost is required – in spite of fluctuating volumes in quay side and gate/rail operations.

Automated equipment and systems will in the next years have to deliver significantly higher throughput for a given size terminal. Automation in various forms will also be deployed in greater extent in all types and sizes of terminals.

The fully integrated container terminal will provide many opportunities for re-thinking how to operate in the future, including changing the roles of the members of the terminal's team.

It will also make operation more resilient for the external factors like the current pandemic.



IN YOUR EXPERIENCE, HOW DO PORTS SUCCEED AT TERMINAL AUTOMATION?

Terminals vary a lot in size, physical limitations, cost structure, from 0 to 99% transshipment and different modalities. The task is to automate the most efficient configuration for each terminal.

The key is to avoid one-off solutions and complicated engineering projects.

Today we can offer proven automation packages for multiple terminal configurations and nodes (quay, yard, rail and gate). Using proven solutions and interfaces from our huge library together with proper testing and verification in a simulated environment enable fast project delivery and cut the ramp-up time to a minimum. Thus, the cranes can start moving containers as soon as the first work order is received.

WHAT ARE SOME OF THE KEY TECHNOLOGICAL INNOVATIONS ABB IS WORKING ON OR LOOKING TO WORK ON? WHY ARE THESE A KEY FOCUS FOR THE COMPANY?

Crane and terminal automation are largely evolution not revolution. We are now developing the 12th revision of the ABB STS automation package and the 10th revision for yard cranes. These will deliver more autonomous operation, higher performance in speeds, accelerations, control and positioning and easier handling for operations and maintenance.

We now deliver automation systems optimised for cabinless STS cranes. Additionally, the remote operation capabilities of

our system allow integrated operation of multiple sections of terminals, or multiple terminals in a port, from a single location.

WHAT ADVICE WOULD YOU GIVE TO ANY PORT HOPING TO AUTOMATE IN 2020 AND BEYOND?

Consolidation is driving bigger calls (and ships) even in markets with low volume growth.

Many terminals now realise that to stay relevant they need to increase capacity and productivity, even more than anticipated just a few years ago.

Terminals increasingly introduce automation step by step as part of expansions and transformation of existing operations: a terminal can be gradually upsized by adding larger quay cranes, by replacing RTG blocks with cantilever ARMGs, or by adding intermodal cranes in the on-dock rail operation. The trend can already be seen for example in automatic stacking crane deliveries, approximately a third of our deliveries now go to originally manual terminals, a share that is increasing. We will also soon see automated horizontal transportation being introduced step by step.

A stepwise approach does not mean that a grand plan for the terminal is not needed.

On the contrary it is necessary to have a long-term vision for equipment, systems and processes to maximise return on investments. The process to introduce automation tends to be smoother and less costly for the terminal if it is started proactively, somewhat ahead of the requirements.

ABOUT THE INTERVIEWEE

Uno Bryfors, Senior Vice President of ABB Ports, is one of the most experienced professionals in the ports industry today. During his four decades long career at ABB and in the industry he has been a key person in driving the development of automation solutions for cargo handling starting from automatic grab ship unloader and automated yard operations to fully automated, integrated terminal operation. Uno Bryfors joined ABB as a Development Engineer after graduation with a Master of Science degree in Electrical Engineering. Since then he has headed the R&D department, led the Crane Systems unit in Sweden, and is now responsible for ABB Ports business- from ship to gate.

ABOUT THE ORGANISATION

ABB Ports develops and delivers intelligent terminal automation solutions and services to make container terminals safer, greener and more productive. The solutions include automation and remote operation for all types of container handling cranes, and complete OCR and electrical systems. With the track-record of the largest installed base, ABB's systems help to optimise container handling from ship to gate in greenfield installations and in existing terminals.



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