



# AUTOMATION TRENDS





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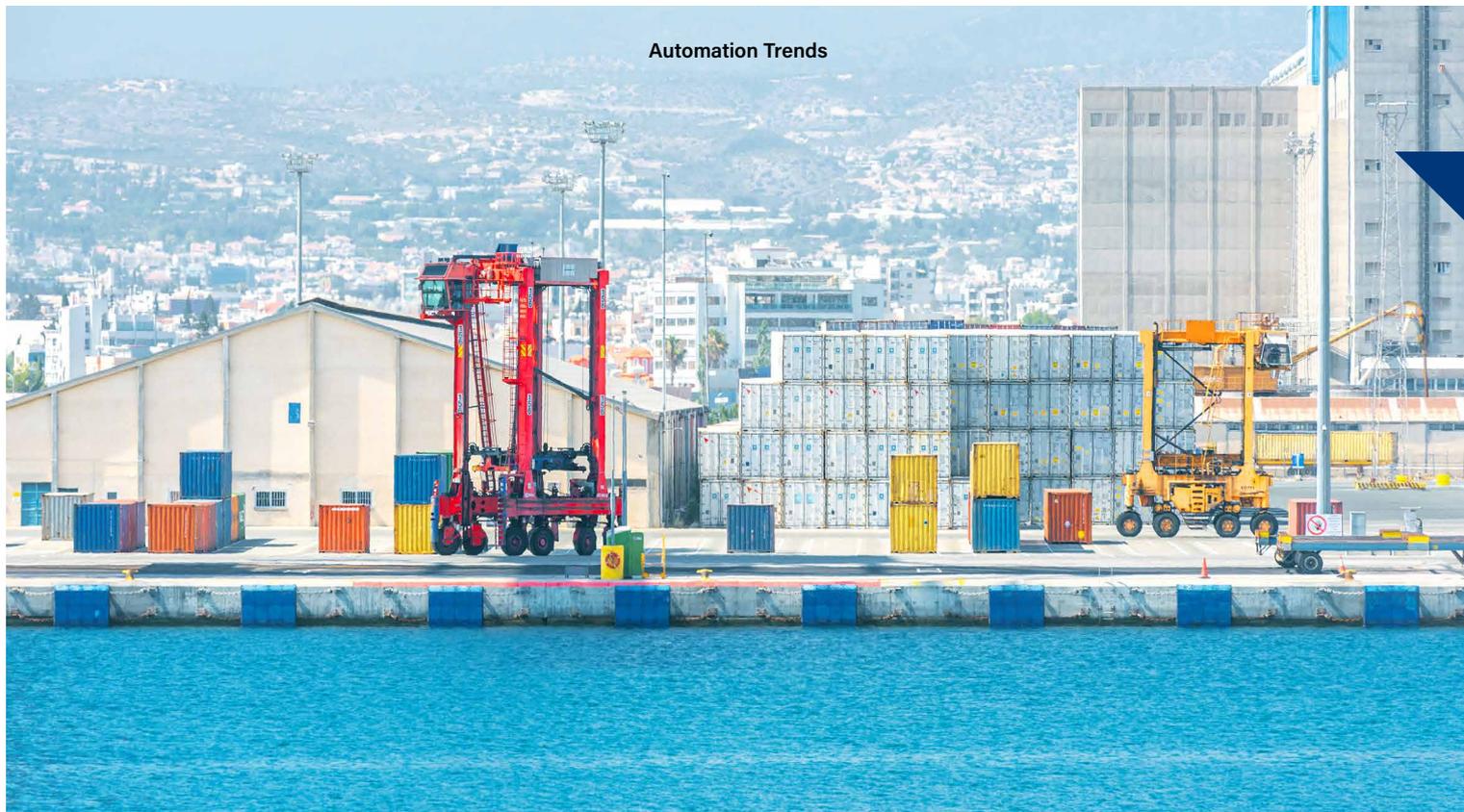
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**Jack Donnelly,**  
Editor

# FOREWORD

Automation and its future in ports is one of the most fascinating talking points across our industry currently. Investment in semi or full automation can provide a wealth of benefits – from an increase in operational efficiencies to driving down emissions through the reduction of wasted moves.

But price points can be eye-watering for cost operators, evoking a value-for-money debate. Moreover, the process of automating equipment is one of the central debate points between parties during crucial ongoing US West Coast labour talks.

This PTI 122 'Automation Trends' edition takes a long look at all things automation in ports and terminals.

We welcome not one but two submissions from global operator DP World on long-term outlooks for port automation.

Tiemen Meester, Group COO of Ports and Terminals at DP World, has contributed an insightful standpoint on the current hurdles logistics chains are facing and how a versatile Terminal Operating System (TOS) can alleviate those pressures. Meester highlights automation in operation at ATI Batangas as a recent example.

We also are delighted to receive an editorial piece from Que Tran, Regional Chief Information Officer and Head of IT, DP World Europe. Tran outlines the green benefits of terminal automation, noting how DP World Antwerp has prevented over 10.6 million kilograms of carbon dioxide from being emitted over a four-year period.

COMPAS is the only network of multipurpose ports in Colombia. Having recently launched its Navis N4 TOS at its container terminal in Cartagena, President & CEO Andrés Osorio Barrera pens his thoughts as to the resulting benefits of investment in automation at the port.

I take a look back at Port Technology International's hugely successful Container Terminal Automation Conference (CTAC) 2022 back in March this year. From standardisation, to emerging technologies, and investment strategies, we reflect on the key takeaways from the event and what to look forward to next year.

Finally, we welcome an outstanding contribution from experts behind a digital twin-based project based in Germany. Funded by the German Federal Ministry for Digital and Transport, read more into how digital twin technologies and emerging solutions such as AI and predictive analysis can drive efficiencies at EUROGATE terminals.



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# AUTOMATION AND THE PATH TO SUSTAINABILITY

**“WITH AUTOMATION YOU CAN VASTLY  
INCREASE THE ACTUAL DIVERSITY OF THE  
TALENT POOL THAT ARE ABLE TO ACCESS  
WORK IN A ‘PORT ENVIRONMENT’.”**

MAIN

DP World Antwerp  
Gateway





### Que Tran,

Regional Chief Information Officer  
and Head of IT, DP World Europe

Ports and terminals are the gateways to smarter, more efficient and more secure global supply chains.

In recent times, the perfect storm of pent-up demand and supply chain challenges has put renewed focus on ports and terminals. DP World is hard at work reimagining the future, with step-change terminal handling innovations designed to streamline our global network of ports and keep trade flowing.

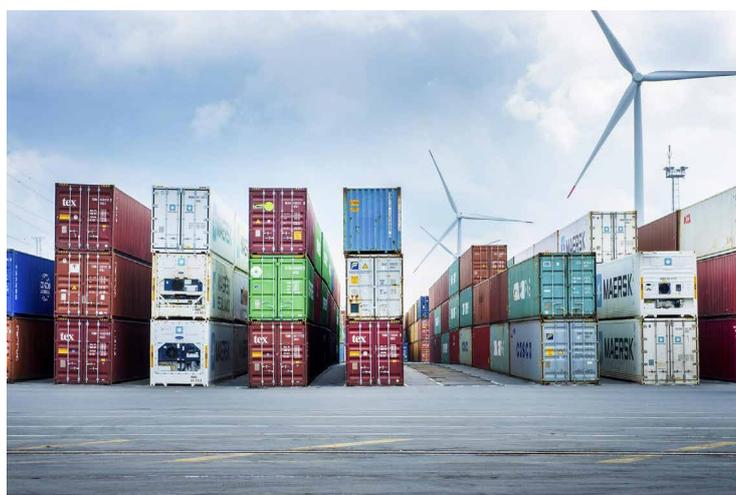
Across Europe, with industry-leading automated terminals in Rotterdam, Antwerp and London Gateway, DP World is well versed in the benefits of automation and its contribution towards sustainability.

During the early implementations of automation in the industry, the commonly envisaged 'technical' and 'operational' benefits of automation included agility, efficiency, safety and scalability. For operations teams following best practice such as Lean, automation has been synonymous with operational and technical efficiency.

There are, however, other benefits that automation enables which are not so commonly trumpeted – this includes sustainability, inclusivity, accessibility and diversity, skills enhancement and increased job satisfaction.

With automation you no longer need to be physically in a cab to operate the equipment. You can operate from a remote office, essentially still within the vicinity of the port and terminal, so extending this beyond the terminal only requires connectivity.

Therefore, with automation you can vastly increase the actual diversity of the talent pool that are able to



access work in a 'port environment'. For the ports and terminal industry, which has traditionally been challenged to attract new talent based on the location, automation brings the opportunity for a more flexible working environment and hours. As an industry we can attract different kinds of workforce who were previously unable to fulfil a location attendance-based type of work, bringing a much greater scope of employability to the industry.

Automation in this case, is serving as a complementing technology, enhancing productivity

and skills, rather than a displacing technology as often portrayed.

### **AUTOMATION & THE JOURNEY TO NET-ZERO**

A key benefit of automation is how it can help to drive the sustainability of our industry and the transition towards net-zero.

According to the Maersk McKinney Moller Center for Zero Carbon Shipping, the global shipping industry accounts for around 3 per cent of global carbon emissions.

**“AUTOMATION ENABLES SYNCHROMODALITY TO WORK BETTER AND DELIVER CARGO INLAND, IN THE MOST OPTIMAL AND GREENEST TRANSPORT MODES AVAILABLE.”**



As the world moves toward a net-zero future, there is a business imperative for decarbonising the industry in line with the Paris Agreement (COP 26) and the United Nations Sustainable Development Goals (SDG).

In the Netherlands, the fully electric, fully automated Rotterdam World Gateway (RWG) terminal is on the pathway to be the first carbon neutral container terminal in the world. It boasts a number of new and existing green innovations and advanced automation technologies, including 84 electric lift AGVs (Automated Guiding Vehicles) that operate on green electricity and 18 state-of-the-art cranes that capture and regenerate their own energy.

In neighbouring Belgium, DP World Antwerp has invested in Automated Stacking Cranes (ASCs), wind turbine and a biogas plant, and plans to invest further in building ASCs to help it meet

its ambition to handle 80 per cent of its volume using automatic and electric cranes by 2026. This would increase capacity by 700,000 containers and simultaneously help reduce emissions as the cranes run on locally produced green electricity.

DP World Antwerp was also the first terminal in the world to publish its own sustainability report, which included information on how it has prevented over 10.6 million kilograms of carbon dioxide from being emitted over a four-year period. The terminal's intermodal links to greener rail and barge facilities were found to take more than 90,000 trucks off Belgian roads.

This is significant when considering that road transport accounts for approximately 12 per cent of global carbon emissions. Thus, automation enables synchromodality to work better and deliver cargo inland, in the most optimal and greenest transport modes available.

**ABOVE**  
ASCs operating on containers at Antwerp Gateway

From the scale of energy required to make and move goods to the resource intensity of logistics, automation can help us focus on measuring and managing our direct environmental impacts and preventing global climate change.

It is important to note that we are just at the cusp of automation in our industry, and the trend for automation is to continually drive forward the sustainability agenda and enhance it through new digital and innovative technologies.

To date, automation has really just been about rules-based decision making.

CARGOES TOS+, DP World's flagship terminal operating system which can also be hosted in the cloud, is integrated into real-time systems and terminal automation. Through complementary technologies within the CARGOES TOS+ ecosystem such as Machine Learning, AI tools, IoT and digital twin platforms, it provides greater

automation efficiency, and also better visibility and interoperability that facilitates the transparency and collaborative efforts in sustainability.

Automation (through data) can provide this transparency and visibility and better facilitate the journey to net-zero.

In short, it is the 'nexus of forces' in the convergence of automation, digital and technology. All combining to provide optimum automation and accelerating the drive towards net-zero.

A common question is how and when to get started on this journey?

The simple answer is that there is no time better than the present. You do not have to wait for completion of one to start the other, for example the completion of automation projects before starting sustainability initiatives.

Both can go hand in hand, and it is not unusual to find that they are highly complementary. For example, automation can contribute to operational efficiencies which directly positively impacts sustainability, and likewise sustainability initiatives can uncover operational deficiencies which can be improved through automation.

### **AUTOMATION BEYOND THE PRESENT**

Moving forward, with advanced technologies such as commercial quantum computing just over the horizon, this will exponentially increase the amount of capacity for complex AI and automation. What we will start to see more of in the future is the self-maintaining and the self-directing of automated equipment. This will enable optimal reliability, further improve efficiencies and thus contribute towards a more sustainable business.

Already today smart innovations in transformative automation technologies like BOXBAY, DP World's intelligent High Bay Storage (HBS) system, can increase terminal handling speed, energy efficiency and safety, while decreasing operating costs.

**“THE DESTINATION SHOULD BE THE SAME - IT IS ABOUT THE COLLECTIVE INTENT AND DRIVE TO SUCCESSFULLY REACH THAT END GOAL DESTINATION OF DECARBONISATION AND NET-ZERO.”**



**RIGHT**  
BOXBAY structure

Looking to the future, we have invested in revolutionary technologies such as Hyperloop, an advanced, on-demand, incredibly fast cargo pod system that will give cargo owners synchronised, seamless and intelligent movement of goods – to connect the automated green port to the smart cities of the future.

Across the industry, different regions and countries will be at varying stages of their automation journey and path towards net-zero, however the destination should be the same – it is about the collective intent and drive to successfully reach that end goal destination of decarbonisation and net-zero.

Mark Zuckerberg has a now famous quote: to “move fast and break things”. With the right investment in automation and commitment towards a better future, a more agreeable and sustainable perspective would be to “move smart and fix things”.

### **ABOUT THE AUTHOR**

Que has extensive senior technology and transformation leadership experience, with a focus on cyber, digitalisation and innovation initiatives to help protect, optimise and transform organisations and the industry.

Que is currently leading the Technology function across Europe at DP World and has been named among the top 30 leading business and technology executives in the CIO 100 by CIO UK.

### **ABOUT THE ORGANISATION**

DP World is the leading provider of worldwide smart end-to-end supply chain logistics, enabling the flow of trade across the globe. DP World's comprehensive range of products and services covers every link of the integrated supply chain – from maritime and inland terminals to marine services and technology-driven customer solutions.

# DIGITAL TWINS AND AI FOR CONTAINER TERMINALS

**“SIMULATION TECHNOLOGY HAS SUCCESSFULLY TAKEN ITS PLACE IN THE PORT AND TERMINAL INDUSTRY.”**





**Leonard Heilig**, University of Hamburg, driveMybox, **Holger Schütt**, akquinet port consulting, **Paul Kokot**, EUROGATE Technical Services

Recent years have again shown how vulnerable global supply chains are when it comes to disruptions. Different situations, such as terminal lockdowns, the Suez Canal obstruction, and Brexit, led to situations where major bottlenecks occurred at container terminals. At the same time, container terminals are under pressure, forced to serve bigger and bigger vessels with more cargo per arrival in shorter times. And, what's more, requirements regarding environmental sustainability are rising.

While enhancing the productivity in container terminals, new means to improve resilience and eco-friendliness are more important than ever. The use of digital technologies can significantly increase transparency and, together with Artificial Intelligence (AI), forms an important basis for operational and strategic decisions. The digital twin is considered as key concept and enables physical systems to be represented in the digital world. This builds a basis for various use cases supporting harsh day-to-day operation at the terminal.

## DIGITAL TWINS

What is a digital twin? Digitalisation has taken big steps in the industry in previous years. More and more sensors are plugged into machines to provide data of the current state of each single component of the system. But how to make use of large amounts of data in daily operations?

According to VanDerHorn and Mahadevan (2021), a digital

twin is a virtual representation of a physical system (and its associated environment and processes) that is updated through the exchange of information between the physical and virtual systems. Essential is that there is a constant and bilateral data connection between the physical and virtual systems. That is, digital twins are able to represent real-time data, such as in forms of visualisations, but are also utilising data from different sources to have an impact on the operational processes by analysing data and providing decision support. The association of the environment and processes is crucial for this symbiosis, achieved by applying sensor technologies and connecting operational systems.

But a digital twin not only allows to represent the current state of a physical system. By using modern data storage

systems, we are able to jump back in time and learn from past processes and even project future scenarios using predictive analytics. And now comes the clue: we are able to even adjust operational parameters and circumstances in a way that we can ask questions like "What would have happened if..." and get certain answers from our digital twin who can visit other places and situations, get back, and share those experiences and learnings with his physical twin.

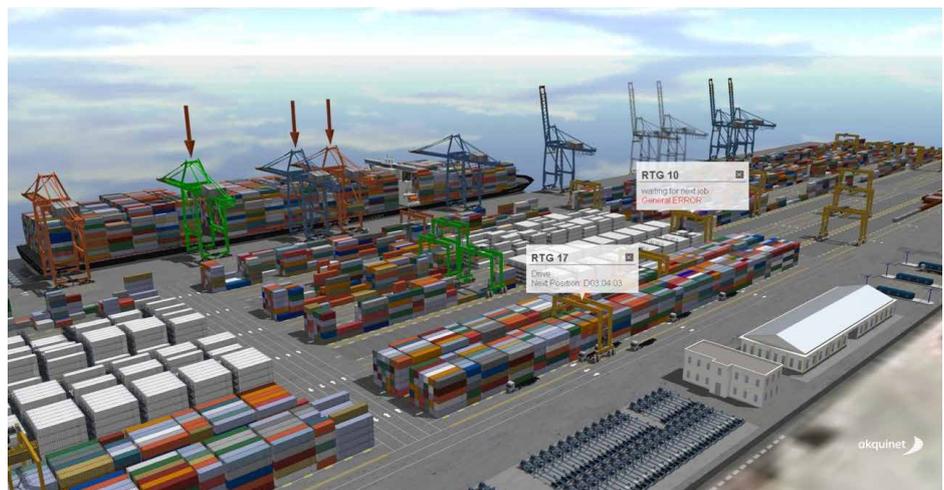
## IMPORTANT FUNCTIONS AND USE CASES IN CONTAINER TERMINALS

### Visualisation and Monitoring

Most people think in pictures instead of bits and bytes or tables. Thus, for humans, providing a view based on pictures will be the perfect view of the current operation at the terminal.

3D-Animations – known from the

**BELOW - FIGURE 1**  
CHESSCON Live-View



## “3D-ANIMATIONS... HAVE MADE ENORMOUS DEVELOPMENTS IN RECENT YEARS, WHICH ALLOWS THE USE OF THIS TECHNOLOGY FOR REAL-TIME VISUALISATION OF ALL PROCESSES AT THE TERMINAL.”



### LEFT

CSCL Arctic Ocean,  
Unifeeder Spirit  
and Marie Maersk  
at EUROGATE  
Container Terminal  
Wilhelmshaven  
Source: EUROGATE

gaming industry – have made enormous developments in recent years, which allows the use of this technology for real-time visualisation of all processes at the terminal as a “Live-View” (see Figure 1).

The first idea that comes to mind is that we need to show the same view as looking out of the window from the control room. But, the use of Augmented Reality (AR) or even Virtual Reality (VR) functions will allow the highlighting of specific activities and states additional to the real world view and can be also used for training purposes.

Other views for terminal staff may be dashboards, showing on one view the current state of all machines of a specific equipment type or aspects from operational processes. By selecting a specific piece of equipment in the 3D-live-visualisation or in the dashboard related properties can be shown which may be different, for example, for yard planners or maintenance staff. Planners might be further interested in contextual information, such as in which process the Container Handling Equipment (CHE) is currently working and what the next jobs are.

Monitoring is used to analyse the recent past and shows the results in a dashboard with pre-defined KPIs. It allows to trigger notifications or even processes in case pre-defined thresholds are exceeded. Moreover, we can monitor the current utilisation of CHE to support the best selection of equipment based on sophisticated algorithms. It further allows to track the conditions of superstructure, especially CHE, in order to estimate when maintenance should be performed.

### Simulation

Simulation technology has successfully taken its place in the port and terminal industry mainly for planning, testing and training tasks. Based on a digital twin it currently supports day-to-day operations at the terminal.



There are mainly two fields of applications:

- Based on the whole information saved in the recent past, “re-plays” of historical scenarios are possible. The control staff may re-run the scenario from a recent shift and replay the operation to analyse occurred bottlenecks or inefficiencies. Furthermore, the planners may run exactly the same scenario with another set of planning parameters to understand and learn how to act better next time.
- Terminal operators may also use simulation technology to forecast the upcoming operation. Based on the current state of the terminal and all its components, the scenario for a simulation run is more or less fully defined. Additional to the states of the yard and all pieces of equipment, the current state of the planning parameters out of the TOS has to be provided to the simulation. This preview functionality can be started by the terminal staff, but it may also run in a scheduled

way. In this case warnings will automatically be generated, if pre-defined milestones (such as when a vessel service is finished) will not be achieved. Thus, either the control staff or – in a more automated way – the Terminal Operating System (TOS) may rethink the current planning and adapt it to the results of the preview.

Both applications of the simulation technology, the “re-play” of historic scenarios as well as the “preview” of the upcoming operation, support the terminal operator and the algorithms in the TOS to find the best decisions and improve the planning of the operation, which will lead to more productive and more efficient processes.

#### **Predictive analysis based on AI**

Another upcoming trend in the port and terminal industry is the field of AI. Again, the data collected within the digital twin is used as a base for AI methods. These methods analyse the big amount of data available and detect correlations between

#### **ABOVE**

Marie Maersk, Unifeeder Spirit and CSCL Arctic Ocean at EUROGATE Container Terminal Wilhelmshaven

Source: EUROGATE

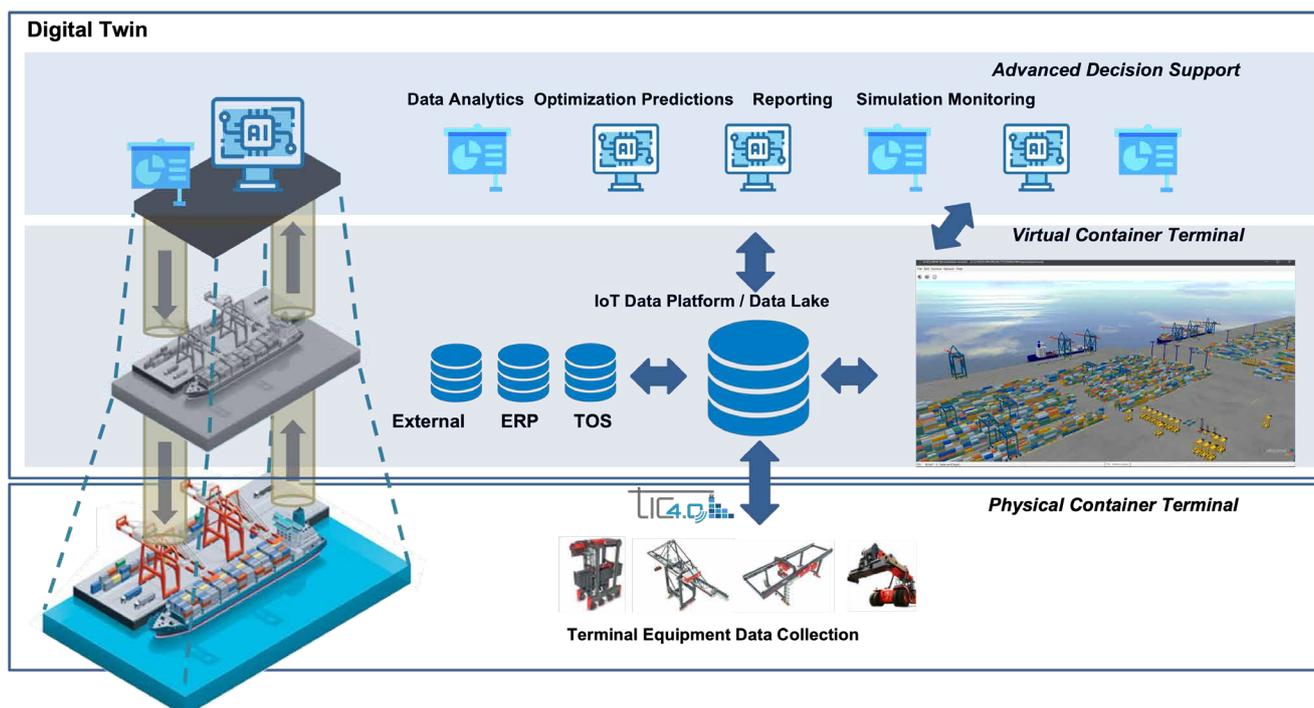
various parameters as well as patterns leading to specific situations. These insights are incorporated in sophisticated optimisation algorithms that automatically and dynamically support planning decisions (such as allocation and dispatching of CHE, assignment of yard storage locations, and on) in order to optimise certain objectives, like the utilisation of equipment, empty trips, and environmental impact.

Another application is predictive maintenance: in this case patterns of sensor data are detected which lets terminal staff know to expect a break down of the device within the next hours/ days and maintain the equipment condition dependent instead of fixed time intervals only. This can be used to better align operational and maintenance processes in order to be more resilient against breakdown-related disruptions.

#### **TWINSIM: DIGITAL TWIN AT EUROGATE**

At the end of 2021, EUROGATE Group and the University of Hamburg initiated the project ‘TwinSim’ and invited akquinet port consulting to join with the aim of developing a digital twin of processes and equipment in container terminals. The three-year joint project is sponsored by the German Federal Ministry for Digital and Transport (BMDV) within the Program for Innovative Port Technologies (IHATEC) and has a grant of €3.65 million (\$3.74 million).

**“WITHIN A FOUR-LEVEL ARCHITECTURE A 3D LIVE VISUALISATION WILL BE PROVIDED, SHOWING THE WHOLE TERMINAL WITH ALL ITS OBJECTS AND PROCESSES.”**



The scope of the project is to build a digital twin for supporting operations and maintenance at the EUROGATE Container Terminal Hamburg (Germany). In the first project phase, main use cases were identified in workshops and interviews, following a structured approach and value benefit analysis. Key topics include the digitalisation of equipment (mainly quay cranes, straddle carriers, rail cranes), deriving operationally relevant key figures and insights from data, equipment monitoring and predictive maintenance, and decision support for operational handling processes using AI. As shown in Figure 2, the digital twin will support all types of functions – from 3D visualisations over control to advanced decision support with simulations, business intelligence and AI.

EUROGATE will implement the required technology on the terminal equipment, such as IoT and edge devices, to establish the physical layer. Moreover, a central datalake and ETL processes will be established to process data from the physical layer, integrate it with planning and process data from the TOS and external systems (such as weather stations), and further

**ABOVE - FIGURE 2**  
TwinSim Generic  
Architecture

connect with the Enterprise Resource Planning (ERP) system to automate support processes, such the ordering of spare parts in the context of predictive maintenance. For the integration of the terminal equipment, Terminal Industry Committee (TIC) 4.0 specifications are adopted.

TIC 4.0 is an initiative which plans to standardise the communication between equipment, systems and subsystems at a container terminal by establishing a common data language and definitions (syntax and semantic) among the companies involved in the cargo handling industry.

“The TwinSim project done by EUROGATE with the project partners from akquinet and University of Hamburg is one of the big pilot implementations of TIC 4.0 standards currently undertaken. It – again – shows the importance of standards when integrating data from different sources to have one unified view on this. Talking TIC becomes more important,” said Norbert Klettner, Vice-President of TIC 4.0.

The research group at the University of Hamburg will analyse the data with means of AI to optimise the planning

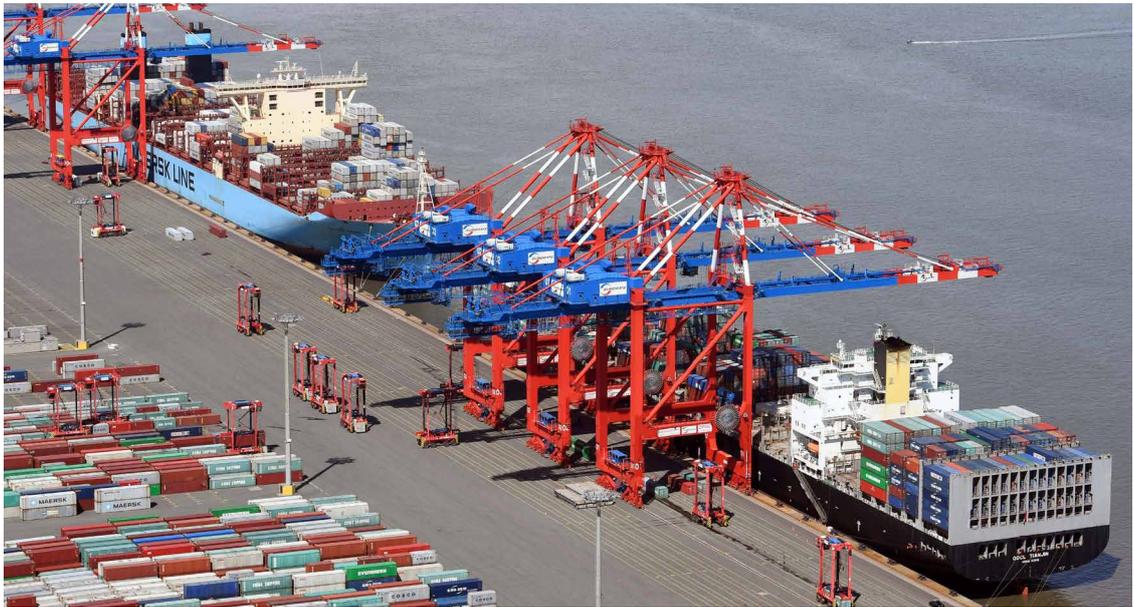
and processes, further taking into account and optimising the environmental impact of operations and individual activities.

Visualisation and Monitoring will be based on akquinet’s 3D-Visualisation “Live-View”, which is part of the CHESSON family. Within a four-level architecture a 3D Live Visualisation will be provided, showing the whole terminal with all its objects and processes. In parallel, dashboards for all types of objects will be provided, showing an overview of all devices of this type. By either clicking on the object in the 3D or selecting a special device in the dashboard, detailed information of the piece of equipment will be shown. Beyond this overview, monitoring data and timelines may be selected and shown. Based on the CHESSCON Sim – and Emulation family, simulation applications – as described above – will be configured to support retrospections and what-if analysis.

Overall, this will lead to a high operational transparency and data-driven and situation-based optimisations, improving processes with respect to efficiency, productivity, resilience, and environmental impact of container terminals.

**RIGHT**

Mayview Maersk  
und OOCL Tianjin  
at EUROGATE  
Container Terminal  
Wilhelmshaven  
Source: EUROGATE

**ABOUT THE AUTHORS**

**Dr. Leonard Heilig** is Co-Founder and CTO at driveMybox and research project leader in the project TwinSim. In those roles, he leads the research and development in the areas of simulation-based optimization, machine learning and cloud computing. He holds a B.Sc. (University of Münster, Germany) and a M.Sc. (University of Hamburg, Germany) in Information Systems and received his PhD at the University of Hamburg. He spent some time at the University of St Andrews (Scotland, UK) and at the Cloud Computing and Distributed Systems (CLOUDS) Laboratory at the University of Melbourne, Australia. In the last years he published more than 50 scientific articles and books in the areas of maritime logistics, operations research and cloud computing, served as guest editor in several peer-reviewed journals and worked as consultant in international logistics projects.

**Prof. Dr. Holger Schuett** combines academics, research and professional services in the field of port and terminal processes and IT. He grew up in Germany and received his Diploma in Applied Mathematics at the University of Hamburg. After he obtained his PhD in Automations Technology in the Technical University in Hamburg-Harburg he joined HHLA, the biggest terminal operator in Germany. The major project was the sim- and emulation based support for the fully automated terminal in Hamburg-Altenwerder (CTA). The emulation technology implemented in 1999-2002 is still used for software releases as well as optimising terminal's strategies. After CTA's going live he joined 2003 the worldwide recognized Institute of Shipping Economics and Logistics (ISL). In 2010 he founded the commercial subsidiary akquinet port consulting GmbH. Also in 2010 he joined the University of Applied Science Bremerhaven as a professor for the mastercourse "Integrated Safety and Security Management". In 2022 he retired from the university and the institute but is still working for akquinet port consulting GmbH.

**Paul Kokot** as Chief Project Manager is responsible for the successful implementation of the TwinSim project. He received his diploma in electrical engineering and automation technology at the University of Bremen. After graduating, he first worked as a member of a working group of the International Electrotechnical Commission (IEC) on the standardisation of wind turbine interfaces. As a developer and later as head of the development department, he was responsible for the implementation of control-, SCADA- and real-time simulation systems in the context of offshore wind energy. He is therefore familiar with the collection, processing, simulation and visualisation of data as well as the importance of this data for the fault-free operation of technical equipment. He joined the EUROGATE Group in 2019, and in addition to automation projects, he is mainly responsible for the development of software solutions in the field of digitalisation.

# TAKEAWAYS FROM CTAC 2022

**"AUTOMATION IS ABOUT CONSISTENCY,  
EFFICIENCY, AND ROI."**





**Jack Donnelly,**  
Editor, Port Technology  
International

Earlier this year Port Technology International welcomed back attendees for the first time since prior to the pandemic for its long-awaited Container Terminal Automation Conference (CTAC) 2022 at the Chelsea Harbour in London.

Automation was the core focus of the event on 9 and 10 March – but the ultimate thrust of the event was on business transformation.

Weapons to achieve optimisation and transformation broached a wealth of automated solutions, of course – automated yard organisation, weighing systems, and terminal entry and exit gates, to name just a few. Yet in the name of transformation, a terminal operator must consider all emerging solutions available to them in our exciting industry. Now, for this automation-focus edition of our e-journal, we briefly look back on some of the key talking points of the fantastic Spring event.

### PROGRESSING STANDARDISATION

Day One kicked off with an interview between myself and Terminal Industry Committee (TIC) 4.0 Founder & Chairman, Boris Wenzel.



### RIGHT

Pictured (left to right): Alla Anashenkova, Head of Product, ThroughPut Inc; Que Tran, Head of IT - Europe, DP World; Pat O' Leary, Head of Technology, PEMA; Matt Stride, Business Optimisation Manager, DP World Southampton; Matthew Wittemeier, Director Marketing and Sales, INFORM's Terminal & Distribution Logistics Division



Wenzel has a wealth of knowledge in terminal operation – with Terminal Link SAS, and PSA International in his repertoire of previous workplaces – but his latest role is as Founder and CEO of TIC 4.0, one of the industry's leading bodies to implement standardisation in ports and maritime.

The interview set the tone ahead of the two-day event due to the overarching need for automated processes to be able to 'talk' to each other. Sharing data across a container terminal can skyrocket an operator's understanding of how a terminal is performing, and where it can improve. But what happens when an Automated Stacking Crane (ASC) produced by one manufacturer has a different gauge of performance compared to another? Or automated processes in a Terminal Operating System

(TOS) have different language sets than an Application Programming Interface (API) implemented by the operator – and they are all in use in the same yard?

This is where standardised processes come in. TIC 4.0 has now released four sets of standards interfaces for terminals to adopt and simplify language in their operations. With this, Wenzel argued that assessment, prognosis, and strategising of future operations becomes easier.

"When you go from one terminal to another, it is hard to compare the productivity of two terminals, unless you apply your own standard to assess how a terminal operates in the same way," Wenzel commented.

"My shareholder in my previous role was the CMA CGM Group. They had their own standards



for berth productivity, which did not agree with the terminals that they were shareholding in." If you implement TIC 4.0 standards, Wenzel contends, terminals can embark on refined analysis of where they have bottlenecks. "From these bottlenecks you can determine improvement strategies

to reduce your cost and improve your productivity," he said.

Since the event in March, TIC 4.0 has added industry trailblazers Prodevelop, Siemens, Nokia, and Bromma as members; accelerating the industry's collective will to 'Talk TIC 4.0' and drive forward common language platforms.

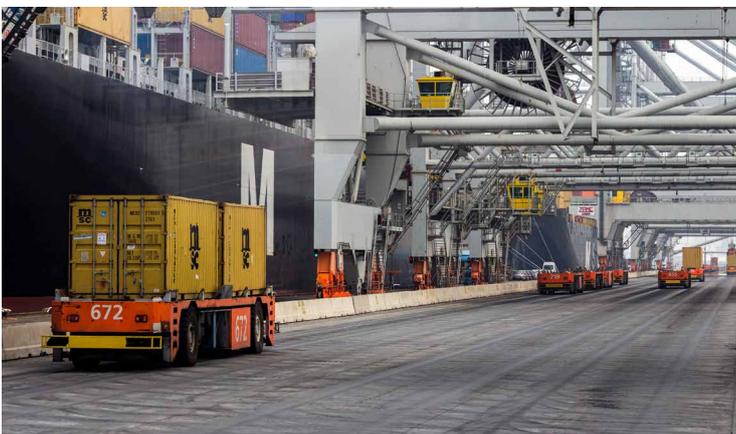
#### ABOVE

Pictured (left to right): Alan Peterson, Industry Segment Leader - Crane Systems, TMEIC; Christian Blauert, Global Director Port and Terminal Development, Moffatt & Nichol; Eleanor Hadland, Senior Analyst, Ports & Terminals, Drewry; Eva Savelsberg, SVP, INFORM's Terminal & Distribution Logistics Division; Sue Terpilowski, Managing Director, Image Line

#### AUTOMATION: PART OF THE BIGGER PICTURE

Through the event experts provided presentations, insights, and participated in discussions on optimising terminals through automation and emerging technologies. DP World's BOXBAY, for example, presented on how the structure can automate the container stacking process by vertically positioning containers in storage. In another session, AUCOS-Systems walked through how they can introduce fully automatic systems coupling and decoupling of containers.

But it was not just automation as the sole topic of discussions. Among wider talking points included technologies such as IoT in use at APM Terminals, Digital Twin technologies at the Port of Rotterdam, and Artificial Intelligence (AI) and Machine Learning (ML) software provision through



## **“WHEN YOU GO FROM ONE TERMINAL TO ANOTHER, IT IS HARD TO COMPARE THE PRODUCTIVITY OF TWO TERMINALS, UNLESS YOU APPLY YOUR OWN STANDARD.”**

companies such as INFORM.

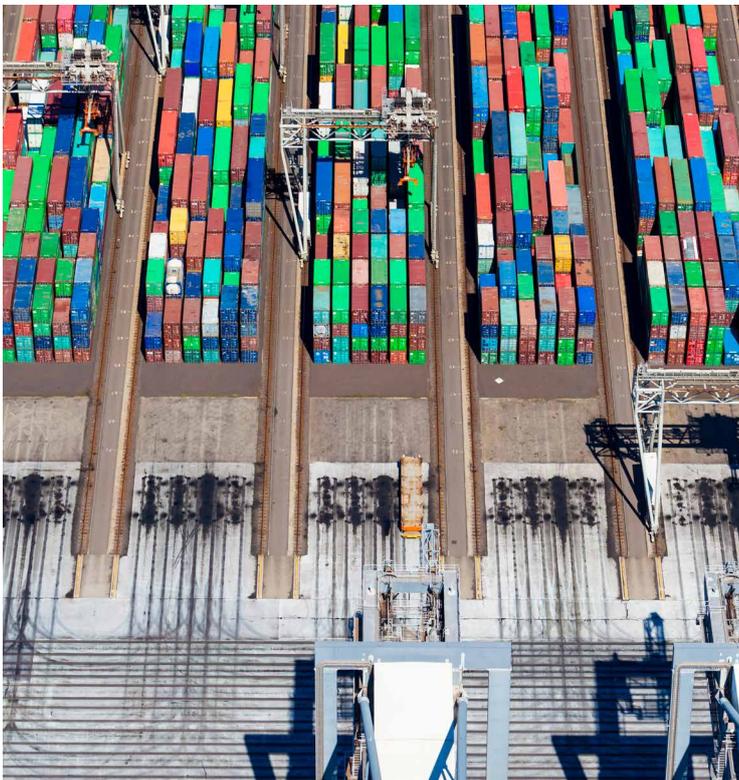
When presenting these technologies to a terminal operator, the wealth of options can be overwhelming. Experts at the event echoed the message that automation is itself a single strand of business optimisation, and not the end game.

Pat O’Leary, President of the Port Equipment Manufacturers Association (PEMA), said it best: “Digitisation and digitalisation are different things. Digitalisation is an umbrella name for IoT, AI, Augmented Reality (AR), Virtual Reality (VR), and big data. Automation is also one of the paths digitalisation.

“This is something that many people in the industry have missed over the years, though they are learning more: the end game is transformation, changing business for the betterment of business. This is not tweaking it, it is a complete change, and something people have to recognise.”

### **RESILIENCY**

The event wrapped up on Day Two assessing the investment benefits of automation in the face of global supply chain disruption.



The ongoing fallout of the COVID-19 pandemic, conflict in Ukraine, in addition to events such as the recent strikes that have hampered Northern Europe can all be game-wrecking influences in the works of logistics chains worldwide.

Creating resiliency through automation is one answer to this challenge. In the face of uncertainty of where a container is on its end-to-end journey Christian Blauert, Global Director of Port and Terminal Development at Moffatt & Nichol, commented during the final panel session: “The automation aspect we might consider on resiliency is that operators who utilise a fully automated terminal enjoy a lot of flexibility. You can switch your capacity on when you want.”

Automating processes, however, can still be a risk-ridden investment for terminal actors moving forward. Automating terminals, whilst optimising processes, can reduce the need for as many staff members working a terminal, putting jobs at risk. The ongoing talks in the United States West Coast between the Pacific Marine Association and the International Longshore and Warehousing Union (ILWU) have highlighted the concern that automation creates to the future of industry jobs.

Moreover, in June, the Ports of Auckland scrapped its terminal automation project at the Fergusson Container Terminal, writing off NZD\$65 million (\$40 million) in terminal software automation after its project was late and unable to meet operational targets.

The Ports of Auckland case study emphasises that automation is a significant investment, first and foremost. And achieving value is essential. Alan Peterson, TMEIC, told the audience that automation starts with Return on Investment.

“Automation is about consistency, efficiency, and ROI,” he said. “If a terminal operator is going to invest \$300 million to create an automated terminal, it’s all about how quickly can operators see that money returning to them.”

# CAN WE FIX TRADE WITH THE CLICK OF A BUTTON?

**“WHAT IS MAKING THE SMART PORTS [IN ASIA] SO SUCCESSFUL IS THE IMPLEMENTATION OF INDUSTRY 4.0: A REVOLUTION OF THE ENTIRE TERMINAL ECOSYSTEM.”**

MAIN  
Sunset view of Port of  
Vancouver



**Tiemen Meester,**  
Group COO, Ports and Terminals,  
DP World

Supply chain delays continue to plague the headlines – and while there are many contributing factors, the overarching issue is capacity.

Ports worldwide are struggling to keep up with skyrocketing demand for greater volumes of cargo – with the added expectations that deliveries are faster and greener wherever possible. Staff numbers, outdated equipment, and square-footage are failing to meet this demand at a time when people need reliable trade most. This infrastructural inability to deal with changing trade patterns is having a direct impact on capacity at sea too, leading to unsustainable costs for customers and consumers.

Expanding port capacity to save our supply chains and bring costs down is a pressing need, but this is no small feat. At DP World Vancouver in Canada, for example, renovating the infrastructure of this container terminal has been a decade-long project. On a global scale, we simply cannot afford 10 more years of supply chain flux to implement this change.

However, what we have at our disposal in the meantime is the ability to leverage existing

technology. While Terminal Operating Systems (TOS) are not the panacea that will overhaul global supply chains for good, they are a vital tool that can help us build smarter, more agile solutions for our ports and terminals as trade continues to boom.

Fully utilising TOS and port automation can offer us the real-time data we need to plan better, negate delays, and automate processes for the faster and greater transition of cargo through our port environments. Importantly, as we are seeing in the East, the data gleaned from this resource can also help us strategically envision long-term management of larger cargo volumes in a faster, efficient way that minimises our industry's impact on the environment.

#### **EMBRACING INDUSTRY 4.0**

Post-pandemic, in a world driving towards a net-zero agenda while demanding greater, faster volumes of cargo, TOS is being reviewed as a resource that will reimagine existing port models. Because when this smart solution is properly implemented, it can cut carbon emissions and costs for

every party along a supply chain – and spark exponential economic growth by increasing capacity.

By 2026, for example, the global smart ports market is projected to reach \$5.1 billion from \$1.7 billion in 2021 – and the area leading this transition is the Asia-Pacific region.

Over half of the world's smart ports are found in Asia (equating to over \$850 million in value), and this is due to the region's central role in global manufacturing and supply chains.

Asia's ports have the ability to deal with enormous volumes of cargo, which they have achieved, in part, by adopting more efficient terminal operations.

Specifically, what is making the smart ports here so successful is the implementation of Industry 4.0: a revolution of the entire terminal ecosystem. This makes automation, AI, real-time data, and connectivity to the Internet of Things (IoT) the foundation of their everyday workings – and it is paying off.

To understand how this translates into greater capacity and improved performance, let us look at ATI Batangas Container Terminal in the Philippines – a good example of Industry 4.0 in action.

**“WHILE TERMINAL OPERATING SYSTEMS ARE NOT THE PANACEA THAT WILL OVERHAUL GLOBAL SUPPLY CHAINS FOR GOOD, THEY ARE A VITAL TOOL THAT CAN HELP US BUILD SMARTER, MORE AGILE SOLUTIONS FOR OUR PORTS.”**



### **AUTOMATION IN ACTION: ATI BATANGAS**

This year ATI Batangas implemented CARGOES solutions from DP World which connects TOS, automated gate systems, customs functions and more to the IoT, centralising every element of a terminal's operations.

CARGOES TOS+, along with other solutions, was easily integrated into existing platforms and did not require extensive training to use. Each programme also offers a secure option for vendor transactions and data sharing – a must for maintaining the seamless flow of goods.

These programmes work in tandem to automate all the moving parts of a terminal – from ship-to-shore-cranes to fleet management systems – creating a synchronised system that works faster and can process more cargo.

For Batangas, which handles 450,000 TEU annually, everything from gate entry to the cranes needed to move goods now operates from a centralised, cloud-

based system. Using a 3D map of the terminal, Batangas staff use smart maintenance to enhance equipment uptime and prevent costly delays; the IoT enhances their productivity drive, aligning with shipping lines to improve schedules; and with real-time capacity monitoring, they predict future needs to improve customer service and value.

This granular detail can also be used to optimise yard utilisation, operation strategies and ETAs through simulation modelling, providing Batangas with data they can use to justify site improvements and hit KPIs. For example, within 23 days of adopting this new TOS system this year, ATI Batangas was seeing an average increase of 3.1 movements per hour amongst its quay cranes.

Customers stand to make huge gains from this kind of predictive software too. With ETA modeling, a port can predict when a piece of equipment is needed to move a container – and this information can be proliferated beyond the

### **ABOVE**

Aerial view of entire terminal at ATI Batangas port

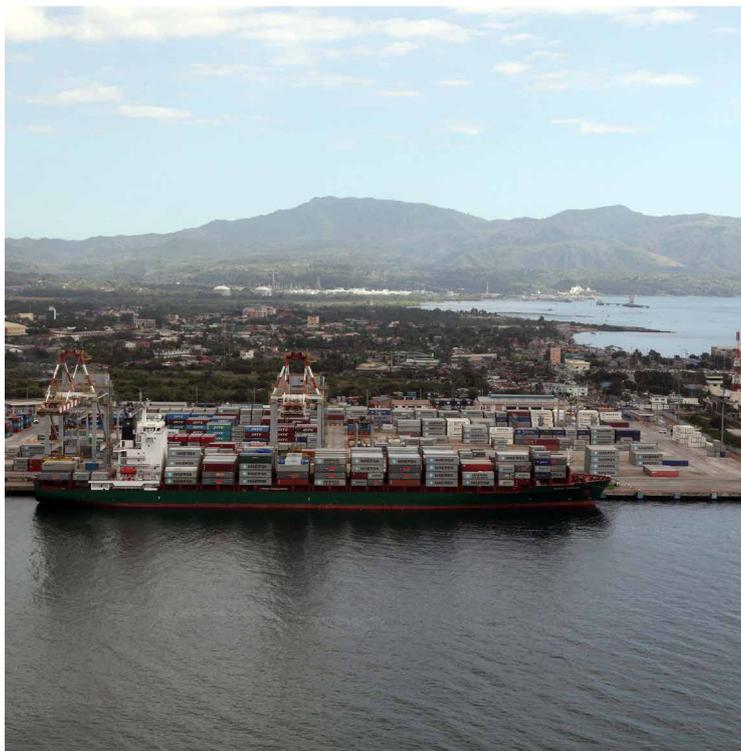
port's borders, such as to inland container depots. This connected supply chain also provides accurate live cargo tracking, meaning businesses at the end of the supply chain can make more informed decisions.

Already, the benefits of smarter ports are showing. Efficiency is set to increase by as much as 35 per cent as a direct result of automation and the average expenses at automated ports like ATI Batangas have been reduced by as much as 35 per cent.

### **WORK SMARTER, WORK SUSTAINABLY**

Using the IoT to drive TOS has ripple effects beyond smart ports and their capacity – which is relevant when it comes to the matter of sustainability.

Our industry is famously not eco-friendly, but automating ports is improving this. In terminals such as DP World Antwerp, for example, electric Internal Terminal Vehicles (ITVs) controlled by the site's TOS are contributing to



**LEFT**  
Aerial view of customer vessel and yard at ATI Batangas port

their achievement in halving their carbon emissions since 2013 – a staggering feat for a terminal that handles over 2 million TEU every year. Having the facilities to predict problems and plan accordingly ahead of time creates options to maximise higher capacity multimodal transport as well, such as rail and barge instead of high pollution trucks.

Clearly, TOS automation carries enormous potential for the terminals and regions using them, as seen with Batangas. But it does raise questions around its limitations; how effective can the latest TOS automation really be if only some ports are adopting it?

If we cannot implement this level of hyperconnectivity across every port and terminal, regardless of

**“IF WE CANNOT IMPLEMENT THIS LEVEL OF HYPERCONNECTIVITY ACROSS EVERY PORT AND TERMINAL, REGARDLESS OF SIZE, THEN THERE WILL BE LIMITATIONS TO HOW MUCH WE CAN IMPROVE CAPACITY AND EFFICIENCY THROUGHOUT OUR SUPPLY CHAINS.”**

size, then there will be limitations to how much we can improve capacity and efficiency throughout our supply chains.

However, COVID-19, instability in Europe and other factors are driving a rapid shift towards terminal automation – because it offers the reliability and resilience needed to keep goods moving and get supplies to where they are needed. Those who resist transforming into smart ports will see lower outputs and profits, because manual processes cannot compete with smart port capability or capacity.

Already, TOS software is streamlining aspects of our supply chains such as administration and over-reliance on manpower – factors which delayed world trade through errors and, as we saw during the pandemic, mass staff absences.

By shifting our focus to how TOS software can help boost capacity, we can begin to overcome the barriers facing our supply chains and the wider industry. With cargo volumes on the rise, sophisticated automation from such software will ease the impact of rising cargo demands and help us envision a more efficient, cost-effective future for trade.

#### **ABOUT THE AUTHOR**

Tiemen is the Group Chief Operating Officer, Ports & Terminals at DP World. Tiemen has worked in the industry for 30 years, with experience covering the globe on large scale multi-port acquisitions, greenfield and brownfield port projects, and logistics responsibility over a large portfolio of ports and terminals.

#### **ABOUT THE ORGANISATION**

DP World is the leading provider of worldwide smart end-to-end supply chain logistics, enabling the flow of trade across the globe. DP World's comprehensive range of products and services covers every link of the integrated supply chain – from maritime and inland terminals to marine services and technology-driven customer solutions.



# COMPAS STRENGTHENS ITS OPERATING SYSTEM IN CARTAGENA WITH NAVIS N4

**"COMPAS HAS INVESTED MORE THAN \$278 MILLION IN THE DEVELOPMENT OF PORT INFRASTRUCTURE AND TECHNOLOGY BETWEEN THE YEARS 2013 AND 2021."**



**Andrés Osorio,**  
President & CEO, COMPAS

Ten years ago COMPAS was established, a company that entered the Colombian port market with the aim of taking advantage of the privileged location of the Latin American country, in favor of foreign trade.

This is how the company developed the only network of multipurpose ports in Colombia with four terminals in the Atlantic Ocean: Barranquilla, Cartagena and Tolú; two terminals in the Pacific Ocean, in the District of Buenaventura and an international operation in Houston, Texas, United States.

With the intention of providing its clients with an efficient and standardised service in each of its terminals, throughout its history, COMPAS has invested more than \$278 million in the development of port infrastructure and technology between the years 2013 and 2021, and in this 2022 it will be investing \$55 million in order to continue strengthening its port network and expand the storage capacity for food bulk in the terminals of Tolú, Barranquilla and Cascajal. This investment includes the purchase of 100 per cent of the port operator of its terminal in Cartagena, CCTO (Cartagena Container Terminal Operator), where the Company already had a 50 per cent stake.

Specifically at its Cascajal terminal located in Buenaventura, specialised in handling solid bulk, the organisation will begin the construction of two vertical silos with a capacity to store 26,000 tons of bulk food, a work projected to be completed in the first half of 2023.

In addition to the above, COMPAS is in the process of implementing the new TOS (Terminal Operating

## **“THE NEW TOS... WILL ALLOW [CARTAGENA] TO HAVE A MORE EFFICIENT HANDLING OF CONTAINERS AND, IN THE MEDIUM TERM, TO SEMI-AUTOMATE CARGO ENTRY AND WITHDRAWAL PROCESSES.”**

**PREVIOUS**  
COMPAS Cartagena

System), Navis N4, at its container terminal in Cartagena, which will allow it to have a more efficient handling of containers and, in the medium term, to semi-automate cargo entry and withdrawal processes.

Currently, it is developing the configuration stage of the Navis N4 system with the application of technical tests, before its entry into production, which is estimated to occur in the last quarter of 2022. However, this system does not come alone, soon, as part of this technological transformation, COMPAS will have a new portal for users, a billing system, and the most modern data transmission system.

### **BENEFITS OF N4**

- It will contribute to making the tasks of the collaborators involved more agile, in real time and without reprocessing.
- It assigns positions to the containers considering reducing storage costs and, through artificial intelligence, random positions are located, increasing security standards.
- Improvement in the planning time of the loading and

unloading of containers from the ship by more than 50 per cent.

- Accurate historical control of operational data.
- It allows obtaining more exact predictions of container movements and execution times, increasing productivity, and optimising resources assigned to the operation.

The support of local shareholders such as the Echavarría Obregón family, the commitment of international giants such as West Street Infrastructure Partners III (investment fund managed by Goldman Sachs) and the Ership group from Spain, the latter, with more than 100 years of global experience in the maritime and port industry has been essential for the growth of this ports' network.

COMPAS, year after year, continues strengthening its port infrastructure and technology, contributing to Colombian foreign trade, and providing its clients with a comprehensive and diversified service in different types of cargo such as: solid bulk, coal and coking coal, liquid bulk, containers, general cargo, and project cargo.



**“[N4] ALLOWS OBTAINING MORE EXACT PREDICTIONS OF CONTAINER MOVEMENTS AND EXECUTION TIMES, INCREASING PRODUCTIVITY, AND OPTIMISING RESOURCES ASSIGNED TO THE OPERATION.”**

**ABOUT THE AUTHOR:**

Andrés Osorio Barrera is President & CEO at COMPAS - Compañía de Puertos Asociados. Business Administrator, with MBA in Global Management from Thunderbird School of Global Business and Tec de Monterrey. Within a total of 30 years of professional experience as Managing Director, Country Manager, Vice President and Regional Director, with total responsibility over the P&L working for multinational companies in different countries in Latin America.

**ABOUT THE ORGANISATION:**

COMPAS, is the only network of multipurpose ports in Colombia with 6 terminals in Barranquilla, Buenaventura, Cartagena and Tolú and an international operation in Houston, TX, United States. For 10 years, COMPAS has offered port and logistics solutions providing its clients with a diversified service in different types of cargo such as: solid bulk, coal and coking coal, liquid bulk, containers, general cargo, and project cargo.