

# Harbours review

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### EUROPEAN PORT SECTOR FORUM

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## featured article

# Quo vadis, containers?

14-16 June 2016, DE/Hamburg

by Przemysław Myszk

In the past, it seemed that containerization was on a golden path of development. The 1990s and the few first years of the new millennium were bursting with consumer confidence, economies were growing, trade flourished, and box handling facilities got embroiled in congestion. In such an environment, container carriers filled shipyards' order books with ever growing box vessels. It all came to a sudden halt when another US-born crisis struck the world with enormous waves.

**In other words, *quo vadis*, ye who run the container business?**

**O**blivious to the new normal of no normal, shipbuilding yards received further orders for unimaginable behemoths, at least 18,000 twenty-footers of capacity. And as nobody wanted to quit the race which in the past yielded heavy chunks of money, the TEU arms race began. This in turn led to unhealthy overcapacity on the market, thus seeing freight rates plummet to historic lows, pushing many to discover new shades of red in their spreadsheets.

At the same time container terminals were burdened by a new headache – the need to make capital intensive hard infrastructure investments to accommodate the newest class of wider-and-wider Ultra Large Container Carriers (ULCC) that require adequate quay walls, be it water depths or the outreach of ship-to-shore cranes. Meanwhile – to blame the onshore part of the container business as well – port performance and productivity actually declined recently (not that it has changed significantly since the 1970s...), hence congestion could once again sooner rather than later become a teeth grinding issue in Europe, as ULCCs start to queue for handling. “More of the same,” seems to be the industry’s repeated answer to new world (dis)order problems.

In order to improve the situation, container carriers launched an “alliance soap opera.” The P3 Network of the three biggest players on the market pilot episode was shot down before its premiere, giving birth to other alternatives, alliances’ re-shuffling, as well as mergers and acquisitions. Freight rates remained unruffled, though. Last but not least, the EU some time ago launched an anti-cartel investigation, targeting the practice of announcing in advance rate changes via press







Photos: Wikimedia Commons

**“What could be drawn as a general conclusion is that the global supply chain is becoming more complicated these days rather than more straightforward; uncertain, instead of tailored; and troublesome rather than being just a part of the background.”**

releases... In other words, *quo vadis*, ye who run the container business?

#### The latest from Hamburg

This year's edition of the trade fair TOC Europe, held in Hamburg between July 14<sup>th</sup> and 16<sup>th</sup>, was accompanied by i.e. the TOC Container Supply Chain conference, also giving floor space to those who contract container professionals on a daily basis, namely shippers. And while Rolf Niese, most recently British American Tobacco's Head of Logistics Operations, admitted that shippers have “celebrated” the lowest freight rates in living memory, they also worry about the container carrier consolidation process, which can have a profound impact on the global supply chain; and no one knows today whether it's for the better or worse. “With all the merger and acquisition (M&A) activity there is a lot of uncertainty. Firstly, we are not well informed – we do not know who is cooperating with whom and where, or who are on the M&A list. This in itself is a

huge risk for us,” Niese commented. “I’m of the opinion that more and more carriers are simply focused on their core business and not the end-to-end view, but we as a shipper are only interested in the end-to-end view of the supply chain,” he added. In his view, Niese summed up, shipping lines should take more stock of freight forwarders’ efforts, “What we are seeing in the third party logistics (3PL) sector is that they differentiate their services, such as guaranteeing on-time deliveries. And we are always asked whether we would pay for it – yes we would, in fact we already do with our 3PLs.”

Uncertainty was also touched upon by Filip Degroote, Stanley Black & Decker's Transportation Director for the region Europe, the Middle East and Africa. For instance, what happens if a given shipment is left blocked due to a carrier's problems? “In a lot of cases these goods are already sold to our customers and we are not able to manufacture them again because everything we do is based around inventory, and we are selling out of that inventory to customers who are waiting for their goods,” Degroote warned. In some cases, the pressure felt on the market is pushing manufacturers to re-shore logistics again to in-house solutions. As such, Black & Decker is building its own less-than-container-load boxes, and contacts carriers directly. “However, if carriers want to play a bigger role with Black & Decker, they will also need to provide

some of the services that the 3PLs provide,” Degroote said. From another angle, bungled delivery time impairs reputation, something which in turn hampers business. “Time is money,” simple!

These are just a few quick flashes from the shippers' point of view. What could be drawn as a general conclusion is that the global supply chain is becoming more complicated these days rather than more straightforward; uncertain, instead of tailored; and troublesome rather than being just a part of the background. And these are just problems – i.e. overcapacity and lower terminal performance – caused by the industry itself! Geopolitical risks can rub salt into the wound – China's dragging export-to-consumption shift; the need to re-invent the EU in the aftermath of Brexit; the upcoming US presidential election; vast territories of North Africa and the Middle East catching on fire; the deepening worldwide rich vs. middle & poor inequalities; climate change and extreme weather events, etc. Technological and societal advancements can become a game changer, too, including 3D printing; a digital revolution that is exponential in its nature; automation and the Internet of Things; a shift to a sharing & circular economy; re-shoring of manufacturing back to Europe and the US; power generation transition towards renewables, and so on and so forth.

Again, in light of the above, *quo vadis*, ye who run the container business? ■

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Photo: Wikimedia Commons



**Tomas Girdzevičius**  
CEO at AUTEPRĄ

The recent TOC Europe event took place in the Hanseatic City of Hamburg, which is home to one of Europe's busiest container ports. The three-day seminar & exhibition positioned itself as the annual general meeting for port & terminal professionals, while the two-track seminar programme was tailored towards technical and operational personnel at both container and bulk terminals.

The first day at TECH TOC assessed the ramifications of the IMO SOLAS VGM convention and the obligations it imposes on ports and terminals. Further sessions then looked at operational excellence cranes and also within software. The second day focused solely on robotics and automation, with four expert seminars. The final day looked at the people working in ports, how to recruit and train them.

The Robotics and Automation Day started with a strong session which took a 360 degree look at the industry. Alex Duca, Director, Head of Design & Automation at APM Terminals, joined a panel which also included representation from Innotech, ABB, TBA, and Solid Port Solutions. They put a spotlight on the latest projects, thinking, and expectations, and then opened up a discussion into the business of how automating terminals is developing.

In the second session the discussion deepened into the developments within automated facility design and robotic handling equipment – both for seaports and inland terminals. Major equipment manufacturers joined the panel for this wide-ranging discussion including Bromma, Gaussin Manugistique, and RMM Metternich Mechatronik.

After lunch, attendees joined a session focusing on project management and implementation. This detailed briefing dug into reducing cost, complexity, and risk in automation projects. Speakers including Hamburg Port Consulting and Moffatt & Nichol looked at the major hurdles as well as new methodologies, approaches, and tools that are being developed to address the challenges. The final touch of the day was a super-session that focused on integration. Specifically, the practices of integrating software, process automation, and robotic equipment within container terminals.

Speakers and audience members quickly surmised that simply “substituting the man” is not enough to deliver the required quantum leap in terminal performance that is now expected in automation. Expert speakers from Hamburg Port Consulting, Navis, ISL Applications, Mofatt & Nichol, and AUTEPRĄ headlined this crucial session.

I, personally, as AUTEPRĄ's CEO, highlighted the need to lift operations visibility to the highest level, and used case studies to demonstrate the case in point. My first example showcased Baltic Container Terminal (BCT) Gdynia's container positioning system. This EU-funded project was fully compliant to the requirements of the Polish Transport Technical Supervisor, and can be seen

as a testament to excellence from the suppliers who included AUTEPRĄ, Identec, and Tideworks.

Another illustration, slightly further afield, looked at an integration example in Longoni Port's Mayotte Channel Gateway (MCG) terminal in the Mozambique Channel off the East African coast. AUTEPRĄ cooperated with Liebherr to implement a highly integrated tracking solution connecting RTG cranes in real-time to the NavisN4 server, using AUTEPRĄ's vehicle computers and WiFi network.

Standardising the interface between TOS and equipment control systems was a key point in the discussions, and attendees closed the day by discussing the advances in automated terminal logistics and application software. The Robotics & Automation day at TOC Europe was hailed a success by its participants, and the event organizers are set to make this a regular feature of the event.



Photo: Cargotec





**Michael Geiger**  
*Kuenz's Sales Director*

**F**or Kuenz, an exhibitor at TOC Europe for many years, this year's focus was on automation. We have to define and create the boundary conditions to make automation work in an economic way. And that's why we are paying special attention, both

in Europe and North America, to the development of innovative and efficient solutions across the entire intermodal container operations chain, automated stacking cranes being one of them.



Photo: Cargotec



**Łukasz Binaś**  
*Country Manager  
at Unifeeder*

**I**n recent years we have observed that the container shipping sector has become much more complex comparing to the 1990s and 2000s. Changes in external circumstances are even more disruptive

for the transport and logistics industry, and unfortunately happen a lot more often.

Demand for services fluctuates nowadays more than ever before. As a result, it requires high flexibility from market players, as well as a lean and agile organization capable of quickly adapting to the turbulent market situation.

One of the key success factors for the shipping lines nowadays is to be able to assign "capital heavy" resources (like vessels and equipment) in such a way, that the final operational cost of doing business is as low as possible. This in turn equals allowing to provide services to customers on the most competitive level in terms of the both price and quality.



Photo: APM Terminals



**Michał Kuźajczyk**  
*Marketing Manager, Sales & Marketing Department at the BCT  
– Baltic Container Terminal Gdynia*

**I**n the past few years changes in the container market have indeed revaluated the up-to-date principles which ruled the shipping market. The astonishing "arms race" between the operators causing

an oversupply of the container ships' tonnage as well as a considerable decrease in shipping rates; the downturn of the Chinese economy being the main cargo supplier for the mega container ships; and the formation of alliances, dangerously monopolizing maritime transport services – these are the elements which also directly influence container terminals. The requirements that are made today for the terminal operators are tougher and more difficult than in the past, while at the same time their relation to shipping operators continues to grow. However, it seems that customers and companies serving container shipping from the land side might be very close to refusing further financing of wrong investment decisions made in the first place by container operators.



Photo: Eurogate



## Benoit de la Tour

*President of Navis*

The ocean shipping industry is on the brink of change. And inevitably, as with any massive transformation, there are challenges that must be boldly addressed to achieve positive progress. This year at TOC Europe I listened as shipping and logistics professionals addressed our industry's greatest hurdles, including the following key three:

1. The critical need to invest in port infrastructure to accommodate Ultra Large Container Carriers (ULCC);
2. The importance of terminal efficiency and productivity, and the need for robust technology solutions and automation;
3. Risk and uncertainty in the wake of recent mergers and acquisitions activity among carriers.

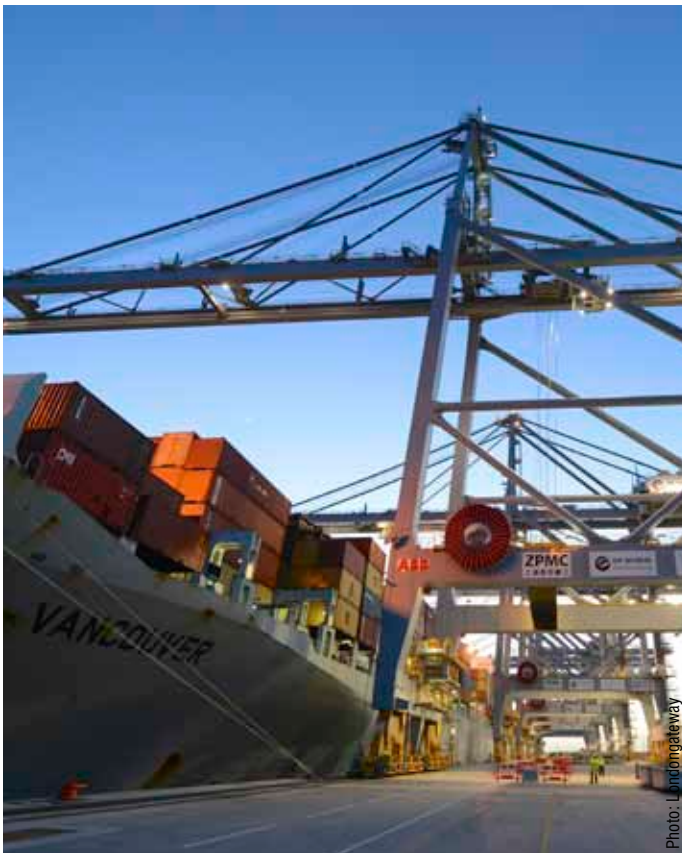
From Navis' perspective, there is one common thread in the solution to all of issues, namely collaboration. The entire industry is feeling the strain of its own silos and fragmented infrastructure; there's a true lack of visibility and not enough reliance on the data and technology that provide high-level insights to empower smarter decision-making. Collaboration among shippers, carriers, and technology vendors will drive standardization, which in turn will enable the entire industry to work more effectively, in such a way overcoming so many of the obstacles that have historically stood in the way of progress.

The needs of the global container shipping industry are changing rapidly, and technology is essential to enabling both terminal operators and ocean carriers to optimize their operations, improve efficiency, and gain transparency into their supply chains. This will support better-informed, data-backed business decisions.

We believe in this so deeply that we've restructured and launched the Navis Software Division. This new corporate brand will oversee all of our software solutions and represents our commitment to expand and scale our capabilities to improve terminals worldwide. We know that robust software solutions can drive collaboration by allowing terminals to be more nimble and adaptive to user demands. We also know that the industry's evolution will continue, and that software solutions make it easier to upgrade to new, critical features and functionality, while supporting terminals as they progress towards automation.

Data are also key to collaboration across an industry that needs to break down silos and bring all parties to the table. The only way to overturn the recent decline in port performance and productivity is to take a higher-level look at operations by utilising and analysing data and business intelligence from all sides. Collaborating on data will directly result in an increase in savings and profitability for shippers and carriers alike. Sharing data and business intelligence will also address shipper concerns on the lack of end-to-end visibility from carriers. At Navis we've started to address this with XVELA – a cloud collaboration platform for ocean carriers and terminal operators that we believe will have a tangible impact on port visibility, specifically vessel stowage planning and execution.

It's an exciting time of change for our industry – a time of technological innovation and advancement. Technology that enables effective collaboration is the answer to overcoming obstacles to productivity, optimization, bringing in turn improved profit and bottom-line.







## Enrique César López Veiga

*President of the Port of Vigo*


**W**e, as a port authority, aim to promote the economic development of Vigo and its hinterland. As such, we look at the future of maritime transport determined to take advantage of all incoming changes on the market that may reinforce our position and opportunities. While the expansion of the Panama Canal will definitely change container traffic routes to and from Europe, Vigo will also benefit from its strategic Atlantic position, and we expect a

strengthening of our port's role as the Spanish Atlantic export-import gateway.

Next, the port authority is very concerned with the growing importance of technology and automation for maritime transport and industry; therefore, we are investing means and economic resources in several projects, such as Smart ViPort and Blue Growth, aimed at providing efficient solutions based on technological innovation and environmental commitment. This philosophy is shared by our container terminal operator, TERMAVI, S.L., which has developed its own software solutions to improve the terminal services and productivity, one of the main requirements demanded by all agents involved in container transport.



Vigo is a naturally sheltered port, highly specialized in reefer traffic, open all year round, offering 769 m of berthing line, and draughts over 17 m. There are more than 50 regular container lines linking the Vigo Container Terminal with the rest of Europe, America, Africa, and Asia. The facility handles 200,000 TEU annually (imports and exports accounting for 97%), and has a 180,000 m<sup>2</sup> big depot. The Port of Vigo leads northwest Spain in container traffic and, with 1,300 connection points, is Spain's second-biggest terminal in terms of reefer capacity. Our essential features are intermodality (a direct link to Vigo's railway terminal), the joined Border Inspection Post (BPI) and other security facilities available, including an X-ray scanner for monitoring and surveillance of containers (US C.S.I. initiative), as well as a radiation and spectrometric portal monitor (US Megaports project), both of them operated by State Security Forces.



Advanced simulation models to support terminal planning and operations

# How can simulations help ports and terminals?

by **Remmelt Thijs**, *Senior Project Manager*,  
and **Dr. Yvo Saanen**, *Managing Director and Principal Consultant at TBA*

The container industry is dynamic by nature. Due to considerable growth, the competitive situation in and between ports, and the changes in shipping line alliances of recent years, the container market has gained a certain dynamic. This is reflected at container terminals accommodating larger vessels, new combinations of shipping lines and often a step-wise growth. This growth could result in higher utilization of existing sites as well as regular expansion projects and new greenfield development for which simulation modelling can be of value.

**“**  
**But what exactly is “simulation”?**  
**The essence of it is to make a**  
**model of the (future) reality within**  
**the scope of the study objectives.**  
**”**

**a**s one can imagine, planning of new sites and places of expansion as well as operations improvement is not that simple and requires answering several important questions about the layout, the attainable quay crane productivity, the yard operating strategy, the terminal operating system, and the equipment. We'll try to show you that it all can be done in an efficient and reliable way.

## The power of simulations

Although simulation is increasingly used in container terminals, it is not as common as for example in the automotive industry, where no significant investment is made without thorough proof by means of simulation. This is not strange at all when using a benchmark that for every Euro spent on simulation, ten are saved.

But what exactly is “simulation”? The essence of it is to make a model of the (future) reality within the scope of the study objectives. With this model all kinds of experiments can be performed. Usually, simulation is used to assess the effect of different alternatives, for instance, an operation with straddle carriers versus an operation with rubber-tyred gantry cranes

(RTGs) and terminal trucks. However, as we will discuss further on, simulation can be applied for many more uses. In general, a simulation project exists of four steps: First, specification and development of a model, second the validation of a model, then experimentation with a model, and finally analysis of the results. By means of the animation, which visualizes the behaviour of the system, people involved are able to look closer and validate the work of the system.

## Model terminal operations

Some terminals are influenced by shipping alliances and may be under pressure to grow quickly. Therefore, a simulation can be a tool to help assess where bottlenecks could be expected – e.g. at the quay due to larger vessels, the yard due to storage constraints or in the yard or transport equipment to support the targeted service levels. It is very valuable to be able to analyse a what-if-scenario, using suitable tools to answer such questions.

Many terminals, for instance, are re-considering their yard handling system to increase the stack density and therefore increase the throughput capacity of the



terminal. As shipping lines are requesting higher service levels, terminal systems need to be designed striving for various – mostly contradictory – objectives. Quay crane productivity has to go up, stack density has to increase, operating costs have to go down, and the landside service has to be improved. In order to create handling systems that comply with those requirements, the use of a simulation approach can be beneficial to separate good from bad solutions and to prioritise improvement measures. Moreover, simulation provides an environment where one can evaluate under varying, but manageable, conditions, e.g. busy and quiet operations, breakdowns, and so forth. In the end, this will result in a more robust plan, solutions that are better thought through, increased software robustness, all leading to a reduction in risk. We aim to assess a solution within the overall system performance and include not only the technical capacity of a component, but also consider the unavoidable inefficiencies when considering a system comprised of several of those components. For instance we consider it much more realistic to consider the dynamics of 20 RMG blocks with twin cranes with its dynamics, than considering the capability of one block with twin cranes and multiply the result by 20. The overall system has

instance the container loading sequence, the grounding rules, and the equipment assignment rules – are left away. We adhere an approach where those aspects are considered, so that the results from the simulation are similar to the operational data. Close cooperation between a modelling team and terminal operator to arrive at a valid model is essential here.

The output of these kinds of models typically consists of productivity numbers of all the equipment (quay cranes, RTGs, and so on), service times (e.g. of hauliers and trains), occupancy rates of equipment, but also the utilization of the stack, and also the equipment's operating hours.

### Terminal planning of a greenfield site

The development of a new container terminal and the expansion of existing ones create new questions to be answered. Which layout, what kind of equipment and how many pieces of that equipment to purchase in order to have lower costs per move, an acceptable investment level, and competitive performance? These are typical questions awaiting a new container terminal's development team. In the decision making process around these questions, simulation can play a supportive role regarding the dimensions of the terminal (e.g. quay length, stack size), the type of

(vessel arrival pattern, rail pattern, truck pattern, dwell time) as a starting point. Under these external conditions, the main requirements are assessed. This means that we analyse the service level (vessel service time, gross berth productivities, and crane density on vessels) under varying terminal configurations (quay length, number of quay cranes, gross quay crane productivity). Typically, per configuration, one year of operation is simulated, creating a picture of the service over the year. During the year, the variation in the stack (seasonal effects, peaks during the peak and even hourly peaks due to large discharge calls), the variation in berth occupancy (due to vessel delays, and variation in the call size), and the occupation of quay cranes can be observed, giving a rich picture of the service the terminal provides.

For a robust design, several important parameters can be modified to obtain an even richer picture in the terminal planning. A variation in cargo mix, dwell times and vessel mix can be varied to understand the terminal's requirements for varying circumstances. As important input for the next step (determination of the handling system), the model creates an understanding of the peaks in handling (waterside, but also rail- and truck-side). These peaks are important to determine how much

### *Example view within a simulation model of operations using an automated rail mounted gantry crane (ARMG) and automated guided vehicles (Lift-AGV)*



inefficiencies that should be considered and therefore a system view is preferred.

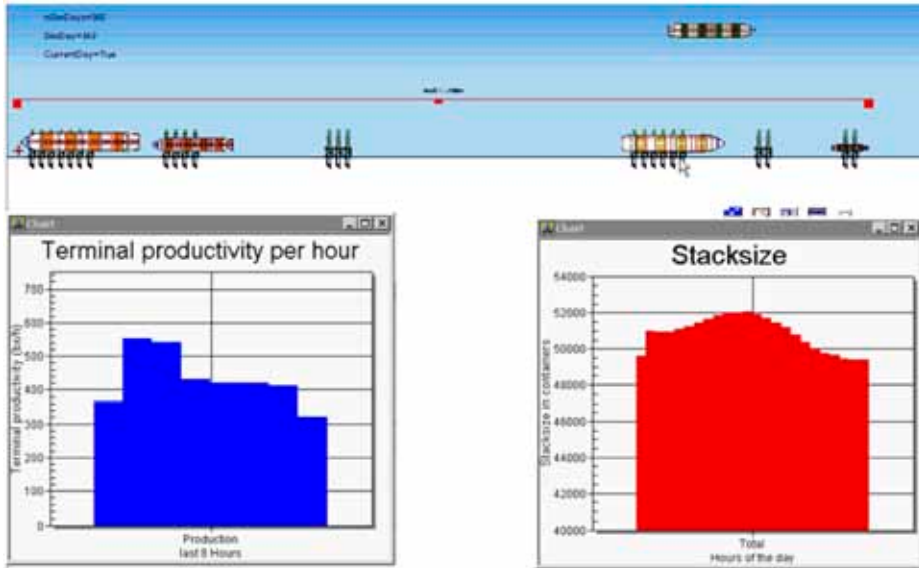
The key to supporting these decisions by means of simulation is to model the equipment and operational procedures at a rather detailed level. Many attempts fail to link with reality, because the details that make an operation complicated – for

handling system (equipment, operation, and layout), and detailed specifications for equipment, layout and terminal operating system's (TOS) functionality.

The first step is to determine the main requirements for the terminal. Here we apply an outside-in approach, taking the container flows that go through the terminal

equipment is required to supply the quay cranes with enough containers during these peak circumstances. Based on the outcome, decisions can be made concerning the quay length, the number of quay cranes, the gross productivity that quays have to achieve to accommodate a certain terminal throughput, the requirements for

Fig. 1. Screenshot from the simulation model to determine the key terminal parameters



“Although everyday operations at a container terminal differs from that of the day before, it is worthwhile to explore the possibilities of using models to improve such operations.”

storage capacity, and the peak handling conditions.

The second step is more comprehensive, in the sense that there are many variables involved. Planning of the handling system involves the layout, type of equipment for the various operations – think of the number of trucks and RTGs, the number of rail cranes, the number of gate lanes, and so forth, and the logistical concept (incl. yard operating strategies). The latter is gaining importance in the case of automated terminals, since many tasks are taken over by computers. However, also at manually operated terminals is the emphasis put on efficient operations – for instance the implementation of truck or straddle carrier pooling. In this step, the TOS should be considered in close relation to the equipment as the TOS will make important decisions on grounding and dispatching and a realistic decision systematic is important to be included with a realistic feed of information from the operations, such as the equipment position and estimated time for finishing a job.

An example of this second step is a recent comparison we carried out between manually-driven shuttle carriers (SHC), automated shuttle carriers (ALV) and Lift-AGV's. All in combination with an automated high density yard, operated by ARMGs. In terms of productivity, all three systems achieved the same performance level (40 net bx/h), but with different equipment numbers. In a peak operation the ratio between SHC, ALV, and L-AGV was 2.5-3.5-4 (per QC). The automated equipment is more sensitive to the density of the operation in terms of operating speed. Subsequently, one needs to compare the CAPEX required for each system, as well as the OPEX and understand key risk factors to come to an evaluation of such systems.

A simulation detailing such can be taken further getting close to civil design questions on pavement design, electric system requirements but also detailed kinematic characteristics of equipment and TOS functionality specifications.

#### Optimise the day-to-day operation

Although everyday operations at a container terminal differs from that of the day before, it is worthwhile to explore the possibilities of using models to improve such operations. The models are getting more comprehensive and are able to capture real operational procedures and handle real operational data. They can also depict processes at the level of individual container moves around the terminal and represent decision-making around grounding containers based on a container's profile. With these models we see a great opportunity to apply them in the analysis and replay of past operations and in the pre-planning of upcoming operations. In this way, we can address questions around equipment usage and manning given a certain operation at a quay, rail and gate, as well as decisions concerning the in-advance preparation of the yard. Similarly operational procedures, namely equipment pooling, sharing part of the equipment, real-time re-allocation of equipment, and sizing the gangs, together with strategies and patterns for yard operations in terms of yard density, travel distance and unproductive moves (shuffles).

The outcome of these analyses can be fed back into the TOS functionality specifications, and into the minds of the managers, planners, dispatchers, and operators, running the terminal. It can overcome the often contradictory perceptions of the bottlenecks in the current operation, and prioritize improvement measures. Thanks to

the use of real data and operations, the value of these exercises heavily increases, because it becomes much easier to translate the result back into the consequences for coming operations. Examples of the recent findings comprise the effect of equipment pooling (15% increase of equipment productivity and therefore the potential for reducing operating costs), and the effect of an improved RTG assignment and yard grounding strategy (20% less equipment required on average with the productivity level remaining at the same level).

The essence of arriving at models that can accomplish this added value is a good understanding of the operation, including the rules in the terminal operating system. An alternative to overcome cumbersome modelling of TOS functionality is to link the simulation environment directly to the system. In this set-up, the simulation represents all the physical processes, the TOS uses the real container data to control the operation. By doing so, it can be configured much faster to accomplish a smooth and performing operation under various conditions.

Operations at container terminals are highly complex, but automation makes them even more complex. Optimisation tools treating the operation as a deterministic process are difficult to apply because in real-time the operation differs highly from the planned situation due to the dynamic processes, weather delays and human intervention. Therefore, tools that explicitly consider the dynamics of a life operation should be favoured over others. Simulation is such a tool, able to represent and visualise container terminal operations – both the physical processes and the rules in the terminal operating system.

Applying simulation makes the decisions concerning the investment in quay and quay cranes, the choice of handling system, and the configuration of a terminal's control system better founded, better to understand, and more transparent to follow. It enables a terminal operator to reduce the risk of developing a new terminal or improving an existing one for similar or changing circumstances. If simulation is applied, one should make sure that the specific characteristics of an operation are validly represented in the model. Otherwise, the risk of nice pictures over sound results lies just around the corner. ■



# Lifting the game #1

by **Charles Moret** and **Andy Lane**  
*Partners at CTI Consultancy*

CTI Consultancy aims to constantly develop cutting-edge expertise surrounding port and vessel operations. CTI looks beyond the hardware to analyse how an organisation can drive more value and growth through enhanced processes and people. CTI combines the toolbox of an international business consultant with extensive practical maritime experience. All CTI business advisors have recently held senior leadership positions with leading carriers and port operators. To learn more visit us at [www.cticonsultancy.com](http://www.cticonsultancy.com). This is the first article in a series of CTI commentaries on the headline subject which will be published in BTJs over the coming months.

**Container terminals are a vital link in the overall supply chain, but are they as strong as they need to be? In the years since containerisation was invented (attributed to the late Malcom McLean, 1956, and ISO668 standardised in 1968) there has been evolution, however, what we essentially experienced was merely the up-sizing of ships and terminal handling equipment. The standard gantry quay crane remains of “A-frame” design with performance still stuck in Ronald Reagan’s times, while the internal terminal container conveyance remains the same, rubber on concrete. There has been no revolution!**

**d**uring the 1980s and 1990s, demand growth for containerised transportation was raging, with anywhere between a 10-20% volume increase per year. During these years the supply chain bottleneck was usually ship capacity, with terminals and landside nodes able to scale effortlessly catering to growing demand.

As we reached the early 2000s, the bottleneck shifted to container terminals and this continued until the financial crisis of 2007-2008, resulting in an unprecedented 15% global container volume contraction in 2009. Just to highlight the crisis’ long reaching impact with one example – it was August 2015, when the Port of Long Beach broke its own monthly volume record, which dated all the way back to 2006.

**Why did container terminals “suddenly” become a major bottleneck (again)?**

Before 2008, terminals generally aimed to expand capacity to match traditional volume growth rates. When demand growth plateaued, contracted, and then re-emerged far more modestly, there were already plans on the table for terminal expansions based on the old norms. This temporarily alleviated the terminal capacity crunches of the early 2000s, but root causes of those had not been addressed or fixed.

In our modern world, the lead time from idea to realisation of new additional terminal capacity can be anywhere between three years and a decade, depending upon where you are in the world, what you are building on, not to mention environmental considerations and studies which are required.

In more recent times, we have read new stories of congestion raising its ugly head. It has again become a potential critical bottleneck to the supply chain, 12 years on. The misperceived way to overcome, beat or avoid congestion – is to invest in more land and equipment. Do more of the same, but on a larger scale, “evolution”. When what is really required is revolution.

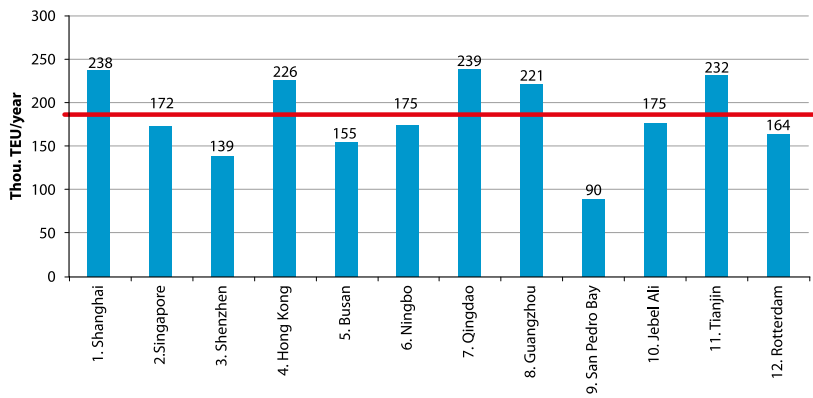
**It’s stuck!**

When one of us (Andy) joined Maersk in Felixstowe in 1987, the terminal’s cranes were producing roughly 24-25 container moves per operating hour – and in 2015 they still do! This was further confirmed earlier this year when Maersk Line’s CEO Søren Skou said in a Journal of Commerce interview, “The industry is stuck at 25 to 30 moves per crane, per hour. We haven’t had any breakthrough development that can get that to 40 to 50 moves per hour.”

The capacity of any terminal is dictated by two factors, equipment utilisation, i.e.

**“Before 2008, terminals generally aimed to expand capacity to match traditional volume growth rates. When demand growth plateaued, contracted, and then re-emerged far more modestly, there were already plans on the table for terminal expansions based on the old norms. This temporarily alleviated the terminal capacity crunches of the early 2000s, but root causes of those had not been addressed or fixed.”**

**Fig. 1. Quay crane utilisation in 12 of the world's largest container seaports in 2013 (TEU moves per quay crane)**



how often it is actually working, and the efficiency of it when it is. This is precisely the same in manufacturing where a method known as OEE (Overall Equipment Effectiveness) is used to measure it. Ideally, your fixed assets need to be planned to be producing for the maximum number of hours per day, week, month or year as they can be. In a factory this might be governed by factory operating hours – many are not 24/7, or it could be due to demand peaks and troughs. When the factory is open, however, the bottleneck machine (ideally either the most expensive or the machine which has the greatest influence over your revenue stream) will be expected to be operational at least 95% of all available production time. And it will be expected to run at 85-90% efficiency, giving an OEE of  $95\% \times 90\% = 85.5\%$ .

not even 30 (62.5%) is achieved. So the OEE is  $50\% \times 62.5\% = 31.3\%$ ! Quite some way off (lean) manufacturing plant OEE. And the only material difference, is that a factory has a roof!

### Show me your moves

In August 2014, CTI Consultancy performed an analysis on the utilisation levels of the world's 12 largest (by container volumes) ports. We wanted to see Asian, European and North America terminals, so we combined Los Angeles and Long Beach as one port, nicknaming it San Pedro Bay.

We used the over-arching metric of container TEU moves per quay crane (QC) per year, and determined that these 12 "mega-ports" produced on average 187 thou. What was also evident was the huge range in performance, from 239 thou. to just 90 thou. TEU. Ironically the worst "utilised" port is often the one with the highest incidences of "congestion".

Working backwards, we sought to determine potential average asset utilisation and crane efficiency metrics. Usually 1.6 TEU per container is transported (it is 1.8 in San Pedro Bay in all fairness) – so  $187,000/1.6 \approx 117,000$  container per crane per year. We assumed that these larger ports were producing an average of 28 container moves per operating hours  $117,000/28 \approx 4,180$  hrs per year.

$365 \text{ days} \times 24 \text{ hrs} = 8,760$  total hrs per year – so utilisation was calculated to be around 48%. Naturally with faster cranes, then utilisation levels would drop even further, or rise if crane speed was less than the assumed 28 moves per hour.

We then said, "Might 60% utilisation not be possible, and might these cranes actually average 32 moves per hour when being utilised? Is that a target which is impossible to achieve?" We sincerely believe that it can be achieved, and if it were to be achieved, the capacity per crane per year would be approx. 270,000 TEU (+44%  $\approx$  83,000 TEU). The gap will also vary between ports, but this remains the average.



These 12 ports collectively have 1,295 quay cranes. If the contribution margin (operating profit) is just USD 10 per TEU (and it is often far higher), that would represent an industry value pool of  $83,000 \times 1,295 \times \text{USD } 10 = \text{USD } 1.0 \text{ bln}$  – direct to the earnings before interest and taxes (EBIT) line. One would assume that this was compelling enough for a change to happen, but apparently not. It should be stated here that at present global growth projections, this 44% of untapped available terminal capacity would not be fully saturated for four to six years and therefore the value pool is not USD 1.0 bln in 2016. On the evidence of further terminal capacity investments, Singapore, Busan, Shanghai, Long Beach, Rotterdam, etc., it would appear however that the demand is predicted to be there – ultimately.

### Hurry on, for ships and shippers' sake!

If the terminals do not wish to achieve these results for themselves, we are fairly sure that their customers would welcome them. Several shippers have stated that they are not interested in terminal productivity – and they are not necessarily right, but the shipping lines need to find new ways to reduce costs and turning vessels faster and spending more time at sea is one of the few remaining battlefields which has not yet really been entered. The increase in crane productivity (28 to 32) is alone 14% less port time, and if some of the additional crane utilisation was achieved through higher crane intensity, then ships might even be turned 20% faster. This could maybe in turn improve shipping lines' punctuality.

Sadly, we must face yet another fundamental issue at the same time, namely the inability, or reluctance, for the key players in the supply chain (upon each other they all rely for profits) to cooperate and collaborate. From shippers to shipping lines as well as lines to terminals, there is often a complete absence of what could be called the spirit of "winning together". It is maybe an issue of trust, it might be an issue of ignorance, but it will remain as an inhibitor to progress unless mindsets change. We will address this in deeper detail in our next article on this subject. ■

**“**  
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Container terminals are generally 24/7 operations, though, the (ideal) bottleneck machine (quay crane – USD 10 mln investment each) will not usually be deployed for more than 50% of available production hours. A modern (i.e. younger than 15 years old) quay crane is designed to cycle 40 times per hour – 90 second cycles and most can handle twin 20-foot containers or be sequenced to dual cycle – so maybe 1.2 containers per cycle on average. That would mean a theoretical maximum production of 48 containers per hour, yet often



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# Lifting the game #2

by **Charles Moret** and **Andy Lane**  
*Partners at CTI Consultancy*

The chief takeaway from our first article on port performance & productivity was: Container terminals are not yet at the pinnacle of performance or efficiency, and that lifting the game can be highly beneficial to them from a bottom line profit & loss perspective. However, a real push forward will be possible only if there's a notable change in mindset, a true desire to improve, and an acknowledgement that doing more of the same is unlikely to produce better results. Busting a few mega ships and alliances myths along the way might come in handy, too.

**“The industry is in need of a revolution. A change in qualitative not quantitative nature is required.”**

**b**ack in our first article we outlined some of the demand and supply history, and how that has now resulted in some fairly widespread terminal congestion issues. We also drew some parallels between container terminals and lean manufacturing plants, underlining the main differences in performance and utilization between them (in favour of the latter).

The industry is in need of a revolution, we wrote. A change in qualitative not quantitative nature is required; a shift that puts the spotlight on customer intimacy and stickiness, as well as on partnership cooperation with other supply chain parties, rather than a more inwardly looking approach focused on cost, cost price, and revenue (which, we believe, will also come through to break the “It’s always been that way” chains).

## Debunking the myths

We call them “handy hooks.” When confronted with new challenges you can either look for solutions, or you can hang these on the wall next to an already fairly comprehensive collection of excuses for not improving.

Each and every terminal wishes others to think of it as having unique inhibitors, whereby it is not comparable to any other, and is more severely hindered or

handicapped. Yet, in reality this is hardly the case. Look for instance at the working ship side process, which is 99% consistent and 1% different the world over.

We have heard handy hook excuses such as mega ships, berth wastage, peaks & surge, mega alliances, and so forth. And whilst these are new challenges, they can also be opportunities and not insurmountable a priori problems. Let us review them to evaluate if these are true root causes of terminals’ inability to lift the game.

## Myth no. 1:

### Mega ships create berth wastage

To some extent this is true as stated, nonetheless, it does not equal squaring the circle. In both scenarios depicted in Figure 1, all 12 cranes are working. And if crane productivity did not increase over the 2001-2015 period (in fact it hasn’t since the 1980s...), then the demand flow over the quay wall is exactly the same.

Terminals receive a very small percentage of income from dockage fees (driven by length x time); rather approx. 80-85% of their revenue comes from terminal handling charges (crane moves), therefore the revenue does not change.

It can be said – sticking to our comparison with the manufacturing business – that



a large production run is far more efficient than several small ones, and this is also correct for container terminal operations.

**Myth no. 2:**  
**Mega ships cause high peaks and surge**

By and large, peaks exist due to some manufacturing inheritances still in place, and certain deep-rooted behaviours, both

yard), there has been no real change here, just as we pointed out in the berth wastage paragraphs above.

**Myth no. 3:**  
**Mega ships increase crane cycle times**

Again, this is somewhat true. We have witnessed ships growing proportionately wider and higher (stack profiles) than

**“**  
**Myths and handy hooks inhibit progress if they are allowed to do so.**

longer. So yes, this does have an impact, but just how big is it?

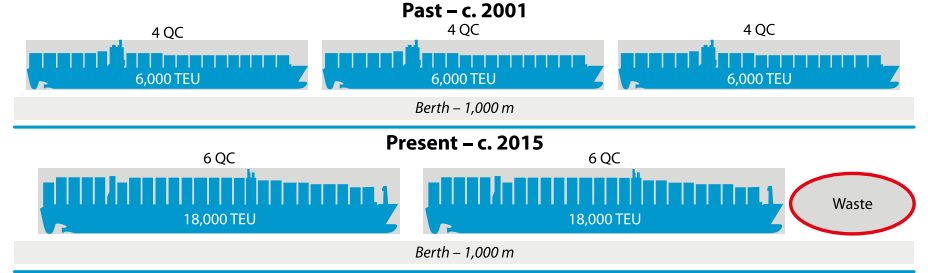
Typically, an average crane cycle time is roughly 90 seconds. It could be as little as 60 seconds for a container from deck and a row close to the quay, or two times longer for the deepest tier on the far side of the vessel.

Let us examine in detail the example from Figure 1, where a 6,000 TEU container carrier stands against its three times the size counterpart. The former is 17 containers wide, eight deep (below deck) and six high (on deck), giving in total around 210 containers per bay.

An 18,000 TEU ship is 22 wide (+5), ten deep (+2) and nine high (+3), thus we have 376 containers/bay. Of those 376 boxes, 210 involve the same spreader distance and time as they once did on the smaller ship, whereas 69 need to travel further (trolley), 76 either higher or deeper, and 21 both higher and further.

On a modern crane, the extra width is covered in around two seconds, and the extra hoist consumes an additional seven seconds. So the cycle time for these ranges between 92 and 98 seconds. Combined

**Fig. 1. Berth utilization – 2015 vs. 2001**



Source: CTI Consultancy

**Tab. 1. Increased average cycle times on larger vessels**

Change	Incremental Distance (average)	Extra Time (seconds)	Container Slots	Cycle Time (seconds)
No Change	0	0	210	90
Further Trolley	7.5 meters	2	69	92
More hoist	8.25 meters	7	76	97
Hoist+Trolley	8.25 meters	9	21	99
<b>Average</b>			<b>376</b>	<b>92.3</b>

Source: CTI research

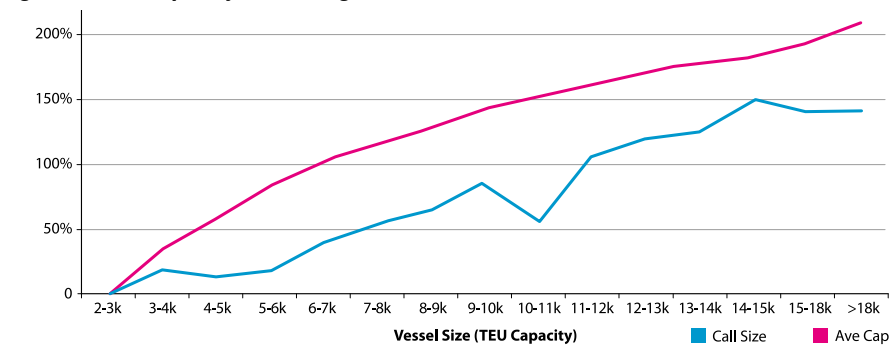
of which, it seems, have been magnified by the emergence of ever bigger ships.

In many parts of the developing world, where setting a plant is often far more expensive than labour force, factories are more inclined to operating all week long. As a minimum anywhere, they will run five days for eight hours. The mentioned legacy peak-creating-factor comes from historic manufacturing cycles, where goods took longer to produce, and production was geared towards completing the cycle at the end of the week. This often means that five or even seven days of production is squeezed into two days (often Saturday and Sunday) for terminal operations and capacity, hence creating large peaks in demand.

Shippers we have spoken with say that this does not need to be the case. They can ship any day, but all the ships are scheduled for the weekends. The interviewed shipping lines, on the contrary, suggest that this is a shipper's requirement. And terminals just nod their heads, saying, "It's always been that way." Indeed, closer communication and collaboration might yield some benefits in this respect.

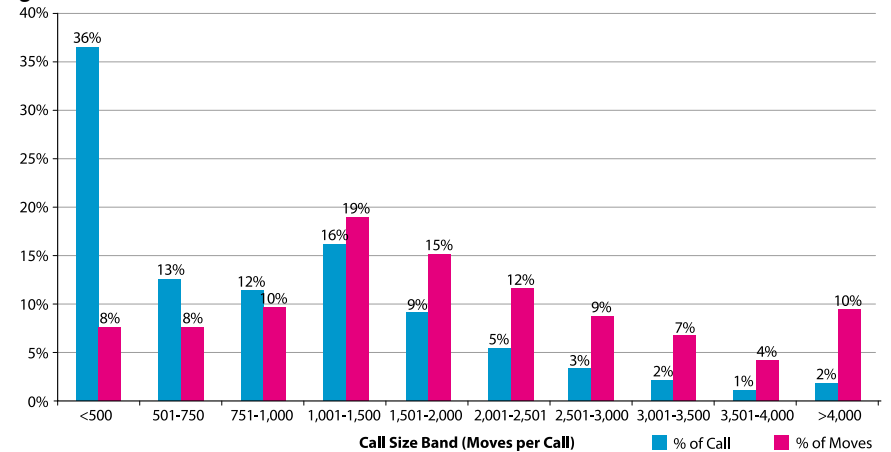
And when it comes to the cargo surge issue (i.e. increased flow from quay to

**Fig. 2. Vessel capacity vs. average call size**



Source: CTI analysis based on the IHS Port Productivity Database

**Fig. 3. Call size distribution**



Source: CTI analysis based on the IHS Port Productivity Database

with the 210 cycles at 90 seconds it produces an average of 93 seconds (+3.3%), which in turn might reduce the cycle/hour level from 40 to 38.7 (Table 1). However, today's cranes are not producing above 30 moves per hour.

So whilst it is valid, it is not the primary cause of lost production and efficiency, and therefore does not deserve to play the main villain in our drama. Other significant root causes of crane time loss need to be explored and corrected as the priority (remember e.g. that the vast majority of ship-to-shore gantries are still manually-operated by humans, where a multitude of factors can influence the operator's shape on a given day, including – a true story! – more STS moves the day after the workers' favourite sports team has gained a victory).

#### Myth no. 4:

##### Alliances increase complexity

Again somewhat true, but mainly for the alliance members. The terminal will

**Fig. 4. The definition of productivity**

$$\text{Quantity of (container) Moves} \\ \text{Quantity of Cranes (or longest crane) X Crane Speed (moves/hour)}$$

deal primarily with the ship operator, and that remains the same – one per vessel.

Container handling facilities do have several different parties to deal with on the landside, because they are all loading to the same ship. Yet, any complexity stemming from this can be remedied through process streamlining and standardization, basically cost-free to achieve.

#### Myth no. 5:

##### Transshipment vs. gateway

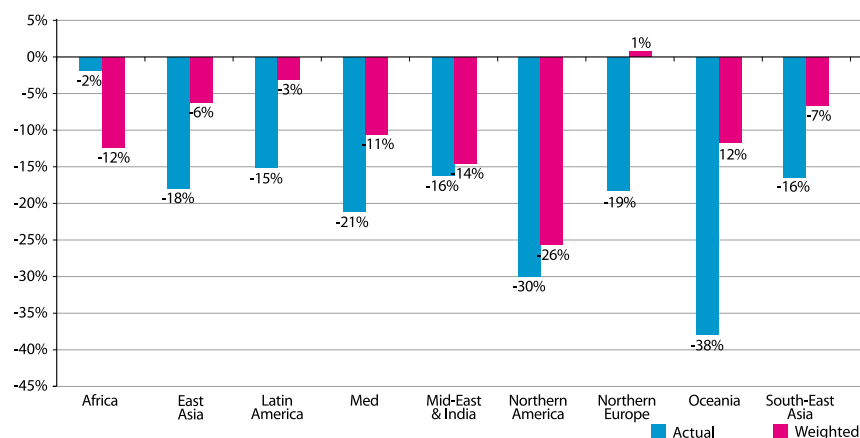
Both sides claim uniqueness and “accuse” the other of having less of a challenge. Neither is really correct. Discharge planning is primarily more complex in transshipment-oriented terminals, but at least when you discharge a transshipment container, you should be able to precisely know when it plans to leave the yard, whilst import collection at gateway terminals is far more random. Nevertheless, lifting a container is lifting a container – anywhere in the world!

#### Change of perspective

Myths and handy hooks inhibit progress if they are allowed to do so. Once more, it's a case of having the right mindset. Let us again look closer, yet from a different angle, at the mega ships issue.

For starters, mega ships have not yet happened! Based on Alphaliner's research, by 2018 there will be 97 container ships with capacities of 16,000 TEU or more. Up-to-date, only around 40 of these are actually in service.

**Fig. 5. Global productivity development H1 2015 vs. H1 2014**



These ships are a large increase in terms of capacity. But while many are generally calling at additional ports to ensure the highest possible utilisation, the quantity of moves per ship call is not growing proportionately (Fig. 2). So in terms of terminal impact, we really need to think in

**“Despite the increasing average size of vessels, productivity is actually in decline.”**

it does shippers. This is why they are interested in productivity, even if they do not recognise it.

Figure 5 shows an analysis of more than 120 thou. port calls across seven regions of the world. The blue bars represent the actual productivity. The red bars weight the productivity based on the average and change in call size. Across the world, productivity is in relative decline.

However, as we know that call size has a major influence over productivity outputs, we also need to take that into consideration. The first observation is that in all regions, except for Africa, the average call size reduced between the two periods. Although Africa's call size increased, its productivity decreased by 2% – but in relative terms (to call size) decreasing by 12% year-on-year. The only region which created a net weighted productivity increase was Northern Europe, but only by a minimal +1% yoy.

#### Shared responsibility

That said, improved communication, standardized and streamlined processes, as well as enhanced collaboration will yield the much needed benefits to all – terminal operators, shipping lines, and shippers – because neither party working in isolation will achieve the optimal results. Lifting the game is a shared responsibility.

In our next instalment, we will focus on the future, reviewing how existing terminals can get more out of their present infrastructure, and also how terminals need to be (re)designed to be fully prepared for challenges and opportunities yet to come.

#### Productivity is in decline!

Despite the increasing average size of vessels, productivity is actually in decline. This in general leads to the erosion of sea buffers. First, it negatively impacts schedule reliability, and when it deteriorates too much, it necessitates the introduction of an additional ship (as well as an extra week of transit time) to a service.

With vessel capacity in abundance, this does not impact shipping lines as much as





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# Lifting the game #3

by **Charles Moret** and **Andy Lane**  
*Partners at CTI Consultancy*

Small steps can climb the highest mountains, you just need to make the first move out of the box. The same holds true for the container business, on- and offshore, where authentic mutual cooperation is rare, either because one thinks the other will steal one's secrets, or the party is head over heels, yet has done little to no genuine benchmarking. Future-proofing a new terminal is uncommon, too, with a "do more of the same" attitude still prevailing, irrespective of its internal fragility.

**“We are often told that we cannot (and should not) compare terminals to manufacturing plants/factories as they are very different. The only variances we see are a roof and very different profit margins.”**

In our first piece we put forward an overall assessment of the industry and ventured into the dark side of “terminal congestion,” which suddenly became topical in parts of 2014 and 2015, having not really been an issue for nearly a decade prior to then. We revealed that terminal utilization levels are still extremely low, especially when benchmarked against manufacturing plants, and thus it is in a terminal's (or port's) best interest to better utilize its fixed assets as for anyone else.

In the follow-up paper we explored some of the challenges, myths, and potential opportunities which exist for terminals to become far more efficient, and through which they can enjoy greater utilization levels for driving higher profitability, along with delivering better customer satisfaction and forging advanced loyalty. We also outlined how in relative terms (measured by the average quantity of container moves per call) productivity is actually in decline, whereas there is really a trend in the other direction that the overall supply chain so desperately needs.

In the third and final article of this series we're addressing other issues relating to container terminal productivity, focusing particularly on two questions. First, how existing terminals can further improve without having to make additional large capital

investments? Secondly, how might new green-/brown-field terminals be designed to remain relevant throughout their entire life cycle?

## **Cooperation and collaboration**

Taking stock of our long association with (and within) the industry, we have generally observed that the relationship between shipping lines and sea terminals is highly contractual and extremely rigid. In fact, it leaves little room for cooperation from the very beginning, neither space for the creation of an environment for the parties to collaborate in the pursuit of mutual and sustainable benefits.

And while contracts covering matters such as limits of liability, insurance, confidentiality, dispute resolution, and other general legal requirements, will always require to be in place and agreed upon on paper, performance or service level-related matters are best left to accommodate flexibility. On the contrary, we have seen examples of performance targets being extremely complex and down to micro-level details, often accompanied by penalty or punitive consequences. This not only results in much wasted time and effort in reconciling accounts, but it leads to a state of zero trust. Both parties can become extremely defensive, and be unable (or



willing) to focus on how collectively they can further improve performance. They have also become allergic to sharing more information with each other.

A far more constructive approach would be through the mutual establishment of a performance-related dashboard comprising only wildly important factors on a more macro level. For this approach to deliver true value, regular and open discussions must take place where trends and the underlying reasons behind them are addressed and explored, and where both parties remain fully prepared to adapt, adjust, and align their processes. Over time this approach assists in building trust, which then assists both parties by making

be fine-tuned. The majority of these were actually identified on the customer's side of the fence; the fence was also subsequently lowered and had many more new unlocked gates installed. Generally, we found many more areas where our individual business needs and drivers were congruent, as opposed to conflicting, and by keeping the focus on mutual win-win gains it was natural to achieve improved results.

So, if a shipping line is not prepared to assist its terminals in improving and it just continues doing what it has always done – then it is quite improbable that it will experience a different outcome. This is a shared responsibility, and both will need to contribute equally, being fully aware that a

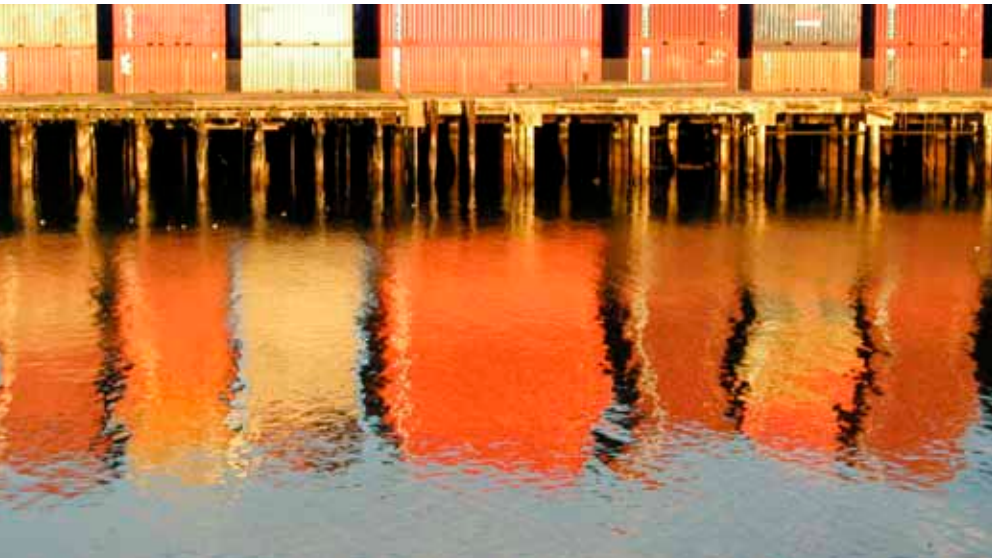
**“If a shipping line is not prepared to assist its terminals in improving and it just continues doing what it has always done – then it is quite improbable that it will experience a different outcome.”**

will have no idea as to what or where it needs to be improved, or how to prioritise improvements. You will not be able to set any meaningful or objective targets for improvements internally as you will not know where the bar is set or what is achievable, not to mention, what the industry's “best-practice” is. So you are highly likely to be playing a percentages game potentially with very small numbers, and with zero visibility or knowledge as to whether you are building or falling away from establishing true and clear competitive advantages.

#### **Data quality**

During a project at one terminal, we embarked on an exercise to measure the performance of an entire shift, but more importantly, also the delays and disruptions suffered by the quay cranes. This is not a particularly exciting task, but it does and did reveal a lot. With our high quality data consolidated and requesting the corresponding shift logs, we found that less than 50% of all delays had been recorded in the terminal's systems. Moreover, what had actually been recorded bore little resemblance to what we had physically observed! However, the shift logs and the delays stored within the terminal's systems were being utilised as the primary input for performance evaluations and improvement prioritisation. Needless to say, no improvements were experienced, and this is not surprising if you do not know where to look. “What gets measured gets done,” but it must always be with empirical data, without which you cannot even take the very first baby steps.

Each quay crane has a Programmable Logic Controller (PLC), recording each and every micro-activity the given crane performs. These data are often used by an engineering department to analyse failures, plan preventative maintenance, etc. Still, this input is very rarely shared with or used by an operations team. The PLC records every twist-lock transaction, hoist and trolley distance, and can reveal a lot about the efficiency of cycle times, and also accurately record delays and waiting times. It does not know itself why idle time resulted; however, this gap would be bridged by linking these data to a Vehicle Mounted Terminal computing platform or to a handheld so a



them more comfortable in sharing information where areas of further improvement can be identified.

Having designed and launched Vendor Performance Systems and the unique “Partnering Programme,” we have learned through experience just what can be achieved through cooperation and collaboration. Embarking on a project encompassing some of the largest terminals in the world, our baseline analysis revealed total stagnation and even slight declines in productivity output over the years. Working more closely with our partners, learning and understanding their constraints and headaches, win-win solutions were identifiable. Through an improved exchange of information and more constructive communication, these improvement levers were also quantifiable and therefore able to be prioritised. The result (with no more investment than the time consumed by a joint project team) was sustainable efficiency gains of 15% or more, achieved within just a few weeks. We found many fundamentally flawed processes which were resulting in efficiency waste and sub-optimisation, and which could easily

single silo-entrenched party cannot generate anywhere near the same positive impact as described above.

#### **Benchmarking**

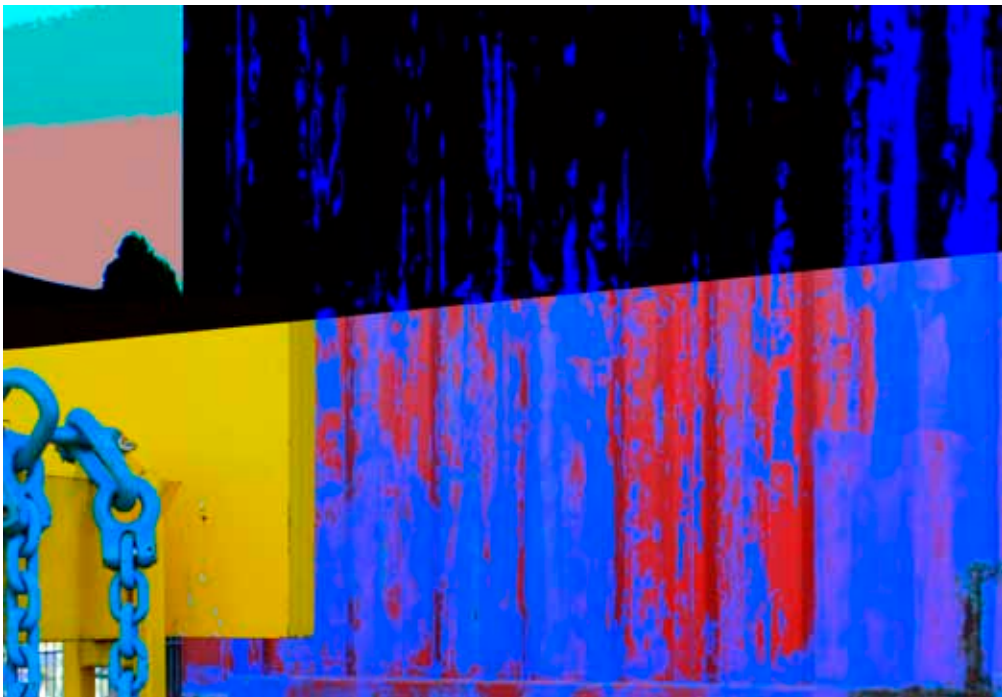
We, as the general entrepreneur-consumer public, often feel this is a “dirty word,” where somebody loses as others gain in a zero-sum game, not necessarily the nicest and fairest on planet earth. Despite the massive inefficiencies which we observe within the industry, each player seems to have a big misperception that its his performance is best in its class, and as a result they do not wish to share their “precious secrets.” We have approached many companies, as we were able (and willing) to provide secure, highly confidential, and totally unbiased benchmarking services; however, not a single one wished to provide non-sensitive, general information.

Nonetheless, the fact remains that unless you are prepared to share data, you will not be able to objectively know how your own performance compares to others – is it good (and improving or deteriorating), bad, or just satisfactory? You

crane operator or tally clerk is prompted to select the reason for delay.

Lean operations

We are often told that we cannot (and should not) compare terminals to manufacturing plants/factories as they are very different. The only variances we see are a roof and very different profit margins. Container terminals generally experience very high EBIT versus revenue and return on invested capital results, whereas manufacturing needs to sustain on razor thin profit margins. Whether they want to or are simply forced to, the most efficient and sustainable manufacturing businesses employ lean methodologies and tools (e.g. Six Sigma) to continually eliminate waste, optimise costs, and provide ever-better products to their customers in what is a



“  
Constant improvement is not a diet, it is a lifestyle. One can only reap maximum rewards if this attitude is championed from the board room all the way down to the frontline.

highly competitive environment. Much of what works and has been successful within manufacturing can therefore be applied to container terminal operations, including measuring and driving

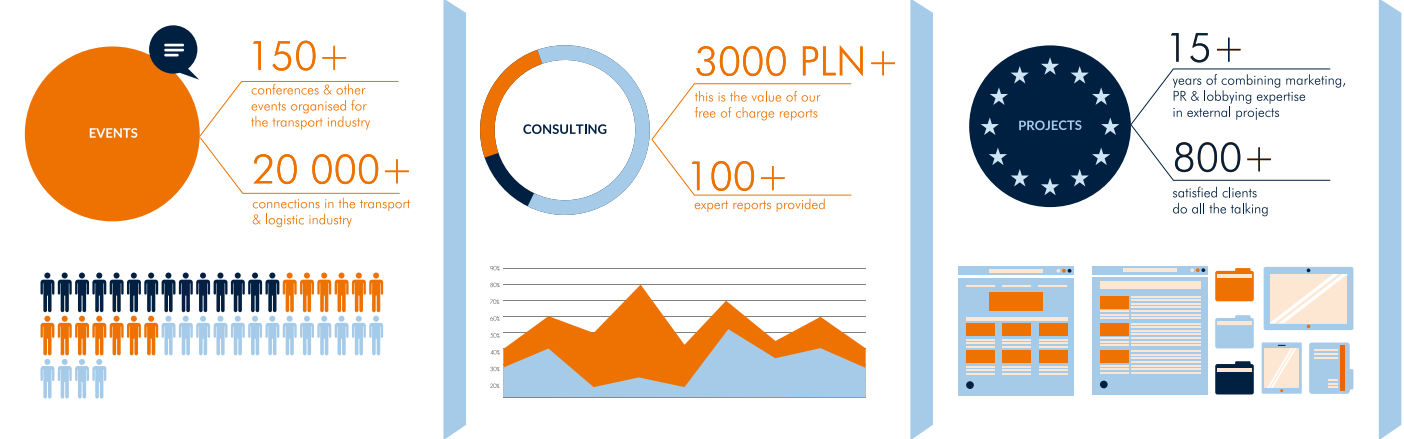
improvements in Overall Equipment Effectiveness (OEE); Line Balancing/ Kanban, root-cause identification (i.a. Fishbone, 5 Whys), and in the case of engineering – Single-Minute Exchange of Die (SMED) and 5S, naming just a few. In any mid- to large-sized terminal, a dedicated department of just a few green or black belt trained lean practitioners can assist in facilitating conscious and

continuous development. Working with the functional teams in a supporting role, they are able to structure project pipelines and data analysis outcomes, perform root-cause identification, test potential solutions and assist in their implementation, as well as ensure that control measures are in place to sustain the implemented improvement. In other words, these lean-steered workers



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define, measure, analyse, improve, and control, as per the traditional lean steps, do nothing more than solve a problem (and the container business, particularly its offshore part, has several issues, both externally-caused and breed in-house).

Constant improvement is not a diet, it is a lifestyle. One can only reap maximum rewards if this attitude is championed from the board room all the way down to the frontline. It is a journey, not a destination, where patience is a sought-after virtue, as results will not fall from the heavens. Commitment, determination, and maintaining a constancy of purpose are the keywords and behaviours needed for sustainable success. It is never too early to start; the best time to plant a tree was 20 years ago, the second best time is now. It might mean that you initially require some external assistance, but establishing such programmes isn't rocket science with the right expertise, and once set up, they can be autonomously run for mid- to longer terms.

### Future-proofed terminals

Any new terminal being planned today (or existing facilities upgraded) will need to stand the test of time. Terminal concessions typically run between 15 and 40 years, and an investor needs to ensure that it is designed in such a way that it will remain relevant throughout its lifecycle.

When it comes to container terminal design, resistance to embracing new and future technologies isn't something new to shareholders. They believe that next-gen stuff entails too much risk, despite the fact that inventing the container was a breakthrough which needed brave

pioneers some 60 years ago! However, doing more of the same, even slightly better, is certainly not risk-free – if the competition creates something which is significantly better, your shiny “new” terminal can quickly become a “white elephant”.

On the other hand, no one is urging someone to re-invent the wheel. Envisage Malcolm McLean (notice the “Lean” in his name), standing next to a 1970s container terminal, and then turn your eyes to one of the many “future” and “innovative” designs of a box handling facility. Both have A-framed well-spaced-out STSes and rubber-tyred machines running on concrete between the yards and the quayside. The devil is in the detail, where small things make big differences. For instance, just as we outlined in part two of this series, a typical quay crane is designed to cycle every 90 seconds, resulting in 40 runs per hour. This is physically possible, even with 59 m beam vessels, in the hands of a reasonably skilled operator. Introducing twin 20-footer lifting, and potentially also dual-cycling, will mean that on average there will be 1.2+ containers moved per spreader cycle. So the potential output is  $40 \times 1.2 = 48$  container moves per hour. However, as a global average, the actual output is closer to 28, giving in the end 58% OEE, or the other way around – a 42% waste. Bear in mind that a quay crane is only in use 50% of the total hours in a given year.

So why is this? Our observations across a large quantity of terminals in the Americas, Europe, Africa, and Asia all point to the same conclusion: Cranes spend a significant time waiting to be fed from the yard. As suggested above,

sea-hinterland cooperation and collaboration, as well as lean operations, can greatly assist in removing some of this waste when driven by people and processes.

However, terminal design can be partially to blame, too, with blueprinting flaws preventing a given facility from working close to maximum potential and efficiency. The most significant and consistent failure which we observe comes down to the ratio of yard versus quay cranes. Let us illustrate this with two recently built examples – Rotterdam's Maasvlakte II (eight quay cranes supported by 28 yard cranes) and Los Angeles' TraPac (four quay and eight yard cranes). On average, it is uncommon for a yard crane to consistently process more than 14 containers per hour, so an entire quay wall efficiency is constrained by that. For Maasvlakte II this means a maximum 392 berth moves per hour for two berths and 1,000 m of quay face, which will not deliver against longer term customer requirements, which already today stand at 250 berth moves per hour per (18,000 TEU) ship. For TraPac, the yard can support 112 moves per hour ( $8 \times 14$ ) across the entire quay (950 m), which will equate to a maximum of 28 moves per quay crane. With call-sizes set to increase, and where the US West Coast (Californian) ports already handle some of the largest call-sizes globally, a vessel which needs to exchange 8,000 containers will be dock-side for three days or more. In both cases, the yard is simply not deep enough, and each yard crane run is too wide to be able to serve the quay wall effectively, which drives 80% of the terminal's revenue stream. These two terminals are not future-proofed, and they certainly are not alone, merely examples of the norm.

How then to shortly sum up our series on port performance & productivity? One thing is granted, namely that a lot needs to be done if the container business is to move forward, not backwards as it frequently does today. Some would call this a “potential for development,” but the sad truth is that we've been talking about solutions which should have logically been in place since the very start, or at least spied promptly from other industries and their best practices. The scope of improvement is wide, reaching human factors such as multi-faced cooperation, streamlining sea-hinterland interfaces and their timetables, along with strategic planning and smart tactics on the one hand, and hardware issues like the abovementioned yard--to-quay crane ratio on the other. One just needs to answer a simple question: Is lifting the game a game for me? ■





**FREEPORT OF RIGA AUTHORITY**

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by **Anna Dąbrowska, Aleksandra Plis, and Maciej Kniter**

Looking at the TEU data of Europe's biggest ports, one has to admit that the previous year was not kind for container handling. The statistics collected by the Harbours Review team show that out of 20 seaports, 11 of them are in the red, one stays at the same level, and only eight mounted up.

The twenty-foot equivalent units' turnover of European leaders – Rotterdam, Antwerp, and Hamburg has decreased. Rotterdam lost least of the three – 0.51% year-on-year to 12,324,535 TEU, while Antwerp's handling decreased to 9,654,000 TEU (-7.53% yoy), and Hamburg's to 8,800,000 TEU (-9.28% yoy).

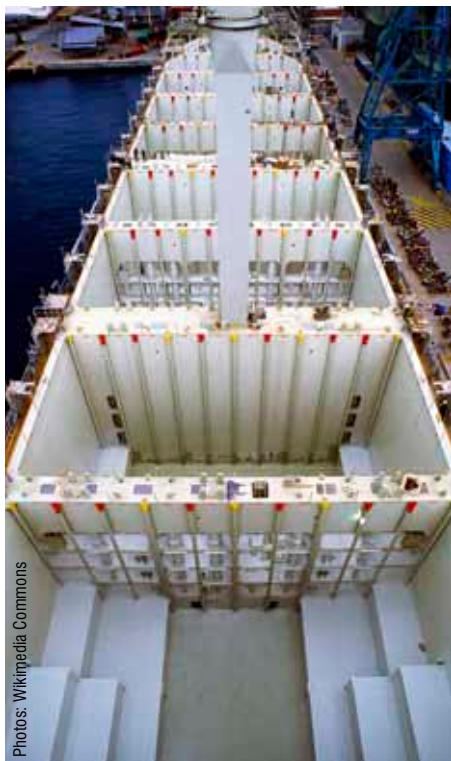
However, the table is more optimistic when it comes to the harbours from southern Europe, especially the Spanish ports. The figures show that 2015 was rather good to them, and they had better results than in the previous year.

## Top 20 European container ports

Nº	Port	TEU 2014	TEU 2015	Yoy
1	Rotterdam	12,297,570	12,234,535	-0.51%
2	Antwerp	8,978,000	9,654,000	-7.53%
3	Hamburg	9,700,000	8,800,000	-9.28%
4	Bremerhaven	5,758,000	5,464,000	-5.11%
5	Valencia	4,441,949	4,615,196	+3.90%
6	Algeciras	4,456,662	4,498,092	+0.93%
7	Felixstowe	4,100,000	4,100,000	+/-0%
8	Piraeus	3,585,000	3,287,000	-8.31%
9	Ambarli/Istanbul	3,600,000	3,080,000	-14.44%
10	Malta Freeport	2,900,000	3,060,000	+5.52%
11	Le Havre	2,550,000	2,560,000	+0.39%
12	Gioia Tauro	2,969,802	2,546,805	-14.24%
13	Genova	2,172,944	2,242,902	+3.22%
14	Southampton*	1,895,000	2,106,000	+11.13%
15	Barcelona	1,894,000	1,966,000	+3.8%
16	St. Petersburg	2,375,070	1,715,139	-27.79%
17	Zeebrugge	2,047,000	1,569,000	-23.35%
18	Mersin	1,498,850	1,466,199	-2.18%
19	Sines	1,227,694	1,332,200	+8.51%
20	La Spezia	1,303,017	1,300,432	-0.2%

Source: Port Authorities

\*Estimation based on units including ro-ro (United Kingdom's Department of Transport).



Photos: Wikimedia Commons



TOC Europe 2016,  
June 14-16, 2016, Hamburg, Germany

## TOC's overview

# News from the AGM for port & terminal professionals

TOC Europe is a global meeting of port representatives, shipping line operators, as well as logistic company delegates, and all business and industry leaders interested in the latest market updates and technical innovations. Thanks to the report prepared by the Team of TOC Events Worldwide, we now have a chance to look again at what was going on in Hamburg on June 14-16.

### Smart systems' key to optimising traffic flows in the big ship era, says the Port of Hamburg

**I**s digitisation the new revolution after containerisation? This was the big question posed by Wolfgang Hurtienne, Hamburg Port Authority (HPA) Managing Director, in his opening remarks to the TOC Europe 2016 Container Supply Chain conference – and a topic that reverberated across many speeches and panel debates over the three days of the 40th anniversary event in Hamburg during June.

Mr. Hurtienne told delegates that the rapidly increasing number of ultra large container vessels (ULCV) and much bigger cargo blocks have been putting a “massive strain” on infrastructure in Hamburg, which handled 8.8 million TEU in 2015. “We have seen a rise from an average 3,000 TEU box traffic per call to 7,000 TEU now,” he said.

“Intelligent approaches” are crucial to managing cargo peaks, optimising traffic flows and maximising infrastructure utilisation across the port, said Mr. Hurtienne, especially at a time when low trade growth is creating new challenges for funding the upgrades needed to serve ULCVs. Deepening channels and raising bridges does not come cheap, he observed. Nor does the training needed for port personnel to handle the new generation of leviathan vessels, both in the approach and their stay at port.

Hamburg is now testing a number of smart technologies to provide it with real-time data on a port-wide basis, as a prerequisite to optimising traffic operations on both the waterside and landside, explained Mr. Hurtienne. Initiatives include digital vessel traffic management and a pilot “virtual depot” scheme, aimed at creating more cost-efficient empty container logistics. Currently, empty container moves eat up around one million truck journeys in and around the port every year.

The challenge for Hamburg, and a key aim of digitisation, is to significantly increase capacity without expanding the current physical footprint, added Dr. Rolf Bösing, State Secretary at Hamburg's Department of Economics, Transport and Innovation. As the port is an industrial area within the city, sustainable development for the future is a priority, he stressed, including a shift to renewable energy and introduction of digital processes to improve traffic flow and capacity management. “Intelligent transport systems are a citywide initiative to ensure mobility,” he said, as part of Hamburg's “smart port, smart city” commitment. ■



Photo: Port of Hamburg Marketing/Michael Linder



## Modularity, retrofitting and intelligent equipment: APM Terminals outlines new automation agenda

**M**ajor greenfield automated container terminals projects such as APM Terminals' MV II facility in Rotterdam – as showcased at TOC Europe 2015 – are vital proving grounds for new robotic and remote-controlled cargo handling technologies, and for automated terminal logistics. But APM Terminals' automation focus for the future will increasingly be geared towards “faster, incremental deployments” at existing terminals, with particular emphasis on improving operational processes through more accurate and integrated information.

Alex Duca, APM Terminals' Head of Terminal Design and Automation, used his speech at TOC Europe 2016 to emphasize the importance of automated and joined-up information to improve safety and efficiency. “The biggest business opportunity is in retrofitting existing terminals with the automation of key processes to enhance our current operational performance,” he said.

At TOC Europe last year, Mr. Duca called on equipment and technology suppliers to embark on a “sensor revolution”, creating a new ecosystem of connected equipment and vehicles that provide real-time data on asset and operational performance. Building on the data theme during

this year's debates, Mr. Duca told the audience at the TECH TOC Robotics and Automation seminar: “What we want is a more integrated container terminal encompassing control systems and equipment functions, instead of today's fragmented activity. We need to make better use of equipment sensors and systems that combine with logistical information provided by terminal systems if we are to achieve automation's true potential.”

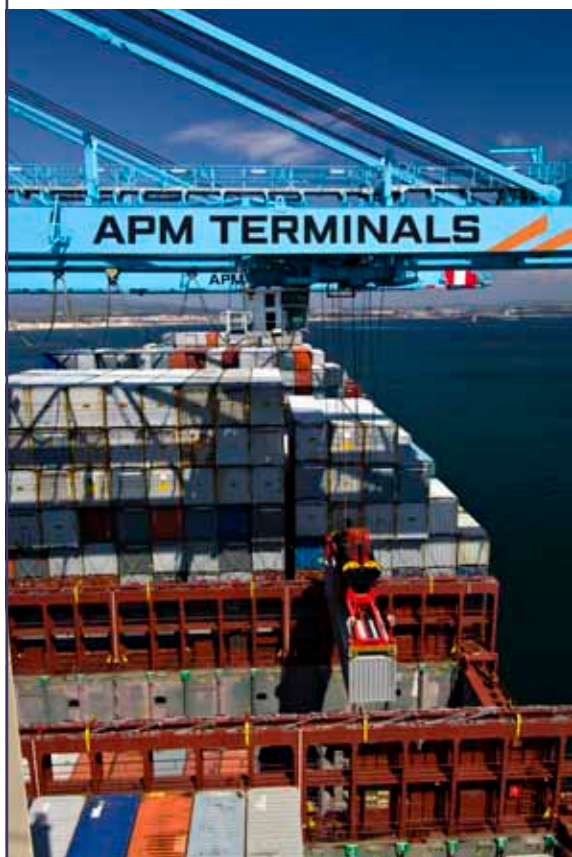
On the side lines of the conference, Mr. Duca told the TOC team that benchmarking the performance of automated container terminals with previous types of operation is not straightforward, as the shift from manned to automated often results in designing completely new processes. Nonetheless, he added, automation has proven its potential to deliver increased predictability and consistency. As a result, APM Terminals will continue to hone its modular approach to developing automation solutions and retrofitting existing terminals.

During his speech, Mr. Duca covered six core modules: crane automation, intelligent yard block, horizontal transport automation, gate automation, reefer control, and resources and utilities. He explained how these various modules have or are

being tested and deployed at APM Terminals' four current green field automated terminal projects. Out of MVII Rotterdam, Lazaro Cardenas (Mexico), Vado (Italy) and Tangiers (Morocco), only the North African facility is integrating all six modules. The automation retrofitting opportunity is far more extensive, both geographically and by type of terminal operation.

Mr. Duca explained that the operator's evolving approach to terminal design allows each module to be documented in a highly detailed manner from both an operational and technical point of view. This enables the company to incorporate lessons learned from past projects, and also to standardise its requirements and reduce automation complexity, another key requirement.

Returning to his theme of intelligent equipment, Mr. Duca called for continued development of automated systems that help human operators of equipment and vehicles to drive, park and handle containers more safely, reducing collisions and other common causes of accidents as well as improving productivity. He pointed out that such digital assist systems have become commonplace in the passenger car and commercial vehicle industry over the past few years. ■



Photos: APM Terminals



## Integrating data beyond the terminal borders: assessing the next frontiers



Photo: APW Terminals



Photo: Carготec



Photo: Eurogate

The traditional terminal operating system (TOS) is steadily migrating towards an integration platform, interfacing with a growing array of terminal process automation and optimisation technologies including gate optical character recognition (OCR), vehicle booking gateways and equipment control systems. But an even bigger shift is set to take place beyond the terminal borders, said Dr. Stefan Wiech, Partner, HPC Hamburg Port Consulting.

Speaking during a session on The Digitisation of Container Trade, Dr. Wiech told delegates at TOC Europe that the TOS will increasingly form part of a larger information ecosystem reaching across the broader port community and along maritime and hinterland transport chains. His presentation focused on two such initiatives – the EU-funded Rhein-Ports Information System (RPIS) and expansion of the Hamburg Vessel Coordination Centre (HVCC) to cover inland vessels.

Stretching from Ludwigshafen/Worth and Mannheim in northern Germany down through Strasbourg in France through to Basel on the German-Swiss border, RheinPorts and the Upper Rhein form a major trade artery serving a busy industrial and consumer corridor. The corridor feeds and is fed by multiple deep sea ports, stretching from Le Havre right across to Rostock in the north, plus Genoa and Marseille to the south. But the starting point for the project was a “low degree of IT and integration,” said Dr. Wiech, with “decentralised data exchange” among the main principles, including ports, shipping lines, barge operators, depots and customs. The inland ports were suffering from waterside congestion and there were particular challenges with traffic moving cross-border between the EU and Swiss ports.

The new integrated system developed provides a single, paperless platform connecting all of the parties with centralised communication, decision support and information transparency. The platform allows the various parties to coordinate barge calls, manage network-wide transport capacity, administer container data and perform customs activities.

In a similar vein, the latest developments at the Hamburg Vessel Coordination Center (HVCC) – a joint venture between Hamburg terminal operators HHLA and Eurogate – will now provide a central clearing house and single point of contact for all operational issues related to barge and inland vessel calls at the port. Deep sea vessel and feeder vessel calls are already handled by the Center. Following several months of pilot tests with Börde Container Feeder, whose ships make about 70 calls a month at Hamburg terminals, the new service went live and fully operational in June of this year.

The trend towards multi-stakeholder data platforms – and, for the future, cross-platform interfaces – is not without its challenges, both technical and cultural. Key factors that can make or break a project include modular IT systems design, flexible interfaces and a high degree of standardisation, said Dr. Wiech. Stakeholder, integration and change management are also critical. ■

## Continuous improvement culture vital to automated terminal design and project management

**I**ft berth productivity to 250 moves per hour for fast handling of ultra large container vessels. Improve safety and reduce lost time injury frequency (LTIF) by separating man from machine. Make operations cleaner, denser and more sustainable by replacing fossil fuel power with electrified solutions. Automated container terminal designs can help operators to meet multiple business challenges – but what does it take to turn design into reality?

“Improve before starting” was the key message from Bart Vermeer, Senior Manager Terminal Automation at Moffatt & Nichol, in his analysis of key success factors in automated container terminal design and project management. Sharing experience gained on landmark green field automated container terminal projects including APM Terminals Maasvlakte II and ECT Euromax, Mr. Vermeer told TECH TOC attendees: “If you don’t design for high productivity, you will not reach high productivity.”

The starting point to any automated terminal project should be to define an optimised process, said Mr. Vermeer. This should be used to drive fundamental design decisions, broken down into manageable building blocks and complemented by a clear definition of the required elements and interfaces, including clarity on “who communicates to whom about what data”. As part of the early design thinking, he said, it is also important to define the “appetite for innovation.”

Are proven technologies preferred? What track records do vendors need? And what track records are needed for integration between vendors? Whatever the appetite, innovative elements should always be phased across the project in order to manage and mitigate risk. Simulation and emulation technologies have also become important tools and should be incorporated from the design stage onwards through the project cycle, he added.

Turning to project organisation, Mr. Vermeer focused on the role of the ‘Improvement Manager’ as a senior team member, playing a vital measure-test-report-and-improve function during the different project phases. Working alongside the project management office (PMO), and reporting into the Programme Manager, the Improvement Manager is responsible for defining the key performance indicators (KPI) tree, defining the improvement strategy and building out the data model and sources for reporting.

However, there is a dilemma to be managed in integrating improvement as a key project function, acknowledged Mr. Vermeer. “Improvement is about change, but during a project every change is a potential risk that can cause delays or increase the budget.” The solution, he said, is to recognise that “continuous improvement is forever” and develop a very clear approach to change management. ■

## Agile optimisation for rail crane operations is a big opportunity for performance gains

**B**ig Data, business intelligence and analytics promise to channel data streams into knowledge, transparency and insight. But real process optimisation requires more than just channelling a flood of data – and for those who work under pressure there is simply no time to analyse the data when rapid action is needed. So how do today’s container terminal operators reach a place where they can make rapid *and* wise decisions?

Agile optimisation, a management concept “responding to the massive challenges of today’s rapidly transforming business world” holds the key, according to Dr. Eva Savelsburg, SVP Logistics and member of the board at INFORM GmbH. The German-headquartered company specialises in software that uses intelligent process optimisation logic and has been involved in the container terminal industry for a number of decades.

At the TECH TOC Robotics & Automation Seminar during TOC Europe 2016, Dr. Savelsburg’s focus was on agile optimisation of rail cranes used to transfer containers between marine terminals and inland transport networks. She observed this was a frequently overlooked issue that offered a “big opportunity for the industry.”

Agile optimisation as a management concept aims for a balance of rapid, smart and interactive response, blending the best of humans and computers, said Dr. Savelsburg. In computing terms, algorithms are “a powerful weapon,” enabling massive increases in complex decision-making. Operations research (OR) powered by algorithms offers “many techniques for greatly speeding up the search for good solutions,” she added.

Agile rail crane optimisation draws on algorithms and OR to simultaneously enhance rail crane moves, train load planning and container handover between yard and rail. Rail crane job sequencing is optimised, with jobs combined wherever possible. The system also automatically creates optimised train load plans, in real time, and proposes times and transfer points for container handover.

With no additional infrastructure, resources or manpower, operators can handle more units per train and more trains a year, and reduce equipment idle time and unproductive moves, among other benefits, said Dr. Savelsburg. Clients to date include terminal operators such as APM Terminals, HHLA, TraPac and Global Container Terminals, and intermodal and inland logistics companies including Rhenus Logistics and Swiss Post. ■

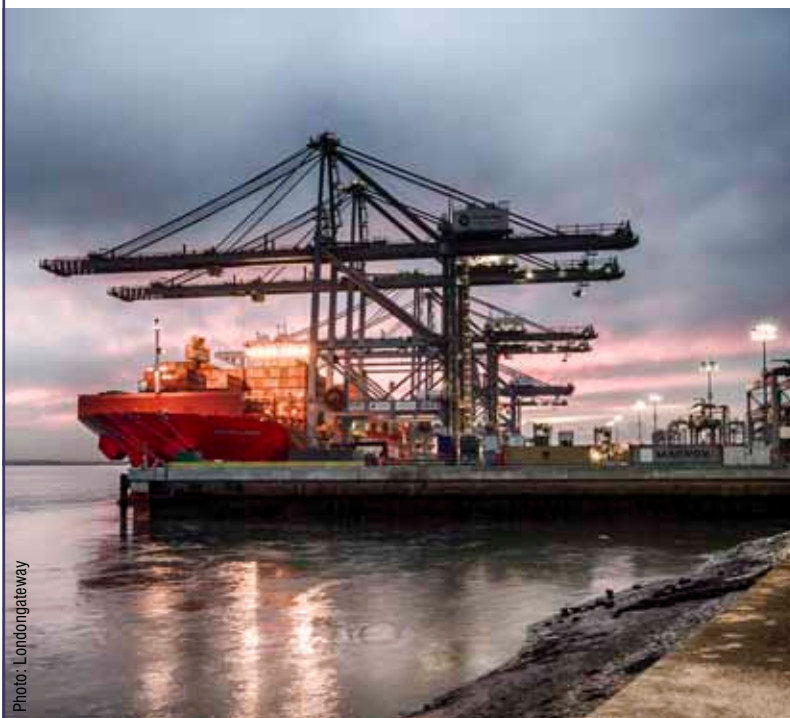


Photo: Londongateway



## Brownfield conversion could drive exponential growth in container terminal automation



Photo: Gargorep

**E**xponential growth could more than double the number of automated container terminals by 2020, according to Ismo Matinlauri VP, Solution Sales and Marketing for Kalmar's Automation and Projects Division. Speaking on "The art of terminal automation – defining a successful deployment strategy" during the TECH TOC seminars at TOC Europe 2016, Mr. Matinlauri said that the high-end growth scenario could catapult the number of automated facilities from around 60 worldwide today to over 140 in the next four years.

The terminal automation market will increasingly be driven by brownfield conversions, he added, which are expected to grow much faster than completely new facilities over the coming few years. This point was reiterated by many of the speakers at TECH TOC this year, suggesting that the industry shift which many have been predicting for some time now could finally be set for take-off.

Key drivers for automation are improved safety, service delivery and flexibility, plus the chance to reduce costs and increase asset utilisation, said Mr. Matinlauri. Safety, once rather relegated, has moved up the priority list in light of bigger vessels and call exchanges, resulting in an increase in traffic in the yard and on the quay. "Optimum efficiency, space utilisation and cost reduction" are also increasingly important, he said, along with sustainability. Additionally, shortages and the cost of trained and skilled labour continue to push terminals towards automation.

The shift to automated operations requires a significant shift in mentality and skills, said Mr. Matinlauri. The focus needs to move "from managing large numbers of people to optimising the system." Business processes and operational procedures are different and users "must understand and leverage decisions made by the system."

In the same vein as other presenters, he emphasised the vital importance of emulation technology and collaborative testing to keep surprises out. Testing must happen early and continuously: "Issues will arise too late in the project if not tested adequately in advance." Additionally, new features or equipment should only be introduced after thorough testing. ■



## Machine-to-machine (M2M) evolution holds the key to the Internet of Things (IoT), Big Data and connectivity in the container supply chain

**M**achine-to-machine, aka M2M, is defined as the process whereby one machine talks to another over a communication channel, generally GSM or satellite. And it's M2M technology that will help drive the real-time connectivity revolution coming to container supply chain operations, generating much of the Big Data to feed smart shipping, ports and logistics networks.

Speaking at the TOC Europe Container Supply Chain Conference, Michael Dempsey, Vice President Containers and Ports for ORBCOMM, said early adopters such as Maersk Line are already using M2M to significant effect and predicted that "within 10 years, M2M will dramatically change how supply chain stakeholders can make decisions." Maersk Line has installed M2M devices including ORBCOMM technology on its entire 270,000 strong refrigerated container fleet, plus GSM networks on its vessels, allowing it to remotely track the location and status of reefer boxes and cargoes worldwide.

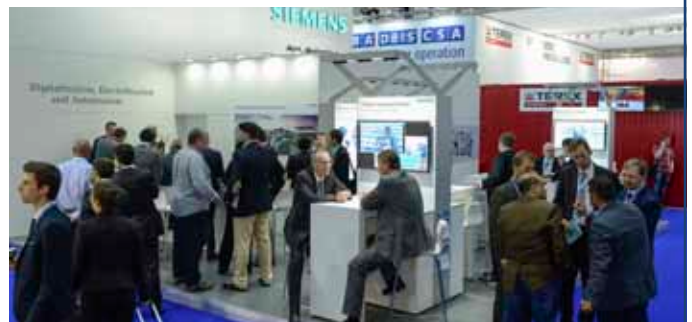
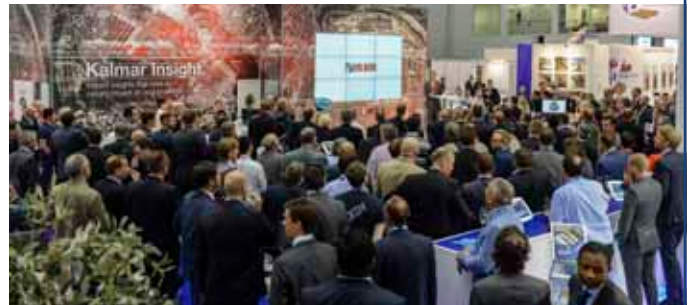
Today, assets used in the container supply chain are generally "dark, dumb and disconnected," said Mr. Dempsey. "What this says is that we really don't know much about them – they are not self-aware, we can't see them and they can't tell us about their actions and status." M2M telemetry is now making assets and shipments "visible, smart and connected," providing a wealth of data that can be used to improve supply chain operations in a variety of ways.

Mr. Dempsey explained that a typical smart asset solution stack includes telemetry devices, connectivity, network management and M2M software applications. Telemetry devices are now available in all shapes and sizes, along with solar-powered options and dual network versions that can switch between GSM and satellite to ensure uninterrupted tracking. Often, devices are closely associated with specialised sensors that can remotely monitor a wide array of conditions such as temperature, humidity, light, shock, motion, door opening, fuel levels and tyre pressure.

M2M is still in the early phases of adoption in container shipping, ports and logistics, said Mr. Dempsey, with an estimated 300,000 smart reefer containers, 30,000 dry boxes and 5,000 tank containers in operation. Trials are just beginning in the US on chassis. "In the trucking industry adoption has far outpaced the container side," he noted. "Approximately 80% of reefer trailers in use on the roads of North America have telemetry. In Europe, it is mandatory." In total today, ORBCOMM has over 1.6M subscribers using GSM and/or satellite networks across industries such as heavy equipment, road transport, marine operations and vessel automatic identification system (AIS).

Mr. Dempsey identified four big areas where M2M will impact the container supply chain: *security*, to tackle cargo theft, smuggling, terrorism and tax evasion; *visibility*, to improve asset availability and positioning, mitigate port congestion and enable advanced decision making along the chain; *process automation* in container terminals to support operational safety and efficiency, provide predictive M&R and help manage energy and labour costs; and *regulatory*, providing hard data and chain of custody for compliance with security, environmental, food and pharmaceutical safety laws.

The Big Data generated by M2M is truly enormous, observed Mr. Dempsey. Just 30 reefer containers reporting over 30 days will generate 30,000 lines and 2 million fields of data, stacking up at 20MB. "More data alone is not good enough," he cautioned. "You must of course collect data, but you must put it in context to make good decisions that protect cargo and manage assets."





## Harbours Review Spotlight:

On-Shore Power Supply (OPS) Seminar  
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## The Port of Gdańsk

# Within a range



Łukasz Greinke, the Port of Gdańsk's President of the Board

For many years, the Baltic Sea region was fed with containers through the long-established North Sea hubs such as Hamburg and Rotterdam. However, this changed a few years ago with the emergence of new port infrastructures that attracted direct ocean-going vessels that allow the Baltic to trade with the Far East directly. On the other hand, global players and markets also brought large-scale challenges. We talk with Łukasz Greinke, the Port of Gdańsk's President of the Board, about the Gdańsk-Le Havre range, as well as developments taking place in and around the port.

■ **How does the current situation on the container market impact the Port of Gdańsk?**

The difficult environment the container market lays down today raises many deep concerns among involved actors. However, a few of them may serve as a good example of how one can successfully sail through rough water, Gdańsk being one of them.

The importance of the Baltic Sea has changed since the full-scale Deep-water Container Terminal Gdańsk (DCT) was put into operation a few years ago, attracting the largest box carriers to call the region on a regular basis. Over the last decade, container turnover in Gdańsk increased 14 times, elevating our port to the position of the Baltic's 2<sup>nd</sup> biggest box handling facility, with roughly 1.1-1.2 mln TEU/year served during the 2013-2015 period. Within the next 15 years we expect these volumes to more than double up to 3.0 mln 20-footers annually. Despite the ongoing West vs. Russia economic sanctions, as well as the fairly sluggish GDP growth in Europe, container dynamics are

here, with +27.3% year-on-year more boxes handled in Gdańsk over 2016's first half up to nearly 646 thou. TEU. We aim therefore at beating another record this year, quickly filling up the gap between us and the region's first-placed St. Petersburg, whose container volumes remain flat so far. Another thing which recently changed is the well-known term "Hamburg-Le Havre" range, reserved up-to-date to container hub heavyweights in the North Sea. We now speak of the "Gdańsk-Le Havre" range, as a clear identification of the region's importance in general, and that of Gdańsk in particular. This is because shipping alliances and other ship-owners are looking around in these uncertain-margin-times for new cost-effective solutions, thus i.e. they bring bigger and bigger ships as close as possible to the final outlet. And they do this because the infrastructure and service quality disparity between the North and Baltic Seas has disappeared in recent years. As such, Polish seaports have become vital links in global supply chain



logistics, and a sound alternative to their more westbound competitors. For instance, while feeder traffic between the Port of Hamburg (reckoned in the past by many as the gateway for Poland's international trade) and Polish seaports has declined (by approx. 40%), the volume of containers directly handled in the country has risen at the same time. In other words, Poland's ports have become cost- and logistics-wise for shippers all the way to the Far East, rendering the use of Dutch or German ports unnecessary and more expensive. And things will get even better when DCT launches its T2 expansion, doubling its overall capacity up to 3.0 mln TEU/year.

All things considered, we could venture making a controversial statement that both the EU-Russia economic sanctions, as well as the aggressive alliance-forming competition on the ship-owners side, have benefited Gdańsk in the end. First, Polish exporters had to re-think their businesses, and started to look for other than Russian markets to sell their goods. As such, our volumes did not suffer as much due to the economic sanctions as one could have initially expected. What was lost in transshipment, was in turn compensated by the Polish market. As such, land traffic at the port increased considerably, rail by approx. 40%, and road by about 20%. All in all, we're glad to experience the shift in Polish entrepreneurs' habits, quite rusty in the past.

#### ■ What are the port's plans for the coming years?

The Port of Gdańsk's development plans need to go hand-in-hand with market trends for the abovementioned ambitions to keep materializing. In the past, the port authority's investments amounted to several millions of PLN annually at best. Now, our yearly scheme totals PLN 100 mln, amounting to a sum of PLN 1.0 bln till 2020, some of it very much container-oriented. For instance, one of our projects got the green light for obtaining funds from the Connecting Europe Facility (CEF) in July, 2016; we'll see almost EUR 29 mln (of which EUR 24.4 mln is EU support) injected into road and railway network upgrades (7.2 km and 10 km, respectively) in the Outer Port, where the bulk of Gdańsk's container handlings take place. The mentioned land-traffic boost made the necessity

of this investment all the more vivid. Apart from DCT also other terminals will benefit from this project, just to mention Port Północny's Dry Bulk Cargo Terminal or the deep-water grain terminal of OT Logistics currently under construction. DCT has made some rail investments itself, including the recently two-to-four tracks expanded rail siding to accommodate a T2 throughput capacity; at the moment, DCT's 780 thou. TEU/year capacity siding comprises 2.5 km of tracks.

The Port Authority is planning to improve railway access through the implementation of a two-track system connecting the Gdańsk Port Północny railway station with the siding of the DCT. Currently, there is a one track connection in place, crossing the only road to DCT. The new access way will include a grade-separated intersection, which will make it possible to provide a smooth flow of traffic for both transport modes. Similar investments, namely the improvement of railway infrastructure from the Port Północny station further into other port areas will also be carried out for other terminals situated within the Outer Port.

Moreover, let's not forget that last year we celebrated the completion of the expansion of the intermodal container terminal on the Szczecińskie Quay in the Inner Port. This investment, worth nearly EUR 7.0 mln, was also executed with the help of EU funds, this time coming from the Infrastructure and Environmental Operational Programme. This investment covered a broad scope of works, i.e. enlarging the storage area, enhancing the traffic system and parking zones, improving the water and sewage management system, as well as providing the area with proper lighting and fencing. As a result, the terminal's throughput capacity rose to 100 thou. TEU/year, unit turnaround times between road, rail, and sea went down, while security was heightened. Additionally, in April of this year, a tunnel was commissioned under the Dead Vistula located next to the terminal, significantly axing down the distance trucks need to hop onto the nearby ring road or the north-south A1 motorway. Lastly, the terminal's operator, Port of Gdansk Cargo Logistics, has ordered a modern 42 tn lifting capacity reach-stacker that can stack five tiers high and three rows deep.

Poland's rail infrastructure manager, PKP PLK, will be busy in the Port of

Gdańsk as well. With the use of EU funds, the company will kick off a big railway stations modernization project on improving rail access to our port. The investment will include upgrading the Port Północny, Kanał Kaszubski, and Zaspą Towarową stations, along with the Przeróbka and Gdańsk Wiślany areas. What's more, the port authority recently announced a re-development concept tender of the railway system in the area of the Wiślane and Szczecińskie quays in order to ensure smooth rail freight operations in this part of the Port of Gdańsk. In short, our port will see a lot of construction works both in and around it in the near future.

#### ■ How will these trends and developments change the Port of Gdańsk in the end?

We predict that around 50-55 mln tn of goods will be handled at the Port of Gdańsk in 2020, containers being responsible for a huge part of this growth. With T2 in place, we'll see next-gen container carriers calling directly at DCT with more or less 2.0 mln TEU on an annual basis.

A few studies back up our forecasts. Firstly, the World Bank estimates that Poland's GDP will increase by approx. 14% by 2020, which in turn will be accompanied by even bigger container flows. For instance, in years 2010-2015, the country's GDP rose by 16%, while at the same time box volumes handled by Polish seaports increased by as much as 78%.

Secondly, neighbouring countries are also predicted to see their GDP rise, with containers passing through Poland on the way to their final destination. Thirdly, containerisation still has a lot of room to manoeuvre in our corner of the world, so more goods can come and go via Polish seaports stuffed in boxes.

Poland in general, and Gdańsk in particular, are expanding. We're directly trading with Far East markets, and are set to play an important role in e.g. developing the New Silk Road. However, as much as relishing is the thought of our recent advances, one swallow doesn't make a summer. Constant development done meticulously – be it infrastructure, market analysis, worldwide business networks, etc. – will see our potential fit to whatever the future may hold, capitalising on it, and making us even more proud to be a cog in this Gdańsk-Poland growth machine.

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