

# PORT TECHNOLOGY INTERNATIONAL



## FEATURED

- Mega-Alliances
- Robotic cargo handling
- Superstorm defence
- Government in ports

[www.porttechnology.org](http://www.porttechnology.org)

Edition 64



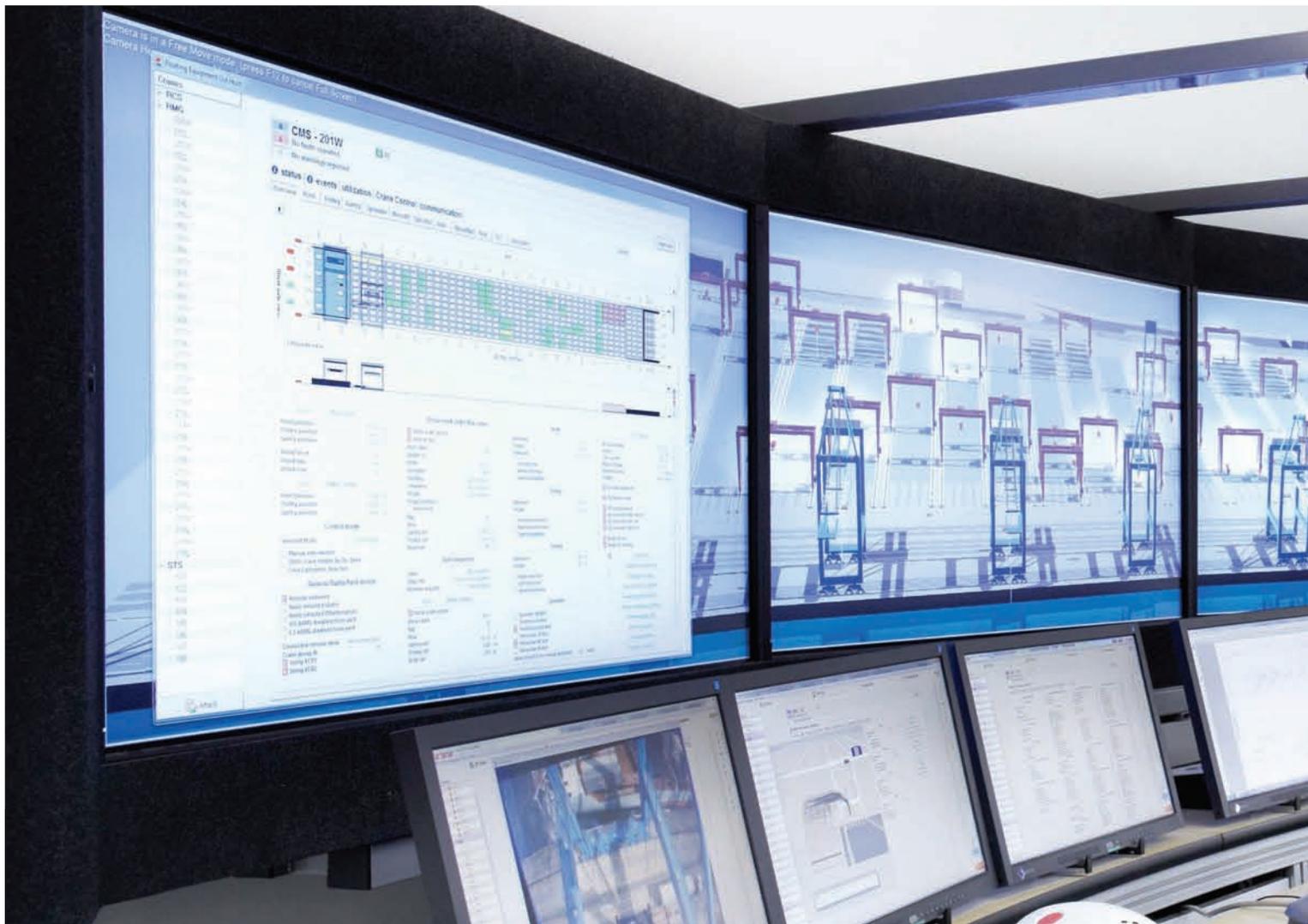
**MEGA-SHIP READY**  
The era of giants



**CONTAINERISATION**  
Looking inside the box



**GREEN PORT PIONEERS**  
Slashing port emissions



Automating container terminals. Safer, greener and more productive.

Container terminals are dynamic entities where the speed is high and large cranes work side by side with people and vehicles in motion. Bigger calls accelerate the speed of operations further and terminals need capacity and systems that in just a few minutes can be ready for full production. Intelligent automation moves more containers per hour – from ship to gate.



Intelligent automation also increases the terminal's energy efficiency and eliminates inefficient processes and bottlenecks at critical transfer points. With Intelligent automation all gates and cranes can be operated comfortably from a central control room which makes terminals safer and the working environment more ergonomic. Find out more at [www.abb.com/cranes](http://www.abb.com/cranes).

# Our Partners in Publishing



**International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA-AISM)** gathers together marine aids to navigation authorities, manufacturers and consultants from all parts of the world and offers them the opportunity to compare their experiences and achievements.  
[www.iala-aism.org](http://www.iala-aism.org)



**International Association of Airport and Seaport Police-InterPortPolice** is a worldwide, non-governmental and non-profit association dedicated to mutual cooperation in setting the highest standards of safety, security and law enforcement regarding the transportation of persons and property through air and seaports, across boundaries and other terminals.  
[www.interportpolice.org](http://www.interportpolice.org)



**The World Customs Organization (WCO)** is the global centre of customs expertise and research, with a primary mission to enhance the effectiveness and efficiency of customs administrations. It is an ideal forum for the organization's 177 members, who collectively process over 98 percent of world trade, to exchange experiences and share best practices on a range of international customs and trade issues.  
[www.wcoomd.org](http://www.wcoomd.org)



**The International Maritime Pilots Association** is a forum for the exchange of information. Its main objective is to provide a representative voice for pilots in international maritime forums, particularly at the International Maritime Organisation (IMO), an agency of the United Nations, and the International Maritime Law-Making Body.  
[www.impahq.org](http://www.impahq.org)



**ICHCA International** speaks for cargo handling interests at an international level and consults, informs and advises its members accordingly. It has a worldwide membership and is a recognised Non-Governmental Organisation (NGO) with ILO, IMO, ISO and UNCTAD.  
[www.ichca.com](http://www.ichca.com)



**AIM** is the global trade association for automatic identification and mobility technologies. As a not-for-profit industry organization, AIM's mission is to stimulate the understanding and use of the technology by providing timely, unbiased and commercial-free information.  
[info@aimglobal.org](mailto:info@aimglobal.org) • [www.aimglobal.org](http://www.aimglobal.org) • [www.rfid.org](http://www.rfid.org)



**International Harbour Masters' Association (IHMA)** promotes safe, efficient and secure marine operations in port waters and represents the professional standing, interests and views of harbour masters internationally, regionally and nationally.  
[www.harbourmaster.org](http://www.harbourmaster.org)



**PortEconomics** is a web-based initiative aiming at generating and disseminating knowledge about seaports. It is developed and empowered by the members of the PortEconomics group, who are actively involved in academic and contract research in port economics, management, and policy. Since October 2012, Port Technology International and PortEconomics have been engaged in a partnership.  
[www.porteconomics.eu](http://www.porteconomics.eu)



**The International Association of Ports and Harbors (IAPH)** is a worldwide association of port authorities, whose principle objective is to develop and foster good relations and cooperation by promoting greater efficiency of all ports and harbors through the exchange of information about new techniques and technology, relating to port development, organisation, administration and management.  
[www.iaphworldports.org](http://www.iaphworldports.org)



**The Coasts, Oceans, Ports and Rivers Institute (COPRI)** works to advance and disseminate scientific and engineering knowledge to its diverse membership, which is engaged in sustainable development and the protection of coasts, oceans, ports, waterways, rivers and wetlands. COPRI works to enhance communication and cooperation among more than 3,000 members, both domestic and abroad, and the industry as a whole by advancing members' careers, stimulating technological advancement and improving professional practice.  
[www.coprinstitute.org](http://www.coprinstitute.org)



**CEDA** promote the exchange of knowledge in all fields concerned with dredging. They enhance contacts between the various groups from which members are drawn and between the dredging fraternity and the rest of the world, enhancing understanding of dredging works from both theoretical and practical viewpoints.  
[www.dredging.org](http://www.dredging.org)



**The International Association of Dredging Companies (IADC)** stands for International Association of Dredging Companies and is the global umbrella organisation for contractors in the private dredging industry. As such the IADC is dedicated to not only promoting the skills, integrity and reliability of its members, but also the dredging industry in general. IADC has over a hundred main and associated members. Together they represent the forefront of the dredging industry.  
[www.iadc-dredging.com](http://www.iadc-dredging.com)



**The Ports and Terminals Group (PTG)** is the UK's leading ports trade association. PTG's mission is to help facilitate its members' entry into, or growth of their businesses in, overseas markets; and in doing so assist port organizations and governmental authorities worldwide to undertake port development and expansion on a build-operate-transfer or similar basis.



**Shanghai Maritime University (SMU)** is a multi-disciplinary university with a special emphasis on shipping, logistics and ocean science. The history of SMU can be traced back to 1909 at the end of Qing Dynasty and the university has been honored as a "cradle of international shipping specialists". At present the university runs 19 doctoral programs, 59 master's degree programs, 45 bachelor's degree programs. SMU has over 20,000 full-time students, including 17,000 undergraduates and over 3,000 postgraduate students. In the MOE evaluation of undergraduate education in 2004, SMU was awarded an "A" (Excellent). SMU has always attached much importance to exchange and cooperation with overseas institutions, and has established close ties with over 70 overseas universities and academies.  
[www.shmtu.edu.cn](http://www.shmtu.edu.cn)

## SUPPORTER COMPANIES

**APM TERMINALS**  Lifting Global Trade.



Port Technology International is supported by leading terminal operator networks, including APM Terminals and DP World.

**APM Terminals** operates a Global Terminal Network which includes 20,300 employees in 67 countries with interests in 71 port and terminal facilities.

**DP World** has a portfolio of more than 65 marine terminals across six continents, including new developments underway in India, Africa, Europe and the Middle East.

# From the MD

**Preferred Partners**



jkhan@porttechnology.org  
 www.porttechnology.org  
 @PortTechnology  
 http://linkd.in/porttech

It's been a magnificent year for both Port Technology International and the port sector, and it's been enthralling recording the innovation, creativity and dynamism exhibited by the industry in this year's journals and through our online output. We have seen ports achieve unbelievable feats and companies consistently provide inspiring solutions to optimise, track and safeguard the supply chain. It's safe to say that, after the difficulties of the 2008 recession, the vitality of the industry has come surging back, and it's great to see it going from strength to strength.

An implicit element of the growth we have witnessed in the global economy and within our industry has been the prevalence of mega-vessels. The world's top liners are demanding ships of a truly astounding capacity and the future looks to see ships getting even bigger. It has become clear that we are at the advent of a new era. The challenges mega-vessels bring ports and the supply chain cannot be shied away from, and this is exactly why Port Technology International has ventured to bring you a dedicated new section: Mega-Ship Ready.

This new and exclusive section will bring you the latest breaking industry insight from a range of specialists and experts regarding all things mega-ship. This inaugural edition features articles from contributors I've been delighted to speak and work with. These guys demonstrate real proficiency and knowledge, as well as being accomplished writers. One such contributor, Chief Commercial Officer at the Port of Long Beach, Dr Noel Hacegaba, was a pleasure to commission after the success of his recent white paper which charted the challenges the new era of mega-vessels brings to ports and terminals. Also worth a special mention is Andy Lane of CTI Consultants, and previously Maersk. His evident knowledge of the industry is beautifully articulated in his article, and he's been a blessing for various members of the PTI team in comprehensively answering some eager questioning, thereby setting the team off with various editorial angles of their own that I'm very much looking forward to see come into fruition in the near future.

As well as our new section, this edition is packed with contributors from top industry names and authors from the world's biggest ports, making an expansive and diverse issue. From the influence of local government in ports, to futuristic cargo handling solutions, to the award-winning environmental practices of Laem Chabang International Container Terminal in Thailand; this edition provides a holistic insight into the industry to mark our final issue of 2014. On that note, the PTI team would like to say a very special thank you to Dr Yvo Saanen and his team at TBA Netherlands. Throughout the year, TBA has consistently penned engaging articles and offered ongoing insight that's right at the cutting edge of simulation, emulation and consultation, and yet again, TBA has provided us with a fascinating piece regarding 'game-training' for container terminal planners for this issue.

We're already greatly looking forward to 2015 at PTI, and not least because it'll be our 20th anniversary. Also expect some new features and cracking content next year, but there's something we've been working on that promises to be a little bit special regarding the contemporary trend of optimisation in ports - this, along with our Mega-Ship Ready section, is going to add a whole new dimension to the PTI output.

Lastly, I'd like to take this opportunity to welcome both ABB and Musco Lighting as PTI Preferred Partners for 2015. ABB bring their global expertise in container terminal automation, and Musco is internationally renowned for sports lighting systems and will be an ideal supplier for port lighting solutions.



**James AA Khan**  
 Managing Director

Published by:  
Maritime Information Services Ltd  
5 Prescott Street  
London, E1 8AP  
United Kingdom

Tel: +44 (0)207 871 0123  
Fax: +44 (0)207 871 0101  
E-mail: [info@porttechnology.org](mailto:info@porttechnology.org)  
Website: [www.porttechnology.org](http://www.porttechnology.org)

The entire contents of this publication are protected by copyright, full details of which are available from the Publisher. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise without prior permission of the copyright owner.

Managing Director  
James AA Khan  
[jkhan@porttechnology.org](mailto:jkhan@porttechnology.org)

Commissioning Editor  
Richard Joy  
[rjoy@porttechnology.org](mailto:rjoy@porttechnology.org)

Editorial Assistant  
Michael King  
[mking@porttechnology.org](mailto:mking@porttechnology.org)

Director of Operations  
Daniel Ledger  
[dledger@porttechnology.org](mailto:dledger@porttechnology.org)

Marketing Manager  
Bee Cansick  
[bcansick@porttechnology.org](mailto:bcansick@porttechnology.org)

Senior Sales Manager  
Angus Chapman  
[achapman@porttechnology.org](mailto:achapman@porttechnology.org)

Head of Ports and Terminals  
Cesar Paris  
[cparis@porttechnology.org](mailto:cparis@porttechnology.org)

Design & Production  
Tina Davidian

Printed by  
Buxton Press Ltd

Back Cover  
Van Oord

Sixty Fourth Edition, November 2014  
ISSN: 1358 1759

While every effort has been made to ensure the accuracy of the contents of this book, the Publisher will accept no responsibility for any errors or omissions, or for any loss or damage, consequential or otherwise, suffered as a result of any material here published. The opinions expressed in the enclosed editorial are the sole responsibility of the authors and organisations concerned and not those of the Publishers. Neither Maritime Information Services Ltd nor its Agents accept liability in whole or in part howsoever arising from the content of the editorial published herein.

# Contents

2 PARTNERS IN PUBLISHING

3 INTRODUCTION

8 NEWS DIGEST

11 MEGA-SHIP READY

12 **Big ships bringing big changes: port industry takes on the challenge**  
Dr Noel Hacegaba, Chief Commercial Officer, the Port of Long Beach, California, USA

18 **The impact of ever larger vessels on terminals**  
Andy Lane, CTI Consultancy, Singapore, and Charles Moret, CTI Consultancy, Marseille, France

21 **The benefits of offshore ports for the USA and Africa**  
Marco Pluijm, Ports and Marine Sector Manager, Bechtel, London, UK

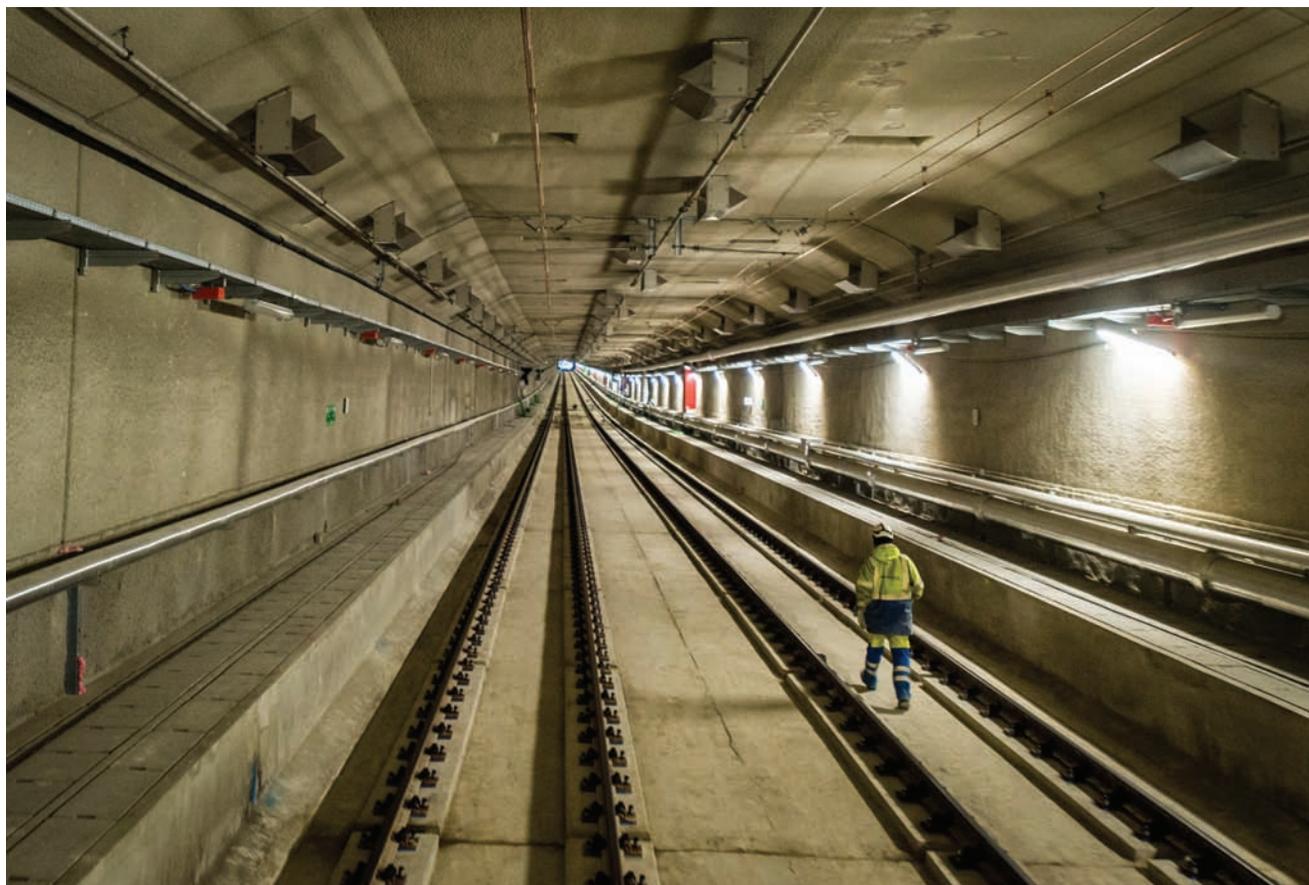


23 GLOBAL ISSUES  
In Partnership with:



24 **Looking inside the box: the containerisation of commodities**  
Professor Jean-Paul Rodrigue, Hofstra University, New York, USA, and Professor Theo Notteboom, Dalian Maritime University, Dalian, China, and ITMMA, University of Antwerp, Belgium

28 **Addressing industry challenges through collaboration**  
Manuel Perez, Director, Product Management, Xvela, San Francisco, USA



- 30 **Local government in ports: a perfect match?**  
Olaf Merk, Administrator, Ports and Shipping, the International Transport Forum (ITF) at the Organisation for Economic Co-operation and Development (OECD), Paris, France

- 32 **Plug-in at ports**  
Meredith Martino, AAPA Director of Publications, Digital Media and Technology, Virginia, USA

### 37 **PORT PLANNING, DESIGN AND CONSTRUCTION**

- 38 **Near-to-live training for container terminal planners: bridging the gap between training and live operation**  
Nikolaos Koumaniotis, Electrical and Computer Engineer; Dr Yvo Saanen, Managing Director and Founder of TBA; Menno Bruggeling, Consultant at TBA; Dr Csaba A. Boer, Senior Product Manager and Head of the Emulation Department, Delft, the Netherlands

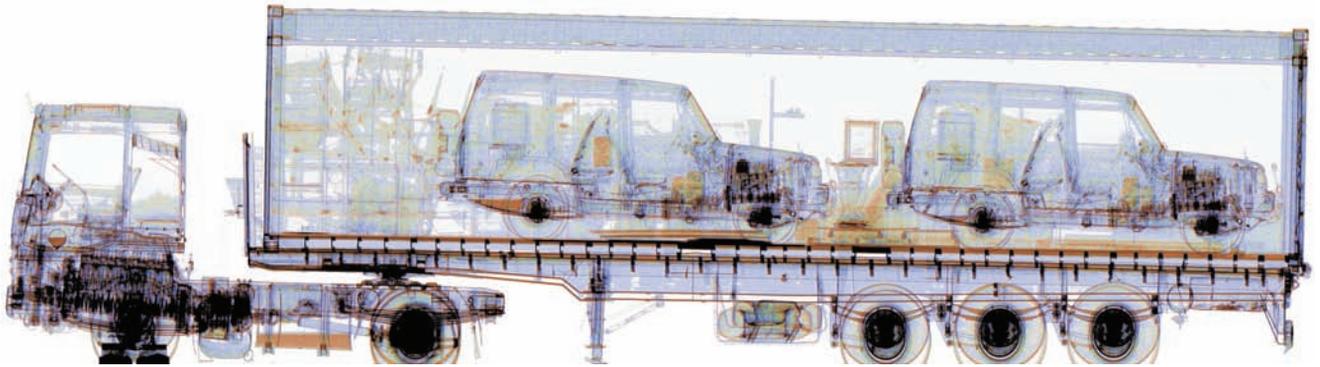
- 42 **The times they are a-changin': new models in port business**  
Fox Chu, Director of Infrastructure and Transportation Asia Pacific, Accenture, Shanghai, China

- 44 **Asset enterprise management for ports and terminals**  
Rajesh Nair, Director, Envecon, Mumbai, India

### 47 **CONTAINER HANDLING**

- 48 **Container weight verification: opportunities and challenges**  
Lars Meurling, Vice President and Marketing Director, Bromma, Stockholm, Sweden





- 52 **Battery-electric drive trains for terminals: the ultimate in sustainability and cost-effectiveness**  
Dr Armin Wieschemann, Senior Director of Global Systems Development, Terex Port Solutions, Düsseldorf, Germany
- 56 **Organisational feature**  
Globe Tracker
- 58 **Organisational feature**  
TMEIC
- 60 **Electrifying RTGs: improving productivity and savings**  
Dr Lawrence Henesey, Key Account Manager, Vahle, Kamen, Germany
- 
- 65 **SECURITY, SURVEILLANCE AND DETECTION**
- 66 **Organisational feature**  
Dallmeier
- 70 **Exclusive Q&A L3**  
Paul Simpson, Vice President and General Manager of Cargo Solutions, L-3 Security and Detection Systems, Woburn, USA
- 74 **Exclusive Q&A Smiths Detection**  
Jean Olivier Fer, Director of Product Management (Cargo Detection Systems), Smiths Detection, Paris, France
- 
- 78 **DRY BULK AND SPECIALIST CARGO HANDLING**  
In Partnership with:  
 **BEDESCHI**
- 79 **RobLog: the future of unloading containers**  
Teresa Rittel, Marketing, Communications and Finance at the EU funded RobLog project, Reutlingen, Germany
- 82 **Dealing with dust**  
Dr Robert Berry, Research Fellow and Consultant Engineer, the Wolfson Centre for Bulk Solids Handling Technology, the University of Greenwich, Kent, UK
- 86 **Organisational feature**  
Bedeschi
- 
- 89 **OIL, GAS & CHEMICAL HANDLING**
- 90 **Small-scale LNG port infrastructure: aligning safety and economics**  
Jacob Genauer, Naval Architect and Marine Engineer, Braemar Engineering, Houston, Texas, USA
- 94 **Organisational feature**  
The Port of Antwerp
- 
- 97 **VTS, NAVIGATION, MOORING AND BERTHING**
- 98 **Ensuring safety and efficiency with e-Navigation traffic surveillance**  
Professor Michael Baldauf, World Maritime University, MaRiSa Research Group, Malmö, Sweden & Institute of Innovative Ship-Simulation and Maritime Systems (ISSIMS), Warnemuende, Germany, and Professor Knud Benedict, Hochschule Wismar, University of Applied Sciences - Technology, Business and Design, Dept. of Maritime Studies Warnemuende, ISSIMS, Germany, and Dr Michael Gluch, Hochschule Wismar, University of Applied Sciences - Technology, Business and Design, Dept. of Maritime Studies Warnemuende, ISSIMS, Germany
- 103 **Safe navigation in the straits of Malacca and Singapore**  
Thomas Timlen, Asia Liaison Officer, Baltic and International Maritime Council (BIMCO), Singapore

**105 ENVIRONMENT AND SUSTAINABILITY**

In Partnership with:

**106 Superstorms and rising sea levels: the new challenges for seaports**

Dr. Becker, Assistant Professor of Coastal Planning, Policy, and Design in the Department of Marine Affairs at the University of Rhode Island, Rhode Island, USA, and John Englander, Oceanographer, Consultant and Sea Level Rise Expert, Florida, USA

**110 Shipping emissions in ports: overview, impact and prognosis**

Olaf Merk, Administrator Ports and Shipping, the International Transport Forum (ITF) at the Organisation for Economic Co-operation and Development (OECD), Paris, France

**112 One planet, one chance: let's get it right**

Alpesh A. Sharma, CEO, Laem Chabang International Terminal, Laem Chabang, Thailand

**114 Environmental innovation at the Port of Long Beach**

MaryKate McHardy, Media Relations, the Port of Long Beach, California, USA

# Advertisers Index

ABB AB Crane Systems	IFC & 1
Bedeschi S.p.A	87
Cavotec SA	33
Coaltrans Conferences	85
Darveen Technology	61
GDF Suez S.A.	92 & 93
Lloyd's Maritime Academy	46
L3 Security & Detection Systems	73
Liebherr Container Cranes	63
Navis LLC	17
Orbita Ingenieria	9
Port of Long Beach	14 & 15
RBS EMEA UG	49
Schneider Electric	109
Smiths Detection	76 & 77
Tank Storage Middle East	95
TBA Netherlands	IBC
TOC West Africa	41
Transport Events	36
Transport Security Expo	72
Van Oord	OBC
Varian Medical Systems	69
Vigan Engineering S.A	83
Zhejiang Dahua Vision Technology Co Ltd	67

# Alliances of the seas: shipping lines unite in battle



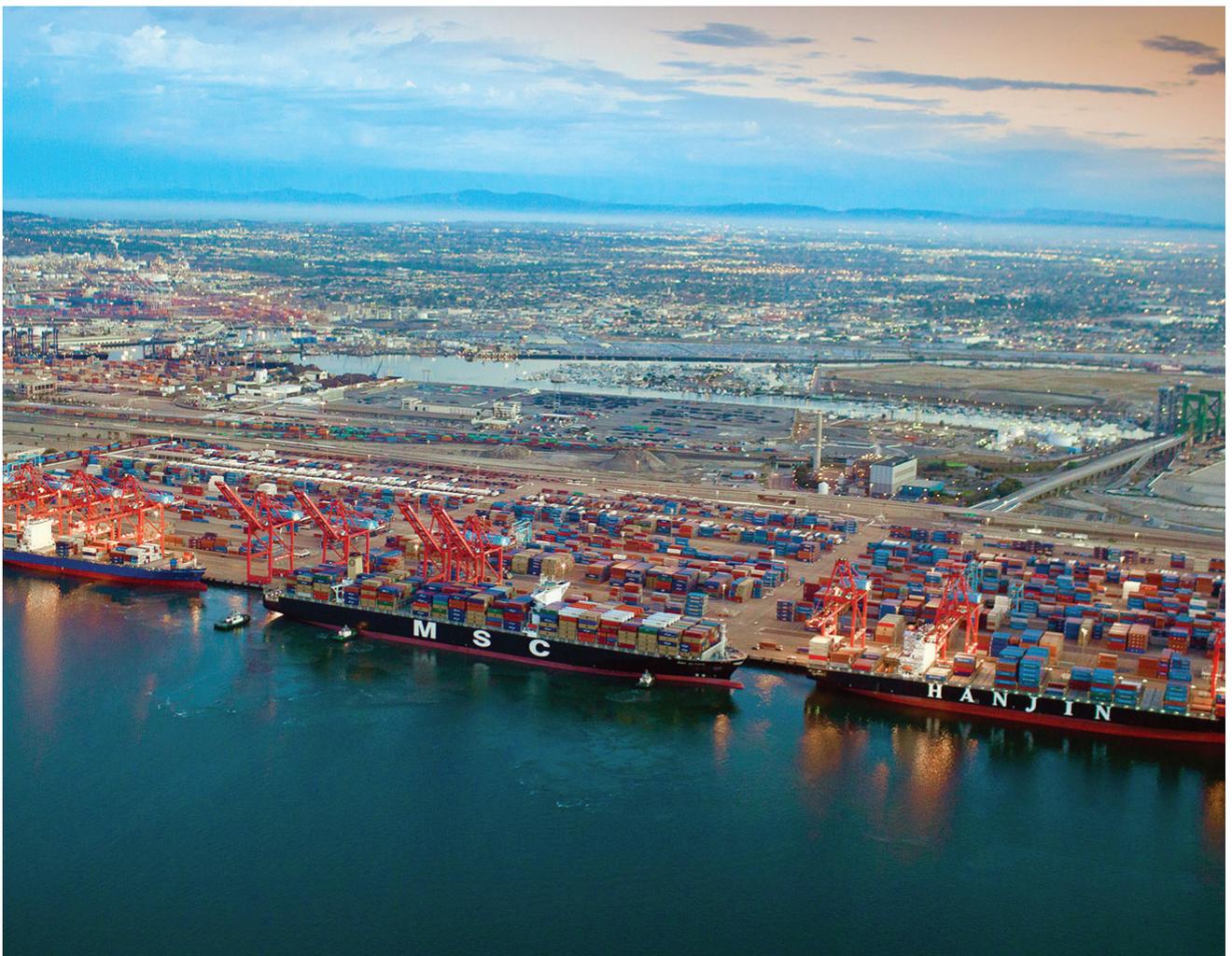
Richard Joy, *Commissioning Editor,*  
*Port Technology International, London, United Kingdom*

2014 has seen a drive towards vessel-sharing agreements between the world's biggest players in the shipping sector. After Maersk Line, MSC and CMA CGM's 'P3' alliance was quashed by Chinese regulators on antitrust grounds, Maersk, the world's biggest shipping line, has risen from the embers with MSC at its side

and proposed the new 2M alliance. CMA CGM meanwhile has rejuvenated its vessel-sharing goals with China Shipping Container Lines and United Arab Shipping Co, in the form of the Ocean Three 'O3' alliance.

Both alliances have received clearance from the US and Europe, however the

stumbling block of China looms. Yet, with the big three who constituted P3 disbanded, and with a personal trip from Maersk head Soren Skou to China, the alliances look to stand a much better chance this time around as they will not be able to monopolise over the market quite so easily as China had once feared.



Port **Consultancy**

Crane **Operations**



Watch  
CraneOCR  
in motion:

[youtube.com/  
orbitaingenieria](https://youtube.com/orbitaingenieria)



Gate **Design**

Advanced port automation engineering

# In Brief

The most populated alliance 'G6', which consists of APL, Hapag-Lloyd, Hyundai Merchant Marine, Mitsui OSK Lines, Nippon Yusen Kaisha and Orient Overseas Container Line, has recently temporarily suspended its CC2 service between Asia and the US West Coast until further notice due to seasonal shifts in market demand. Despite this, the alliance has numerous routes still operating between Asia and the US, exhibiting the success the union has fostered.

However, given the intrinsic competition of shipping lines, alliances are still a product of circumstance rather than altruism. Given the vast number of ports globally and the increasingly expansive trade networks in which shipping lines must perform at optimum levels at low costs, alliances function as a safety net in which the world's biggest liners can seek security in numbers and keep pace with the industry implicit commercial demands.

Complexities for lines in alliances such as difficulty in fine-tuning services, revealing operating secrets to competitors, making concessions to other liners concerning trade-routes and ports-of-call, as well as cultural and business differences between members, make them a far from ideal proposition for the idiosyncratic personality and practices of an autonomous liner. However, the current industry climate does not favour independent shipping lines with the implicit demands.

Mega-vessels also present new challenges. The mega-vessels that are an intrinsic part of the mega-alliances create a situation for ports in which fewer calls are made, but with much larger loads distributed into the port arena. This means ports are also under pressure to ensure an efficient practice, and maybe even expand in size or redevelop if need be.

Regarding the longevity of the big alliances, the climate does not appear to be in a state of flux at present, and with Maersk and MSC's 2M agreement planned for 10 years, the marriage of mega-ships could become a feature of the industry long into the future.

## Container terminal revolution?

A video charting a container terminal concept of the future that aims to revolutionise operations at the ports of Los Angeles and Long Beach has been released by US-based company GRID Logistics. The company envisions a massive, holistic terminal which is equipped to haul containers off ships simultaneously and then plant them directly onto one of two trains which travel to separate destinations. One train is planned to travel underground, utilising Los Angeles' disused sewage network, while the other would take a conventional route to a truck depot away from the port area. These implementations would thereby slash traffic congestion and harmful emissions, as well as drastically optimise port operations. The video is viewable online at [www.porttechnology.org](http://www.porttechnology.org).

## China to invest \$40 billion in Silk Road initiative

President Xi Jinping of China has pledged to invest US\$40 billion into an infrastructure fund which aims to increase the interconnectivity of countries in the Asia region. The Maritime Silk Road initiative is a method by which China is looking to revive historic linkages in trade with various Asian states, and it is widely seen as further evidence of China's growing might. India has also sought to establish itself in the region by countenancing China with its own Project Mausam.

## US West Coast in Christmas quagmire

Labour issues at several ports on the US West Coast could potentially jeopardise the delivery of Christmas goods. The Pacific Maritime Association, which represents companies that import and export cargo at 29 West Coast ports has accused workers' unions of purposefully stultifying productivity in order to benefit them in contract talks. In 2002, a strike cost the US economy billions of dollars. A spokesman for the International Longshore and Warehouse Union did not deny a slowdown, according to The Post and Courier.

## ABP awards \$100m Green Port contract

Associated British Ports has awarded a contract of over \$100 million to begin construction works at the Green Port project in Hull, UK. The two companies that have

been awarded the contract are a joint-venture, consisting of national construction, asset management and project investment firm Graham, and civil engineering and building contractor Lagan Construction Group. A third of Hull's Alexandra Dock will be filled with 780,000m<sup>3</sup> of material and a 650m quay wall will be created along the river to accommodate three wind installation vessels. The site is due to become fully operational in 2017.

## Port of Shanghai volumes boom in October

In October 2014, the Port of Shanghai experienced higher box volumes in comparison to 2013, according to figures released by the Shanghai International Port (Group) Co (SIPG). Volumes in October 2014 crept up to 3.02 million TEU compared to 3.01m TEU registered during September this year which represents an increase of 7.5% compared to the 2.81 million TEU recorded in the same month in 2013. Total throughput volumes for the Port of Shanghai in the first 10 months of 2014 increased by 5.4% to 29.47 million TEU, compared to the 27.97 million TEU recorded in the same period in 2013.

## Port privatisation may trigger consumer spike

Consumers could be in line to pay higher prices for their goods if state governments decide to push on with the privatisation of port assets, according to DP World CEO Paul Scurrah. Some ports in New South Wales, Australia have already been privatised, such as the Port of Botany and Port Kembla for as much as US\$5.1 billion in 2013. Sydney's Port Botany, the Port of Brisbane and the Port of Adelaide have also been privatised. Expressions of interest have also been invited from new operators at Fremantle Port from 2017 by the Western Australian government.



For the latest news, and to register for our free daily news email service, visit

[www.porttechnology.org](http://www.porttechnology.org)



# Mega-Ship Ready



“The role of the port authority has never been more critical. The big ships are a game-changer and the port authorities that respond strategically will have the best opportunity for success.”

'Big ships bringing big changes: port industry takes on the challenge', page 12

# Big ships bringing big changes: port industry takes on the challenge



Dr Noel Hacegaba, *Chief Commercial Officer, the Port of Long Beach, California, USA*

The rapid pace at which container vessels are growing is affecting the entire supply chain. While cargo owners have the ability to adjust their business processes to accommodate mega vessels, ports, which are fixed assets with limited resources, are not as nimble.

Even for ports that will not see mega vessels calling at their terminals any time soon, the arrival of larger ships is creating a cascading effect. Ships being replaced by mega vessels on major trade lanes are being deployed in the smaller trade routes. Therefore, the strain of larger vessels has the potential to affect all ports, big and small.

## Vessel sharing agreements

Shipping lines are investing in mega vessels in order to take advantage of economies of scale. Larger vessels allow the lines to reduce unit cost, or the cost per container. However, these economies of scale can only be maximised when vessels are at full capacity. This need to fill the extra capacity generated by bigger ships has led carriers to enter into vessel sharing agreements and join alliances with other carriers to improve the chances of filling the larger ships. While vessel sharing agreements are not new, the size, reach and market concentration of recent alliances are.

The combination of bigger ships and vessel sharing agreements presents new challenges for port authorities. The concentration of alliances is providing carriers with leverage and options that ports do not have. Furthermore, ports across the US have excess capacity. Recognising this, carriers and their respective alliances are capitalising on the excess capacity by pitting ports against each other for more favorable rates and

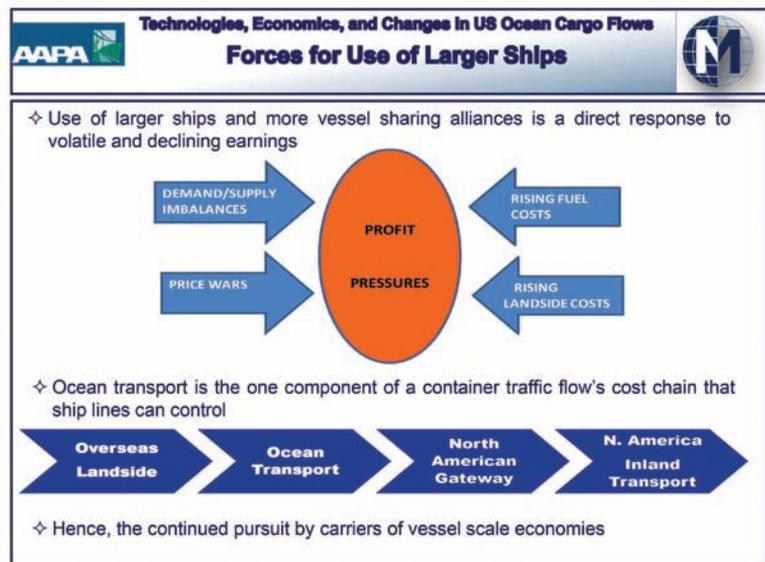
other financial incentives.

In addition to financial incentives, carriers are requesting that ports make capital improvements that require significant financial investments and time. According to the American Association of Port Authorities (AAPA), US ports plan to spend US\$46 billion to upgrade their facilities by 2017. Ports across the country are racing to obtain adequate water draft, berth size, crane height, terminal space and rail connections to handle the bigger ships. Few ports across the country can meet all of these requirements today, and even those that can cannot be guaranteed that the big ships will call at their port.

Concurrently, the new alliances are creating financial uncertainty for port authorities. Carriers that currently call at a particular port may shift their cargo

to neighboring ports in accordance with the vessel deployment strategy agreed upon by alliance partners. Although this scenario may play out in only those regions where alliance partners call at neighboring ports, the potential consequences for the ports affected could be considerable.

All of these changes in the industry are leaving ports in a vulnerable position. As a result, the role of the port authority is more critical today. Port authorities must be able to evaluate how the changes in the industry could impact their commercial operations. They must also be proactive in identifying ways to mitigate the related risks. Carriers are no longer committed to specific gateways for the long term as they have been in the past. There is no loyalty to specific ports.



Source: Rothberg, S. (2014). "Technologies, Economics and Changes in Selected U.S. Ocean Cargo Flows." Presented at AAPA Commissioners Seminar on June 4, 2014.



### Evolution of container ship size

From 1970-2014, the largest vessel type grew from 1,800 TEU to over 18,000 TEU. This represents a growth in vessel capacity of 900% during this period. To put this in perspective, an 18,000 TEU vessel is three times the capacity of the biggest ships only two decades ago. The trend towards even larger vessels is expected to continue. According to Drewry Maritime Consultants, an estimated 42% of current ship orders are for vessels exceeding 12,000 TEU.

Although 18,000 TEU vessels are the largest in service currently, ships that carry more than 10,000 TEU are still considered large and have limited options with regard to trade lanes and to the ports that can accommodate them. Besides reducing the unit cost and the number of vessel calls, the new ship designs are also more fuel efficient, providing another financial advantage to the shipping lines.

### Emergence of mega alliances

In order to fill the growing capacity of vessels and take advantage of economies of scale, there is a trend for carriers to strengthen and, in some cases, form new alliances with other carriers. The decisions these alliances make with respect to vessel deployment and terminal selection will impact ports.

For decades, ocean carriers have shared

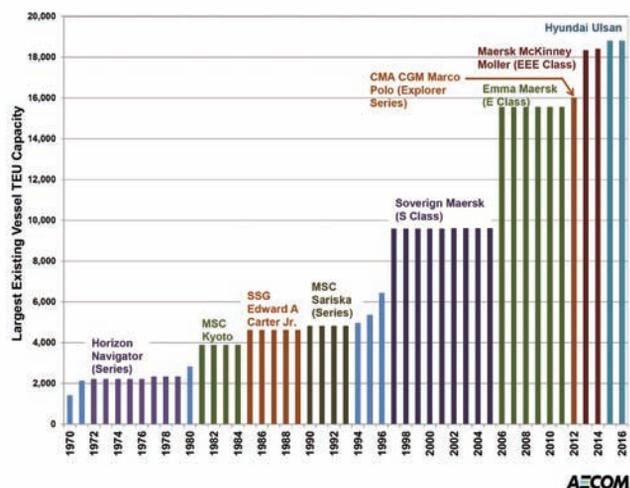
ships through vessel sharing agreements, enabling them to lower costs and increase efficiency by splitting up the available slots for containers. The US Federal Maritime Commission (FMC) has allowed more than 220 vessel-sharing agreements to advance. So, while vessel sharing agreements are not new, the size, reach and market concentration of recent alliances such as Maersk and MSC's 2M, CMA

CGM's Ocean Three and Hapag Lloyd's G6 are unprecedented. For instance, it is estimated that G6 will control roughly a third of the Far East-US West Coast market and about 40% of the northern European-US trade.

### Impact on ports

The key question facing ports is how vessel rotations will be influenced by the

### Largest Vessel Size over Time



Source: Sisson, M. (2014). "Impact and Opportunities from Global Change." Presented at AAPA Facilities Engineering Seminar on November 6, 2013.





Your Intermodal Cargo.  
Our unparalleled  
productivity.  
*Better Together.*

We are committed to speeding your cargo efficiently and affordably through the Port of Long Beach en route to its global destination.

Frequent vessel calls including today's biggest ships. The best on-dock productivity in North America. Coast-to-coast rail connections. Huge nearby distribution and warehousing capacity. Foreign Trade Zone 50. \$4 billion in infrastructure improvements. A commitment to green and sustainable operations. And great weather.

The Port of Long Beach has it all.

To learn more, please visit [polb.com/trade](http://polb.com/trade).



Port of  
**LONG BEACH**  
The Green Port

[www.POLB.com](http://www.POLB.com)



combination of alliances and larger ships. For example, alliances could lead to the movement of cargo from one port to another, especially between neighboring ports such as Los Angeles and Long Beach. In the past, this has led ports to offer financial incentives to carriers in order to retain cargo.

Excess terminal capacity is another factor affecting a port's ability to respond to the pressures of big ships and alliances. This excess capacity, combined with the threat of new vessel deployments stemming from the larger ships and alliances, gives carriers more leverage and flexibility at the expense of ports. While liners, shippers and beneficial cargo owners have the ability to adjust their business processes to meet the changes in the shipping industry relatively quickly, ports do not have that ability.

Another impact to ports is the severe congestion that has been seen at some of the biggest container gateways in the US. As mega container ships replace smaller vessels in major east-west and north-south trades, terminals are being challenged to move containers through their facilities very quickly and extremely efficiently.

Finally, there is the whole subject of terminal operations and the cost of upgrading infrastructure, facilities, equipment and productivity. The bottom line is that the trend towards larger vessels will have significant implications for ports that compete to service them as well as for the landside warehouse, trucking and rail

operations that must also accommodate an increase in volumes.

### Role of the port authority

As the maritime industry evolves and technologies improve, port authorities play a primary role in educating both the industry and the public about what these changes mean. Ports must be built to handle larger ships and be prepared when the decisions of the shipping alliances do not go in their favour. They must bring awareness to the need for improved efficiencies, and identify opportunities, explore options and present concepts and ideas to the port's stakeholders.

For example, although the Port of Long Beach is a landlord port, it uses its authority to bring attention to issues of common importance to the port's partners and assumes the role of facilitator to bring port stakeholders together to address issues such as productivity and congestion.

It should be noted that investments in infrastructure not only require significant amounts of funding, but they also take time to plan, bid for and build. Also, as ports continue to invest heavily in port infrastructure, port authorities should also consider pursuing a freight strategy that encompasses the entire supply chain, from gateway to destination.

The role of the port authority has never been more critical. The big ships are a game-changer and the port authorities that respond strategically will have the best opportunity for success.

### About the author

Dr Noel Hacegaba is the Chief Commercial Officer and Managing Director of Commercial Operations for the Port of Long Beach. He is responsible for the port's commercial operations and manages the port's business development, customer service, terminal operations and security functions. He joined the port in 2010 and has also served as Chief Operating Officer and Executive Officer to the Board of Harbor Commissioners. This article is based on his recent white paper, "Big Ships, Big Challenges: The Impact of Mega Container Vessels on U.S. Port Authorities," which can be read in its entirety at <http://www.polb.com/civica/filebank/blobload.asp?BlobID=12230>.

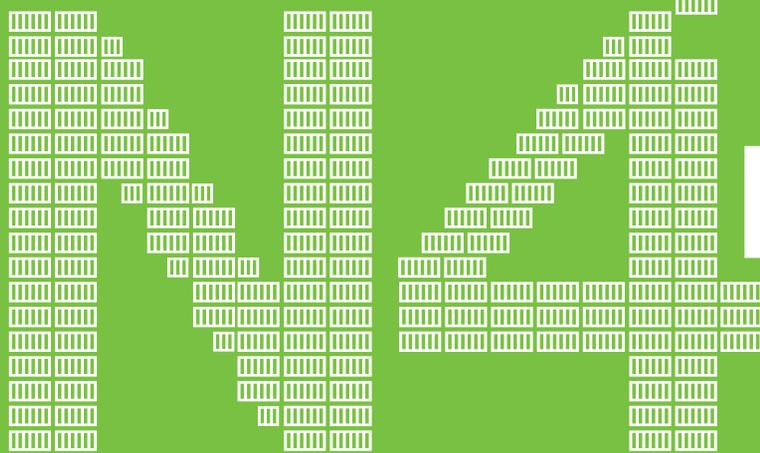
### About the organisation



The Port of Long Beach is the premier US gateway for trans-Pacific trade, the nation's second-busiest container seaport and a trailblazer in innovative goods movement, safety, environmental stewardship and sustainability. With annual trade valued at \$180 billion, the port supports hundreds of thousands of jobs and is "Mega-Ship Ready" serving 140 shipping lines with connections to 217 international seaports. The port is three years into a decade-long capital improvement program worth \$4 billion, the largest in the US.

### Enquiries

Port of Long Beach  
4801 Airport Plaza Drive  
Long Beach, CA, 90815  
[info@polb.com](mailto:info@polb.com)



# 100 LIVE

## HELPING TERMINALS BUILD BETTER OPERATIONS.

Today's terminals are facing more challenges than ever. That's why N4 is the choice of the world's leading terminals. More than 100 are live on N4 right now. To see how it can help your operation visit [www.navis.com/itstimeformore](http://www.navis.com/itstimeformore).

**navis**<sup>®</sup>

# The impact of ever larger vessels on terminals



Andy Lane, CTI Consultancy, Singapore  
Charles Moret, CTI Consultancy, Marseille, France

## Introduction

Since the first fully cellular container vessels of the early 1970s commenced service, we have experienced container ship capacities increasing from 2,400 TEU (240m long) to the latest generation of 18,000 TEU (400m long). In time, ship capacities could even reach 24,000 TEU (456m long).

Container terminals have historically built berths to be anywhere between 300 and 360m, so it seems that the new generations of ships may have become too large for contemporary berths. This paper will consider the impact of larger vessels on terminals, analysing myth versus fact, as well as offer some ideas as to how lines and terminals can best operate moving forwards as more and more large ships characterise the appearance of the industry.

## Dimensionally, how have ships evolved?

Until the mid-1990s, when lines decided to build container vessels which exceed Panama Canal (primarily width) limitations, a lot of the additional capacity created on new vessel classes was achieved through increasing the length.

This resulted in long narrow ships which suffered major issues in terms of stability, bending and torsion; meaning that on some routes, for every 3 tonnes of cargo loaded, 1 tonne of ballast water was also required to be carried in addition to full fuel loads for vessel safety at sea.

Since the mid-1990s, we have seen the beam of vessels increase proportionately faster than the length, and that means that in terms of TEU capacity per metre of vessel length, we have experienced a doubling over the last 18 years, from 21

to 45 TEU capacity per metre. For the next generation, we are likely to see ship length increase dramatically, but these ships will still have a higher TEU per metre.

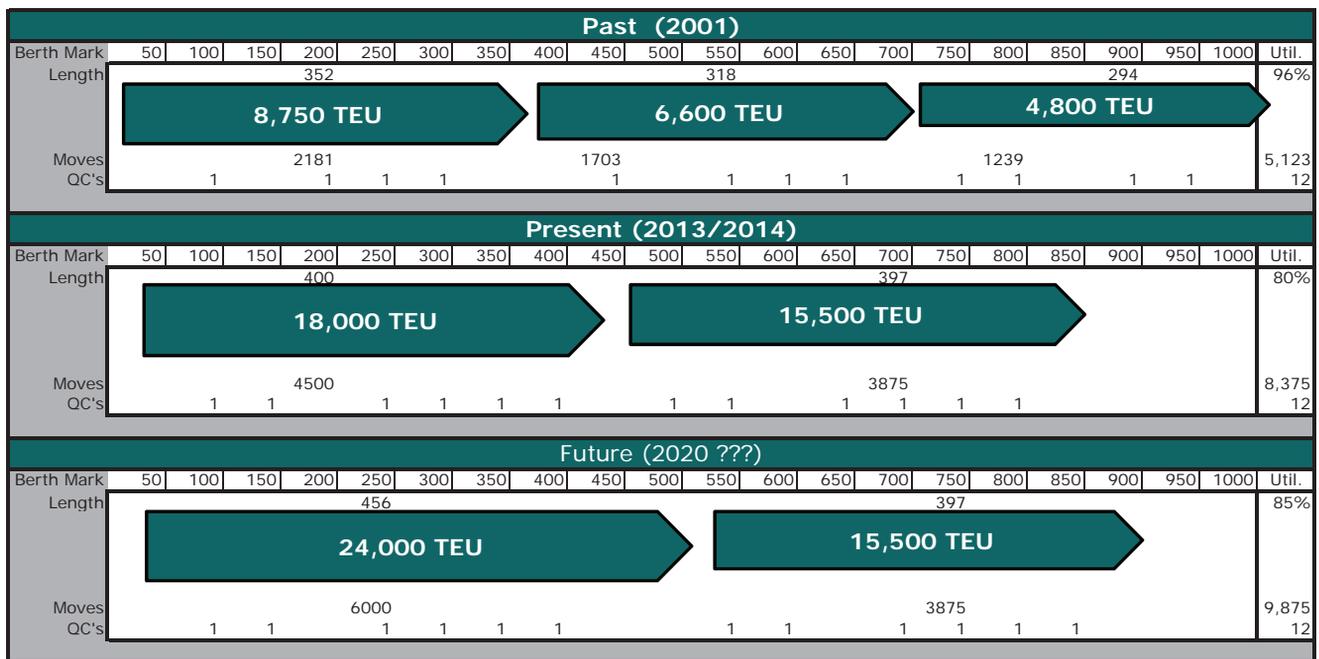
## Vessel call size developments

As per figure 1, on the assumption that overall ship utilisation has not dramatically declined in recent years, on average, between all port calls, the moves per ship call will have proportionately increased. The largest ship in service in

Year	CAPACITY (TEU)	LOA (M)	BEAM (M)	TEU/M	GROWTH	
					LOA	BEAM
1974	2,400	239	30.0	10.0	-	-
1981	3,600	267	32.3	13.5	12%	8%
1988	4,800	294	32.3	16.3	10%	0%
1995	6,600	318	42.9	20.8	8%	33%
2001	8,724	352	42.9	24.8	11%	0%
2006	15,500	397	56.5	39.0	13%	32%
2013	18,000	400	59.0	45.0	1%	4%
2020	24,000	456	63.9	52.6	14%	8%

Top: Figure 1; Bottom: Figure 2

YEAR	TEU	LOA (M)	MOVES/ROTATION	PORTS	MOVES /PORT	MOVES /METER	INCR-EASE	QC'S	MOVES /QC	METERS /QC	QC MPH	PORT DAYS	% IN PORT
1974	2,400	239	6,813	9	757	3.2	-	3.0	252	79.7	28	3.4	6%
1981	3,600	267	10,219	9	1,135	4.3	34%	3.5	324	76.3	28	4.3	8%
1988	4,800	294	13,626	11	1,239	4.2	-1%	3.8	326	77.4	28	5.3	10%
1995	6,600	318	18,735	11	1,703	5.4	27%	4.2	406	75.7	28	6.6	12%
2001	8,724	352	23,991	11	2,181	6.2	16%	4.5	485	78.2	28	7.9	10%
2006	15,500	397	42,625	11	3,875	9.8	58%	6.0	646	66.2	28	10.6	14%
2013	18,000	400	49,500	11	4,500	11.3	15%	6.5	692	61.5	28	11.3	15%
2020	24,000	456	66,000	11	6,000	13.2	17%	7.0	857	65.1	28	14.0	18%



Top: Figure 3; Middle right: Figure 4; Bottom right: Figure 5

2001 would generate an average of 2,200 moves per call, yet the largest ship in 2013 would generate an average of 3,850 moves per call - this marks an increase of 75%. As shown in figure 2, when these numbers are put into a moves per metre metric, the increase is 6.2 to 9.8, or 57%. This appears to be validated by a disclosure from PSA-Singapore recently that it had experienced an increase in average moves per call of 67% between 2001 and 2012.

More moves per call and more moves per ship metre create the opportunity to deploy additional quay cranes (QC) at potentially higher production speeds, which in turn increases the overall throughput capacity of a terminal, provided the stowage plans facilitate this.

In 2006, the 15,500 TEU ship arrived, and there was evidence of a step-jump in QC deployment. However, the increase in QC's was still not on-par with the increase in vessel capacity and moves per port, resulting in more days spent in port for vessels. The additional port time caused further issues such as the degrading of sea buffers and the jeopardising of schedule integrity, or potentially, additional vessels being required within a rotation; increasing both costs and transit times.

Despite the initial increase in QC deployment, over the last two and a half years we have actually seen productivity decreasing on the largest generation of container vessels by 6%, according to data from the Journal of Commerce.

### Berth wastage

Figure 3 is a simulation of different

Metric	Past	Present	Future
Berth Utilisation	96%	80%	85%
Quay Cranes	12	12	12
Moves	5,123	8,375	9,875
Moves/QC	427	698	823
QC MPH	28	28	28
Ops Hours	15.2	24.9	29.4
BERTH METERS	1,000	1,000	1,000
MOVES/M/HOUR	0.34	0.34	0.34

Metric	Past	Present	Future
Berth Utilisation	96%	80%	85%
Quay Cranes	12	12	12
Moves	5,123	8,375	9,875
Moves/QC	427	698	823
QC MPH	28	31	34
Ops Hours	15.2	22.5	24.2
BERTH METERS	1,000	1,000	1,000
MOVES/M/HOUR	0.34	0.37	0.41

berthing scenarios as they have developed over the years with increases in vessel size. This is simulated over a quay wall length of 1,000m and with 12 QC's available. This simulation demonstrates that berth occupancy can decrease as vessel sizes evolve, and therefore it is not unknown to see berth wastage has occurred in the contemporary era. In this particular simulation, when vessels get even larger by 2020, berth wastage will also diminish.

It is also important to understand what these various changes mean to container

move volumes. We can calculate that the length of vessel is somewhat irrelevant when it comes to maximising container volumes handled over the quay, which will also represent 75% or more of a terminal's revenue stream. So, as calculated in figures 4 and 5 above, rather than berth occupancy or utilisation, the following method of calculation is more objective when measuring berth capacity:

**Quay cranes x moves per-crane per-hour = berth capacity**

The below table shows how moves per berth metre per hour increase when the quantity of QC's remains the same, yet the efficiency of each QC improves. Where this is achieved through waste elimination and process improvement, it is a mutual win-win situation; the terminal can get more through the same footprint and a liner's vessels spend less time in port.

### Cargo surge

There has been some suggestion that larger vessels create a cargo surge, negatively impacting both the yard and the gate. In light of the above scenarios and tables, this is not necessarily attributable entirely to vessel size, but again driven by how efficient the quay wall is in terms of assets deployed and the speed of each. With the quay wall and QC's typically being the most expensive assets in a terminal, the yard should not be the constraint to the entire enterprise. This needs to be more efficient and / or scaled to be in the right proportion to what it supports.

The gate, which is usually the lowest cost aspect of a terminal, also needs to be scaled up to deal with the more efficient quay side operation. When this hits its absolute physical maximum, then cargo flows need to be better managed, potentially through truck appointment systems.

### Off-schedule vessels

As mentioned above, terminal efficiency is not keeping pace with vessel capacity and size developments and vessels are requiring more and more port time within a rotation which leads to the eroding of buffers. Delays caused by poor terminal efficiency and extreme weather will also have knock-on effects. With freight revenues depressed and costs high, profit margins are razor thin, running vessels at higher speeds to catch-up on time lost is a thing of the past. All of these dynamics have resulted in lower reliability levels. An off-schedule 18,000 TEU vessel will naturally be more difficult to squeeze into a berthing line-up than a far smaller one, and therefore the impact magnifies. Minimising the impact is a shared responsibility, and when achieved, it is mutually rewarding.

Lines need to obtain more accurate volume forecasts from their customers and make far better use of this data, then tactically plan much better. They need to protect the critical touch points (such as a few ports) in their networks for overall integrity. The optimisation of the network at design phase is critical; buffers need to be of appropriate size and placed in the

right legs of a rotation to absorb delays and seasonal volume shifts. Forecasts, both pro-forma and operational, provided to terminals need to be more accurate and frequent.

Lines might consider buying contingency capacity at key terminals as an alternative to either speeding-up vessels or arriving late at subsequent ports or regions.

Terminals need to be far better at managing off-schedule vessels. These can be seen as a virus, and that virus must not be permitted to infect several other on-schedule vessels.

Home berth assignment needs to be adhered to as a top priority and strategy, as that matches what is operationally a static yard, and berthing several ships away from their planned berths will add a huge strain on the yard and therefore drag down overall terminal performance on all vessels and for all customers. It might be counter-intuitive, but an off-schedule vessel cannot be a top priority, it needs to wait for a suitable alternative window in which it can be quarantined.

Terminals need to change aspects of how they contract with their customers. Off-schedule vessels could have penalties assessed against them and their cargo, not be considered in productivity targets and merely handled on a best endeavours basis.

Lines and terminals need to cooperate much closer together in building trust, communicating, planning and better understanding each other's primary drivers and challenges. Key processes such as ship stowage plans, berth, yard and gate planning as well as exception handling need to come more into focus also.

### The cost of handling new generation vessels

Whereas port authorities will generally levy costs based on vessel size, handling a container is still handling a container, almost regardless of vessel size. Terminals need larger QC's and stronger bollards, and the incremental capital cost is relatively small. This is likely off-set to some degree by more efficient operations and therefore some reductions in operating costs. 5 QC's for 12 hours is the same as 6 QC's for 10 hours, assuming that landside deployment ratios are the same for both scenarios.

Terminals need to get back to basics and improve processes to get to the next levels of efficiency, and this is largely cost-free. Lines are not likely to readily accept additional costs because terminals become less inefficient. Once these inefficiencies are removed, achieving the next level of performance is only possible by adding

more yard assets, a cost compensatory model might be appropriate, we are however not close to that state presently.

### Conclusion

Larger vessels will continue to be employed on all trade lanes. Dealing with larger vessels is not necessarily an insurmountable challenge, but changes to how we work are required for the supply chain to fully benefit from these.

*This paper follows on directly from the CTI Consultancy study and article on "Ship Size Evolution", which is available to read at <http://www.cticonsultancy.com/~Insight->*

### About the authors

Andy Lane has been in the transport industry for over 25 years, working both in liner operations and terminals. He specialises in the interface between them.

Charles Moret has been in the transport industry for 20 years and specialises in fleet deployment and network optimisation.

Both are partners at CTI Consultancy.

### About the organisation



CTI aims to constantly develop cutting-edge expertise surrounding port and vessel operations. CTI looks beyond the hardware and systems to analyse how an organisation can drive more value and growth from processes and people. CTI combines the toolbox of the international business consultant with extensive practical maritime experience. All CTI consultants have recently held leadership positions with leading carriers and port operators. The CTI service portfolio ranges from strategy development to operational and commercial specialism. The company's focus on organisational development and process optimisation offers an insight into the optimum practices in leading a modern business in the shipping and ports sector.

### Enquiries

Web: [www.cticonsultancy.com](http://www.cticonsultancy.com)

E-mail: [contact@cticonsultancy.com](mailto:contact@cticonsultancy.com)

# The benefits of offshore ports for the USA and Africa



Marco Pluijm, *Ports and Marine Sector Manager, Bechtel, London, UK*

In many parts of the world, offshore ports can be the perfect solution for meeting the requirements of the rapid changes in the international container and bulk shipping industry. Bigger ships, changing routes and destinations require larger and deeper ports, which port owners and operators can be confident will be capable of handling ever-increasing sizes of vessels for many years to come.

## Changing shipping routes

One of the major challenges in the current container shipping industry is to bundle and organise capacity in the most economical way. In terms of vessel size, Maersk is leading the way with its Triple E vessel-class, but the capacity of these new, larger ships needs to be combined with other main carriers in order for it to be effective. Various alliances have been formed and new ones are being developed. As part of this process, capacity is being shifted to routes which haven't changed for many years; such is the case in West Africa.

Due to the so-called cascading down process, ships which were never originally intended for use in West Africa will now soon be there. Ports like Abidjan in the Ivory Coast are already anticipating these changes and looking at possible solutions. Others are talking about it, but haven't really started to tackle the issue yet. However, many of the traditional ports lack the physical possibilities in terms of size, depth and finance to make the necessary changes required to enable them to cater for larger vessels and increased capacity.

As a consequence, offshore hubs along parts of the West and East African coasts are a very valid solution: in the Guinea-Liberia region for the export of minerals; in the Cameroon-Gabon region for containers; and in Mozambique for bulk. The benefits are

massive. We've predicted that the savings in investment and operational costs could add up to between 40 to 50%.

Similar developments can be seen on the East Coast of the USA due to the same cascading effect and the fact that the biggest container vessels can sail direct via the Suez Canal straight to the US East Coast - an option that is rapidly developing as an alternative to the soon to be expanded Panama Canal. The route via Suez has a greater degree of freedom in terms of ship size, especially when the planned increase in two-lane capacity is ready. The big question now is, if and how quickly the US East Coast ports can adjust to this development. New cranes have just been ordered and installed for the New Panamax vessel sizes, and some ports have dredged their channels and quays and widened their basins at substantial cost. Others aren't yet ready to do this, which might be an advantage. Investing in an offshore port could be the best solution as it provides a hub for a whole region, with fewer limitations for long term development than is often the case in existing ports. It also negates limitations in free height (draft), which is an issue in New Jersey for instance, and also provides various environmental benefits.

## Offshore ports as a solution

Some coasts are just not suitable for deep water ports due to their extended shallow foreshore. For a required water depth of 20m, a deep water port might need to be 15 or more kilometres away from the shoreline. This is a situation found along large parts of the African coast, particularly in West and East Africa. So, instead of bringing the ship to the port and dredging long, deep channels and port basins on the coastline, one solution could be to bring the port to the ship at the

required water depth, with an offshore port providing various handling facilities for bulk and/or terminals for containers. Barging cargo to and from an offshore facility to nearby coastal or river ports, whilst utilising existing corridors and facilities, can save on capital construction and operational costs, furthermore, this solution reduces environmental impact and minimises the ecological footprint left behind.

By concentrating present and future development in one spot, an offshore port could work very well not just in Africa, but also in the US. Currently, up to 70% of all US West Coast containers are understood to move east by rail and road. If only 20% of these containers would shift from overland transport to all-water direct import via the Suez Canal to an East Coast offshore port, this would save:

- 20 - 30% on direct freight costs from the Far East to the US East Coast due to the all-water economy of larger scale shipping
- 30 - 40% (or even more) on direct freight costs due to 40 - 50% shorter overland transport distance in the US itself
- 20 - 30% in emissions on the all-water-route (lower fuel consumption, more efficient engines) plus a 40 - 50% reduction in overland transport emissions

We estimate the overall cost reduction in constructing an East Coast multi-user offshore hub compared to improving existing ports and relying on overland transport to be between 30 - 40% for both investment and operations. Also, lower freight costs could also mean lower consumer prices, and therefore be better for the overall economy. Instead of ships first going via Caribbean hubs, having an offshore port hub in the US would mean



that without extra handling, the industry can keep money and jobs in the US.

**The concept itself**

In the offshore port model, dredging is not required as the facility is placed in water of sufficient depth. In order to avoid or reduce the need for expensive breakwaters, technologies such as dynamically controlled mooring and proactive fender systems will be used to guarantee safe operations and a sufficient wide operating window for handling the cargo.

For bulk, the degree of freedom is usually much larger than for containers, which is why these dynamic systems are being used on an increasing number of container terminals all over the world, especially in existing ports with heavy swell issues.

For containers, the offshore hub would consist of a smart terminal arrangement

of around two or three berths for the main carriers and four or five berths for barges travelling between nearby ports. The facilities can be extended in almost any combination with dry bulk, wet bulk and containers, depending on zoning and safety requirements.

This concept is not entirely new. Bechtel has already built the deep water Khalifa Port and Khalifa Industrial Zone in Abu Dhabi, one of the world's largest combined port and industrial zone developments. However, Khalifa Port is connected to the mainland by a causeway and bridge, while the offshore hub proposal is essentially an island.

**Conclusion**

The offshore hub represents a viable solution to the future requirements of ports which will need to adapt to facilitate the ever-increasing sizes of vessels,

particularly in the US and Africa. Offering the opportunity to save costs, minimise environmental impact and increase capacity, this concept could provide the answer that traditional ports cannot. In Africa, the multi-user offshore port concept provides a strategic solution by maximising the benefits of infrastructure corridors. While in the USA, Bechtel is currently in discussions with various government agencies about the development of an offshore port on the East Coast.

**About the author**

Marco Pluijm is responsible for the business and project development of Bechtel's port and marine projects worldwide and has more than 30 years experience in planning and building ports. He is currently leading a joint-industry study into the safer mooring of large cargo ships in West Africa, and recently led the highly-acclaimed Research on Passing Effect on Ships (ROPES) research, which resulted in new international guidelines for the design of safer ports. Mr Pluijm has previously worked for a port authority, a dredging company, an international port consultancy and the Ministry of Transport in the Netherlands. He has an MSc Civil Engineering in Port Planning from Delft University of Technology.

**About the organisation**



Bechtel is a global engineering, project management, and construction company. Bechtel operates through five global business units that specialise in civil infrastructure; power generation, communications, and transmission; mining and metals; oil, gas, and chemicals; and government services. Since its founding in 1898, Bechtel has worked on more than 25,000 projects in 160 countries on all seven continents. [www.bechtel.com](http://www.bechtel.com).

**Enquiries**

Marco Pluijm  
 Tel: (44-208) 846-5111  
 Address: Bechtel Ltd  
 11 Pilgrim Street  
 London  
 EC4V 6RN  
 E-mail: [ports@bechtel.com](mailto:ports@bechtel.com)

# Global Issues



In Partnership with:



# Looking inside the box: the containerisation of commodities



Prof Jean-Paul Rodrigue, *Hofstra University, New York, USA*; Prof Theo Notteboom, *Dalian Maritime University, Dalian, China, and ITMMA, University of Antwerp, Belgium*

Container shipping has become an essential driver in reshaping global supply chains. It has created global sourcing strategies, pull logistics strategies and the development of global production networks. New supply chain practices have increased the requirements on container shipping in terms of frequency, schedule reliability, global coverage of services, rate setting and environmental performance.

## **The container: we barely know thee**

While the dynamics of containerisation and container flows are well-known, what is actually being carried by containers is known much less, particularly as it concerns commodities. The container has evolved from a transport unit to a supply or commodity chain unit, and as such, carriers pay limited attention to what is being carried inside a container. This is understandable, since it is not the role of carriers to be overly concerned by the containerised cargo they carry.

The container transport market is however becoming increasingly fragmented with a growing commodity sector and niche market opportunities to satisfy new demands. Containerisation is increasingly driven by a commodity-wise approach which inherently creates an array of challenges such as weight restrictions, the conditioning of cargo and safety and security considerations. By 'looking inside the box' it is possible to assess the underlying factors that enable the growth or decline of commodity-based niche markets in containerisation.

## **Ubiquitous box, divergent growth**

Containerised freight is commonly

characterised as the movement of manufactured goods and parts from manufacturing facilities to retail centres with a whole range of distribution activities in between. This process has substantially benefited from the mobility containerisation provided in terms of spatial flexibility and distribution efficiency. Although the container is a ubiquitous standard, the drivers of its growth are quite distinct (see figure 1).

## **Substitution-based growth**

Initially, substitution was the main factor behind the growth of containerisation with the gradual capture of the break bulk cargo market. This process has been particularly visible in many ports, as illustrated by rising containerisation degrees (the ratio between containerised throughput of a port and the total general cargo volumes). The container penetration into world general cargo traffic increased from 21% in 1980 to a rather solid 65% in 2010. Furthermore, the largest container ports have reached containerisation degrees above 80%. Since almost all break bulk cargo that could be containerised has been containerised, this substitution process is essentially near to completion in developed economies. It is also rising rapidly in emerging economies and developing countries. This leaves the possible further containerisation of niche markets such as commodities and temperature sensitive cargo.

## **Incidental growth**

Production and trade imbalances in the global economy are reflected in physical flows and transport rates, and these lead to specific container repositioning strategies. Containerised flows are almost

never balanced, implying that empty containers must be repositioned to locations where export cargo is available. Containerised freight flows between East Asia and North America are almost three times as voluminous as containerised flows between North America and East Asia. Imbalances on the Europe-East Asia trade are also substantial. Despite observed imbalances, the empty incidence in port throughput on a global scale has remained rather stable at 20-21%. The more imbalanced the traffic is, the more containerised capacities are required for repositioning. This also leaves opportunities to take advantage of empty back hauls and the lower freight rates they imply.

## **Induced growth**

The growth of deep sea services and the use of larger containerships has led to the implementation of intermediary hubs connecting different systems of circulation via transshipment. Intermediary hubs emerge in locations offering clear advantages over direct port calls at mainland ports. The setting of intermediate hubs occurs around specific regions ideally suited for maritime hub-and-spoke distribution patterns. Transshipment has proven to be a major driver for the growth of world container port throughput, with substantially higher growth rates than observed for gateway traffic. The worldwide transshipment incidence has steadily increased from around 18% in 1990 to over 28% in 2010.

## **Derived growth**

Often labelled as 'organic growth', derived growth is an outcome of economic development with greater quantities

of containerised cargoes being traded. Globalisation also inspired a growth in the average distance over which containerised freight is being carried. In both cases, greater containerised capacities are required, average voyage days per vessel increase, and the number of vessel roundtrips per year decreases. The dynamics based on derived demand may have reached maturity in terms of its containerisation potential as many global supply chains are now fully containerised. For the conventional containerised markets, this implies that changes are derived from the ebb and flow of commercial activity, and much less from the geographical and functional diffusion of the container.

### Commodities: an emerging driver

Given that the derived growth function of containerisation is becoming less dynamic and the substitution effect is getting weaker in developed economies, with empty incidence staying relatively stable, an increasing share of the growth will come from transshipment volumes and the development of niche markets. For the latter, it is thus important to consider commodity chains as drivers of containerisation.

Commodities, from chemicals to wood products, are among a large array of goods being traded in the global economy. Temperature sensitive products, particularly food, also represent a niche for containerisation. Both transport systems - bulk and containerised - have a role to play implying that the containerisation of commodity chains is more likely to be a process based on a complementarity rather than on competition, since each transport chain has its own advantages.

It is clear that for several commodities such as grain, iron ore and coal, that containerisation will at best perform a niche role in the total volume handled. Both are likely to benefit since containerisation offers speed and flexibility, while bulk offers volumes and the lowest transport cost possible. Because of vested interests, in terms of accumulated infrastructure investment and long standing practices, many opportunities could be captured by commodity producers, large and small alike, over niche markets (high quality grains, organics, etcetera).

The emerging phase of containerisation encompasses a complementarity with the commodity sector and the extraction of niche market opportunities to satisfy new demands. However, niche markets

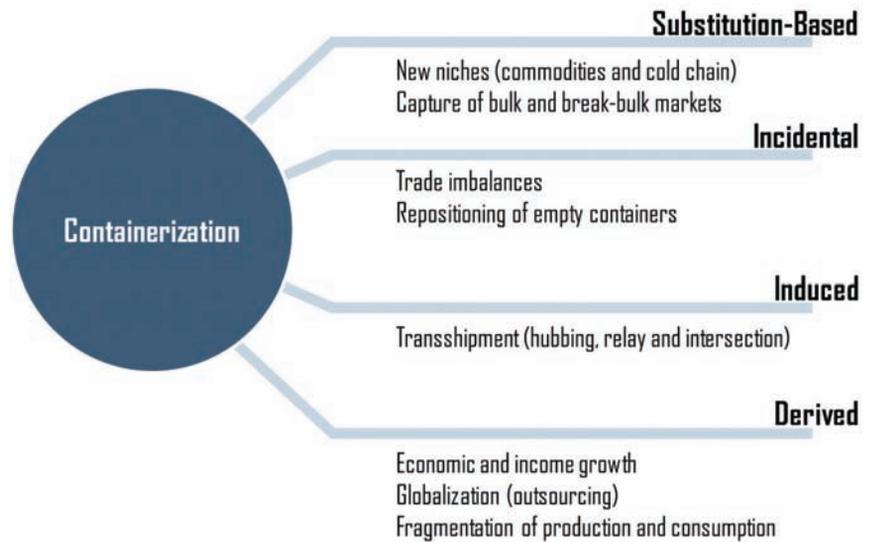


Figure 1: Containerisation growth factors

develop or disappear based on temporary market conditions, the balance of flows on trade routes, the strategic decisions of traders and the need for market size. Still, the nature of the commodities being carried is a fundamental element in the emerging containerisation of commodities.

### Which market potential?

The degree of market penetration of containerisation remains to be assessed and there is a wide variety of levels to which the container can be embedded within various commodity chains. Some commodities are already fully containerised, while for others containerisation is still in its infancy. For instance, 95% of all coffee trade is containerised since coffee is a commodity of high value and its consumption is rather ubiquitous (see figure 2). The demand structure of coffee is therefore well suited for the benefits of containerisation. Many segments of raw materials and food commodity chains are in the process of being containerised, which is starting to account for a notable share of international trade. This process is supported by several factors:

- A growing number and availability of containers in transport markets around the world is making it a rather ubiquitous transport product. Yet, this ubiquity is challenged by temporal shortages of containers and of specific container sizes in some markets. Since 2000, the global inventory of containers grew 6.9%

annually, while the container ship fleet capacity increased 11.1% per year

- A general rise in commodity prices and a growing demand in new markets has made many commodities more prone to being containerised from a value proposition standpoint
- Fluctuations and rises in bulk shipping rates have incited the search for alternatives to bulk shipping. The increased volatility in bulk shipping also makes long-term planning for bulk shipping complex and subject to risks
- Relatively stable and even declining container shipping costs, particularly in light of rising commodity prices, rendered the container even more attractive since shippers can be more confident about the stability of shipping rates
- Global trade imbalances are transcribed in imbalanced container shipping rates which represent a notable export subsidy for return (backhaul) cargo. For markets having notable imbalances, such as China (exports) and the United States (imports), incentives are acute. Empty container repositioning has created opportunities by making available pools of empty containers that can be filled for backhauls. Cargo flows which are attracted by low backhaul rates include waste paper, scrap metal and lower value agricultural and chemical bulk commodities



Figure 2: Container coffee stuffing station, Port of Cartagena (Source: Sociedad Portuaria Regional de Cartagena)

### Containerisation at a turning point

Containerisation has benefited substantially from economies of scale, particularly for maritime shipping. The container confers few differences in scale economies for a producer as each container is a unique transport unit; also containerised shipping networks are fairly ubiquitous. Barriers to entry are thus quite small as each container is an independent load unit that can accommodate lower volumes without many drawbacks as long as other containerised volumes are present (economies of scale are very important for terminal operators and maritime shipping). For instance, farmers (or cooperatives) may develop their own markets by sending small agricultural commodity loads through regular containerised supply chains. Thus, containerisation can provide the double benefit of permitting the development of global niche markets where numerous small exporters may compete, as well as offering new economic development venues in commodity sectors which

could not previously access foreign markets.

The first phase of containerisation, from the 1960s to the 1980s, was mainly fuelled by a process of substitution, mostly in the form of the containerisation of conventional general cargo. Then, from the 1990s, globalisation propelled the derived demand for container transport. Over the coming years, it is expected that containerisation will increasingly focus on niche markets as the opportunity of conventional markets get tapped off. In particular, the whole paradigm based on the off-shoring of manufacturing will reach maturity. 'Looking inside the box' thus becomes an increasingly important endeavour to understand the evolving dynamics of containerisation and the extent to which commodities will be carried in containers.

*This article is a brief of the paper: Rodrigue, J-P, and Notteboom, T., (2014) "Looking Inside the Box: Evidence from the Containerisation of Commodities and the Cold Chain" Maritime Policy and Management.*

### About the authors

Dr Jean-Paul Rodrigue is a Professor at Hofstra University, New York. His research interests mainly cover the fields of economic and transport geography as they relate to global freight distribution. Areas of interest involve North America and East and Southeast Asia, particularly China.

Dr Theo Notteboom is a Foreign Expert Professor at Dalian Maritime University in China, a part-time Professor at ITMMA (an institute of the University of Antwerp) and the Antwerp Maritime Academy and a visiting Professor in Shanghai and Singapore. He has published widely on port and maritime economics.

### About the organisation



PortEconomics is a web-based initiative aiming at generating and disseminating knowledge about seaports. It is developed and empowered by the members of the PortEconomics group, who are actively involved in academic and contract research in port economics, management and policy. Since October 2012, Port Technology International and PortEconomics have been engaged in a partnership. [www.porteconomics.eu](http://www.porteconomics.eu).

### Enquiries

Dr Jean-Paul Rodrigue  
Dept. of Global Studies &  
Geography - Hofstra University  
Hempstead, New York, United States  
[jean-paul.rodrigue@hofstra.edu](mailto:jean-paul.rodrigue@hofstra.edu)  
Prof Dr Theo Notteboom  
Dalian Maritime University  
1 Linghai Road,  
Dalian, Liaoning (China)  
[theo.notteboom@gmail.com](mailto:theo.notteboom@gmail.com)



## PTI IS RANKED NO 1 IN THE WORLD for port related news, searches & content

You need Port Technology's Supplier Directory. It's a lead generation tool designed to showcase your products and services in the port and terminal sector, and the latest feature added is the ability to reveal the identity of your unknown visitors and turn these visitors into hot leads you can follow up: immediately. With advanced IP-look up, our supplier directory gives you complete access to who is visiting your pages, what products they looked at while there and how to make contact with them. We deliver all this information through a simple email alert that allows you to easily assign leads to sales team members and access full contact and visitor information. Your sales team can be more empowered and more effective. Stop wasting time and money and start using the Port Technology Supplier Directory. Visit today to set up a no-risk 90-day trial.

**70% of B2B business is conducted prior to any contact with the client or brand** (Forrester)

- 12 month exposure with full search engine optimisation (SEO)
- Direct enquiries & sales leads
- Real time email alerts with the company name of visitor
- Data reports including number of pages or product page visited
- Data report also includes length of time of each visitor
- NO FREE LISTINGS
- Eliminate your competitors from search results

It's not just about advertising, it's about **Content in the right Context** which drives **"Inbound Marketing"** through all of your touch points for greater lead generation.

"The Port Technology International website is a great portal for business professionals and we have received many enquiries through this great website!"

*Meclift oy ltd*

Contact James AA Khan | Managing Director | +44 79462 14440 | jkhan@porttechnology.org

# Addressing industry challenges through collaboration



Manuel Perez, *Director of Product Management, Xvela, San Francisco Bay Area, USA*

Both capital expenditure and operating expense figures would concern any investor in the shipping industry. Massive investment in assets, port expenses, high stevedoring costs, extraordinary bunker fuel costs (definitively not recovered by the bunker adjustment factor (BAF)), vessel damage cost not recovered from terminals, and evermore security and environmental regulations all collate to keep moving costs upwards.

The shipping lines' actual return on investment in the modern day scenario has become a sort of lottery in which financial forecasts and risk assessment is better coming from some kind of fortune teller than from the most brilliant market analyst. Rates are unpredictable and more volatile than in the past. Over capacity in the market is a disease without a cure. Despite the efforts for consolidating industry capacity, the antidote is not yet available.

Things get further complicated when countries protect their own strategic interest by financially sustaining unprofitable national carriers, thereby keeping capacity artificially high. Meanwhile, the carriers' shippers continue fishing for lower rates in these troubled waters, taking advantage of the imbalance between supply and demand while the industry looks for economies of scale, whilst terminals focus on their own operations as they watch this bad industry movie play out.

What can the carriers do in this challenging scenario? They have little room to reduce their fixed costs and market and operational volatility will not allow them to establish a solid base for financial forecasting. Shipping lines must focus only on what they can control; reducing operational cost and doing their utmost to try and control market capacity.

Reducing cost starts with rejecting unjustified costs, revising contracts and agreements and finally evaluating better ways to provide the same service at a lower cost (though not necessarily at the same service level).

## Addressing unplanned disruption

What matters is what you can control. Carriers cannot control the weather, but they can do more to control contingency costs created by weather disruptions. Carriers cannot control a vessel breakdown, but they can establish the most efficient way of predicting the unpredictable. Carriers cannot control upfront the speed of the vessels to be on-time for the next port, but they can create pro formas and buffers that can absorb unplanned delays in the most cost efficient way. Conventional wisdom states carriers cannot control terminals, although this is not a concrete conclusion.

Why can't the most important source of operational cost deviations for a carrier be shaped to mitigate disruptions and improve on-time and predictable vessel operations? Bunker fuel cost is not the most important operational cost for carriers on its own. It is the combined consequence of the different disruptions in a network which creates the greatest uncontrolled and unbudgeted costs, and this quickly derails any operational savings initiatives.

A delay in a port obliges the carrier to choose between speeding up to the next port to catch up (when possible) or be late and create a problem in the next terminal. This, in turn, will have a domino effect on the transport network around the terminal and subsequent port calls for those vessels. Things get

further complicated when a carrier is forced to skip a port to avoid further impact on the network. The omission implies an entire re-planning of the cargo on board (and the cargo left behind) and this always, without exception, incurs more unforeseen costs such as additional handling costs ☒ usually extra transshipment ☒ unexpected use of trucking or feeder services and un-forecast bunker fuel costs. These unplanned disruptions are the most important operational costs of all and increase exponentially when the port is also a hub.

## Collaboration

If a terminal doesn't try to understand the actual costs of their customers and the consequences of their internal decisions on the overall network complexity of the carriers, the terminal sector will continue to destroy value for its carrier customers, as well as the customers of their customers. Ultimately, this all adds up to damaging the viability and profitability of the customers terminals serve.

The day-to-day scenario is unchangeable: vessels will always be affected by unpredictable weather or engine breakdown, and the number of moves will always fluctuate from this week's call to next week's. Also, of course, ports can't control the weather either, and port equipment will have unplanned breakdowns, labour disputes will cause disruptions and port stays will always vary subject to a plethora of factors.

Although the reality of the business conditions will not change, no matter how much ports, terminals and shipping liners keep blaming each other, the approach to managing this reality can be changed. Only when the industry can sit together



### About the author

Manuel Perez is director of product management at Xvela. He recently joined Navis to manage the design, development and execution of Xvela products. Prior to joining Navis, Manuel worked for Maersk Line for 17 years in various operational roles and led the development of several IT projects focused on efficiencies and process optimisation.

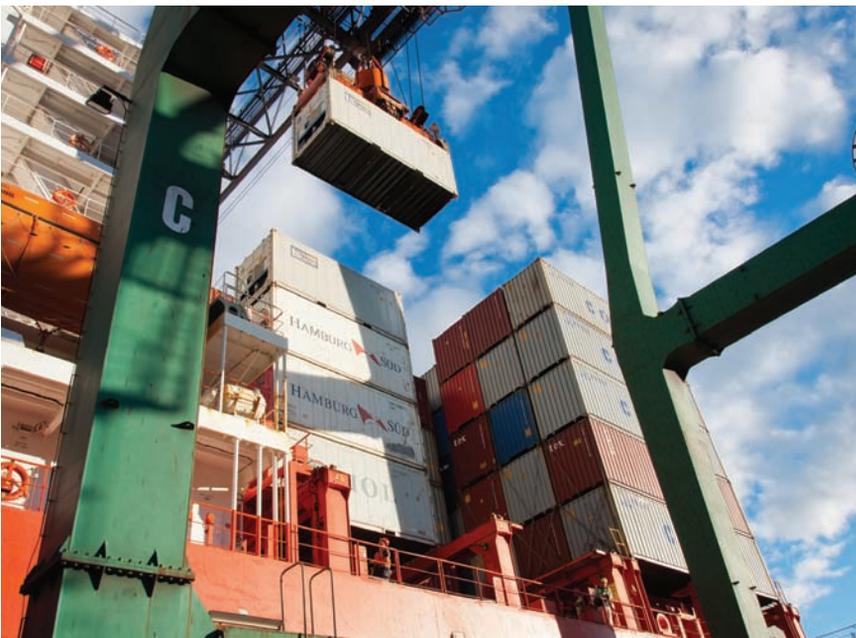
### About the organisation



Ocean carriers and terminal operators know that efficiencies can be gained, waste eliminated and revenue increased through better collaboration on vessel stowage planning and execution. But the tools and incentives to change business processes have been lacking until now. Xvela is a new company that utilises the legacy of Navis PowerStow vessel stowage solutions to provide a transformative, cloud-based collaboration platform and network for ocean carriers and terminal operators. Xvela enables its users to easily connect and coordinate vessel stowage planning and execution activities, resulting in reduced vessel operation and terminal costs, as well as improved utilisation of critical crane, vessel and manpower resources.

### Enquiries

Xvela  
55 Harrison Street, Suite 525  
Oakland, CA 94607  
Christopher Mazza  
Christopher.Mazza@navis.com  
+1 510 267 5000  
www.xvela.com



at a table and come to an understanding of one another's costs, make them visible and agree on the tradeoffs (and figure out how to share the additional costs generated) will we be able to enjoy a healthy and thriving industry for years to come.

This industry challenge to foster collaboration is one of the main

reasons behind the creation of Xvela, a platform that can provide access to collaboration tools, analytics and exchange of information. Change can be difficult and slow even when the status quo is demonstrably not providing the productivity, but I believe matching the right tools with the will to change can lead to changes in behaviour.

# Local government and ports: a perfect match?



Olaf Merk, Administrator Ports and Shipping, the International Transport Forum (ITF) at the Organisation for Economic Co-operation and Development (OECD), Paris, France

Shipping and port operations have globalised with rapid pace over recent decades, with most of the economic benefits of ports spilling over regions, and most negative impacts staying close to ports. This leaves ports with the challenge of creating local value in order to sustain local support for port activity in the area. In this context, the question is if more local government involvement in ports is conducive to ports providing a positive impact locally.

## Local government involvement in ports

This article distinguishes four different indicators: ownership of ports by local governments, the influence of local governments on the decision-making of port authorities, the port as an investment and revenue source for local governments, and local government influence over the staffing of a port.

Exclusive ownership of ports by local governments is fairly rare, although it does occur in Northern Europe and the US. Most countries actually fall into hybrid models as either locally and nationally jointly-owned government ports, or because local governments own some categories of ports – usually the smaller ports – whilst national governments own other categories of ports – the larger ports. The majority of the 50 largest ports in the world are exclusively owned by their national governments, with just over a third owned by local governments. Exclusive national ownership of ports is as rare as exclusive local ownership, yet it is visible in countries such as Ireland, South Africa and Turkey. Although port ownership by government level usually follows a national pattern, there are some remarkable differences between ports

in the same country. Finally, regional ownership of ports is fairly common in federal countries, such as the US, Australia and Germany, where states have responsibilities for port development.

There are many ports that have some form or formalised local institutional representation, that is they have, within their main decision-making bodies, representatives that are appointed or assigned by local governments to serve their interests. There is no linear relation between local ownership and local representation. However, it is difficult to generalise, because practices in one country already tend to differ from one case to another. Main issues in which local governments are involved include the appointment of the port president and board members, the budget of the port and the long-term strategy of the port. In various ports, other port stakeholders, such as port users, are also included in the main port bodies as part of a wider effort of stakeholder relations management, which is becoming a key management field for modern port authorities.

Ports are often direct revenue sources of local government, and as such, the competitiveness of a port can be considered in the direct interest of a local government administration. The local influence over a port is generally larger when the local government invests in the port infrastructure or infrastructure that is related, such as hinterland.

Mayors of some cities – in particular in the US – have the power to appoint port directors (in addition to the port president and/or the board of the port). This gives them control over the operational and implementation-related side of the port. In many cases, the appointment process of port directors is diffuse and in the

hands of more actors than just the local government, and as a result, port directors often lack local roots. As a matter of fact, it is difficult to find port directors of large ports that have a ‘local’ profile; instead, directors often have a background in their national governmental administrations or in industry.

The existence of a national port policy could undermine local government involvement in ports. This is particularly the case if national port policy establishes a national port hierarchy. It then defines a port system in which some ports are of ‘national importance’ whereas other ports merely represent regional or local importance. This is of particular relevance if these ports of national importance receive priority treatment in terms of funding.

Some countries have decentralised their port authority functions from the national to the local level. The most notable example is China, but other port decentralisation reforms have taken place in Argentina, Canada, France and Spain. The reverse situation, the centralisation of locally controlled ports, has only rarely taken place. Most port decentralisation reforms have taken place in different, subsequent stages. Decentralisation often results in a diversity of port governance models in the same country. Port decentralisation is also frequently part of a larger set of port reforms including the liberalisation, corporatisation and privatisation of port operations, including moves towards a landlord port governance model.

## Impact of local government involvement

Our analysis shows that ports with high local government involvement tend to

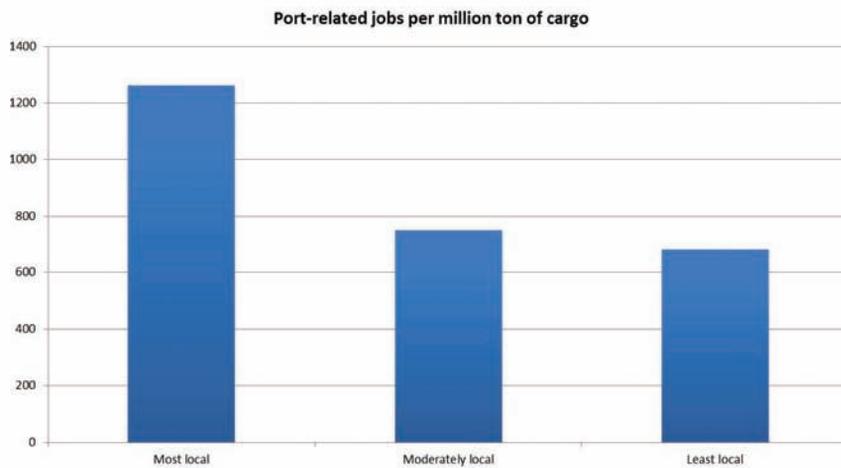


Figure 1 Relation between local government involvement and local port-related employment

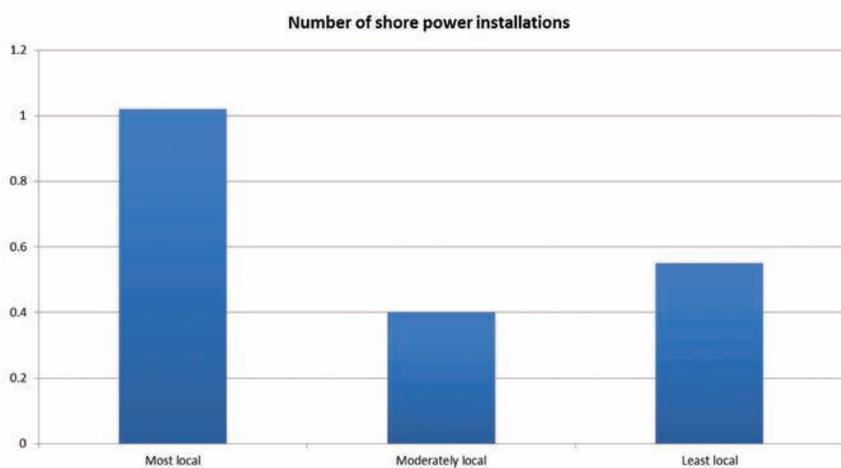


Figure 2 Local government involvement and number of shore power installations in the port

have more port-related employment, almost twice as much as the ports with the least local government involvement. If ports are divided into three different groups, the average amount of port-related jobs per million tonne of cargo appears to be slightly more than 1,200 jobs for the ports with the most local government involvement (see figure 1). The differences between the moderately local and least local ports in this database are fairly small, which might suggest that the impact of adding some local government involvement in a predominantly nationally oriented ports system is relatively small.

Analysis carried out regarding the environmental effects of local government on ports shows that ports with the most local government involvement have on average double the shore power installations in their ports (see figure 2). This is based on a dataset of 73 ports, consisting of the largest ports on the different continents, with data on the availability of shore power installations and a score on local government

involvement. The results are in line with the expectation that ports with significant local government involvement would be more sensitive to local impacts, such as air pollution.

### Conclusion

In conclusion, one of the arguments in favour of local government involvement in ports is the proximity to the port market and the community. It is often stated that local governments are better suited than central governments in managing ports as they are much closer to the real action, and are thus much better placed to detect and react to market opportunities and community issues. This proximity and responsiveness is much more difficult to achieve when ports are run by civil servants who are hundreds of kilometres away from the action. Our analysis shows that local government involvement in ports frequently comes together with net positive port impacts, such as port-related employment and active air emission policies in the form of shore power facilities.

What are the implications in terms of policy recommendations for port governance? Much depends on the local situation, such as the extent of inter-regional spill-overs from port activity. The potential of some ports might be unleashed if part of the national government responsibilities or ownership would be decentralised, whereas some ports might actually be trapped into too much local government involvement which constrains their possibilities to act as a national gateway.

### About the author

Olaf Merk is administrator for ports and shipping at the International Transport Forum (ITF) at the OECD. He has directed studies on ports, port-cities, and port regulation and governance. He is the author of various OECD books, most notably "The Competitiveness of Global Port-Cities". He is also lecturer on the Governance of Port-Cities at the Institute for Political Science (Sciences Po) in Paris. Prior to working with the OECD, he worked for the Netherlands Ministry of Finance. He holds a Master's degree in Political Science from the University of Amsterdam.

### About the organisation



The International Transport Forum (ITF) at the Organisation for Economic Co-operation and Development (OECD) is an intergovernmental organisation with 54 member countries. It acts as a strategic think tank for transport policy and organises an Annual Summit of Ministers. The next Annual Summit will take place May 27-29, 2015 in Leipzig, Germany.

[www.internationaltransportforum.org](http://www.internationaltransportforum.org)

### Enquiries

ITF/OECD  
2, rue André Pascal  
75775 Paris Cedex 16  
France

Tel: +33.1.45241660  
Email: [olaf.merk@oecd.org](mailto:olaf.merk@oecd.org)  
twitter: @o\_merk

# Plug-in at Ports



Meredith Martino, AAPA Director of Publications,  
Digital Media and Technology, Virginia, USA

## Plug-ins enabled

As more and more seaports power their operations from electrical grids, a new set of assumptions about cost and reliability have been created. Operating costs and efficiency are important considerations for all seaports, but for the Georgia Ports Authority (GPA) which oversees the ports of Savannah and Brunswick, the issues are especially front and centre. With no private marine terminal operator responsible for terminal infrastructure or cargo handling, GPA has a direct and immediate stake in the way its cargo handling equipment performs and the costs associated with running it.

## How GPA 'plugged-in'

Rich Cox was GPA's general manager of equipment and facilities maintenance for more than 18 years before he retired last autumn. It was he who highlighted that all of GPA's cranes were fuelled by diesel and were experiencing a 3.8% downtime rate. His aim was to get that downtime to less than 1%.

When GPA began investigating electric-powered cranes, it ran into constraints, as cranes that utilised 480 volt power could only travel approximately 900 feet from the power source. When another power option became viable in the form of a 13,800 volt feed to cranes the mathematics started to change, as the

cables for the higher voltage could allow travel of up to 2,300 feet from the power source.

Mr Cox noted that after the ports authority purchased two electric cranes, the reliability got better and the maintenance costs began to significantly decrease. Consequently, GPA made plans to convert seven more cranes from diesel to electric, implementing the change in 2000.

Today, all ship-to-shore cranes at GPA facilities are electrified, and the authority is now turning to electrifying rubber-tired gantry (RTG) cranes. In 2011, GPA carried out a demonstration project using a Conductix-Wampfler mobile energy supply system which proved so successful that GPA now has an additional eleven electrified RTGs. Though they can still run on diesel, the cranes use electric power approximately 95% of the time.

According to Mr Cox, the payback period is just over five years considering capital and diesel savings. He found that by not running diesel all the time, GPA has significantly reduced its maintenance costs. However, while the change has yielded many benefits, it has created some new challenges as well.

## A storm strikes: a microgrid is born

In 2008, there was a wind storm that wiped out the transmission lines of

Georgia Power, the local utility that supplies power to the GPA facilities, and the port lost power for about 12 hours.

GPA and Georgia Power learned a lesson from the wind storm and have constructed parallel pathways from the local substation to ensure stability in the supply. However, GPA has also investigated the use of microturbines as a temporary power source to address the supply concerns. Utilising microturbines, fuel cells, solar, natural gas and other alternative sources are a key component of microgrids; the way to achieve local power goals.

Clay Sandidge, president of Muni-Fed Energy, noted that the ultimate goal for ports is ensuring reliability and resiliency for total overall demand. Mr Sandidge explained that municipalities, ports, universities and others are turning to microgrids as part of their energy strategies, which also include efforts to reduce consumption where possible. It often makes good sense to power sources of consistent energy consumption, such as high-mass lighting, cranes and yard equipment with a microgrid. A port might set a goal of providing 20, 50 or 70% of its power from a microgrid because, in a disaster or catastrophe, things can still run because a portion of the power supply is 'islanded'. Furthermore, if the grid does not go down, a microgrid can redeploy power into the system.



## Five advantages of electrifying RTGs with the Drive-In L System:

- Compact and light design in integration in any kind of RTG even in constricted space is possible
- Short drive-in zone the e-RTG runs with electrical power from the very first container row
- Changing container blocks without any ground staff
- Up to 6 RTGs per container block
- Ready for automated terminals integrated data transmission, auto-steering system, positioning system, diagnostic and monitoring system
- Drive-in L RTG electrification: less noise, fully automated, 55% less emissions, 95% less diesel fuel costs



# Cut costs and emissions with Cavotec AMP



Together with ports and shipping lines, we're cutting vessel emissions and improving operational performance with our innovative Alternative Maritime Power (AMP) technologies across Asia, Europe and North America.

Our uniquely varied range of innovative shore power technologies - mobile, ship- and shore-based, low and medium voltage - make connecting to shore power easier and more cost efficient than ever before.

We also support port operations with our MoorMaster™ automated mooring technology, Panzerbelt cable protection systems, motorised cable reels, crane controllers, power chains and radio remote controls.

Find out more at [cavotec.com](https://cavotec.com).

Cavotec is a global engineering group that enables industries worldwide to improve productivity, safety and sustainability.



While reliability is one of the most appealing aspects of utilising a microgrid, it can also help address power costs. Using alternative energy, such as natural gas, in a long-term contract can be very attractive for operations managers, as the strategy enables them to lock in costs and have a better knowledge of what their energy costs will be in the long run.

Mr Sandidge found that many ports are looking at using microgrids to baseline a portion of the power needed for a marine terminal. For example, a port might seek to provide four megawatts of power from a microgrid for a terminal that runs on 10 megawatts of power. He said a microgrid, which can be as small as 100 kilowatts or as large as 100 megawatts, is attractive because it offers better management of energy usage, high-quality power, and reliability and resiliency of power.

A supply of reasonably priced, reliable power is the number one priority for large-

scale electrification efforts at seaports, including shore power for vessels. So much so, a number of ports have built infrastructure to electrify cruise ships while at berth.

### Shore power

The Halifax Port Authority announced in 2013 that it will be the first port in Atlantic Canada to provide shore power for the 2014 season. Part of a US\$10 million cooperative initiative between the Government of Canada, the Province of Nova Scotia and the Halifax Port Authority, the project gained traction because of the air quality benefits associated with allowing ships to 'plug-in' and turn off their auxiliary engines.

Typically, vessels are in port for approximately nine hours, and during that time if they are connected to shore power, there would be no carbon dioxide, mono nitrogen oxides, sulfur oxides or particulate

matter emissions from the vessel auxiliary generators.

At British-American multinational cruise company Carnival Corporation, cruise ships have been utilising shore power for about ten years. The first installation was in Juneau, Alaska, and others have followed in Vancouver, Seattle, San Francisco, Los Angeles, Long Beach and San Diego.

Because cruise ships already have auxiliary engines that can be utilised, the reliability of the power supply itself is of less concern. The primary issue for powering cruise ships is the large load requirement. It can be 12 megawatts, compared to a cargo ship that might only be 1 to 1.5 megawatts.

There's a high cost of putting in place distribution infrastructure for the large, irregular loads associated with cruise ships. It can cost US\$1.5 million to US\$2 million to retrofit a vessel to be able to



Top: Shore Power Construction at Halifax Port on March 19, 2014; Bottom: Super Post-Panamax cranes at Fairfew Cove Terminal



Courtesy of Halifax Port Authority

connect it to a power supply, as well as the cost of landside infrastructure to provide the power additionally.

Because of the associated costs, many cruise ships are looking at exhaust scrubbers as an alternative to shore power to address air quality concerns. Scrubber technology has advanced in the past several years to a stage where emissions can be reliably calculated as the equivalent of 0.05% sulphur fuel – well below the 0.1% sulphur fuel requirement for the North American Emissions Control Area that will go into effect in 2015.

However, vice president of public affairs at Carnival Corporation Tom Dow thinks that installations that already utilise shore power for cruise vessels will continue to do so, despite the progress on scrubbers.

It is likely that ports will continue to find new and innovative ways to utilise grid power for their operations, solving some problems such as air emissions or maintenance costs of diesel equipment in the process, but also encountering new challenges such as reliability and resiliency. New solutions, such as microgrids and better cooperation with utilities, will be necessary, however ports are forging ahead to make these solutions realities.

*This is an abridged version of an article written by AAPA Publications, Digital Media and Technology Director Meredith Martino that first appeared in AAPA's Seaports magazine and is reproduced by kind permission of the American Association of Port Authorities ([www.aapa-ports.org](http://www.aapa-ports.org)).*

## About the author

Ms Martino is responsible for AAPA's quarterly Seaports magazine and the AAPA website. Prior to her current role, Ms Martino served as AAPA's Director of Environmental Policy and Advocacy Outreach, handling policy issues such as ballast water, diesel emissions and regional oceanic planning.

Ms Martino has worked for US Senator Tim Johnson, serving the Senator on natural resources, transportation and environmental issues, as well as the US Senate Government Affairs Committee, monitoring issues of the Committee's jurisdiction and drafting correspondence on behalf of then-ranking member John Glenn.

## About the organisation



Founded in 1912 and based in Alexandria, Virginia, US, the American Association of Port Authorities (AAPA), is a trade association representing more than 130 public port authorities in the US, Canada, Caribbean and Latin America. Additionally, it represents more than 300 sustaining and associate members with an interest in the seaports of the Western Hemisphere. The AAPA promotes the common interests of the port community, and provides leadership on trade, transportation, security, environmental and other issues related to port development and operations.

## Enquiries

Meredith Martino:  
AAPA Director of Publications,  
Digital Media and Technology  
Email: [mmartino@aapa-ports.org](mailto:mmartino@aapa-ports.org)



**TRANSPORT EVENTS**  
[www.transportevents.com](http://www.transportevents.com)

**9<sup>th</sup> Southern Asia**  
 Ports, Logistics and Shipping 2014  
 India

Thursday 27 and Friday 28 November 2014  
 Hosted by Chennai Port Trust  
 ITC Grand Chola Chennai, India

**9<sup>th</sup> INDIAN OCEAN**  
**PORTS & LOGISTICS**  
 2015

Thursday 22 and Friday 23 January 2015  
 Hosted by Port Maputo  
 Girassol Indy Congress Hotel And Spa, Maputo, Mozambique

**8<sup>th</sup> PHILIPPINE**  
**PORTS AND SHIPPING** 2015

Thursday 12 and Friday 13 February 2015  
 Hosted by Philippine Ports Authority  
 The Peninsula Manila, The Philippines

**3<sup>rd</sup> MED PORTS**  
 2015

Wednesday 25 and Thursday 26 March 2015  
 Sheraton Casablanca Hotel and Towers, Morocco

**11<sup>th</sup> TRANS Middle East**  
**DOHA** 2015

Wednesday 6 and Thursday 7 May 2015  
 InterContinental Doha The City, Qatar

**4<sup>th</sup> BLACK SEA PORTS & SHIPPING**  
 2015

Thursday 28 and Friday 29 May 2015  
 Istanbul Marriott Hotel Asia, Istanbul, Turkey

**13<sup>th</sup> ASEAN**  
**PORTS & SHIPPING**  
 2015

Wednesday 24 and Thursday 25 June 2015  
 JW Marriott, Jakarta, Indonesia

**10<sup>th</sup> Southern Asia**  
 Ports, Logistics and Shipping 2015  
 India

Thursday 17 and Friday 18 September 2015  
 The Leela Kempinski Hotel Mumbai, India

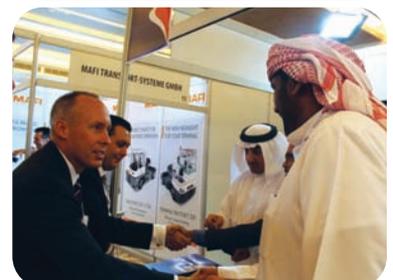
**13<sup>th</sup> Intermodal**  
**AFRICA**  
 2015

Thursday 29 and Friday 30 October 2015  
 Hosted by the Ministry of Transport, Works, Supply and Communications  
 Mulungushi International Conference Centre, Lusaka, Zambia

**14<sup>th</sup> Intermodal**  
**AFRICA**  
 2015

Wednesday 25 and Thursday 26 November 2015  
 Hosted by Nigerian Ports Authority  
 Lagos Oriental Hotel, Nigeria

[www.transportevents.com](http://www.transportevents.com)





## Port Planning, Design and Construction



“To achieve business benefits, port operators cannot remain within the traditional paradigm of fixed-variable cost modelling. They need to introduce an enterprise-wide change encompassing process, organisation and technology.”

# Near-to-live training for container terminal planners: bridging the gap between training and live operation



Nikolaos Koumaniotis, *Electrical and Computer Engineer*; Dr Yvo Saanen, *Managing Director and Founder of TBA*; Menno Bruggeling, *Consultant at TBA*; Dr Csaba A. Boer, *Senior Product Manager and Head of the Emulation Department, Delft, the Netherlands*

Proficient use of a terminal operating system (TOS) for planning and equipment control is essential for the efficient and productive operation of container terminals. The degree to which a TOS is used effectively is highly reliant on human operators. The training of these operators is traditionally done through conventional and on-the-job training with a limited structure and a narrow scope. Besides, it heavily relies on the expertise of the on-the-job trainer(s). In this article, we report a systematic training approach we have applied in a number of cases to improve the skills of control room operators in various container terminals. The approach is supported by virtual terminal emulation and allows for accurate measuring of an operator's performance.

## The importance of training

Providing employees with appropriate training is becoming a matter of utmost importance due to the fact that organisational performance is totally dependent upon the performance of the organisation's personnel. As a consequence, in order to achieve the targeted performance increase, the organisation should invest to improve its employee's skills through training.

The main objective of training operators with a TOS system is to achieve higher terminal productivity by giving operators hands-on knowledge and experience of using the system. This can be translated into the improvement of decision making and the planning skills of individual operators. However, the main challenge is

to train the operators to make the correct decisions in real, high-pressure operations. To achieve this, we propose the use of 'serious game' training in a virtual reality arena. Not only is this more effective and efficient than traditional training, it's also much safer.

## Issues with traditional training

Designing a good training system is a challenging task for even the most talented educators. Traditional training usually consists of lectures and book studies, or a combination of the two. Despite its popularity, the traditional method of training cannot show the holistic complexity of a real TOS at work as it focuses only on isolated learning points. Given this static approach, there are obvious limitations in effectively training staff for the complex environment that operators encounter on a daily basis.

## Virtual reality and serious games

The type of training we are pioneering is a combination of games and pedagogy that typically consists of simulation models. These models place the trainee in an artificial environment that closely imitates actual working conditions. People's increasing fluency with virtual reality, and the capacity to facilitate the use of modelling tools in virtual environment training, is providing a great opportunity to surpass the disadvantages of traditional on-the-job training processes. With virtual reality training, a trainee can test his skills under realistic conditions, immediately witnessing the consequences of his

decisions in real-time. Most importantly, the virtual environment provides a safe playground for testing new strategies that the trainee would not experiment with in real life. Virtual reality training prepares an individual for both complex and high-pressure situations.

## Training operators using serious games

During the last decade, much has been published regarding the new-wave training phenomenon serious games. A serious game is a form of virtual training which utilises a simulated virtual environment in which education is given priority over entertainment. There are two things serious games must achieve in training: on the one hand, the training process should aim to transfer the required knowledge and skills to TOS operators in a fun, personalised and subjective way. On the other hand, the training format should be 'serious' and didactic in order to avoid the impression that it is just a game with no practical learning application. The two ingredients that are essential to harmonise these two seemingly contradictory methods of pedagogy are a mature virtual reality tool and a properly designed training process.

## Virtual reality training tool

In order to run serious game scenarios there is a need to invest in or develop a simulated virtual reality environment. Since the use of serious games is still in its infancy for container terminal logistics, there is only a very limited

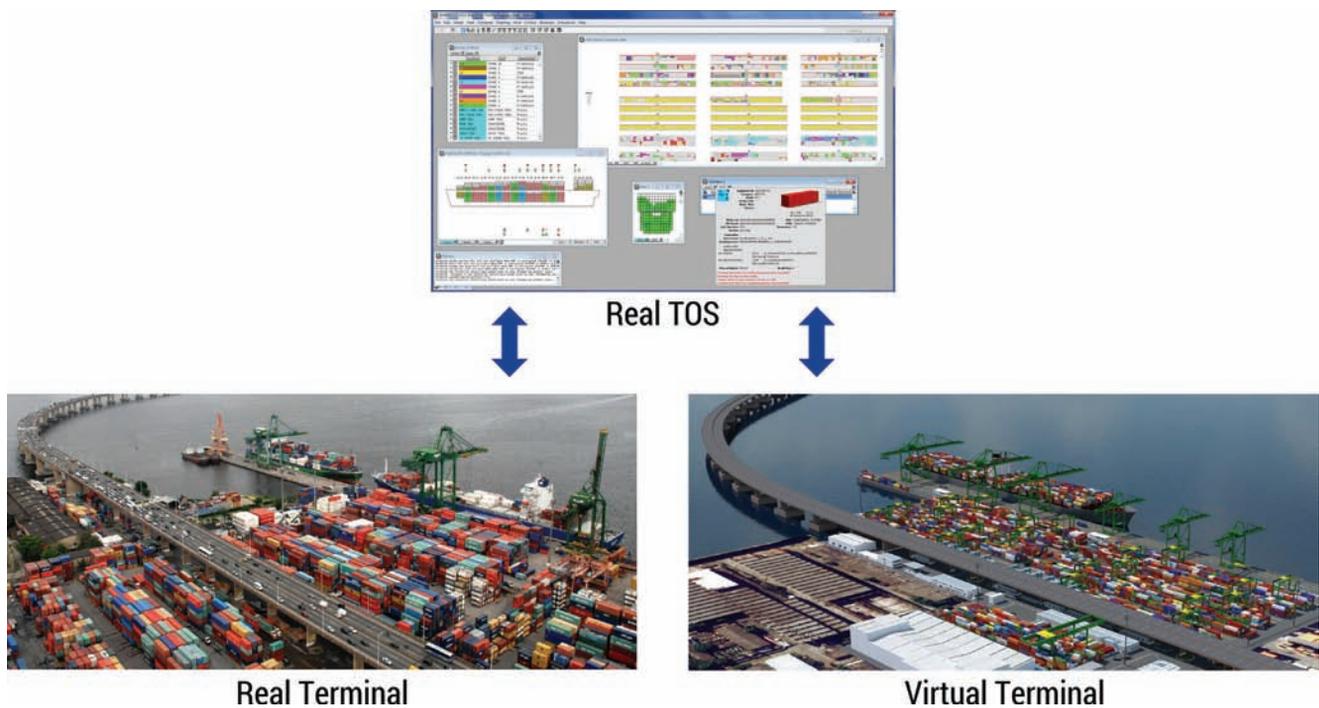


Figure 1 - Real Vs Virtual - Container terminal using SPARCS TOS and CONTROLS

number of simulated virtual container terminal tools. We are aware of two of them, one is 'CONTROLS' (Container Terminal Optimised Logistics Simulation) implemented by TBA, and the other is 'ChessCon' from the Institute of Shipping Economics and Logistics. As depicted in Figure 1, the aim of these simulated virtual container terminal tools is to connect to the TOS and let the operators use the TOS as they would use it in real-life situations.

### Virtual reality training process

The presence of a good tool is not a guarantee for good training. Our experience has taught us that a well designed training process is more important than the tool itself.

Every training process has three phases: prepare, provide and evaluate. The pre-training phase, or prepare phase, starts when container terminal authorities first request a training session for the TOS operators. This training phase is the most crucial one for the whole process since most of the preparation takes place during this period. The pre-training phase ends when the trainer starts giving the training.

During the training phase, or provide phase, the trainer and the trainees work together in order to achieve the transfer of knowledge and skills according to the training goals that have been set during the previous phase.

The post-training phase, or evaluate phase, focuses on providing assessment. We propose a training process that aims to fill in the three training phases as

mentioned above, with a few well-defined training goals central to all phases. A training goal should always be specific. Setting too many training goals is a bad idea because the training might lose its focus. One or two main training goals accompanied with a few secondary goals is considered to be a good combination.

Once the training goals have been finalised, TBA offers training for three kinds of planning roles:

- Vessel planning training for operators responsible for planning the optimal loading and unloading of vessels
- Yard planning training for operators responsible for planning the optimal container locations in a yard
- Equipment dispatching for operators responsible for planning the optimal use of container handling equipment

For each of these roles, different levels of skill and expertise exist that may influence the type of training that is delivered. It is very important to take into account that these two are not necessarily related. We therefore run training on novice, intermediate and advanced levels.

In novice training, the focus is on the correct use of the TOS system and the introduction of a systematic workflow for each role. To familiarise the planners with the different roles, a trainee may perform all three roles in a simple simulation exercise. At intermediate level, the focus is much more on planning with less focus on the TOS itself. By informing trainees of various practices and by placing them in teams, a synergy of teamwork and advanced insight creates an optimal

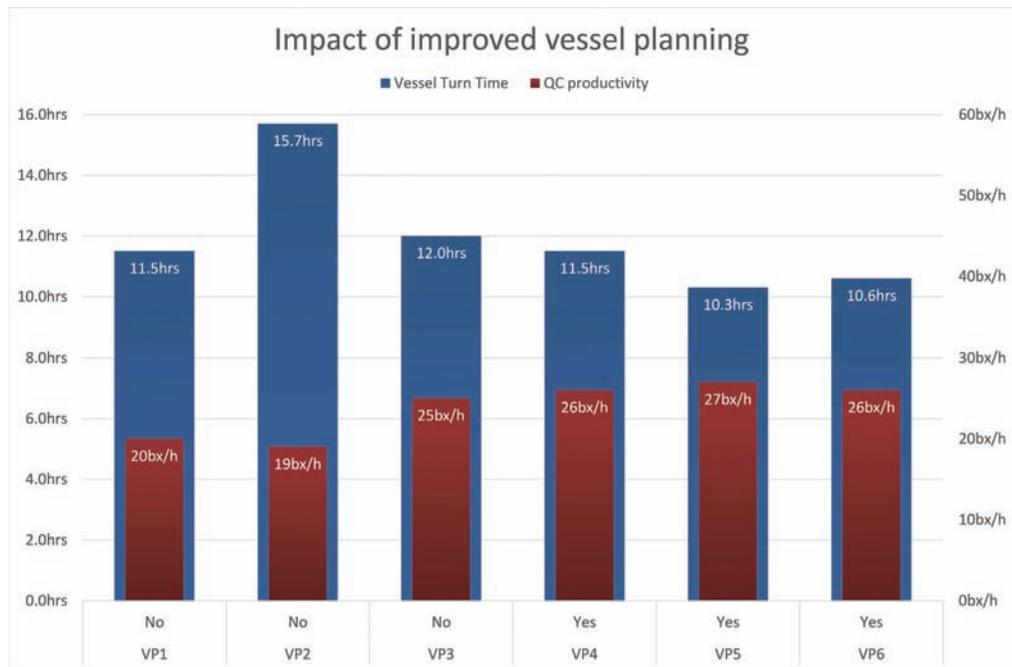
environment for trainees to empirically learn the best port planning practices. On advanced levels, we instruct trainees in the detailed control of modern and complex TOS modules. As with the intermediate stage, different types of simulation exercises are used for different skill levels.

### Experience using near-to-live training

We have now carried out a number of training sessions using the near-to-live approach. One of the emulation-supported trainings that has resonated most has been vessel planning training. The main goal of this training is to improve the decision making skills of vessel planners in allocating space to containers on board a vessel. Prior to the arrival of a container ship, the ship's operator sends a so called stowage plan to the container terminal. The stowage plan indicates which containers are to be removed and identifies information about the vessel slots occupied by containers covering container type, destination and weight. Having this plan available, the TOS operator allocates quay cranes that are going to carry out the load and discharge operations without interfering with each other. Currently, the vessel planning process at most terminals is done manually, so creating such a plan takes multiple hours.

### Vessel planning experiment: Manual versus Automation

In order to analyse the efficacy of manual versus automation planning, an experiment was carried out with a trainee group



consisting of six vessel planners. Each of the six planners was told to plan the same vessel. Three of the vessel planners organised everything manually, while the other three planners were requested to use an automated stowage planning module.

The results of the experiment highlight the average productivity of a crane and the vessel turn time of each individual vessel planner. A key point to state is that the three vessel planners who used an automation solution had no experience at all with the tool. Despite lacking experience, they all performed better using it than their manual counterparts. All planners that used automated stowage planning turned the vessel quicker than the ones that practiced traditional procedures, requiring 25% less time to complete the planning process.

### Summary

The serious game training using virtual reality tools has been applied for a while in areas such as defence, but it is new to container logistics. Previously, the lack of tools and training approaches rendered it impossible to properly train TOS operators. In contrast, the virtual reality training enables the trainee TOS operator to execute typical day-to-day tasks in a risk-free environment, consistently acquiring feedback on their actions and decisions. Two key elements are required for proper virtual training: a good training tool, and a well planned training program. The training tool together with the training program supports the container terminal logistics community in utilising a new methodology of training; we are anticipating it to be the training practice of the future.

### About the authors

Nikolaos Koumaniotis is an electrical and computer engineer. He holds a Master of Science in Engineering and Policy Analysis from Delft University of Technology and he currently works as a business analyst in the strategy and planning office of an aquaculture company.

Dr Yvo Saanen is managing director and founder of TBA. He holds an MSc in Systems Engineering and a PhD in the design and simulation of robotised container terminals, both from the Delft University of Technology. He is also a lecturer at Delft University of Technology.

Menno Bruggeling is a consultant at TBA. After joining TBA in 2010, he has conducted and managed a number of simulation projects and specialises in planning training for terminal operators using 'CONTROLS'.

Dr Csaba A. Boer is a senior product manager and head of the emulation department at TBA. He holds a PhD in Computer Science and Logistics from Erasmus University Rotterdam. His research interests include distributed simulation, distributed virtual environments, port logistics, port simulation and port emulation.

### About the organisation



Netherlands-based TBA is a leading international provider of consultancy and software concentrating on marine terminals and intermodal container terminals. Key services are terminal planning using simulation, support of complex software (TOS) implementations and TOS fine tuning using TBA's emulation tool controls, as well as the training of terminal planners. TBA is also the leader in equipment control software (ECS) for automated terminals, having supplied Euromax in Rotterdam, CTA in Hamburg and Antwerp Gateway.

### Enquiries

Dr Csaba A. Boer  
 Karrepad 2A, 2613 AP Delft, Netherlands

Email: [csaba.boer@tba.nl](mailto:csaba.boer@tba.nl)  
 Website: [www.tba.nl](http://www.tba.nl)

**NEW Conference & Networking Event in Tenerife**

**TOC**

**MARKET BRIEFING**

**WEST AFRICA**

[www.toc-events.com](http://www.toc-events.com)

**10-11 December 2014**

The Auditorium  
Santa Cruz de Tenerife  
Canary Islands, Spain



# Maximising West Africa's Trade Potential

2 day conference Ice-breaker drinks reception Port tour Gala dinner Exhibit area

## International expert speakers include

## Who should attend



**Richard Anamoo**  
Director General, Ghana Ports & Harbours Authority



**Leonard Ebute**  
Head of Supply Chain, Kimberly-Clark West Africa



**Ségolène Drogy**  
Managing Director, Central & West Africa, APM Terminals



**Pedro Rodriguez Zaragoza**  
President, Ports of Tenerife



**Michel Donner**  
Senior Advisor, Drewry



**Manuel E. Benítez**  
Deputy Administrator, Panama Canal Authority



**Michael Luguje**  
Secretary General, Port Management Association of West and Central Africa (PMAWCA)



**Jan Hoffmann**  
Chief, Trade Facilitation Section, UNCTAD



**Frank Tony Eshun**  
Chief Commercial Officer - West Africa Cluster, Damco



**Younouss Soungui**  
Deputy General Manager, Cameroon National Shippers' Council



**Pascal Ollivier**  
Director of Corporate Development, SOGET



**Markus F. Brinkmann**  
Line Manager, UASC Agencies Nigeria

**Book your delegate place now!**

Sponsors



Global Port Partner



Supported by



Industry Partners



Online Media Partner



Global Media Sponsor



Media Partner



[www.toc-marketbriefing.com](http://www.toc-marketbriefing.com)

# The times they are a-changin': new models in port business



Fox Chu, *Director of Infrastructure and Transportation Asia Pacific, Accenture, Shanghai, China*

Well-run container terminal operations are generally high margin businesses characterised by predictable revenue streams. In a bid to maximise profits, many port operators have actively pursued sector-based and geographical asset diversification, expanding their current operations or acquiring overseas port management businesses in order to grow, as well as to mitigate risks linked with specific regional or national markets.

However, even as global trade continues to increase, warning signals on the future of the container terminal industry have begun to surface. The organic growth of container handling volumes has slowed in response to a declaration from China that it will see a five-year low in its economic growth rate this year.

This slowdown is exacerbated by offshoring and outsourcing cycles from global sourcing reaching optimum levels. This in turn has led to a decline in the growth of container traffic driven by such activities.

Correspondingly, the expansion of port operators and new port facilities coming online has led to increased levels of competition in the industry. Operators are now unable to raise container handling fees without losing business as liners have the option to head to other competing ports to service their cargo.

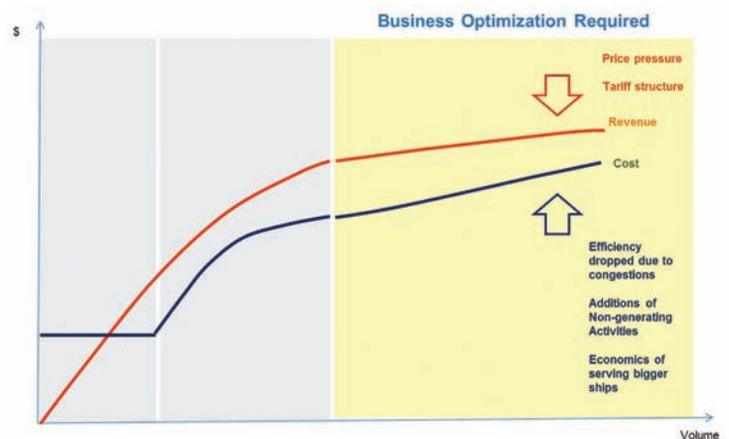
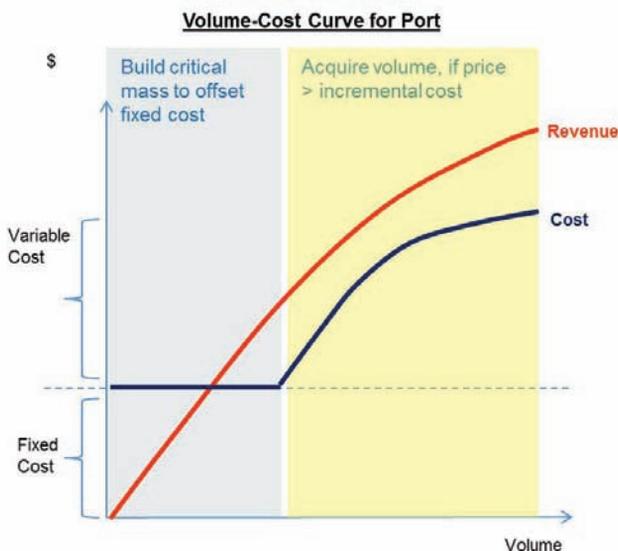
With limited top-line growth, port operators have to look for new ways to optimise business returns. They must select the right customers and deliver the right level of service to maximise port output and profitability.

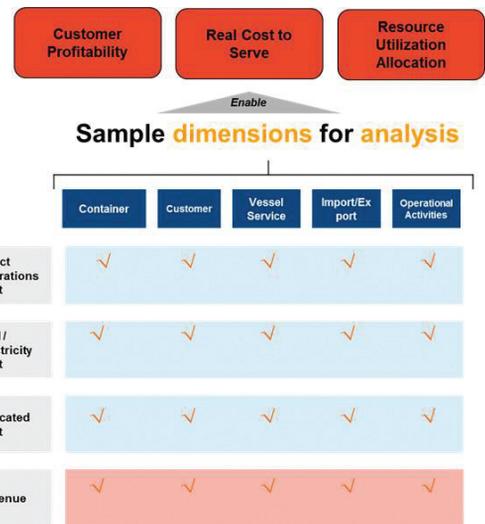
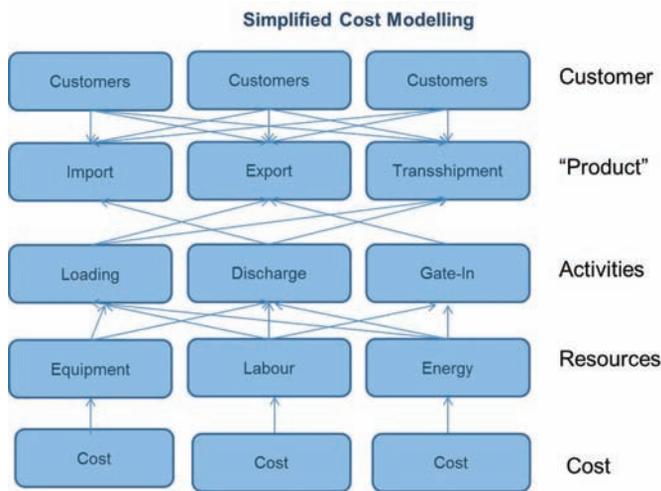
## Traditional model overhaul

A fixed-variable cost approach is the standard way port operators use to analyse their business. Cranes, trucks and other physical assets are examples of fixed costs, while wages of dockworkers and utility bills are two types of variable costs. Operators measure the average variable cost of handling each container and set a price factoring in a profit margin after covering the costs of cranes, trucks and other container handling equipment.

Such a model is simple to understand and easy to adopt. To implement this business model organisationally, a company's sales department will be responsible for selling as much as they can at a price higher than the variable cost. Operations will be responsible

### Traditional Concept is grounded on "Economy-of-Scale"





for productivity while finance will be responsible for billing and collection.

The traditional approach has worked well until recently when port congestion became an issue. On top of organic growth, more and more vessel sharing agreements have led to an exponential increase in the complexities of terminal operations. Increased container movements are required, along with rework due to unpredictability, and this has led to a rise in resource utilisation. The rise in such non-value added activities has consumed terminal handling capacity, pushing capacity to saturation and resulting in congestion.

This is exacerbated by how port operators, in their bid to add value, have taken on customised activities from shipping lines, not all of which are revenue-generating, further dampening the ability for port operators to maximise profits.

### Activity-based costing

Accenture has introduced an activity-based costing approach to help port clients improve asset efficiency and maintain performance. This new model addresses the relationship between assets, resources and business activities by allocating the cost of assets to revenue-generating activities.

The model is supported by enhanced analytical capabilities which identify meaningful performance indicators such as revenue per customer, per service, per vessel, per equipment deployed, per intermodal mode and thereby this method provides a fresh view of asset efficiency. The enhanced business optimisation it provides helps management decide the right mix of business, the service level to be committed, operations resources and equipment to be deployed, and the right level of terminal utilisation to maximise profitability.

### Need for change

To achieve business benefits, port operators cannot remain within the traditional paradigm of fixed-variable cost modelling. They need to introduce an enterprise-wide change encompassing process, organisation and technology.

Also, the need for change will create opportunities for functional departments to play more significant roles to add value. Finance can take up the analysis role and partner commercial and operations activities to determine the optimal mix of price and service level to each customer. The commercial areas of a business can offer more in-depth insights to determine the price, volume and service-level mix to maximise profitability from each customer. Operations can review cost components to separate revenue-generating and non-revenue-generating activities, and identify areas to minimise wastage due to under-utilisation.

Port operators should take advantage of today's sophisticated modelling technology to support data analysis and generate insights. These multi-dimensional analytical tools will be valuable in extracting and transforming data across finance and accounting systems, terminal operating systems and customer relationship management systems, as they serve as the heart of activity-based cost modelling implementation.

Several port operators have already embarked on this journey and achieved significant results. The implementation of activity-based cost modelling analytical tools has empowered not only senior management, but also the supervisory level of functional departments who have embedded the technology into their day-to-day routine, thereby taking up new roles contributing to enterprise value.

### About the author

Fox Chu has been with Accenture's Transportation and Travel practice since 2005. He is currently the APAC Port Industry Lead, driving the business development and running key accounts in the region. Fox has extensive project experience in transportation services, spanning across airport and seaport terminals, as well as shipping lines, logistics, postal and express, and global sourcing. Representative port accounts that Fox is serving include major port operators in Hong Kong, Singapore, China (Shanghai and Shenzhen) and Indonesia.

### About the organisation



Accenture is a global management consulting, technology services and outsourcing company incorporated in Ireland, with more than 305,000 people serving clients in more than 120 countries. Combining unparalleled experience, comprehensive capabilities across all industries and business functions, and extensive research on the world's most successful companies, Accenture collaborates with clients to help them become high-performance businesses and governments. The company generated net revenues of US\$30 billion for the fiscal year ending August 31, 2014.

### Enquiries

iris.p.li@accenture.com

# Enterprise asset management for ports and terminals



Rajesh Nair, *Director,*  
Envecon, Mumbai, India

For port and terminal operators, optimal use of assets is a key factor in running a successfully performing terminal. Ports and terminals are increasingly based on the concept of driving assets to the maximum, while simultaneously improving the performance in the yard, quayside and gate arena. The end-goal is to continuously improve berth moves per hour and gross moves per hour.

Currently, the challenge facing port operators is how to ensure all their handling equipment is managed in a way that ensures high productivity and improves reliability. Ensuring this requires a well-designed IT solution that can keep port and terminal assets from ageing by implementing maintenance on a regular basis to keep machines in good shape without jeopardising current port operations.

The basic requirements of a terminal could be monitored by an off-the-shelf enterprise asset management (EAM) solution. However, to make things really work, terminal solutions need to be integrated into other port domains such as finance and accounting, procurement, and inventory management to give a full picture of operational efficiency.

Next, a terminal must make the decision between whether to buy an off-the-shelf EAM solution and integrate it with the other systems referred to above, or to go with an enterprise resource planning (ERP) solution. There are various ERP systems that are available in the market that can meet the entire requirements of ports and terminals, and currently, SAP is considered as an industry leader in providing end-to-end solutions in this domain.

## The need for enterprise asset management

Terminals require flexible solutions that can analyse data to predict and plan maintenance activities and costs in order to optimise operations. Terminal specific implementations have made it difficult to

compare performances between different terminals in the past. Therefore, the information available from ports rendered it problematic to increase efficiency and to implement techniques such as total productive maintenance.

Having learned from the innumerable challenges unverifiable data manifested, the industry trend has gravitated towards a single system solution that can meet the majority of the needs of a terminal. Using a system with integrated architecture removes key obstacles in IT management, as well as overall business administration, especially through updated and newer versions of systems that are aimed at streamlining business processes.

## The benefits of enterprise asset management

A truly effective EAM solution will bring terminals under a global server and under one version of ERP applications. The EAM solution offers key information regarding work order cost, work order execution details and work order downtime. Maintenance monitoring is also a core feature, as it helps in minimising downtime and integrating asset-related data as well as business processes. By defining a global standard for terminal asset management in the areas of equipment, maintenance organisation, work order management and preventive maintenance schedules, this will re-imagine port and terminal organisation from a breakdown maintenance strategy to a scheduled maintenance strategy.

Terminals are then free to redesign solutions to slash the time-expended on breakdowns and are also able to achieve a faster return on investment concerning ERP. EAM solutions can be integrated with other applications such as terminal operating systems (TOS), fuelling systems, barcode systems and crane management systems. An EAM solution which reaches over all important assets such as

terminal operating equipment, tools and fixtures, yard, civil equipment and civil structures enables incident reporting at the appropriate structure levels to provide a solid and reliable cause of failure. With this solution, terminal executives can design preventive maintenance schedules which facilitate smooth terminal operations.

Amongst the myriad challenges ports and terminals face is the need to monitor asset condition and usage information so that assets are not being used for the unauthorised or illicit movement of goods through a port or terminal. With the implementation of an EAM solution, the processes are automated, bringing efficiency and reducing operational overheads. Furthermore, implementation of an EAM solution will provide greater insight into asset performance and maintenance, aiding in effectively managing the expense of assets, enhancing productivity and significantly reducing operating costs whilst improving the strategic planning.

Port authorities utilise EAM solutions to exceed goals and requirements. For ports, unplanned maintenance equals unscheduled downtime and a significant hit to operations, not only in terms of reduced throughput and revenue, but also in terms of managing relationships with shipping lines.

## Benefits of enterprise resource planning for terminal management

Ports and terminals routinely face difficulty when systems which have not been, or cannot be, calibrated need to work in tandem to pass information on to each other in order to process transactions seamlessly. That is precisely when the need for integrating systems together arises.

The core of ERP for terminals is in practices such as berth planning and yard planning. Leading ERP products with integrated architecture are a one-stop shop solution for terminals as they meet



## Enterprise asset management dashboard

The dashboard provides an overall vista of equipment utilisation and its performance. It offers real-time visibility of data and is especially useful in equipment allocation planning and forecasting the functionality of port operations.

The dashboard calculates the cost of labour, materials and equipment to provide an insight into equipment maintenance costs, maintenance cost by work-specific duties and the monthly fuel consumption of every piece of equipment at a port or terminal.

By providing detail into planned and unplanned downtime, the dashboard allows a terminal to balance the needs of operations and maintenance and allocate upon planned downtime schedules. Port executives can compare the downtime events of multiple terminals and then make decisions to increase their terminal's productivity.

## Business benefits

An EAM solution reduces downtime and inventory costs by utilising the optimisation of preventive maintenance schedules. It provides the reliability of real-time data for strategic business decisions and manages third party service providers whilst eliminating duplicative systems and standardising modern port technologies.

a terminal's holistic business needs. ERP is used by many of the global industry leaders within multiple terminals worldwide as it offers an extra-edge in terminal management.

By adopting an integrated architecture, issues relating to the duplication of information and the loss of data integrity will be eliminated. There will also be faster processing of information due to real-time integration, which in turn ensures instantaneous decision making at all levels. Furthermore, there will be a significant reduction in operational costs due to advanced forecasting tools ensuring better equipment availability, as well as better planning and scheduling capabilities. All this constitutes much faster cycle times.

## Business intelligence for enterprise asset management

Designing a robust business intelligence (BI) solution by integrating ERP applications, TOS applications and workforce management applications under a single umbrella helps immensely in

making efficient, quick-and-easy strategic decisions. A well acclimatised BI framework provides insightful and intelligent analysis by mining a vast volume of data to ensure optimisation of operations and better management of key performance indicators.

## In short, a BI tool provides:

- Analytical capability to perform frequent failure analysis
- Comparative insight into the financial outlay between periods of planned downtime and delayed downtime
- Insight into contributing factors for the delay of maintenance, such as weather, operational issues and maintenance inefficiencies

BI utilises integrated data from a TOS system and ERP, and through the use of graphically rich visualisation tools such as dashboards and cube features, it clearly and accurately illustrates business results and exposes the root cause of problems.

## About the author

Mr Rajesh Nair is the director of Envecon IT. He has over 18 years of experience in the maritime industry and has held several positions in IT management at Maersk Line. Specialising in maritime and logistic technology, Mr Nair has worked with ports across the globe.

## About the organisation



Envecon is an IT company specifically focused on the maritime industry. It strives to provide innovative technology solutions and services for ports and terminals. Envecon has implemented solutions in Asia, the Middle East, Africa, South America and Europe. Envecon combines practice with technology to enable marine terminal operators worldwide to maximise performance with reduced risk.

## Enquiries

sales@enveconit.com



Utilise Khalifa Port and Maasvlakte 2 case study insight to assess the benefit of installing automation

Lloyd's Maritime Academy presents

# Terminal Automation

Assess the latest technology and automation applications to maximise terminal efficiency and competitiveness

Wednesday 10 – Thursday 11 December 2014  
Bonhill House, London

## Attend this essential seminar to:

- Examine global shipping and port industry trends to assess key drivers for terminal automation
- Explore the latest equipment developments including crane automation, automatic truck handling and Autostrad
- Understand how to utilise software and equipment control systems to improve automation and minimise integration challenges
- Determine strategies to optimise management of automation from a human resources perspective

## Your expert speaker line-up includes:

**Simon H. van Wijlen**, *IT Director*  
**ABU DHABI TERMINALS**

**Yvo Saanen**, *Managing Director and Chief Operating Officer*  
**TBA**

**Dennis Koegeboehn**, *Partner*  
**HPC HAMBURG PORT CONSULTING**

**Aleksandr Artjomov**, *Director*  
**VISY IN UK LTD**

**Neil Davidson**, *Senior Analyst - Ports & Terminals*  
**DREWRY**

**Ben-Jaap Pielage**, *Head of Port Development*  
**WITTEVEEN + BOS CONSULTING ENGINEERS**

**Rob van Eijndhoven**, *Senior Consultant and Owner*  
**RVE MANAGEMENT**

**Michael Richter**, *Senior Automation Specialist*  
**MOFFATT & NICHOL**

**Ray Familathe**, *International Vice President, International Longshore & Warehouse Union, Vice Chair Dockers Section*  
**INTERNATIONAL TRANSPORT WORKERS FEDERATION (ITF)**



### ABU DHABI TERMINALS AND MAASVLAKTE 2

Learn from the automation experiences at the Khalifa Port and Rotterdam container terminals and assess the impact on port operations



**SIMULATION-EMULATION** – Work through simulated examples of applied automation to utilise CAPEX, OPEX and cost calculations and assess the optimum solution for different scenarios

QUOTE **FKT2832PTAD** TO SAVE £100

**NEW!** Download the documentation electronically pre-seminar. View the documentation on your electronic device at the seminar

Registration hotline: **+44 (0)20 7017 5510**  
Email: [maritimecustserv@informa.com](mailto:maritimecustserv@informa.com)  
Book online: [www.lloydsmaritimeacademy.com/FKT2832PTAD](http://www.lloydsmaritimeacademy.com/FKT2832PTAD)

Official Publication

Official charity

**Lloyd's List**

Free five day online trial





## Container Handling



“The burden to comply with the new regulations is not with terminal operators as such, but the situation - where many shippers will not have access to the facilities needed to fulfil their duties - provides terminal operators with an opportunity to offer such a service to shippers.”

# Container weight verification: opportunities and challenges



Lars Meurling, Vice President and Marketing Director, Bromma, Stockholm, Sweden

The process within the International Maritime Organisation (IMO) to implement the mandatory verification of a container weight before it is loaded on to a vessel is progressing as expected. In a May 2014 meeting, the Maritime Safety Committee (MSC) approved draft amendments to SOLAS (the International Convention for Safety of Life at Sea) chapter VI to require the mandatory verification of the gross mass of containers, either by weighing a packed container, or by weighing all packages and cargo items and adding the tare mass. The requirements are expected to enter into force in July 2016.

It is clearly stated in the draft amendment that the responsibility for obtaining and documenting the container weight lies with the shipper. This means that the burden to comply with the new regulations is not with terminal operators as such, but the situation - where many

shippers will not have access to the facilities needed to fulfill their duties - provides terminal operators with an opportunity to offer such a service to shippers.

## The methods

The SOLAS regulations prescribe two methods by which the shipper may obtain the verified gross mass of a packed container:

- To weigh the packed container after loading and sealing. The shipper can do this or have a third party do it
- A shipper weighs all packages and cargo items including pallets, dunnage and packing material. The sum of all the single masses plus the tare mass of the container forms the verified gross mass of the container. Certified methods must be employed for the individual masses and the total gross container mass

## Business case for terminal operators

It is likely that the second method may bring an administrative burden for the shipper that will actually lead to, or encourage, the use of the first method. There are also some cargo types such as scrap metal and unbagged grain that are not as easy to weigh as individual items, therefore the second method will be inappropriate and impractical.

There seems to be an interesting, if not a necessary, case for terminal operators to offer a weighing service to shippers. It is necessary because a terminal does not want to end up in a situation where containers arrive at the terminal without having certified container weights declared. It is interesting strictly from a business point of view.

## Available technology

A quick review of the various technologies available to accomplish the weighing



**Complex  
Logistics  
Processes?  
Raising Costs?**



**One solution to manage:  
RBS TOPSExpert**

Contact us to be inspired and how your terminal will increase  
profitability running Real Time Business Solutions TOS

**Your success is our commitment!**



**TOPXExpert TOPOExpert**

global: [www.rbs-tops.com](http://www.rbs-tops.com) - [sales@rbs-tops.com](mailto:sales@rbs-tops.com)

emea: [www.rbs-emea.com](http://www.rbs-emea.com) - [sales@rbs-emea.com](mailto:sales@rbs-emea.com)



service quickly boils down to two main alternatives: weigh bridges and load sensing devices fitted to, or integrated into, spreader twistlocks. The sensors and load sensing devices available in different cranes and mobile lifting equipment are primarily used as safety devices. The accuracy of these systems is probably not high enough to meet the requirements for container weight verification.

Taking a deeper look into the characteristics of the two main systems, there are a number of areas that distinguish them. This does not necessarily mean that one is better or more suitable than the other, but each will have a different effect on the logistical flow and procedures in the terminal.

### System accuracy

A weigh bridge is the long-established technology which has typically been used to measure the weight of vehicles. This is the technology that offers the highest 'system accuracy' of the two main solutions. However, the process and algorithms for deriving the container weight out of the total weight of a vehicle adds both complexity to the logistical flows of a

terminal and/or inaccuracy, as the weight of the vehicle (including the driver, fuel, etcetera) is estimated and deducted from the total mass of the vehicle measured.

Load sensors installed in or on twistlocks have an advantage in that they only measure the weight of a container. The measure that is obtained is the gross mass of a container. The accuracy of these measuring systems is what is expected to be in line with prospective requirements, especially when looking at the accuracy relating to a container weight, the difference in accuracy to the weigh bridge is small (assuming a truck weight estimate rather than an actual weighing).

### Effect on terminal logistics flow

When weigh bridges are employed, they add an extra step in the handling process. The vehicles carrying containers will have to go to and pass over a weigh bridge. Traditionally, the vehicle has to stop on the weigh bridge but technologies where the truck can continue to roll over the bridge are available. In either case, the weigh bridge will require space to be dedicated for the task and be one of the stations all containers have to pass in order to be weighed.

The biggest advantage for terminal operations regarding a twistlock based system is that it measures as part of the regular lifting cycle. Installed on, for instance, an RTG, the load will be measured and the weight derived as part of the lifting cycle. This simplifies the logistical flows of a terminal by eliminating the extra step to pass a weighing station.

### Twin lift

When two twenty-foot containers are loaded on a truck, the weigh bridge cannot measure the weight of each individual container. A possible procedure for obtaining the individual weight is to unload one of the containers, weigh the vehicle again and then apply the mathematics to achieve the individual weights. When a spreader twistlock based system is employed, individual twenty-foot containers can be weighed as there are sensors in each of the eight twistlocks on a spreader for twin-lifting.

### Summary of the technology comparison

To conclude the comparison of the two main alternatives; the twistlock based

system provides benefits from a handling and terminal logistics point of view, while the weigh bridge is expected to provide a slightly higher accuracy in the container weighing. The accuracy of both systems is expected to be within requirements (which are to be defined while the equipment is in use).

### Calibration and certification

One of the requirements of the equipment that is to be used is that it has to be 'calibrated and certified'. The text in the SOLAS amendment defines what this means: "Calibrated and certified equipment means a scale, weighbridge, lifting equipment or any other device, capable of determining the actual gross mass of a packed container or of packages and cargo items, pallets, dunnage and other packing and securing material, that meets the accuracy standards and requirements of the state in which the equipment is being used."

This definition leaves some room for interpretation. The accuracy requirement is clear and straight forward; based on the specification of the equipment it will be easy to see if the national requirements are met. The certification part however is less obvious, and there is a risk that suppliers will have excellent equipment available but will not know how to qualify to the certification requirement.

Certification means that someone, typically a third party accredited by a national regulatory body, confirms certain characteristics of a system. Characteristics that will be addressed in this case are accuracy, documentation, quality control and so forth. However, when we start to look at the possibility that standards and directives can be made by different bodies of legislature for different countries, the situation becomes quite ambiguous. The IMO currently have 170 member countries, theoretically, this could mean that certification must be agreed between 170 different national standards.

In reality we know that the number of different standards will be lower. For example, the different countries within the European Union typically follow the same European directives. Also, many countries adhere to, or at least accept, the corresponding US standards. It will not be 170 different standards, but the number will be high enough to present the suppliers with a challenge.

The approach I believe will be taken is to go through the process of 'Type Approval' of equipment. This means that a third party, qualified according to the above mentioned criteria, will issue a certificate for the equipment, again in accordance



### About the author

Lars Meurling is vice-president and marketing director at Bromma, Stockholm, Sweden. He previously served as Bromma's market area manager for Europe, and acting director of Bromma after-sales and services. Prior to joining Bromma, Mr Meurling worked for nearly 20 years in business unit management and sales management in the biotechnology industry. Mr Meurling is a graduate (MSc) in Engineering Physics from Uppsala University in Uppsala, Sweden.

### About the organisation

#### **BROMMA**

Headquartered in Stockholm, Sweden, Bromma is a world leader in providing crane spreaders. In more than 50 years of continuous operations, Bromma has delivered crane spreaders to 500 terminals in 90 nations on 6 continents. Bromma spreaders are in service today at 97 out of 100 of the world's largest container ports. Bromma is part of the Cargotec organisation.

### Enquiries

Mr Lars Meurling  
BROMMA, Malaxgatan 7, SE-164  
22 Kista, Sweden  
Email: Lars.meurling@bromma.com  
Tel: +4686200900  
Website: www.bromma.com

with what has been described above. I am hoping, for the sake of the industry, that the big and commonly acceptable standards and directives, such as European and US standards, will be widely accepted in the other member countries of the IMO.

### Conclusion

There is an appealing business case for terminal operators to offer a weighing service to shippers. The choice of system to do the weighing depends on a number of criteria. Currently, there seem to be two main options for weighing systems: weigh bridges or the twistlock based load sensing systems. Certification of the equipment and system may become a bottleneck unless the big standards and directives (such as those from the EU and US) are widely accepted by the other IMO member countries.

# Battery-electric drive trains for terminals: the ultimate in sustainability and cost-effectiveness



Dr Armin Wieschemann, *Senior Director of Global Systems Development, Terex Port Solutions, Düsseldorf, Germany*

Many ports and terminals are looking for opportunities to reduce the impact of their operations on the environment and to simultaneously lower their costs. Increasing demands from authorities and society generally, and the growing uncertainties over energy sources and their costs, has resulted in the search for alternative drives, not only for cranes, but also for mobile equipment used for stacking and container transportation at terminals.

During the last decade, the industry has presented considerable improvements in drive trains for mobile equipment operating in container terminals. For stacking operations there is a tendency to shift towards electric supplied, rail-mounted stacking cranes; also, rubber-tyred gantry cranes (RTG), so far with diesel-electric drives, are increasingly connected to the public electricity grid through bus bar systems or cable reels with flexible cables.

For rubber-tyred equipment operating in a terminal without tracks (terminal tractors, automated guided vehicles (AGVs), straddle carriers (SCs), reach stackers (RSs) and empty (MT) handlers), the standard drive train was a diesel engine connected to an automatic gear reducer. However, for straddle carriers (1970s) and AGVs (2000 onward), diesel-electric drive trains proved to be an improvement with regard to energy consumption, speed control, reliability and maintenance cost.

The interest in electric drives has been heightened by developments in the automotive industry; this is a result of society's demand for lower environmental impacts and the uncertainty over developmental costs of fossil energy sources and their associated taxes. Diesel price rises and increasing regulation has generated greater interest in electrically-powered equipment, as have green energy sources. Terminal operators are aware of these

developments and have taken steps towards more efficient and environmentally-friendly drive trains.

## Drive train alternatives for mobile terminal equipment

There are currently various alternative designs for the drive trains of mobile equipment at terminals. The most common are:

- Diesel engine, gearbox and differential to the drive axle (terminal tractor, reach stacker, straddle carrier)
- Diesel engine, hydraulic pump, control unit, hydraulic motor, (via differential or direct) to the axle(s) (straddle carriers and early-design AGVs)
- Diesel engine, electric generator, control unit, electric motor(s) and gear reducer to the axle(s) (rubber-tyred gantries (RTGs), AGVs and straddle carriers) (see figure 1)

During the past decade, energy efficiency, emission control and concerns over fuel costs have resulted in the application of new technologies from other industries, such as:

- Energy recuperation during vehicle braking or load lowering through the use of energy storage systems
- Electric drive trains supplied from on-board batteries that can be charged while still in the vehicle or can be interchanged either manually or automatically
- Combustion engines fuelled with less costly and/or less polluting fuels such as CNG (compressed natural gas) and LNG engines
- Hybrid drives comprise of a combustion engine, generator, transmission, energy storage device and an electric motor. The greater number of components in hybrid drive trains means a more intricate control unit is required to achieve maximum

reliability. Yet, despite this, their well-to-wheel (WTW) emissions cannot match the more favorable figures of full-electric drive trains

The selection of an appropriate drive train for terminal equipment is a complex process for terminal managers. On the one hand, they want to support societal demands to be assessed from pollution figures measurable from WTW or, less correctly, tank-to-wheel (TTW) pollution figures. On top of well-known exhaust gasses such as nitric oxide, the CO<sub>2</sub> emissions are becoming more important from energy sources in mobile equipment. The recent interest in CNG and LNG-fuelled engines comes from their lower CO<sub>2</sub> production per mega-joule (MJ) of fuel (compared to regular diesel engines). However, the higher efficiency of diesel engines partly compensates for their higher CO<sub>2</sub> emissions. Overall, the CO<sub>2</sub> emissions of CNG/LNG engines is around 15% lower than that of diesel engines.

On the other hand, terminal economics are equally (or even more) important and that is determined by fuel consumption per operating hour, fuel cost, maintenance cost, availability and cost of provisions for fuel storage, fuel supply and safety measures.

In general, a full-electric drive train offers the best energy-efficiency and lowest maintenance. When the choice includes a combustion engine, the modern diesel engine is still attractive due to its rather high efficiency and the high energy content of diesel fuel. CNG or LNG-fuelled engines are more expensive and may need more maintenance; their fuel consumption in litres per hour is somewhat higher. This is often compensated for by lower fuel prices.

A total cost of ownership (TCO) analysis is a good tool for comparison. Unfortunately in many cases, the initial investment is misleading when it comes to drive-train selection. The straight forward diesel-



Figure 1: Examples of terminal equipment manufactured by Terex Port Solutions (RTG, AGV, Straddle Carrier)

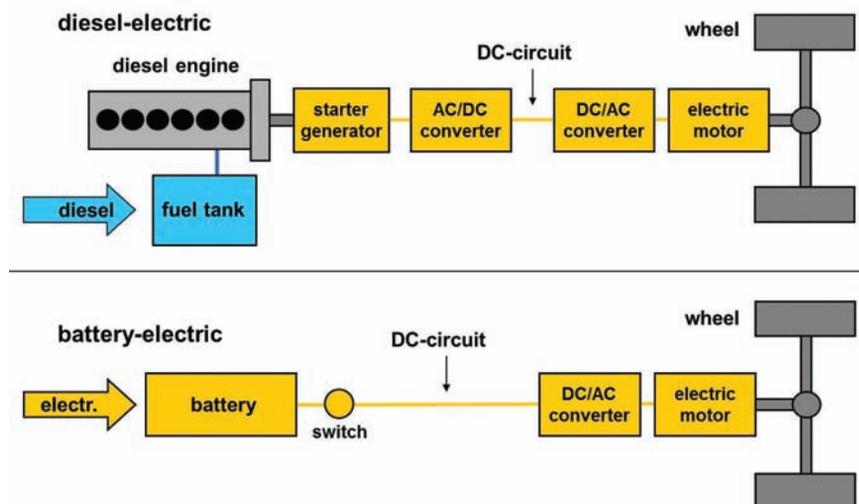


Figure 2: Simplicity of battery drive train through less components

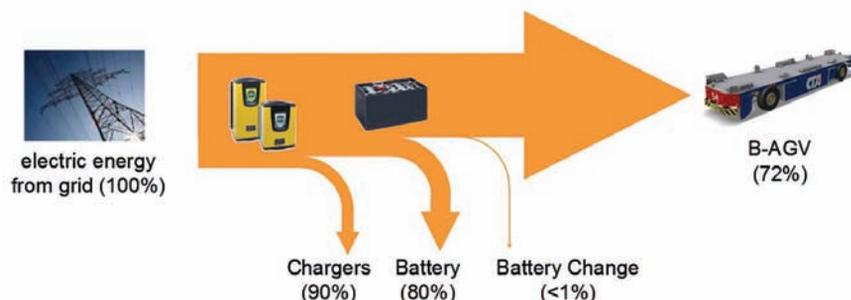


Figure 3 : Favourable energy transfer of lead-acid battery

mechanical and diesel-electric drive trains are still the most-applied configurations.

As for maintenance costs, availability and lifetime, diesel-electric drives have already ushered in some improvements, but full electric drives have shown their superiority in this respect. Lifetimes longer than 40,000 operating hours are normal and maintenance costs (spare parts, labour) are regularly less than 50% of those common for diesel-hydraulic/electric drive trains. The reduction in parts, especially for full-electric drive trains, causes a much higher availability and often, full-electric mobile equipment can achieve more than 6,000 operating hours per year.

### Battery-electric drive characteristics

At the beginning of this century, many ports and terminals showed sustainability awareness and turned to policies to “reduce, reuse, recycle and regulate”. Emissions had to be minimised and equipment designs were to be eco-efficient, reducing or

avoiding the use of fossil energy. For many decades, full-electric drives were used in equipment for internal transportation (such was the case with forklift trucks). Recently, the automotive industry has given a boost to full-electric drive technologies and many governments have developed programmes for more sustainable transport.

At Terex Port Solutions, the experience with diesel-electric drive trains, applied in its AGV-transportation systems, triggered research aimed at even more environmentally-friendly AGVs. Many alternatives were analysed, including some hybrid drive train concepts and full-electric drive trains, supplied with either lead-acid or Li-Ion batteries. The advantages of full-electric drive trains are illustrated in the simplicity when removing a diesel-generator and connected AC/DC converter (see figure 2). They also have a much higher energy-efficiency by avoiding the unfavourable energy conversion of a combustion engine (see figure 3).

Compared with a diesel-electric drive

train, the overall efficiency is about two times better (see figure 4). The intensive utilisation of AGVs with a maximum gross vehicle weight of 90t (compared to 1.5t for a luxury road car) necessitates a battery capacity of over 350kWh; allowing 15-20 operating hours, after that, the battery must be re-charged or exchanged with a fully-charged one. Unfortunately, the required battery capacity for AGVs in container terminals has so far not been met economically by Li-Ion batteries (see figure 5).

For reasons of economics and design, the lead-acid battery today offers the best feasible concept and at present there are more than 100 battery-AGVs operational – all of them with recyclable lead-acid batteries. To support a continuous terminal operation, an automated battery exchange and charging system was developed and it proved to be a cost-beneficial concept with hardly any influence on a terminal’s logistics. In future, Li-Ion batteries may become attractive due to their increased life-cycles, better energy transfer efficiency, low maintenance, reduced investment costs and easier environmental disposal.

To avoid battery recharge and/or exchange, hybrid drive trains could be a solution, however, they have some disadvantages: the technology is much more complex and expensive and will increase maintenance costs; also, the combustion engine reduces eco-efficiency (see figure 6). Hybrid drive trains will never match a full-electric drive train with regard to energy-efficiency.

The high eco-efficiency of battery-powered drives also results in a considerable decrease in greenhouse gas (GHG) emissions. Compared to a diesel-electric drive, the full-electric drive reduces CO<sub>2</sub> emissions by 50% (see figure 7). The WTW results are based on energy sources used in German power plants. Obviously a full-electric drive train will have zero-emissions when using solar, hydro, wind turbine or bio-mass power generation.

Three years of experience with battery-supplied AGVs showed increased equipment up-times and much lower maintenance costs. For Western European conditions (diesel fuel costs, electric energy costs, maintenance labour costs) the TCO analyses made for diesel-electric AGVs and battery AGVs (including BES) over a period of 15 years, showed a 20% better result for the battery AGV (see figure 8); this gap looks likely to increase through developments in battery technology driven by the automotive industry.

### Battery exchange and charging facility

The charging time for batteries involves downtimes (around 6-8 hours for lead-acid batteries and 1-4 hours for lithium-ion

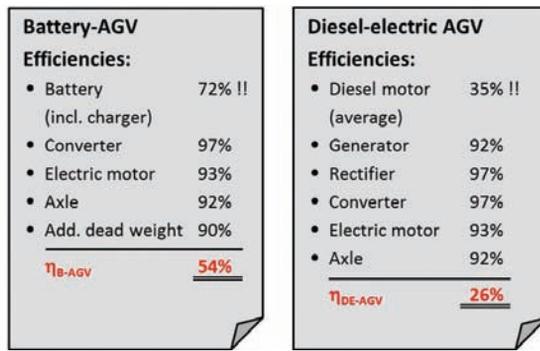


Figure 4: Battery drive train doubles the energy efficiency

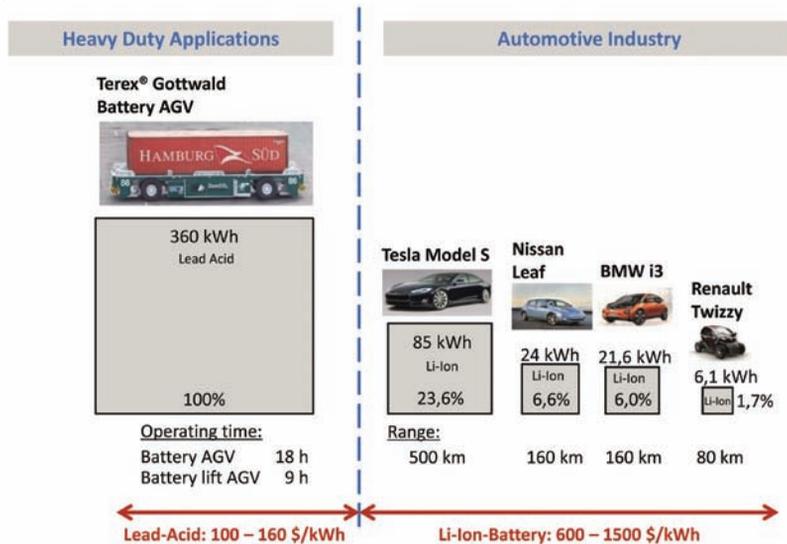


Figure 5: Comparison of battery capacity demand for various equipment types

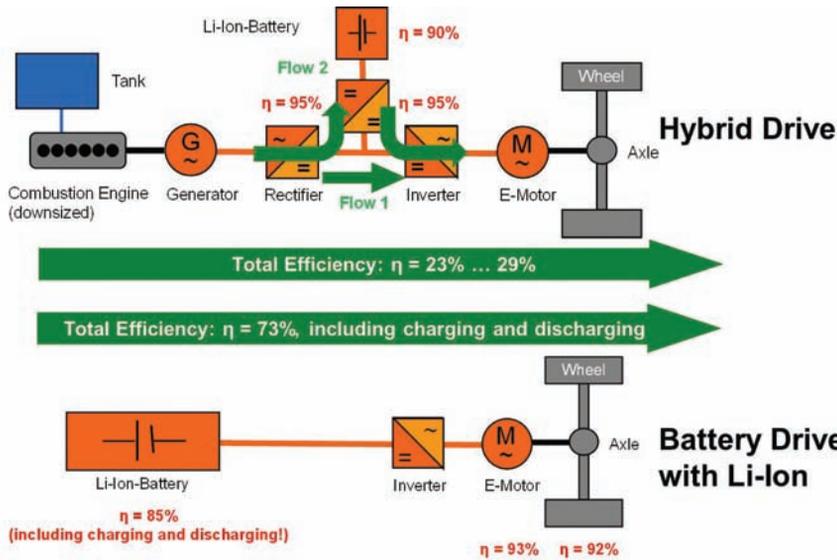


Figure 6: Hybrid drive energy efficiency cannot beat battery drives

batteries applied in heavy-duty transport vehicles). In general, the longer the charging time and the lower the amperage, the longer the battery lifetime. Daytime operations like warehousing do not suffer from such recharging times as they are executed during the night. However, continuous operations in container terminals require a 24-hour uptime of equipment for which there are two possibilities:

- Install more equipment to deal with discharged batteries (requiring 30-40% higher investment and larger areas for parking and charging)
- Create a battery exchange facility, preferably with an automated battery exchange into and out of the equipment. In the case of lead-acid batteries, this solution has proved to be the more economic for container

terminals (see figure 9). The logistical characteristics of automated container terminals allow integration between logistic control and battery recharge/exchange management systems. This approach proved that a vehicle outage of 6-7 minutes for battery exchange has no influence on the transportation performance of an AGV fleet. The fluctuating utilisation of the AGV fleet even allows the future application of smart grid technology to benefit from low electrical energy costs during low demand periods, or during wind turbine surplus periods.

The design of an automated battery exchange/charging station requires a systems approach between logistics, infrastructure and economics, covering battery storage capacity, electrical supply (transformer) power, maintenance facility, ventilation and fire-detection provisions (see figure 10). The design should have some flexibility in order to adapt to future battery technologies. Nowadays, this technology is proven in some major terminals and the electrical supply from the grid allows long term cost control and the potential to apply green energy when the power utility purchases solar, hydro or wind energy. In that case, terminal transport will be a real zero-emission system.

### Outlook

- A number of developments are likely:
- The whole industry will be increasingly focused on electric drives due to their better control and better sustainability. This will result in lower costs of electric drive train components
  - Battery manufacturers will develop batteries with longer lifetimes, with lower battery costs resulting from economies of scale (such as the Tesla Giga-factory)
  - Li-ion or other composite batteries will be developed with the potential for short recharging times
  - Rising fossil fuel prices and GHG emissions directives will further encourage the application of full-electric, battery-supplied drives
  - With terminal operators increasingly interested in acquiring complete systems with guaranteed performances, system suppliers such as Terex Port Solutions may offer a total transportation system, including installation and commissioning of all components (see figure 11)

### Conclusions

So far, the lead-acid battery-electric drive train is attractive from environmental, energy-efficiency, maintenance and economic viewpoints and offers the greatest potential for high sustainability. The economics of battery-electric drives are slightly better than



Figure 7: Battery AGV reduces WTW Green House Gasses with 50%

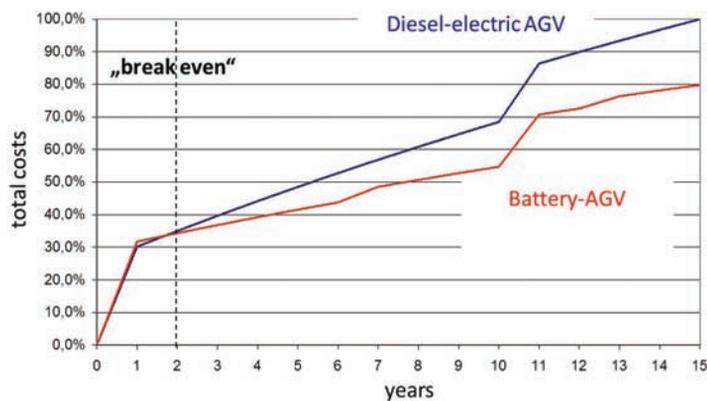


Figure 8: TCO and break-even results for two drive trains

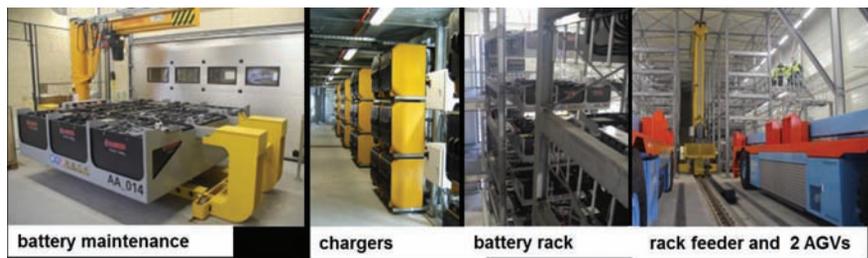


Figure 9: Details of an automated BES (Terex Port Solutions)

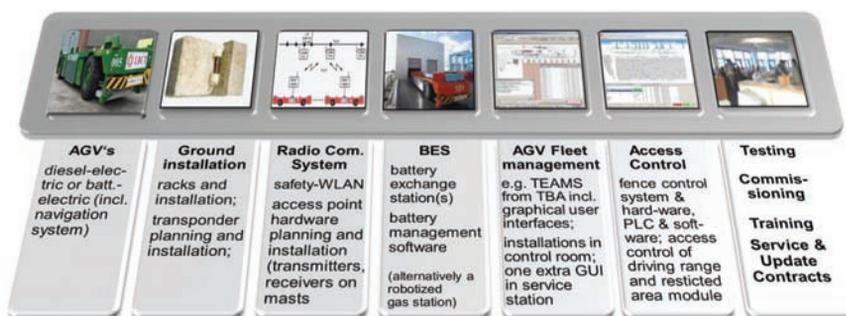


Figure 11: Summary of Transportation System Components

for diesel-electric drives but energy prices are changing continuously. At the moment in most countries there is a tendency to make diesel fuel (and even natural gas) less attractive due to their limited sources and negative impact on the environment. The future increase in sustainable sources (hydro, solar, wind, tidal) further supports the

benefits of full-electric drive trains. Lithium batteries may become attractive following major cost reductions and proven solutions for recharging; this may reduce considerably the BES size due to the faster charging or might even result in avoiding BES altogether. However, in general, the required electrical power demand will remain the same.



Figure 10: BES, applied for battery-powered Lift-AGV

### About the author

After finishing a Master's degree in mechanical engineering and a Doctor's Degree at the Technical University of Aachen, Dr Wieschemann joined Terex Port Solutions (TPS) in 2001 as a member of the systems group. Concerning the global activities of TPS, Dr Wieschemann is managing a team of engineers responsible for the planning and design of handling systems, the improvement of existing systems and the development of new technologies for terminals. Recent examples are the Terex Gottwald Lift AGV and the zero-emission Terex Gottwald Battery AGV with an automated battery exchange station.

### About the organisation



Terex Port Solutions is part of the Material Handling & Port Solutions business segment of Terex Corporation that supplies customers in ports with a unique combination of machines, software and services under the Terex and Terex Gottwald brands. Whether it is ship-to-shore cranes, reach stackers or fully automated, integrated handling systems for containers and bulk, Terex Port Solutions provides reliable solutions for rapid, safe, efficient handling of all forms of cargo with low downtimes and excellent return on investment.

### Enquiries

Terex Port Solutions  
Terex MHPS GmbH, Forststrasse 16,  
40597 Düsseldorf, Germany

# Wireless tracking, monitoring and streamlining operations



Robert Estes, Global Sales and Technical Communications, Globe Tracker, Melbourne, Florida, USA

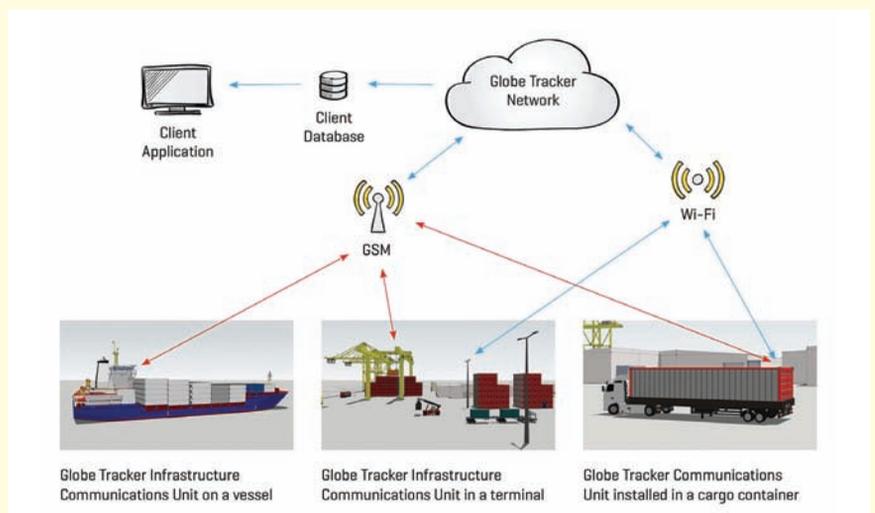
## Part 2 - Behind it all: the GT Communications Unit

The Globe Tracker Communications Unit (GT Comm. Unit) is the industry's most advanced real-time tracking, monitoring and communications device. The GT Comm. Unit, combined with the GT Smart Autonomous Asset Network (SAAN) and the GT Trade Data Exchange Network (TDEN) cloud services, is the most comprehensive and cost-effective solution available anywhere. Globe Tracker International is dedicated to continuously investing in and advancing its technologies to maintain its industry leadership.

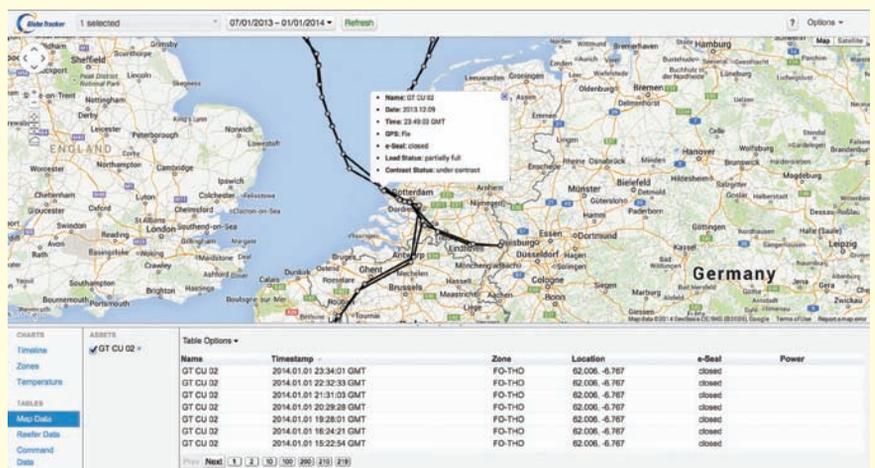
The GT Comm. Unit is designed to be permanently installed on the asset it is tracking and monitoring. This asset may be installed on a cargo container, a truck trailer, a railway car, a vessel, even in a terminal or a yard. The battery operated GT Comm. Unit is completely autonomous, communicating with its local area network of sensors and with its owner's server, wirelessly, from anywhere in the world.

The 'ruggedised' GT Comm. Unit has been designed for permanent installation, sitting tucked away within the corrugation walls of cargo containers and truck trailers. For optimum performance, the electronics unit is installed on the inside wall of a container for added protection, while the antennae unit is installed on the outside wall for best reception. This design is versatile enough to be installed on flat walls and even on light poles in terminals and yards.

The GT Comm. Unit is compatible with a growing portfolio of GT Wireless Peripherals including sensors, reefer control unit interfaces, and electronic door seal monitors. These GT Wireless Peripherals are battery-operated and are most often deployed inside the asset with the GT



GT Communications Unit Real-Time Tracking Platform



Communications Unit, enabling the sensing of cargo area temperature and conditions.

## Software, graphical user interface and integration

The GT Smart Autonomous Asset Network includes a state-of-the-art Graphical User Interface and a full suite of analytical

tools to present and review data. GT Communications Units send data to a customer's server IP address, where it is authenticated and operated upon, before being securely deposited into the customer's target private database. The GT Graphical User Interface draws call data from this private database and then applies

customer-selected analytics, presenting the results for viewing and exporting. The User Interface can display current container position, the route thus far, dwell status and location, temperature, and other sensor data including g-force, motion and even when and where the container door has been opened or closed. This data can significantly improve a carrier's ability to manage the efficiency, security and state of container assets and cargo.

The data in the customer's private database is compatible with the customer's legacy software for customer relationship management, enterprise resource planning and accounting applications. Furthermore, the GT Smart Autonomous Asset Network and user platform can operate with any smartphone, tablet or computer anywhere in the world.

This solution means an entire global container fleet enterprise can be operated and monitored in real-time from one central location. The network offers tiered access to functionality, such as remote administration for the GT Communications Unit and Reefer Interface Device. From vessel crews to terminal reefer technicians, the GT Smart Autonomous Asset Solution allows customisable access to information at tiered security for differing levels of control over reefer assets, all from one interface.

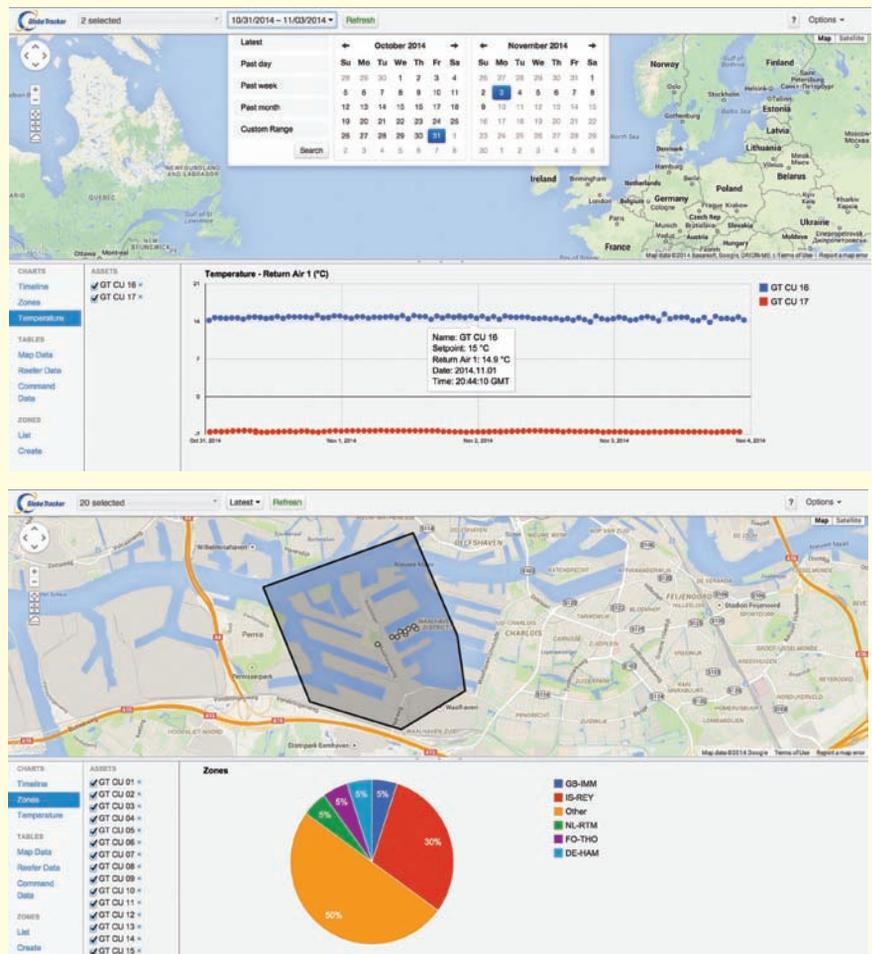
## Reporting and analytics

The SAAN Graphical User Interface provides the user with unique analytic capabilities for estimating position, arrival time and elapsed time. In addition, SAAN can report anomalies in transit such as unexpected movement, excessive acceleration and abrupt stops. SAAN also records unexpected temperatures as well as other sensor readings, dwell time and geo-fence exceptions.

With the SAAN Graphical User Interface harmonising with Globe Tracker's Trade Data Exchange Network, a user has the capability to perform an electronic Exchange Verification by comparing data in the delivering and receiving into a partner's private database, which is triggered with the timestamp of the data exchange. Globe Tracker is currently pioneering an Exchange Verification trigger device of the future that will force the GT Comm. Unit to send data to the SAAN customer's private database precisely as cargo is unloaded.

## Globe Tracker Trade Data Exchange Network

The era of complex and expensive trade data sharing is over. Supply chain partners no longer need to take risks and deposit



Top: Dwell time status alarm and sensor data; Bottom: Actionable real-time terminal data

their private data in central repositories. The GT Trade Data Exchange Network protects supply chain partners by enabling them to share important trade data directly between their own private databases at the customer's discretion. This information can be shared securely and selectively with their customers or with other supply chain partners. The GT Trade Data Exchange software is downloaded directly from Globe Tracker, or from a partner website. It can be installed by customers in a matter of minutes. Supply chain partners can then share data freely, and pay only a small micro fee of a fraction of a cent for the data they receive.

## Globe Tracker Comms. Unit total care warranty

The GT Communications Unit comes with a full warranty and is maintained by Globe Tracker International for the life of its service contract, and the asset in which it is installed. Globe Tracker International supports and maintains its networks and network software at zero cost to its customers. The GT Comm. Units include built-in remote management software that allows them to both send information to a server, and to receive information. Remote Administration includes settings for the GPS acquisition

and GSM reporting frequencies, and includes cutting-edge technology for sending commands to reefers such as set points, remote PTI inspections, and more.

*Part 1 of this feature was published in Issue 63 of Port Technology International*

## About the organisation

Globe Tracker International is a privately-held Danish company specialising in supply chain visibility and profitability. It is a leading provider of data-sharing, data-analytics, and global asset tracking and monitoring services and equipment. Globe Tracker opened a development centre in Beijing, China, in February 2007, and now has offices and development centres in Qingdao, China; Copenhagen, Denmark; Tórshavn, Faroe Islands; Reykjavik, Iceland; and Melbourne, Florida, US.

## Enquiries

www.Globetracker.com  
 Don Miller  
 Director, Sales and Marketing  
 Globe Tracker International ApS  
 1-800-506-4030 ext 5  
 1-647-984-4693  
 don.miller@globetracker.com  
 mailto:don.miller@globetracker.com

# TMEIC improves productivity at the Georgia Ports Authority



Rackley Dawson and Jeff Cranford, Regional Sales Manager & Application Engineer respectively, TMEIC Corporation

Georgia waterways are a southern hub that provides access to raw materials and finished products from around the globe. Since 1945, the Georgia Ports Authority (GPA) has managed deepwater ports in Savannah and Brunswick, as well as inland barge operations in Bainbridge and Columbus.

Over the years, the GPA has seen tremendous growth and now boasts more than 9,700 feet of contiguous berth space and one of the busiest single terminal container facilities in the United States. Due to this continued growth and dedication to provide customers with the most productive port facilities, the GPA identified the need for more efficient container movement.

To help develop a solution to this need, they contracted TMEIC, a leader in safe and efficient port automation. TMEIC helped the GPA install their Maxspeed electrical drive systems in an effort to upgrade six ship-to-shore cranes. The cranes are located at Garden City Terminal in the Port of Savannah, which is the fourth-busiest container port in the United States.

"The Georgia Ports Authority continually strives to provide our customers with the most efficient container handling equipment available. We are excited that this philosophy has been achieved on two of our cranes with the assistance of TMEIC," GPA Director of Engineering and Facilities Maintenance, Chris Novack, said. He also noted that TMEIC was awarded the contract to supply these upgrades as a result of a competitive selection process.

The project replaced the original DC

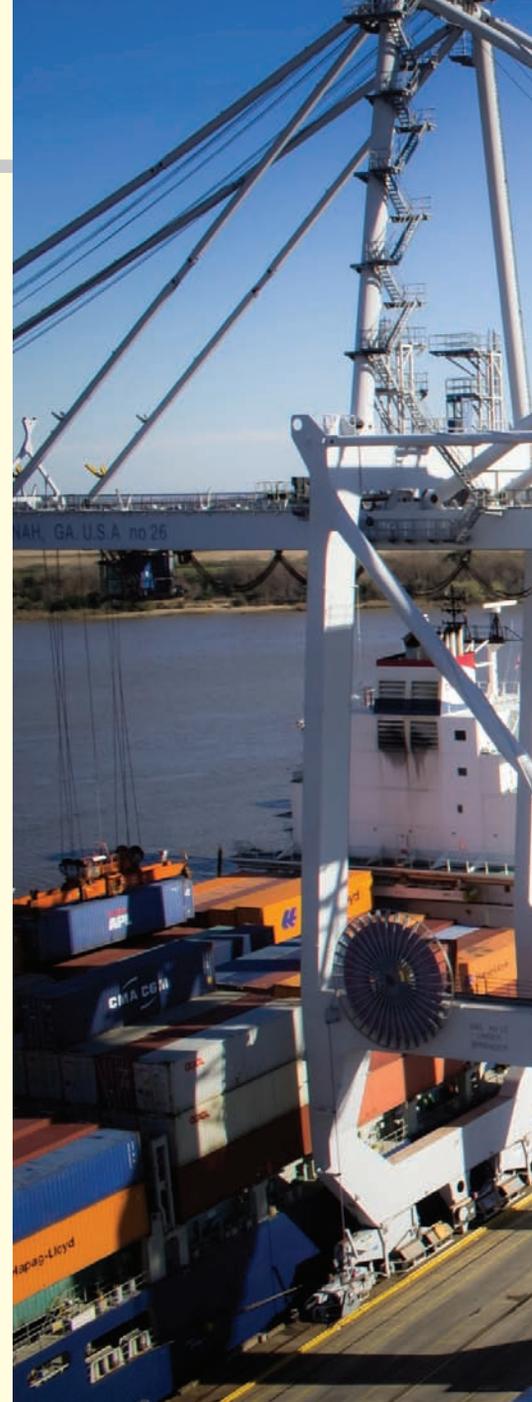
drives with TMEIC's TMdrive 10e2 drives and controls. TMEIC also supplied new AC hoist motors with higher HP that enabled GPA to increase container moves by two containers per hour.

"To design the right solution for GPA, TMEIC worked directly with Paul Harkness and his team to understand what they were trying to achieve. With TMEIC's many years of experience designing crane drives / control systems, we were able to choose the right sub-components to make this project successful. For example, Woelfer Motors supplied AC Motors that were a drop in replacement for the existing DC units. Pintsch Bubenzer Brakes and Hubner's U-One encoders were integrated along with the GE Rx3i PLC to give GPA the right solution to meet their customer's demands," TMEIC Sales Manager, Rackley Dawson said.

## How Maxspeed works

The Maxspeed crane control system uses adjustable speed drives to control the speed and direction of the crane motors driving the gantry, trolley, boom, cable reels, and hoist. The operator uses a master switch (joystick), which inputs signals to the controller through the I/O racks to control speed and direction. A high-speed local area network (LAN) transmits the control signals to the individual drives, which generate the variable frequency three-phase AC power to the induction motors.

The link between the operator switch and the controller is optimised for speed so the operator has fast and responsive control of the motor.



Earlier crane systems used DC drives and motors, but most regions of the world are now standardised on AC technology. Several factors have contributed to this shift to automation, including the continuous increase in vessel size and the need for enhanced productivity.

Benefits Include:

- The same architecture for ship-to-shore and yard cranes
- Crane duty drives and motors with global recognition for their quality and reliability
- Open architecture
- System scalability that allows for smooth integration of advanced options

Since the hoist at Garden City Terminal has been upgraded, GPA has seen the increase in productivity they desired.



“The hoist is capable now of better performance than it ever was before,” GPA General Manager of Crane Maintenance and Repair, Paul Harkness, said.

Additionally, he noted that they expected to realise a productivity increase in container moves by two containers per hour, but they have seen as high as six since the upgrade. The level of productivity they observe on any given day can be attributed to many factors, including how the ship is stowed, where the crane works on the ship and operator skill level.

“The entire process was very smooth, [TMEIC] did a great job coming to site and doing the upfront work. There were no surprises and the startup on the very first [crane] went about how we expected.

We had a couple of small issues right out of the gate, but they got a good, qualified engineer in here and commissioning went well. On the second crane, the commissioning was even better. It was pretty uneventful overall, which is always good,” Harkness said.

#### About the author

Rackley Dawson and Jeff Cranford, Regional Sales Manager & Application Engineer respectively, TMEIC Corporation.

#### About the organisations

GPA and TMEIC have a previous, long-standing relationship. Since 1996, TMEIC has been involved with every GPA ship-to-shore crane. On their most recent collaboration, GPA crane operators and customers seem very pleased with

the upgrade. Initially, customers stated that they thought GPA might have hit a homerun.

TMEIC strives to be a key player in crane control and the shift to automation, delivering this increase in productivity to the GPA is just the latest achievement towards this goal.

# Electrifying RTGs: improving productivity and savings



Dr Lawrence Henesey, Key Account Manager,  
Vahle, Kamen, Germany

In the container terminal arena, it could be argued that rubber-tyred gantry cranes (RTGs) are the workhorses of the industry, since they are one of the most ubiquitous pieces of equipment used for container handling. The main contemporary challenges for RTGs have revolved around how they interface with a number of yard terminal tractors in the transportation of containers. Currently, the average number of gross container moves per hour is eight, and with the increasing demands for faster productivity, efficiency and safe operations, many terminals are seeking ways to improve.

In recent years, due to the high costs of fuel, attempts have been made to reduce the utilisation of RTGs. For many container terminals, RTGs constitute one of the largest users of diesel fuel, which can represent as much as 50% of total energy costs. One of the major attempts practiced by terminals aimed at negating this outlay has been to introduce hybrid motors and electrification.

## Electrification

The introduction of cables and reels to electrify RTGs was first considered in China, and the first electrified rubber-tyred gantry crane (eRTG) was unveiled at Shekou Container Terminal (SCT) in August, 2008.

As China is considered the largest market for RTGs, representing nearly 60% of the world's fleet, its main motivation has been on identifying improvements. One such technology that has been trialled is the use of the 'high wire' system. The Port of Shanghai practiced this by installing 40km of overhead wires to power 130 RTGs. The main obstacle in further developing this type of technology was the large costs for the civil works required for the installation of steel towers to hang overhead wires throughout the container yard. This led to other solutions for full

## Eco'Logical' facts from an eRTG solution from a container terminal operator -- Georgia Ports, US

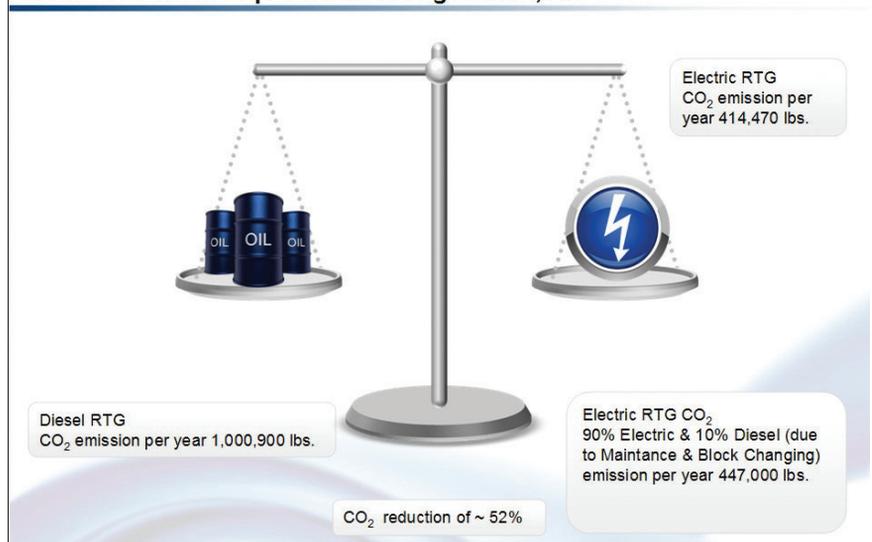


Figure A

electric RTGs being quickly identified and implemented, such as cable reels and conductor bars.

The concept of an eRTG with a plug-connection was a relatively simple one. Electrical energy is provided through a conductor-rail system running alongside a container block. The support structure of the conductor rail also includes guidance for a collector trolley. A towing rope attached to the travelling RTG pulls the trolley, which holds the current collectors for three-phase and earth connection. A cable and a plug maintain the connection between the RTG and the rail system. The plug-in method is proven as a practical, safe and reliable system, with several hundred installations world-wide.

In Figure A, an illustration is given in which data from a real container terminal was analysed by comparing its current fleet of diesel-powered RTGs with RTGs retro-fitted with electricity.

Many container terminal operators view conductor rail solutions as a significant

improvement. Also, with advances in smarter terminal operating systems (TOS), improved education and training for RTG staff, the management of container terminal yards now requires smart solutions that are part of an overall system, rather than operating with stand-alone solutions.

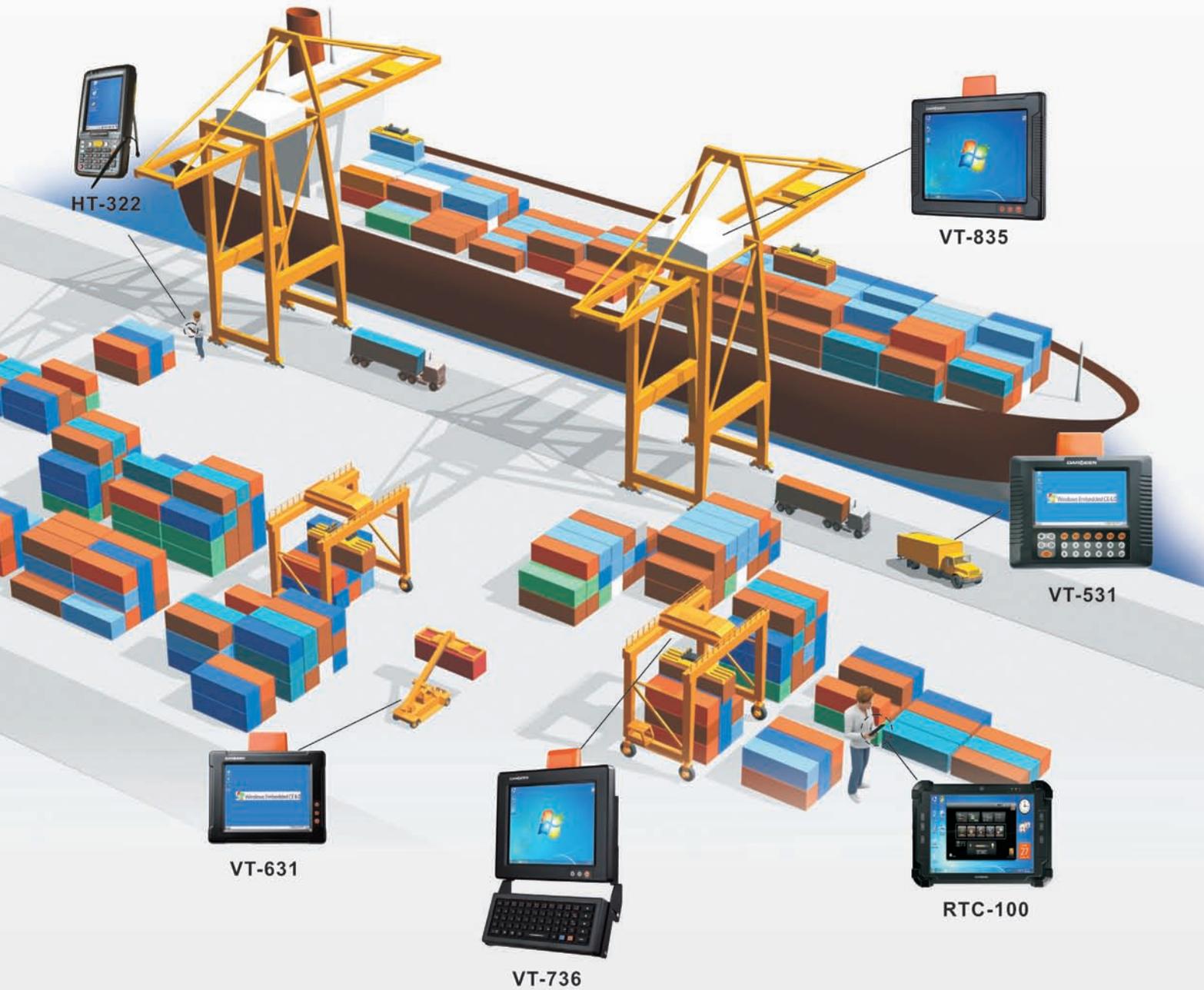
## Challenges for terminal operators

The importance of RTG solutions to integrate easily and seamlessly with current RTG systems is deemed by many experts to be paramount for any retrofitting project. As the retrofitting of an existing RTG can be a complex project, the container management decisions are driven by operational requirements. Some of the major challenges raised by container terminals in using cable reels include:

- Significant additional weight and possibly mechanical structural modifications on the RTG
- The need to unplug and plug-in again to change aisles

# Total Industrial Computer Solution for Ports

Darveen Technology is an industrial computer specialist in port Solution. As result of the most modern computer technology these days, Darveen has a complete product line special made for ports environment. It is compatible with most of major Terminal Operation Systems up to now. there are more than 100 container terminals worldwide using Darveen technology solutions.



## Worldwide Sales Contact

Tel: +86-755-8340 8246  
E-mail: sales@darveen.com

Amsterdam, the Netherlands  
Tel: +31 85 273 68 60

Hongkong, China  
Tel: +852-2687 0062

Shenzhen, China  
Tel: +86-755-8340 8246

Guangzhou, China  
Tel: +86-20-8758 3210

Shanghai, China  
Tel: +86-21-6278 6215

Beijing, China  
Tel: +86-10-6296 4648

Xiamen, China  
Tel: +86-592-5321 112

Qingdao, China  
Tel: +86-532-8617 1782

Stock code: 663765

**DARVEEN**<sup>®</sup>  
Industrial Mobile Computing

[www.darveen.com](http://www.darveen.com)





Electric RTG in Lazero Cardenas, Mexico

- Cable alignment between RTG and container stack and additional cable protection to avoid damage
- Additional measures have to be taken if a number of RTGs are to operate in any one lane

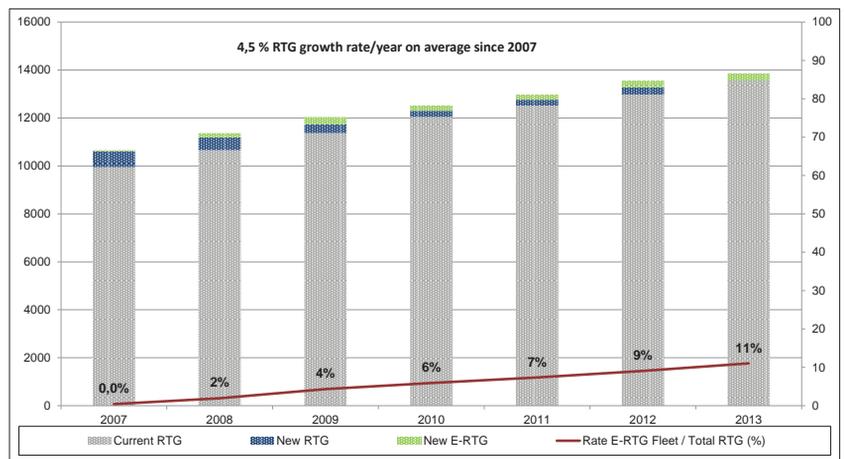
A current challenge for container terminal operators is information transmission alongside the electric transmission solutions. Many container terminal operators are initially considering low-density 'process' data being transmitted to the TOS, or other control software. This is a step on the way to the full automation of eRTGs. As illustrated in Figure B, many experts view the implementation of technology for electrification along with the integration of communication systems as a key step on the journey to the automation of RTGs.

**Solutions**

A key method in helping ports is to put in place a system that is not just able to be integrated into the TOS as it stands, but can also be a platform for the further development of remotely operated, semi or fully automated, eRTGs. To this end, ports are looking at a high data-transfer rate – around 100 megabits per-second – which can send real, lifelike images to the control room that enable the eRTG to be driven remotely.

One technology that is being considered in data-communication for RTGs is the slotted microwave

**Conventional Wisdom is leading to e-RTGs**



- ▲ RTGs becoming more Electrofied representing 11% of the 2013 Fleet from less than 1% in 2006.
- ▲ As of early 2014, 75% of all converted and newly supplied E-RTG systems are electrified by conductor rails

Figure B

guide (SMG) data transmission system, articulated in Figure C.

SMG has been proven in automation technology for contactless and interference-free transmission at high data rates of up to 100 megabits per second. It opens up a wide range of applications through its variable design, and it can operate parallel to a conductor rail system. Some of the key features of the SMG are:

- Immunity to interference due to isolation of the SMG profile from the surroundings
- Maintenance-free due to contactless

transmission technology

- Error-free transmission of high data rates
- Simultaneous transmission of up to six data channels
- Emergency-off transmission
- Coupling of several mobile subscribers to one SMG profile
- Transmission independent of travelling speed of mobile subscriber
- No negative effects on transmission quality due to environmental influences such as temperature, humidity, clouds and dust

# Maritime Cranes.



maritime.cranes@liebherr.com  
facebook.com/LiebherrMaritime  
www.liebherr.com

# LIEBHERR

The Group



### SMG for eRTG

#### Vahle SMG-System – the components

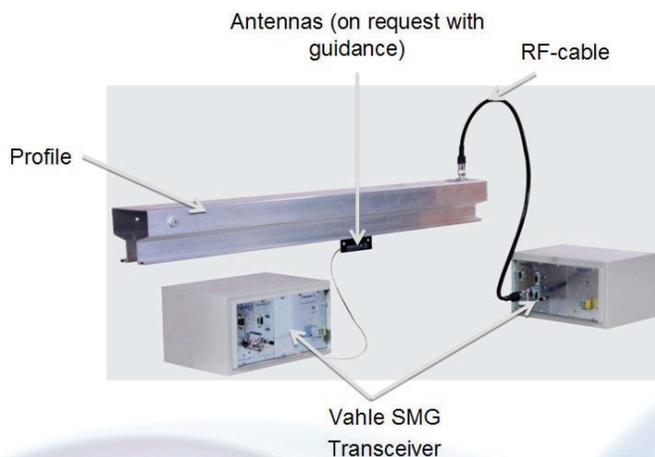


Figure C

### Conclusion

eRTGs are a light-type of RTG and possess a number of advantages over traditional RTGs, such as purchase price, maintenance costs and energy consumption. Often the operating power of an eRTG is provided by an external electric power supply, instead of a large diesel generator. This will not only reduce purchase cost and largely eliminate maintenance costs, but also slash emissions and benefit the environment.

Further research by Taiwanese academics has found that the conversion of diesel RTGs to eRTGs using conductor bar technology can save a total of US\$1.8

million per year. This indicates that an RTG conversion project is not only beneficial for the environment, but also an optimal means of avoiding the impact of high diesel fuel prices in the shipping industry.

Future work on the development of RTG electrification will be on lighter components that are more robust with smart technologies installed. This will allow for remote maintenance and improved performance for yard operations. In addition, integration of the software will require more open source applications, achieving results such as better visibility of containers and the terminal's assets. This implies that optimisation can be employed fully.

### About the author

Dr Lawrence Henesey assists in the development of solutions for energy and data transmission needs at ports and container terminals globally for Vahle. He has worked with clients on employing automation and electrification technologies on AGVs, ASCs, Automated cranes, RTGs and RMGs. Dr. Henesey continues to conduct research on the application of techniques from Distributed Artificial Intelligence in Container Ports and Terminals at Blekinge Institute of Technology, Sweden, which has culminated in 50+ published articles and two books. In addition to lecturing at several US and European Universities, Dr. Henesey is a member of the board of advisors at the Port Operations Research and Technology Centre at Imperial College London and PEMA (Port Equipment Manufacturing Association).

### About the organisation



Since 1912, Vahle has specialised in mobile power and data transmission. The company develops, manufactures and installs customised power and data transmission systems for various material handling applications, including port technology.

### Enquiries

Dr. Lawrence E. Henesey  
Key Account Manager  
Paul Vahle GmbH & Co. KG  
Westicker Strasse 52  
D-59174 Kamen  
Germany

Web: [www.vahle.de](http://www.vahle.de)  
Tel: +46 706 009809 /  
+49 152 56777049  
Email: [lawrence.henesey@vahle.de](mailto:lawrence.henesey@vahle.de)



## Security, Surveillance and Detection



“Video surveillance technology is no longer limited to traditional security tasks such as the detection of unwanted intruders, or even the prevention of terrorist attacks. Video surveillance has become an indispensable tool in designing all the processes across the port arena...”

# Process optimisation for ports: CCTV / IP video surveillance technology



Roland Meier, Head of Panomera Multifocal Sensor Systems,  
Dallmeier, Regensburg, Germany

In the contemporary age, the range of applications for video surveillance technology is no longer limited to traditional security tasks such as the detection of unwanted intruders, or even the prevention of terrorist attacks. Video surveillance has become an indispensable tool in designing all the processes across the port arena in the most efficient way as possible. Some areas in which surveillance has become intrinsic include access control, the prevention of accidents at sluices, and the administration of the commodity flows throughout the harbour. One thing that always applies to ports: time is money, and whenever the stream of goods comes to a halt for some reason, profits are at stake.

## Access control

Whether by land or by water the port arena may only be accessed by authorised personnel. High-resolution cameras therefore detect anybody who enters the premises and document the ship traffic, as well as the movements of people and vehicles at the port's gateways.

The multifocal sensor (MFS) system Panomera is ideal for the surveillance of expansive port areas. Unlike single sensor cameras, MFS technology utilises several sensors, each of which has a different focal length. Consequently, the system can reach areas much further away than the industry standard, and can display long distance images with the same image quality as objects that are up-close to the camera. This makes it possible to monitor large areas and distances from a single location, achieving this in real time with uniform image resolution, high dynamics

and consistent focal depth.

In contrast to PTZ cameras, Panomera records the entire scene at all times, even while only a section of the picture is being looked at live. Therefore, an operator can carry out his tasks without undue pressure, and without missing anything. Furthermore, the same scene can be viewed in live and playback modes at the same time.

With MFS technology, an unlimited number of operators can navigate across the entire scene independently of each other. Although all operators are connected with the same camera, each user can select their view individually and zoom or pan as they desire.

Often, the CCTV/IP video surveillance system is complemented by intelligent video analysis systems which automatically carry out certain processes such as opening barriers or issuing alarms in cases where unidentified vehicles or ships are noticed.

## Theft protection

Numerous goods and containers are stored at a port's reloading points, and they all have to be protected from theft. With the analysis 'Intruder', Dallmeier offers a solution for securing certain areas against unauthorised access. Intruder is a development entirely based on Dallmeier's SEDOR technology, and it allows for effective surveillance both outdoors and indoors.

For example, the system determines if an object approaches an area, from which direction it is coming, and how long it stays in a certain area. Based on the predetermined classifications within Intruder, the system is able to differentiate between an object that is a person and

an object that is an animal. Furthermore, quick and comprehensive validity checks reduce false alarms to a minimum without missing real alarm instances.

## Tracking of commodities

Unfortunately, it is impossible to completely eliminate cases of damaged goods, loading errors or other kinds of loss during the distribution of goods at freight hubs. However, using high-value video surveillance, the movements of every single container can be documented completely, and misguided goods can quickly be found again.

The system also helps in conclusively proving transport damages which often occur in congested port areas. In the instance of disputable situations which might, for example, arise when trying to determine when damage occurred and who was responsible, it can be resolved definitively and without the need for time-consuming investigations. Therefore, payments of damages can be allocated to the responsible individuals.

Concerning the tracking of cargo, goods are scanned at the entrance of a port and continuously tracked while passing through freight hubs, and again electronically registered before going out once more. Additionally, every scanning process is recorded by a camera. The ideal solution for that instance is a high-resolution IP camera. These cameras provide detailed and true-colour images, even under the most difficult lighting conditions such as extreme backlighting at the gateways to the storage halls.

The scan data is recorded together with pictures from a digital recording system



# We Cover Your 24/7 Security

Dahua Technology, a world-leading video surveillance solution provider, offering complete portfolios range from front-to-back ends, entry-level to professional. Dahua solutions have been widely used in many fields around the world, which could perfectly fit for different applications such as port, airport and city surveillance.

With the strong R&D support, Dahua aims to provide the cutting edge products with high quality and performance in order to create win-win situation for the customers.



#### Cost-effective NVR (N4-series)

- Easy to use
- High image quality

#### Professional NVR (N7-series)

- Support up to 64 cameras
- 3D intelligent positioning with Dahua speed dome
- Support RAID

#### Network IR Speed Dome (SD6A-series)

- Powerful 18x/20x/30x optical zoom
- Micro SD memory, IP66
- IR distance up to 150m

#### Network IR Speed Dome (SD59-series)

- Max 400°/s pan speed
- IR distance up to 100m

CE FC CCC UL RoHS ISO 9001:2000



**TRS 2014**  
02-03 Dec 2014  
London, UK  
Booth: H30

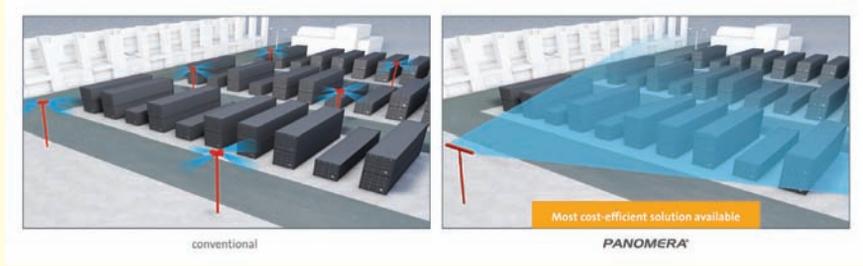


**INTERSEC DUBAI 2015**  
18-20 Jan 2015  
Dubai, UAE  
Booth: SA-C26

## DAHUA TECHNOLOGY CO., LTD.

No.1199 Bin'an Road, Binjiang District, Hangzhou, China. 310053  
Tel: +86-571-87688883 Fax: +86-571-87688815  
Email: overseas@dahuatech.com  
www.dahuasecurity.com

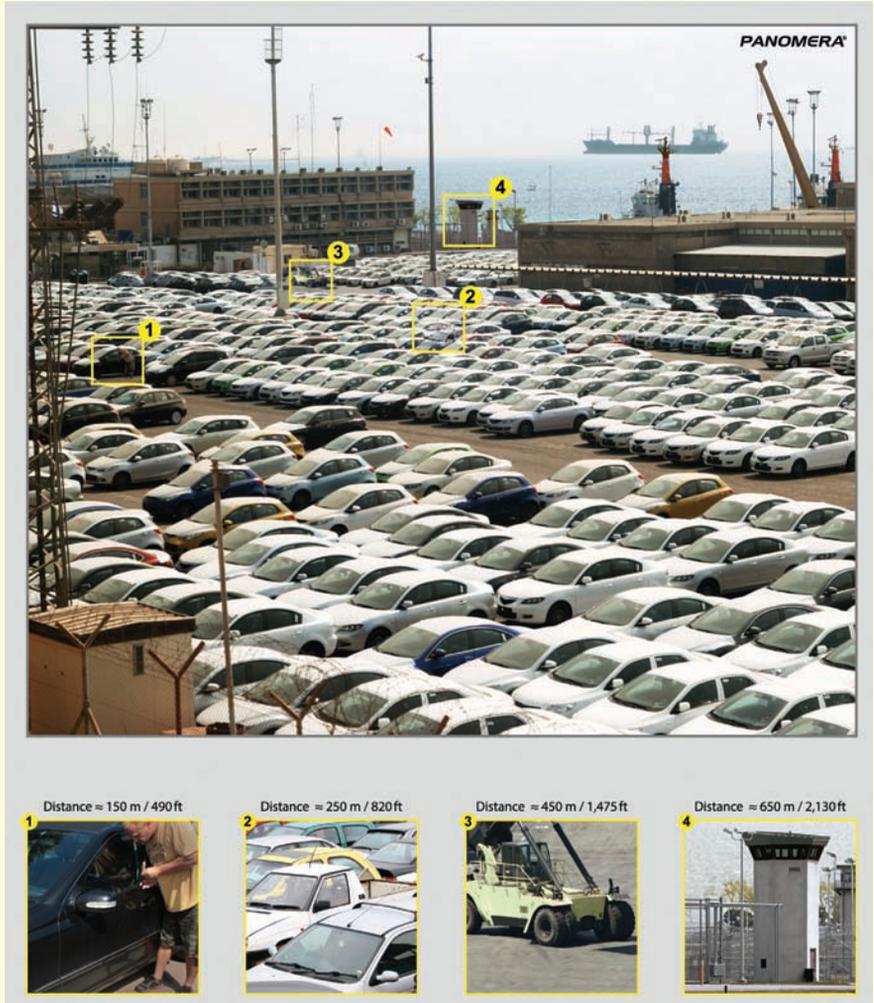




so that the pictures and package data can later be matched up. The barcode for each package can then be used to identify and trace an item through the warehouse. This allows not only individual packages but also whole pallet loads of assembled packages to be monitored as they progress through a warehouse.

### Preventing accidents and pile-ups

Whether at sluices, quay walls, storage areas or access roads, wherever traffic comes to a standstill, the loading of goods slows down as well. In this context, video systems offer the possibility to react immediately in case of conspicuous events. Such events include accidents, developing congestions, or parking offenders blocking the flow of traffic. Thereby, the system has two main advantages: firstly, automatic alarm messages can specifically direct the attention of the security personnel to certain areas. Without that support it would hardly be possible to monitor the port arena twenty-four hours a day. Secondly, thanks to video recordings, security staff can, in the truest sense of the word, visualise what is happening on the ground and react accordingly.



### Integration possibilities

The surveillance of port arenas is very complex. The biggest benefit is realised when all systems are intertwined and linked up. Every Dallmeier CCTV/IP video surveillance solution is therefore designed to be able to serve as an open platform for third-party integration.

From cameras to recording systems (recorders, servers, VideoIP appliances) right up to video management, all of Dallmeier's products can be integrated into any kind of third-party systems (overriding property management systems, access controls and fire detection systems). Likewise, third-party systems or individual components can also be integrated into existing Dallmeier solutions. The integration process is carried out by using either standard or customised communication protocols, so-called 'Open Platform Tools', or else through tools that are

specifically developed for the customer. Therefore, security systems remain open for adjustments and offer long-term investment protection.

### About the author

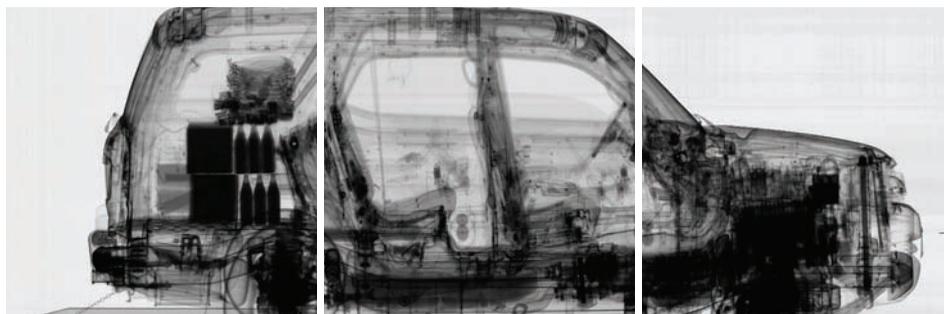
After completing studies of micro electrical, mechanical and optical systems (MEMOS), Roland Meier worked as project leader with an international engine building company. He has been working with Dallmeier for over seven years and was, amongst others, responsible for realising the world's largest IP video surveillance solution at the CoD in Macau. As Head of Panomera Multifocal Sensor Systems he is now responsible for the project handling and sales of the Panomera technology.

### About the organisation

Dallmeier is one of the world leading providers of products for network-based video surveillance solutions and has more than 30 years of experience in the development and manufacture of high quality solutions for the CCTV/IP sector. With Panomera, IP cameras, recording servers, intelligent video analysis and software; Dallmeier offers complete systems and high quality components for video surveillance which can be easily integrated into third-party systems.

### Enquiries

[www.dallmeier.com](http://www.dallmeier.com)  
[www.panomera.com](http://www.panomera.com)  
[info@dallmeier.com](mailto:info@dallmeier.com)



# EXPAND THE FUTURE FOR X-RAY PERFORMANCE AND RELIABILITY WITH VARIAN LINATRON®

Leading manufacturers use Varian's Linatron® products inside cargo screening systems throughout the world. Even in the most demanding security environments, rely on Varian Linatron components for quality and reliability in your cargo screening system.

**Visit us at TRANSEC 2014, Booth #G20.**

To learn more, visit our website at [varian.com/sip](http://varian.com/sip)

#### **SECURITY & INSPECTION PRODUCTS**

tel: 702.938.4859 fax: 702.938.4833

e-mail: [sip@varian.com](mailto:sip@varian.com)

**VARIAN**  
medical systems  
A partner for **life**

*“Port facilities want seamless integration with vendor-neutral capabilities, where images can be displayed from any location, integrating data from multiple sensors.”*

### Exclusive Q&A

Paul Simpson, Vice President and General Manager of Cargo Solutions, L-3 Security & Detection Systems, Woburn, USA



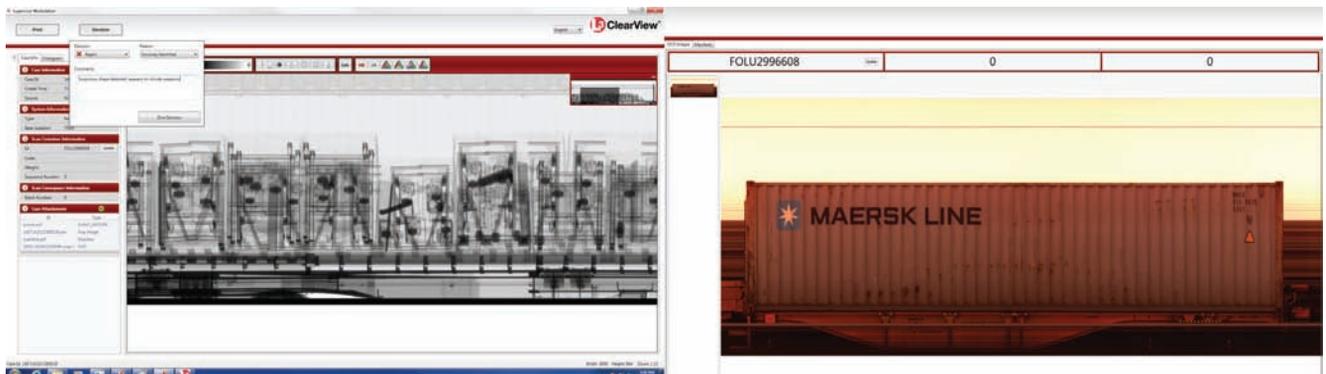
#### Outline your key products and list the items that your systems can detect in a port.

L-3 Security & Detection Systems (L-3 SDS) supplies cargo screening solutions using networked hardware and software that permits a unified and customised view of the critical information analysts need to assess cargo contents for contraband and other illicit materials, including dangerous radioactive

materials. Key to an efficient and high-throughput screening operation is L-3's ClearView software. ClearView integrates data from all scanning systems onto a single, centralised 'Command Center' display and includes tools for image analysis, system operations, user and asset management and computer-based training.

On the hardware side, L-3 SDS supplies a full range of non-intrusive inspection

solutions. These include the CX-Mobile G3, an advanced, high-energy, self-powered scanning vehicle that can be deployed rapidly at any location; and the CX-Portal, a high-energy, drive-through X-ray inspection solution which offers a tool that tackles the high throughputs at the busiest ports and borders. L-3 SDS also provides multiple mobile and fixed platforms for radiation detection and identification.



ClearView software integrates data from all scanning systems onto a single, centralised Command Center display



**What are the main applications of your products at ports and terminals?**

Our scanning solutions enable customs and security operations to protect the supply chain by finding contraband and threats, enforcing tariffs and duties and facilitating legitimate trade, all while minimising risk. The major task is to efficiently determine the contents of the millions of containers that come through port terminals. L-3's cargo solutions offer customs and security officers a portfolio of configurable, high-energy X-ray screening systems and radiation detection systems, as well as integration and support services.

**What would you say is the really big trend in port security and detection currently, whether from your or your clients' viewpoint?**

Networked, automated solutions are the big trends, as ports seek to maximise the effectiveness of their investment in non-intrusive inspection solutions while minimising the operating costs and resources needed to operate those systems. Port facilities want seamless integration with vendor-neutral capabilities, where images can be displayed from any location, local and/or remote, integrating data from multiple sensors.

**How much operator training is required for some of your more complex systems and where does the training take place – at your headquarters or onsite?**

Training requirements depend on the experience of our customers and their particular application of our solutions. We offer a broad range of courses for operations, maintenance and engineering personnel onsite or at multiple L-3 SDS facilities worldwide.

**Apart from automation, what else do you feel is necessary to increase the efficiency of existing terminals?**

Networking is the key to increasing the efficiency of cargo screening operations at existing terminals. The most important impact is the ability to display image data from any location – local and/or remote – and seamlessly integrate data from multiple sensors, including other vendors. This allows screening personnel, such as image analysts, to be used efficiently across multiple scanning systems rather than being dedicated to only one local system. For example, L-3's ClearView networking software and high-throughput, drive-through scanning solutions – including the L-3 CX-Portal for X-ray imaging of cargo contents, and the L-3 CR-Portal for detecting dangerous radiation in



Top: The CX-Mobile G3 is a high-energy self-powered scanning vehicle that can be rapidly deployed at any location; Insert: The CX-Portal: a high-energy drive-through X-ray inspection solution

cargo – can be seamlessly integrated into a terminal's security and customs operations to optimise throughput.

**In the current climate, will it be possible for ports and container terminals to optimise operations, yet at the same time decrease operational costs?**

Yes. As ports and container terminals look for ways to manage the operating costs associated with cargo screening, they are implementing solutions that leverage legacy investments in cargo scanning technology while making more efficient use of their screening personnel. For example, by employing a common user interface across different vendor systems, ports can save on training costs, deploying personnel and equipment more efficiently across multiple locations.



# TRANSPORT SECURITY EXPO

Official  
Show Partner



2015



2-3 DECEMBER 2015

NATIONAL HALL OLYMPIA

# SAVE THE DATE

VISIT [WWW.TRANSEC.COM](http://WWW.TRANSEC.COM)  
TO FIND OUT MORE

 #TRS2015



# INTEGRATE AND OPTIMIZE CARGO SCREENING OPERATIONS



## Streamline Your Operation and Lower Resource Costs with ClearView™

L-3's ClearView software solution brings new value-added capabilities to customs and security operations, delivering maximum efficiency, lower resource costs and support for diverse multi-vendor legacy NII systems. Operating in a secure, broad enterprise network environment, ClearView seamlessly combines image analysis, system operations and data from all scanning systems onto a single, centralized display. This collaborative detection capability yields higher throughput, greater operational efficiency and increased probability of detection. Our team is ready to do for you what we're already delivering for customers globally.

For more information, visit [L-3com.com/SDS](http://L-3com.com/SDS).

*"Even during times of crisis, ports will always need our high performance solutions to help fight the illegal movement of goods and threats"*

### Exclusive Q&A

Jean Olivier Fer, Director of Product Management (Cargo Detection Systems), Smiths Detection, Paris, France

**smiths detection**  
bringing technology to life



#### What are your key products & are you launching anything new?

We offer a complete range of cargo inspection systems for varying customer requirements. We help in the prevention of the transportation of explosives, arms and other threats, as well as alleviate bottlenecks at checkpoints and deter tax evasion activities.

On October 1, 2014, we launched the IONSCAN 600; a cost-effective, portable desktop trace explosives detector, weighing just 10.4kg. The IONSCAN utilises non-radioactive technology, resulting in no special licensing or handling requirements.

Other innovations include our suite of iCmore software enhancements for the automatic or assisted recognition of targets or threats. iCmore supports effective cargo analysis across the Smiths Detection HCV cargo inspection product range, with current available options including cigarette detection and

radioactivity detection.

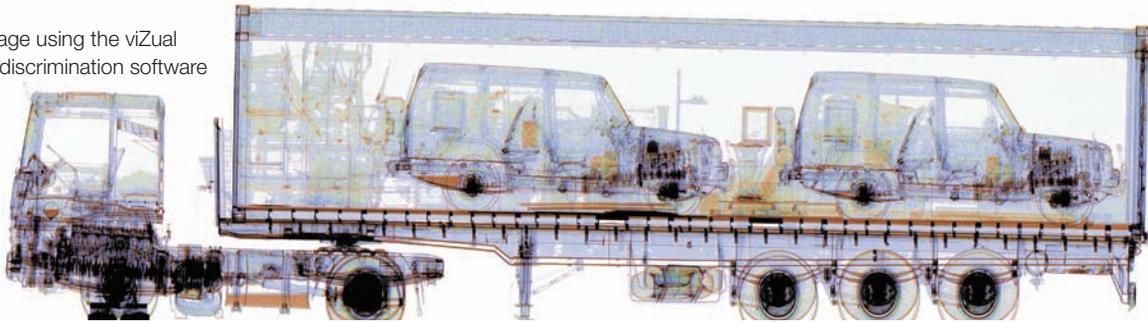
Today the operator is provided with general X-ray images, which he must match with the original manifest report, relying solely on his own initiative and training to look for potential threats and

targets. In the future, the iCmore suite will assist operators by automatically focussing and highlighting a range of defined threats and/or abnormalities within the load. This lessens guess work and speeds up the overall analysis process.



HCVS Stationary Inspection System

X-ray image using the viZual material discrimination software



**How are your products applied in port applications and what sort of lifespan do they have? How much operator training is required and how many operatives are needed for each unit?**

The lifespan of our systems depends on the type of system – mobile, stationary, etcetera – and the amount of usage. Our reliable systems can be easily upgraded to allow port operators to conform and adapt to industry and regulation changes. For example, our HCVS stationary systems can be easily upgraded with advanced software and hardware options, increasing the system lifespan for up to 20 years. These upgrades can include options such as the Dataset Management System (DMS), which offers remote image analysis of cargo and storage of all associated data; creating a centralised operator analysis pool and reducing the strain on on-site operators.

Detailed and in-depth image analysis training is provided to system and image evaluation operators as well as operational training for system operators at the time of installation.

The number of operators required for our scanning solutions depends on the level of throughput; the average operator can evaluate 20-30 images per hour. At peak times, additional operators would be required or centrally evaluated using our DMS remote analysis.

Operator effectiveness can also be increased with our innovative iCmore software enhancements, which provide automatic or assisted recognition alerts for threats and targets, such as cigarettes and gamma and/or neutron radioactive materials. This removes guess work and speeds-up overall analysis time.

**What type of X-rays are used and can these detect powdered narcotics?**

Our full range of accelerator based X-ray solutions can detect discrepancies in the cargo, and powerful 'viZual' software adds coloured material discrimination. This helps to draw the operator's attention to suspect areas. Plus iCmore target/threat recognition software can automatically detect, alert and highlight

specific targets, such as narcotics, within the vehicle contents.

**In a container stacked with many different boxes, how can you be certain what is in the box that is right in the centre?**

In many cases, cargo contents are known in advance, or standard black and white X-ray images are used to "guess" the contents and match to the manifest paperwork.

The transmission X-ray technology passes through the vehicle (similar to a medical X-ray) and as different materials absorb X-rays at different levels, skilled operators can view everything in the container or vehicle, relative to its density. Our advanced viZual imaging software helps to distinguish loads by adding organic/inorganic colourisation which is linked to an atomic number, this helps in highlighting differing materials and hidden cargo, resulting in rapid and reliable results in a single scan.

**The industry globally is now emerging from the downturn which began in 2008. What lessons have you learnt from this period and how will it benefit you?**

Even during times of crisis, ports will always need our high performance solutions to help fight the illegal movement of goods and threats, as well as to deter tax avoidance schemes.

Customs authorities and homeland security organisations are now concerned about potential security threats on incoming shipments as much as contraband. Our response has been to develop systems and software that allow these illegal and threatening shipments to be identified rapidly. Over the years Smiths Detection has developed a range of solutions to accommodate every budget and scanning requirement.

**If you could, what one thing would you change, nationally or globally, that you feel would be of benefit to either your company or the port industry generally?**

Better co-ordination between port authorities, customs and equipment manufacturers would result in the



best solutions available through the sharing of best practices and data. This co-ordination would help to effectively support the control of exports, imports and transit of goods globally at all border crossings and entry points.

**How have environmental regulations impacted your business?**

Smiths Detection was the first company to develop a mobile solution which is powered only by electricity and not vehicle engine power. It was designed to have the least environmental impact, resulting in less noise and no gas pollution.

We have also developed our own accelerators, which provide a lower radiation dose and reduced electricity consumption. These changes are as a result of Smiths Detection initiatives, rather than pressure from port and customs authorities.

**How are you being affected by cheap, Chinese-manufactured equipment/products?**

Smiths Detection has always faced strong competition from around the world and it drives us to offer continuous improvements in our products and better solutions.

Our customers come to us for our reliable build quality and superior and trusted X-ray image quality. Furthermore, we have a wealth of in-house knowledge and expertise. The superior quality of our systems also ensures an extended product lifespan. We provide the option to upgrade and adapt to future requirements and regulation changes as they emerge.

# Smoking out the smugglers

Colin McSeveny, Media Relations Manager, Smiths Detection



It took only a few weeks for Smiths Detection's mobile cargo scanner to prove its worth to Luxembourg Customs in their relentless fight against smuggling. Exploiting its advanced "material discrimination" capability, the HCVM T uncovered a carefully concealed load of 12 million cigarettes in a truck stopped at a random inspection. The resulting €10M fine amounted to five times the value of the tax which would have been levied on the cargo had it been legally bound for the local and French markets.

The incident highlights why the high-energy X-ray system is in great demand from customs authorities and governments around the world, particularly a country like Luxembourg – small, open-bordered and landlocked in the heart of Europe. The HCVM T's non-intrusive but highly effective detection capabilities not only deter the movement of terrorist threats, such as weapons and explosives, but also act as a formidable cash generator for hard-pressed governments. Aside from the tax raised by deterring excise avoidance on the likes of tobacco and alcohol, the scanners can quickly pay for themselves many times over through the hefty fines on perpetrators caught red-handed.

Until recently, Luxembourg's Customs and Excise relied mainly on traditional low-energy X-ray scanners installed at the country's international Findel Airport. However, these systems are not designed to scan complete vehicles and their contents or to offer the level of steel penetration required to view densely packed loads.

As a result, the authorities decided to invest in an HCVM T to carry out arbitrary roadside checks that could be quickly set up for a few hours and then moved on. The operational speed and random nature of the inspections give criminals little time to share surveillance information and greatly increase the successful prosecution rate. With a steel penetration of 320mm (12.5 inches), the system can scan up to 25 trucks per hour.

The HCVM T, which includes an air-conditioned operator's cabin, maximises inspection efficiency by separating the cab from the truck platform. The controls are housed in the trailer, freeing the driver to operate the scanner by remote control and to join other officials in performing various essential duties.

The integrated viZual™ material discrimination, which separates organic from inorganic material by colour, can

quickly and accurately pinpoint anomalies between vehicle contents and the manifest. iCmore™ automatic threat/target recognition software highlights specific areas where a particular threat or target is located. Taken together, these features greatly improve operator efficiency and cut the need for manual inspections.

Detection capabilities can be further strengthened by using additional Smiths Detection systems housed in the mobile scanner including the RadSeeker™ handheld radiation detector, the IONSCAN™ 500DT trace explosives detector, and the HazMatID™ chemical identifier.

Guy Loesch, Head of Security of Luxembourg's Customs and Excise, said "Safeguarding our borders is of utmost importance to us, and we will only invest in premium products. Our HCVM T vehicle scanner is the first of its kind in Luxembourg and we operate it with a great sense of pride; helping us to control illegal trade".

## Enquiries

T: +44 (0)207 808 5534

M: +44 (0)7850 884815

E: colin.mcseveny@smiths.com

iCmore™  
stop guessing  
and start seeing



## Do you wish you could see more when inspecting cargo?

Our new intuitive iCmore suite has the answer.

iCmore assists operators by automatically focusing and highlighting a range of defined threats and/or abnormalities within the load; removing the guess work and speeding up the whole analysis process.

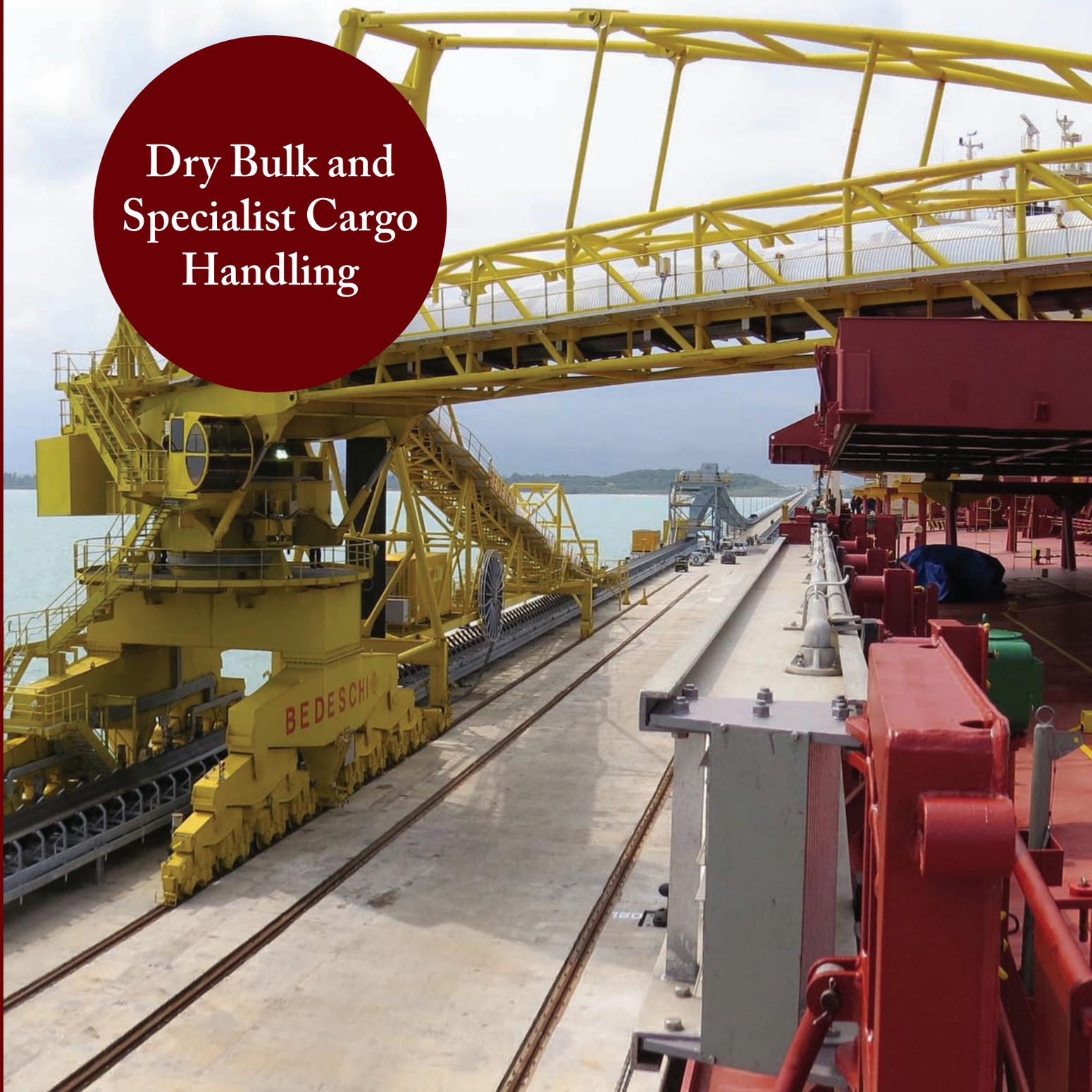
Reduce illicit trafficking and revenue risks from commercial fraud activities with iCmore.

Finally you will see more with iCmore.

For further information on the product or sales, please visit [www.smithsdetection.com](http://www.smithsdetection.com) or contact [globalsales@smithsdetection.com](mailto:globalsales@smithsdetection.com)

iCmore is a trademark of Smiths Detection Group Ltd.

# Dry Bulk and Specialist Cargo Handling



In Partnership with:



# BEDESCHI

# RobLog: the future of unloading containers



Teresa Rittel, *Marketing, Communications and Finance at the EU funded RobLog project, Reutlingen, Germany*

Logistics continues to grow and play a significant part in almost all of our daily lives as the need to move products from one location to another continues to escalate in an instantaneous world. Increasing efficiencies in logistic processes for safer and faster delivery to the end customer are ongoing goals; any interruptions along the way can result in a chain-effect of significant delays and higher costs. New technological ambitions to increase optimisation are gaining momentum.

## Manual handling shortcomings

RobLog came into being as a resource for unloading heavy, bulky coffee sacks from

containers; the goal being to develop an automated solution to safely unload such cumbersome goods in efficient unloading times. Today's manual method involves two workers on either side of a coffee sack who sink large metal hooks into the sack, and then effectively toss the sack onto a pallet. This repetitive motion can later result in severe posterior complications. Furthermore, this potentially back-breaking labour has inadvertently created a loss in productivity, but one that can be resolved through automation.

## Enter RobLog: a fusion of robotic logistics

RobLog is an EU-funded collaborative

project that includes five universities and two industrial partners that will result in the creation of two fully operational physical machine 'demonstrators' by the end of January, 2015.

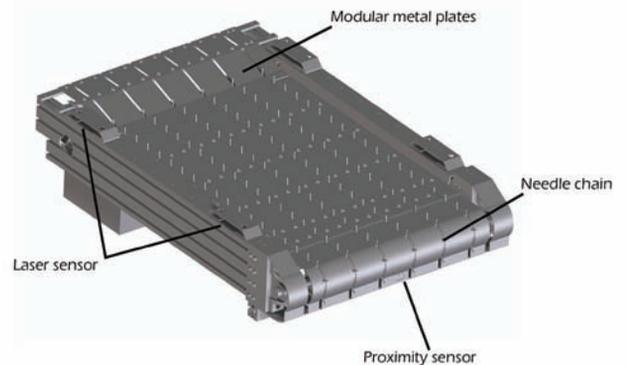
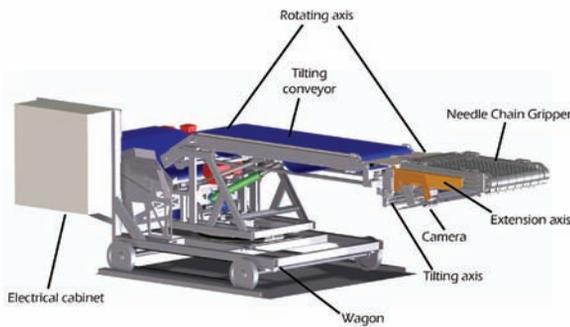
It was realised that with such intricate research and development going into the RobLog project, the end-design could easily be extended to various applications. Hence, a decision was made to create two demonstrators: an advanced one for the unloading of heterogeneous goods, and an industrial one for the unloading of heavy-sack shaped goods.

## How it works

In essence, this solution combines the



The RobLog Industrial Demonstrator removing a coffee sack



intricate mental competences of a human labourer, only in a more robust container. RobLog observes the environment and makes safe unloading decisions before finally executing its decision by securely grabbing a sack or parcel for safe removal. The provisions of RobLog syndicate all of these complicated capabilities into a cognitive and automated working solution. 3D perception fused with mapping in a challenging and dynamic scenario serves as the sight and observational functions. Combine this intelligence with concrete grasping hypotheses, which includes the generation and execution of decision and path-plans in an adaptive manner to avoid obstacles, while re-planning for the next unloading cycle. Merge all operational

components together into one functioning system, and you have an automated unloading machine.

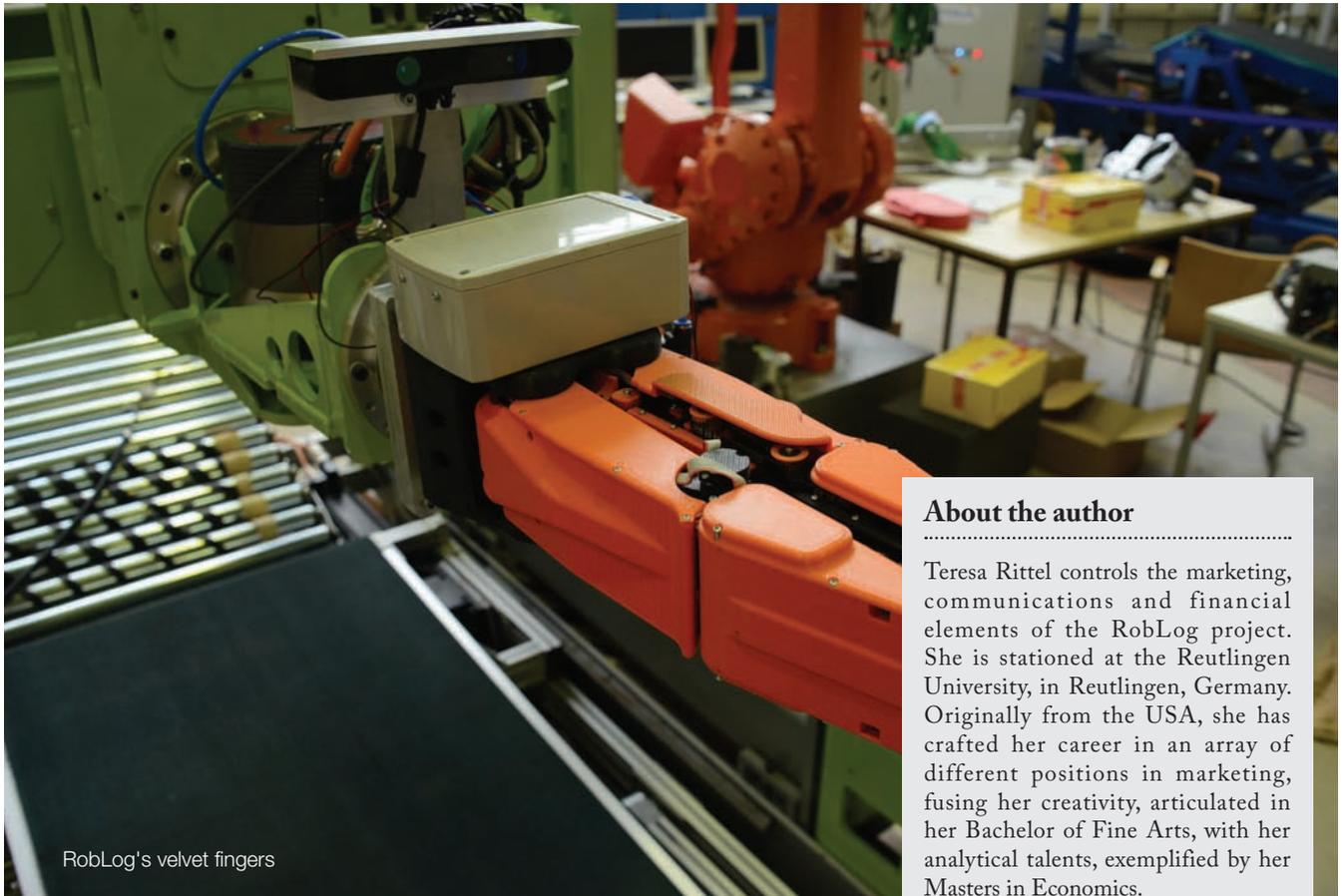
Because the system is cognitive, it can also learn. When the machine scans the environment, the information from the scan is sent to a database where it is compiled and stored. As the machine continues to scan and grasp, it constantly updates its knowledge base, giving it the ability to recognise objects for future faster removal. The system's software is complemented with a graphical user interface that allows a human operator to observe the machine's progress and also, when needed, interface with the software-generated planning process.

The ingenuity of the overall RobLog

design allows for the unloading of containers that are chaotically packed with parcels or that contain heavy and deformable items. A 2008 study revealed that approximately 60% of all shipping containers are packed with goods that fit into three categories: cuboid, such as parcels; free-shaped, such as sacks; and cylindrical, such as tyres. Taking this into account, the technology was designed to maximise the RobLog demonstrators' unloading capabilities. Both demonstrators run the same software for object-recognition and motion-planning, but differentiate in their applications.

### The demonstrators

The advanced demonstrator is a flexible



RobLog's velvet fingers

### About the author

Teresa Rittel controls the marketing, communications and financial elements of the RobLog project. She is stationed at the Reutlingen University, in Reutlingen, Germany. Originally from the USA, she has crafted her career in an array of different positions in marketing, fusing her creativity, articulated in her Bachelor of Fine Arts, with her analytical talents, exemplified by her Masters in Economics.

### About the organisation



RobLog is funded by the European Union's Seventh Framework Programme for Research, Technological Development and Demonstration under grant agreement no 270350. It is an Integrated Project in the area of "Cognitive Systems and Robotics."

The ESB Business School is one of Germany's leading international business schools, and one of the first state institutions to offer integrated international degrees, which the ESB Business School has awarded for more than 40 years now. The ESB Business School is a part of the Reutlingen University, a state-owned university in Baden-Württemberg.

### Enquiries

Address: Teresa Rittel  
Reutlingen University,  
Alteburgstr. 150, 72762 Reutlingen  
Tel: +49 7121 271 3103  
E-Mail: [Teresa.Rittel@reutlingen-university.de](mailto:Teresa.Rittel@reutlingen-university.de)

system capable of unloading all kinds of goods found in a container. Advanced object-recognition techniques provide for fast detection and grasping of rigid objects known by the system, such as boxes and barrels, while on-line grasping planning techniques can be triggered for the grasping of unknown or flexible objects, using a general purpose compliant gripper.

The industrial demonstrator is a more focused system for the autonomous and safe unloading of heavy sack-shaped goods. It was made under the requirements for such a machine to be robust, yet have a streamlined design; flexible enough to fit into different space confinements such as loading docks or warehouses. Flexibility being a goal, the head of the unit was designed with the ability to independently move up and down and rotate 30 degrees in either direction from the main body via a rotating axis. This feature enables the machine all necessary degrees of freedom, again making it suitable to operate in confined spaces.

The tilting hydraulic body was reinforced with a 50mm parallel rod, enabling the head to support up to 70kg. At the end of the head, is the patented and affixed gripping system – the 'Needle Chain' – which features a constant contact unit comprised of six chains with 15mm needles attached

to every fourth chain link. The use of chains instead of a roller in front of the gripper, and a transition conveyor, offers a continuous flow for the unloading of material and ensures that the needles stay in contact with the sack during the whole grasping process. This design eliminates any transition that may compromise the grasping of the sack. When specifically testing with coffee sacks, the newly developed kinematic is capable of unloading objects of up to 75kg whilst simultaneously reaching the full workspace of the container.

### The future of RobLog

Though the project is nearing its final stage, a new phase is about to begin as discussions continue with interested future integrators and customers. RobLog has been developed to be a true resource, one with global potential. Such an autonomous solution could produce solid efficiencies and reduce costs in logistics by automating repetitive and anti-ergonomic work performed regularly today by human labour. The future of this technology is with the integrator who chooses to adopt it. That integrator will continue to perfect RobLog for optimal industrial integration to reach a completely new level of automation in the logistics chain.

# Dealing with dust



Dr Robert Berry, *Research Fellow and Consultant Engineer, The Wolfson Centre, for Bulk Solids Handling Technology, the University of Greenwich, Kent, UK*

## The importance of dust control

Dust emissions can have a range of environmental implications for the operators of a port. The main issues dust can cause in ports include:

- A dirty and potentially hazardous working environment for port operators and ship crews. Conditions such as these can affect staff morale
- A loss of productivity. Dust emitted affects operations, there are also costs involved in cleaning and controlling dust
- Employee health problems
- Abrasive public relations: dust emissions can drift beyond the port arena and generate unpleasant or even hazardous living /working conditions for neighbours
- Explosions: dust emissions generated at ports are potentially combustible

## Dust control measures

When a port operator is faced with a dusty material that must be unloaded and handled, there are five potential approaches that one can utilise. These approaches are:

### Prevention at source

This method focuses on reducing the levels of dust present in materials shipped into a port. To effect changes here, this requires the control of, or an ability to influence:

- Material purchasing decisions. One must investigate the possibilities of changing supplier with a view to find the same material with less dust, or with a coarser particle size
- Material manufacturing. Options for changing the particle manufacturing process to reduce dust by granulation, removal of fines, or the addition of liquid should be explored
- Material handling techniques. Correct practice can reduce particle attrition and dust generation

### Prevention during handling

This approach concerns the reduction of

the level of dust generated during handling operations at ports when loading / unloading ships or silos. A further key area is at the transfer points between conveyors.

Regarding ship unloading there are a range of different approaches which provide different material transfer rates, levels of particle breakage and dust generation. A grab crane generates a low level of attrition as the number of particles in contact with a moving grab jaw surface is relatively low when corresponded with the total volume of material transported. However, the containment is poor. Bucket wheel and screw elevator continuous ship unloaders provide better containment once in the conveyor tube, however, they subject a large number of particles to contact with the moving buckets or screw flights relative to volume of material moved. In this instance, breakage is moderate. For blanket elevators, the conveying action of compressing material between two belts is very gentle, but the containment is poor.

Finally, for pneumatic conveyors the containment is excellent both at the pickup point and during transport, but the conveying velocity at the end of the line can be very high, which results in the material being subjected to large impacts at the bends causing severe particle attrition and dust generation.

At conveyor transfer points the traditional approach is to allow material to drop from one conveyor to another with a wet spray applied to damp down dust. A better approach is to use hood and spoon techniques, whereby the profile of the hood is matched to the trajectory of the material coming off the belt conveyor, and the spoon directs it onto the next conveyor at the right velocity to keep the material and any dust together in a packed stream. This minimises the number of impacts and the severity, and the severity, thus reducing particle attrition.

For bunker loading or ship loading, it is best to use cascades and slow down chutes to minimise the drop heights to keep the material in a dense stream. Again, this minimises dust emissions, reduces impact velocity and limits particle attrition.

## Containment

This method revolves around the concept that any dust generated must be contained within storage vessels and conveyors in order to minimise emissions. Good port practice would also see the fitting of transfer towers or bunkers with high speed roller doors for vehicle access. If a grab crane is used for bunker loading, cover the top with high speed doors and lower the grab into the bunker to unload in an effort to optimise the containment of dust emissions. Vitally, port officials must ensure that any hot surfaces are covered and lagged to minimise convection currents. A common containment issue is caused by access panels being left off after equipment maintenance, thus allowing dust emissions to escape, and also unleash the potential of air currents.

## Suppression

Wet sprays are commonly used to damp down material and reduce dust emissions, yet traditional sprays could result in significant increases in the moisture content of the material. Too much moisture can make a material cohesive and lead to bunker flow problems. A current trend is to use fogging systems to set up a curtain of fog around the trajectory of moving material in order to contain it. Fogging utilises a high-pressure ultrasonic nozzle to generate very fine water particles (wet fogging 50microns, and dry fogging 2microns) to minimise air and water consumption, as well as add moisture addition to the material (typically 0.1-0.5%). The key operating principal for a fogging system is to match the size of the water droplets to the size of the dust particles to be contained. If the water droplet and dust particles are of similar sizes there is a greater chance of their flow streams colliding, resulting in the form of agglomerates that then drop out of suspension.

## Extraction and collection

The use of air extraction ducts around transfer points to collect dust emissions is the last resort in the effort to master dust control. However, dust extraction is not

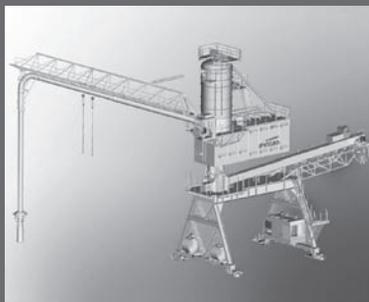
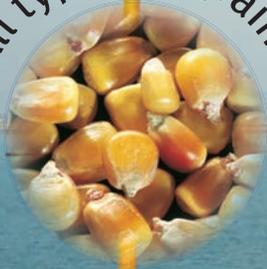


# Pneumatic or Mechanical Ship Loaders & Unloaders Port Equipment - Turnkey Projects

NIV: up to 800 tons/hour  
Average efficiency 75%-80%

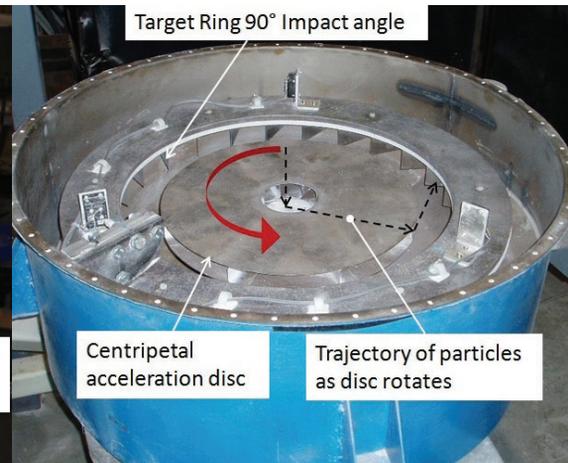
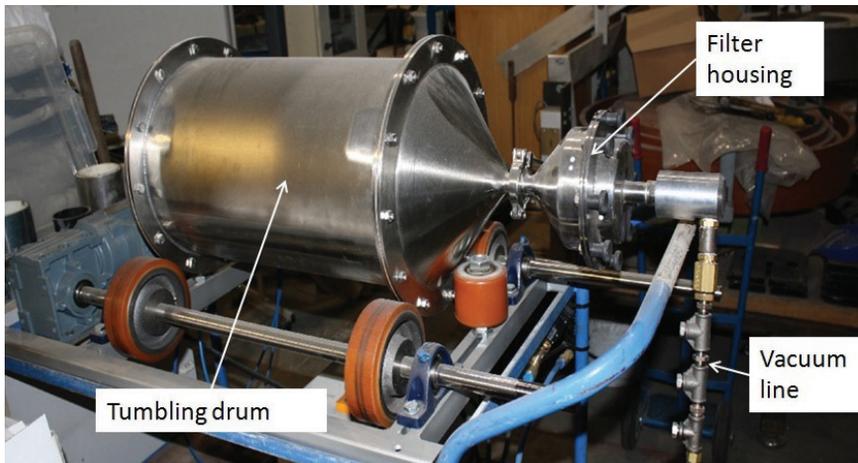


All types of grain



*A win-win solution  
between customer expertise and VIGAN know-how*

VIGAN ENGINEERING S.A. RUE DE L'INDUSTRIE, 16 ► 1400 NIVELLES (BELGIUM)  
TÉL.: +32 67 89 50 41 ► FAX : +32 67 89 50 60 ► WWW.VIGAN.COM ► INFO@VIGAN.COM



Top left: Dustiness tester; Top right: Particle degradation tester; Bottom left: Poor containment offered by grab crane ship unloader; Bottom right: Vacuum ship unloader good containment (high attrition)

a panacea for an inadequate enclosure; it greatly affects the air volumes that must be removed. Thus, the design of the hood and a close proximity to the dust source are both essential for carrying out an efficient operation. For example, doubling the distance from the hood to the dust source will require four times as much air for the same level of extraction, while enclosing the source will reduce the air volume required by around 60%.

### Characterisation tests

The following are two tests that can be carried out in order to quantify a material's potential for particle attrition and dust emissions:

#### The dustiness tester

This method consists of a tumbling drum with lifter bars to agitate the material as it rotates. Dust emitted by a controlled weight of material is collected by drawing a controlled air current through the drum for a specified time and then passing it through a filter element which is weighted before and after the test. The dust emissivity is defined as the percentage of the sample weight that is collected on the filter. The test can be used to evaluate:

- The dustiness of materials from different sources
- The effect of removing fines on the dustiness
- The effect of fogging or humidity on the dustiness

#### The particle degradation tester

This method can be used to measure

the level of particle attrition that will occur after a material has been subjected to a controlled velocity impact on a hard surface. This test is to simulate the impacts that occur in pneumatic conveyor bends or during bunker loading. The tester comprises a centripetal accelerator disc that fires a controlled feed of particulates at a controlled velocity into metallic targets mounted at fixed impact angles around its outer circumference. The level of particle breakage is assessed by measuring the particle size distribution of the entire material sample before and after it has been subjected to a controlled impact. The tester can be used to assess:

- The relative attrition rates of materials from different sources
- The relationship between impact velocity and attrition level. This establishes limiting; pneumatic conveying conditions or free fall drop heights below which attrition is at an acceptable level

#### In brief

To summarise the approach to adopt when addressing a dust issue within the port arena is to always:

- Do as much as possible to reduce dust generation by utilising a range of methods
- Contain the problem by excluding drafts and covering dust sources
- If suppression or extraction are still required after using a variety of methods, the cost will be reduced and the effectiveness will be improved

### About the author

Dr Robert Berry joined the Wolfson Centre as PhD student, evaluating silo design methods for reliable flow, and has been employed as a Consultant Engineer and Lecturer for the last 10 years. His areas of interest and expertise include flow characteristics of particulate materials, design of bunkers/silos, and feeders for reliable material flow and biomass handling.

### About the organisation

#### THE WOLFSON CENTRE for Bulk Solids Handling Technology

The Wolfson Centre for Bulk Solids Handling Technology at The University of Greenwich has a track record dating back to 1974 of troubleshooting and solving industrial storage/handling issues. The Wolfson Centre laboratories house an extensive range of test equipment that can be applied to comprehensively characterise the material for a range of applications from bulk flow properties for storage vessel and conveyor design, to impact tests to assess particle breakage or plant wear issues.

### Enquiries

Tel: +44 (0)20 8331 8646  
Email: [Wolfson-enquiries@gre.ac.uk](mailto:Wolfson-enquiries@gre.ac.uk)  
Website: [www.bulksolids.com](http://www.bulksolids.com)

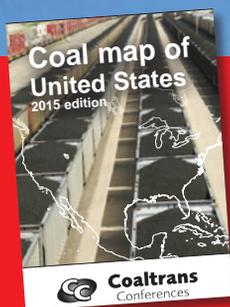
15<sup>th</sup> ANNIVERSARY

# Coaltrans USA

**Coaltrans**  
Conferences

REGISTER BY DECEMBER 12, 2014  
and SAVE US\$250

February 5-6, 2015 JW Marriott Marquis, Miami, Florida, USA



Complimentary copy  
of the 15th Coaltrans  
USA Coal Map

- ★ **Network** with over 350 senior coal producers, traders and buyers active in the US market
- ★ **Hear one-off perspectives** from the US coal sector's key influencers
- ★ **Make your voice heard** in industry debate around the US market outlook
- ★ **The Clean Power Plan** – What does this mean for US coal trade and demand?

Platinum sponsor



Gold sponsor



Silver sponsor



Bronze sponsor



# Bedeschi responds to new challenges



Pietro De Michieli, Chief Operating Officer,  
 Bedeschi S.p.A, Padova, Italy

In an increasingly globalised world, port infrastructure is changing quickly. There is often the need to handle bulk material not at land-based quarries, but at sea with ships that are becoming larger and larger. It has become clear that in order to guarantee efficiency in ports and terminals, there needs to be a paradigm-shift if the positioning and volume of stored bulk material is to be optimised, loading and unloading times are to be reduced, and functional and eco-friendly practices are to be found across the supply chain.

## Shiploaders

Bedeschi has a long history as a supplier in the bulk handling sector, and thanks to its vast experience, it is able to produce a wide set of shiploaders for on-shore installations as well as transhippers, which are utilised in cases in which the loading/unloading process, due to the port size, has to be done away from the port.

Each shiploader is designed to fit the specific project requirements and the client's specific needs. This is why Bedeschi supplies customised shiploaders - to maximise efficiency according to the features of each idiosyncratic project. Some shiploaders therefore have a shuttle type delivery boom with reversible belts, while others have a retractable mechanism capable of extending outreach. Others have been fitted with a straight delivery spout, while some have incorporated a distributing chute designed to deliver cargo into all parts of a ship's hold in order to avoid uneven loading.

In an effort to exhibit the care and attention Bedeschi offers each of its unique customers, several important case studies have been undertaken in order to display Bedeschi's capability to satisfy a customer's specific requirements.

Figure 1: Shiploader screw type operating view



<b>Material</b>	:	Cement
<b>Size</b>	:	millimetres (mm)
<b>Design capacity</b>	:	tonnes per hour (t/h)
		0 to 1 mm
		900

Project data: case study 1

## Case study 1: Titan - Greece

Bedeschi was awarded a shiploader contract in May 2012 with Titan Cement Company, an organisation located in Elefsina, Greece. It was a complete turnkey project, with engineering, design, construction, erection, commissioning and start-up all carried out by Bedeschi.

## The loading process

During the shiploading process, a shiploader moves along the quay on a portal travelling device and then receives the bulk material (which in the Titan case was cement and clinker) from the tripper car on the fixed quay gallery belt conveyor. The portal travelling device has two groups of twin wheels located on its corners and runs on rails. The upper part of the portal is equipped with a transfer screw-conveyor and receives material

from the tripper car installed on the gallery quay conveyor. The delivery is the same to the main screw-conveyor installed on the boom of shiploader.

The portal screw-conveyor is equipped with a bag filter suitable both for the ducting of transition points between tripper and the portal screw conveyor, and for creating a vacuum atmosphere into the same screw-conveyor.

The slewing part of the shiploader consists of a rotating frame superstructure, a supporting luffing boom equipped with the main screw-conveyor, and a telescopic loading chute. On the top part of the slewable boom there is another bag filter dedicated to the ducting of the telescopic loading chute which functions as an extraction system to create a vacuum atmosphere in the hold of an ocean vessel.

The telescopic chute is operated by a cable winch optimised for vertical



# BEDESCHI

Since 1908...



...taking the best from the past to build the future



# BEDESCHI

[www.bedeschi.com](http://www.bedeschi.com) [sales@bedeschi.com](mailto:sales@bedeschi.com)

<b>Material</b>	:	Coal	Iron ore	Clinker	Limestone	Rock phosphate
<b>Bulk density</b>	: t/m <sup>3</sup>	0.85	2.0	1.3	1.4	1.1
<b>Grain size</b>	: mm	0-75	0-75	0-50	0-50	0-50
<b>Humidity</b>	: %	10-30	10-30	5	5	5
<b>Resting angle</b>	: °	37-40	30-39	38-10	35-45	35-45
<b>Capacity</b>	: t/h	2.200	2.600	2.200	2.200	2.200
<b>Design capacity</b>	: t/h	3000				

Project data: case study 2



Figure 2: The first cargo loading at Puerto Brisa's coal terminal



Figure 3: Bulk Celebes in operation

### Case study 3: Bulk Celebes – Indonesia

This case is an example of a solution which is necessary in cases where the increasing size of vessels precludes the advancement of the loading/unloading operations in a port. One way to countenance this problem successfully is with a floating transfer station (FTS), such as the Bulk Celebes.

Bedeschi completed the engineering, supply and installation of a new shiploader which specialises in the loading of coal for an FTS for the client Coeclerici Logistics. In this case, the client asked Bedeschi to study an existing floating transfer station operating in India and supply a new shiploader that is capable of loading coal at 2,200 tonnes per hour. In answer, Bedeschi built a new shiploader equipped with a curved delivery chute. The FTS was retrofitted in Singapore for coal loading operations in Indonesia.

### About the organisation

Bedeschi, with its wide set of machines, is able to satisfy the modern need for flexible, cost-effective, efficient and eco-friendly solutions within bulk handling. Bedeschi has many years of experience in supplying on-shore and off-shore material handling systems and has extensive experience in the design of bulk material handling plants for the continuous loading of dry bulk cargo onto ocean vessels.

### About the author

Pietro De Michieli was born in Padova, Italy, and received his degree in Electrical Engineering from the University of Padua in 1992. In 1999 he joined Bedeschi Italy and he is currently Chief Operating Officer and a member of the board of directors.

### Enquiries

Enquiries  
 Bedeschi S.p.A  
 Via Praimbole 38, I-35010,  
 Limena (PD), Italy  
 Tel: +39 049 7663100  
 Fax: +39 049 8848006  
 E-mail: sales@bedeschi.com  
 Web: www.bedeschi.com

<b>Material</b>		Coal
<b>Grain size</b>	: mm	0-100
<b>Capacity</b>	: t/h	5000

Project data: case study 3

movement. The internal part of the chute is equipped with dedicated lined guide cones. An outlet loader spout is also installed at the final part of chute and is made of a heavy duty metal specifically designed to permit the loading of a vessel with closed hatch covers. The environmentally friendly design of the machine is emphasised in the close screw-conveyor frames which reduce excess noise emissions.

Shiploading is carried out by a combination of slewing, luffing-lowering and telescoping movements. All movements are controlled from the same control cabin by means of automation. The boom screw-conveyor outreach is 25.4m - that is suitable to fill the full hold of a Panamax vessel.

### Telescopic chute advantages

The telescopic chute is an ideal solution in preventing the common problem of breaking particles, as well as minimising dust generation when loading bulk material. In the Titan case this was totally avoided thanks to the loading operation which consisted of the vessel hatch covers being completely closed, similar to a loading operation effectuated on a closed silo.

The design of a telescopic chute ensures that material particles are kept in mass flow form and at low velocity. In fact, the internal lining of the chute's module cones minimise the liberation of dust particles without affecting loading rates. The extraction

system, represented by the top boom bag filter, guarantees a perfect vacuum atmosphere is going into the vessel hold, preventing any further dust emissions. Due to the minimal free-fall and the low velocity that the material experiences, greatly reduced material degradation is evident when loading sizeable products.

### Case study 2: Puerto Brisa – Colombia

Bedeschi America, part of the Italian Bedeschi Group, has recently completed the turnkey supply of a complete coal export terminal in La Guajira on Colombia's Caribbean coast. The main equipment in place at the completed terminal is a 3.5km overland conveyor from the coal storage warehouse to the dock, as well as a shiploader. The entire system can work at a rate of 6,000 tonnes per hour when loading 120,000 deadweight tonnage (DWT) vessels.

The travelling, slewing and luffing shiploader has a curved chute which is designed to enable complete distribution of cargo inside the hold of a vessel, as well as to avoid uneven distribution. Puerto Brisa is strategically located on Colombia's coast with easy access to Central America, South America, the US East Coast, Europe and the Panama Canal. Vessels up to 180,000 DWT can now dock and be loaded-up at the port.



## Oil, Gas & Chemical Handling



“Leading ports in Europe, North America and Asia are taking steps to capitalise on the new reality of small-scale LNG.”

'Small-scale LNG port infrastructure: aligning safety and economics', page 90

# Small-scale LNG port infrastructure: aligning safety and economics



Jacob Genauer, *Naval Architect and Marine Engineer,*  
*Braemar Engineering, Houston, TX, USA*

Leading ports in Europe, North America and Asia are taking steps to capitalise on the new reality of small-scale LNG. While Norway started the trend and set examples for standards and practices, not everyone is developing their small-scale LNG infrastructure in the Norwegian image.

## Safety

The LNG industry takes pride in its high standards that have been essential in maintaining its enviable safety record. Industry leaders are rightly concerned that one incident with LNG as a marine fuel could put a damper on the burgeoning small-scale industry, and even impact the reputation of conventional LNG. While the cryogenic characteristics are the same, small-scale LNG and conventional LNG have vastly different risk profiles, those concerning small-scale LNG include:

- Prominence of pressure vessel storage in small-scale LNG will mean boiling liquid expanding vapor explosions (BLEVEs) are a more tangible risk (increasing the frequency of incidents)
- Elimination/downgrading of risk-reducing equipment that is standard for conventional LNG but unjustified or impractical at small scale (increasing the frequency of incidents)
- Reduced segregation of LNG from unrelated hazards (increasing the frequency of incidents)
- Volumes and flow-rates are one to three orders of magnitude smaller (reducing consequence of incidents)
- LNG transfer operations become more commonplace which can lead to increased competency, but also lead to complacency, particularly when coupled with overburdened

crews (unclear impact on the frequency of incidents)

There are two approaches to small-scale LNG safety. The first approach maintains that small-scale LNG should follow the standards and best practices of conventional LNG, except where strong technical justification exists for accepting a lesser standard. The second approach contends that the most economical method may be used so long as it satisfies a quantitative risk assessment.

In theory, the two approaches should yield similar results. It is not so in practice. It seems that the industry leans towards the second approach, but incidents such as the Fjord Line / Skangass spillage at Risavika (on May 9, 2014) may trigger a shift to be more conservative.

## Typical phases of development

### Ports with LNG

While some new small-scale liquefaction plants will be built, the preferred sources of small volumes of LNG are LNG peak-shavers or LNG import/export terminals because they are faster to penetrate the market and a lower financial risk than completely new developments; they already have LNG, and need only to add or modify distribution infrastructure. Moreover, in many cases, such sites will have no trouble meeting requirements for safety and potential security setbacks. For existing LNG facilities, a truck loading station is the doorway into small scale. A number of manufacturers offer packaged trailer loading systems that can be implemented in under a year.

Small-scale marine loading is the second phase existing LNG terminals will develop. Compared to modifying the primary LNG carrier jetty, a purpose-

built jetty for small-scale applications is simpler and interferes less with operations and scheduling of the primary LNG carrier jetty. However, under-utilised LNG terminals with no waterfront to expand into may attempt to modify their existing jetty for small-scale.

### Ports without LNG

The first phase of development for ports without LNG is to truck it in and transfer it directly to ships or to mini LNGCs (LNG carriers) that serve the bunker market. This requires minimal infrastructure, but the quantity and transfer rate limitations will constrain the size of the operation.

The next phase for ports without LNG is to install storage facilities and short pipelines to the loading point(s). LNG can be delivered to the port by mini LNGC or by road tankers. This a costly phase to implement, but it's essential for ports intending to support all but the smallest LNG consumers. For those receiving LNG from a mini LNGC, the addition of a trailer-loading system may improve the economics by broadening the demand base to LNG-fueled ships at off-site berths and remote industrial users.

Where gas is available but LNG is not, there may be an economic case for a small-scale liquefaction plant with storage, jetty, and trailer-loading facilities. Site selection is critical because at the scales required

While it is natural for ports to focus on marine consumers of LNG, the vast majority of demand remains onshore. Farsseeing ports will give due consideration to industrial demand during planning and outreach efforts.

for the economics to work, high-integrity storage is uneconomical, and lower-integrity containment options come with larger requirements for impoundments and distances to property lines.

### Developing ports for small-scale LNG

Shrinking LNG operations by one to three orders of magnitude shrinks the jetty and changes the concept of an LNG terminal in other ways:

- With the exception of fuelling deep draft ships, ports with limited water depth can participate
- Sophisticated approach, docking aid, mooring instrumentation, and quick-release equipment may not be required. These can be adapted from large-scale to small-scale, but the risk management analysis may not require them
- Fenders need to be lower and more closely spaced, and capable of handling impact forces from hull protrusions
- Connection flanges generally need to be closer to the waterline. The exceptions will be mini LNGCs with a high and low manifold design and deep draft LNG-fueled ships
- Connection sizes are smaller (typically 3-8 inches diameter). While full-scale LNG terminals use mechanical loading arms, hoses are suitable at reduced scale. Hoses can also be adjusted for manifold-height differentials
- Smaller pumps are required. Existing pumps would need to be operated inefficiently at high recirculation rates, so they should be relegated to a backup role
- Not all full-scale LNG terminals can handle the bidirectional flow of LNG, but this is essential in the small-scale market
- Facilities for vapour return are an absolute requirement at full-scale and for any operation at atmospheric pressures. However, it is optional for small-scale operations relying on pressure vessel LNG containment. Where there is market demand for CNG, compression and storage of boil-off gas is another option
- Many small-scale LNG transfers are relying on simple ESD 1 with a stud-bolt breakaway. Others will maintain a higher standard and use conventional ESD 1/ESD 2 systems with PERC valves, and other ESD/automation concepts are under development for small-scale LNG
- Unmanned LNG barges will need to be attended to at all times, so the



LNG facilities handling them will need the capability to monitor and provide emergency response when otherwise unattended

### Project uncertainty

While the pivot towards small-scale LNG is assured, the market size is difficult to project because of:

- Immature supply chain for LNG and fuels that will compete with it (distillates and low sulphur heavy fuel oil)
- Immature cost models for LNG-fueled ships
- Immature cost models for conventionally-fueled ships using scrubbers
- Uncertainty surrounding enforcement of emissions-control zones or addition of new zones or postponement of impending zones
- Uncertain standards for small-scale LNG facilities and LNG bunkering rules – exclusion zones and SIMOPS, for example – and moreover the likelihood that the answer to these questions will vary across ports and port states
- Untold future LNG lightering and ship-to-ship LNG bunkering operations will, in a sense, compete with LNG infrastructure projects in ports

### Conclusion

There is no one-size-fits-all solution for ports to tap into the nascent small-scale LNG market. The considerable capital costs require that the supply chain, port infrastructure, and end users are aligned in all respects, particularly in the safety

approach. Ability to finance the projects will rely on government support or investors willing to develop a project that will not realise profits within the time-span of the anchor customers' initial contracts

### About the author

Jacob Genauer specialises in technical and commercial aspects of ship design, construction, and conversion. He entered the LNG industry in 2009. He joined Braemar Engineering in 2014 and is based in Houston, Texas, USA. Jacob holds a B.S. in Naval Architecture and Marine Engineering from the Webb Institute in New York.

### About the organisation

Braemar Engineering is a global lead consultancy in the design, construction and operation of LNG carriers, as well as in the design development and permitting of LNG facilities (liquefaction, regasification, peak shaving, redistribution, and LNG bunkering). Braemar Engineering is based in the UK and in the US.

### Enquiries

Jacob Genauer,  
2800 North Loop West  
Suite 900  
Houston TX  
77092 United States of America  
Tel: +1 (713) 820 9600  
Web: [www.braemar.com](http://www.braemar.com)

# GDF SUEZ LNG

## launches bunkering solutions

[gdfsuez.com](http://gdfsuez.com)



GDF SUEZ LNG has been a promoter of LNG solutions since the very beginning of the LNG industry in 1965. 50 years after the launch of the first LNG commercial chain, GDF SUEZ LNG is still a front-runner in the industry.

In May 2014, GDF SUEZ announced, together with its partners Mitsubishi Corporation and NYK, the signature of a framework agreement aiming to develop the LNG Bunkering market worldwide through LNG Bunkering Vessels. The partners will provide their know-how and experience to develop this first project in the Northern Europe Emissions Controlled Area (ECA)\* from Zeebrugge, in Belgium.

This partnership has resulted in the order of a first LNG bunkering vessel by NYK on behalf of the venture. This LNG bunkering vessel will be built in the Korean shipyard Hanjin Heavy Industries & Construction with a delivery expected by end 2016. She will have a 5,000 m<sup>3</sup> storage capacity and will be able to bunker LNG at a flow rate of 600m<sup>3</sup> per hour with flexible hoses and cranes. Her home port will be Zeebrugge where GDF SUEZ has already secured long term access rights in the Fluxys LNG terminal. The bunkering vessel will be operated by NYK and will supply a range of shipping operators with LNG as a bunker fuel.



The use of LNG as a fuel for meeting increasing environmental constraints requires a network of LNG bunkering services to be set up for the bunkering of vessels in main harbors, with reliable supply chains.

The ship-to-ship transfer is a flexible bunkering solution for ship operators as it allows bunkering to be performed during commercial operations of the client's vessel.

GDF SUEZ is a global LNG player and the main LNG importer in Europe. GDF SUEZ has the third largest LNG supply portfolio in the world, supplied from six different countries, and representing 16 mtpa. It controls a large fleet of 14 LNG carriers under mid and long term charter

agreements. The fleet is permanently optimized to satisfy GDF SUEZ's long term commitments and short term opportunities. The Group has also a significant presence in regasification terminals around the world, including FSRUs, and therefore a large and flexible access to downstream markets.

*\* Sulfur oxide emissions by the vessels in ECAs will have to be reduced further on January 1st 2015, following an International Maritime Organization (IMO) decision.*

**GDF SUEZ**

BY PEOPLE FOR PEOPLE

# Building a surge in petrochemicals



Chris Coeck, Strategy and Analysis Manager,  
the Port of Antwerp, Antwerp, Belgium

Between 2012 and 2013, the volume of liquid bulk handled by the Port of Antwerp surged by 31.9%. Since 2000, the volume of petroleum derivatives has jumped by 213%, and the chemical volume by 205%. Despite volumes booming at Antwerp, there has been growth in the industry also. The port has strived to see growth in the industry as a challenge and an opportunity to evolve. While the above results demonstrate the competitiveness of the Port of Antwerp's petrochemical cluster, no port can afford to stand still in this erratic market. One way to countenance the fluctuations of the market is to continue attracting targeted investments in new infrastructure and facilities, thereby increasing capacity.

## Largest European petrochemical cluster thanks to integration

In 2013, the Port of Antwerp handled 190.8 million tonnes of maritime cargo. Almost a third of this, 59.5 million tonnes, was liquid bulk. Petroleum derivatives account for 73% of the liquid bulk volume and include products such as petrol, diesel, heating oil and kerosene. Chemicals account for around 19% and crude oil about 8%.

The port maintains these high standards by housing seven of the world's top ten petrochemical companies' production facilities. In the port area there are three refineries operating respectively (ExxonMobil, Total and IBR) and one bitumen plant operated by ATPC (VTTI/Vitol). These companies together use over 30 million tonnes of crude oil a year, of which three-quarters reaches Antwerp via the Rotterdam-Antwerp pipeline (RAPL). These facilities and performances didn't arise overnight - they are the result of a deliberate strategy and a long process. The growth of Antwerp's petrochemical

cluster has developed for many reasons. In this article we look at some of the most important.

## Inland location offers proximity for customers

One of the main advantages of the Port of Antwerp is its location. Situated 80km inland from the North Sea, customers have direct proximity to key European centres of production and consumption, such as the Netherlands, Germany, France and Switzerland, which cuts transport and inventory costs. In the 1960s, private companies chose Antwerp thanks to its prime location, as well as various other factors, such as the favourable tax treatment and the high level of education of the workforce. Several private companies such as Total, Evonik, Solvay and ExxonMobil were the prime movers that decided to invest in Antwerp not simply because of its location, but because the port benefits from its well developed infrastructure. Road, rail and inland waterway networks stretch as far as Switzerland and Austria, and in an era in which ports are competing to provide for their wider regions, investment in infrastructure has proved to be a key step towards optimal port productivity.

## Strategic choices enhance investments

In the past, the Antwerp Port Authority has made many strategic choices to enhance the growth of the port. For example, the concession strategy we designed is to support the petrochemical supply chain. The Port Authority's concession strategy in general ensures that optimum use is made of greenfield and brownfield sites and that contract decisions take into account factors such as added value and economic

and environmental sustainability, as well as enhancing the port's competitiveness.

The concept of 'co-siting' in particular is a plus for the Port of Antwerp. With co-siting we aim to fill all the blank areas in the petrochemical supply chain in our port. The concept of co-siting offers neighbouring companies the opportunity to use products from one another and to reduce transport costs. Co-siting is one of the options for chemical companies to have all components for their supply chain in one location.

## Petrochemical Investment Department

To fill these blank spots and attract even more investment for the future, the Port of Antwerp decided to set up a dedicated Petrochemical Investment Department. This department oversees new business opportunities and is the first point of contact for companies considering investment in the Port of Antwerp. In the past few years, several private companies have already announced large investments. ExxonMobil recently announced plans to invest US\$986 in its refinery. This comes on top of the almost \$2 billion the company has invested in its Antwerp operations over the past decade.

## Proactively improving infrastructure to attract investment

With the natural inland location, concession strategy and dedicated Petrochemical Investment Department we have been able to grow. However there is more that can be done to appeal to new companies and investment. Antwerp has a policy of providing the optimal conditions for investment. For example, one such decision was the deepening of the River

# TANK STORAGE MIDDLE EAST

26-27 JANUARY 2015 - ABU DHABI NATIONAL EXHIBITION CENTRE, ABU DHABI, UAE

The Middle East's event for the bulk liquid storage market

2015

REGISTER  
FREE

“We at Gulf Refining Company are delighted to welcome a dedicated tank storage event to the Middle East. This will be a great opportunity to meet with manufacturers and also keep up to date with market movements via the conference.”

Bahjat Adnan Tuffaha,  
**General Manager,**  
Gulf Refining Company



“Gulf Petrochem are delighted to be partners of Tank Storage Middle East, sharing insights amongst the industry's leading professionals, whilst continuing to meet new peers in the ever-evolving Middle East tank storage region.”

M. Prabakaran,  
**Global Head of Terminals,**  
Gulf Petrochem



Official Media Partner

Tank Storage  
magazine

Supported by



Show Supporters



UNITED OIL SUPPLY COMPANY LTD.



EMPIRE TERMINALS LTD.

Contact the team today:

**Nick Powell**

T: +44 (0)20 8843 8801

E: [nick.powell@easyFairs.com](mailto:nick.powell@easyFairs.com)

**Davinia Bourdon**

T: +44 (0)20 8843 8807

E: [davinia@easyFairs.com](mailto:davinia@easyFairs.com)

Book now

[www.tankstoragemiddleeast.com](http://www.tankstoragemiddleeast.com)

Organised by

easyFairs®



Scheldt in 2010. As a result of this, the port is now able to handle much larger capacity vessels. These include ultra-large gas carriers and LR2-class tankers of up to 160,000 deadweight tonnage. By foreseeing a trend for larger vessels in the market and acting early, the benefits have come into fruition.

Furthermore, between now and 2025, the Antwerp Port Authority and the Flemish government are investing almost \$2 billion in port infrastructure projects. Amongst other things, this includes the construction of a new rail link. Planned to open in late 2014, the \$955 million, 16.2km Liefkenshoek freight line is the largest infrastructure project in Belgium. It runs under the River Scheldt and the Waasland Canal to connect the left and right banks of the Port of Antwerp. This link will significantly reduce the travelling distances to France, the Netherlands and Germany, and render the port a link for these countries.

### More production, more storage

With large investments from the petrochemical sector, plus the Antwerp

Port Authority's own investment, the logistics service providers have a duty to keep up and be ready to cope with the expanding needs of the industry. At the Port of Antwerp it has been great to see that many of the tank storage companies have already responded proactively to these expectations. Ten independent storage companies based in the Port of Antwerp have invested heavily in additional tank storage, whereas ITC Rubis, LBC, Noord Natie Terminals, Oiltanking Stolthaven Antwerpen, SEA Tank Terminals and Vopak, amongst others, have expanded their port storage capacity by 151% over the past decade.

A strong symbol of this growth is that Belgium has become the leading European country for importing chemicals from the Gulf States, with massive volumes being shipped into and stored in Antwerp. Currently, the port has 6.9 million m<sup>3</sup> of storage capacity at its disposal, with the largest concentration of stainless steel tanks in the world.

Within the port's petrochemical cluster there is considerable expertise in the transport, storage and processing of petrochemical liquids, granulates, powders and gases. This is reinforced by the presence of many companies providing value-added logistics services such as tank cleaning, blending, drumming, packaging and quality control.

### Conclusion

The Port of Antwerp's philosophy is to never stand still. With this as a core value, Antwerp began to look into expanding its petrochemical cluster. Apart from its natural inland location, the port has proactively chosen to invest in infrastructure, its people and, most vitally, its future.

### About the organisation

The Port of Antwerp is the leading European integrated maritime and logistics hub and second largest seaport in Europe. Located at the heart of the European single internal market, it has become the centre of worldwide trading activities. Optimal connections through a vast network of highway, railroad infrastructures and inland waterways guarantee a smooth throughput to all of the major European industrial and consumer areas. Antwerp is a multifunctional port, where all types of cargo (containers, break bulk, dry bulk, liquid bulk) are loaded, unloaded, stored and handled with efficiency.

### Enquiries

Antwerp Port Authority  
Port House  
Entrepotkaai 1  
2000 Antwerp  
Belgium  
T.+32 (0)3 205 20 11  
An.Damen@portofantwerp.com



VTS,  
Navigation,  
Mooring and  
Berthing



“The functionality of dynamic path prediction can be utilised for calculating the operational limits of manoeuvring needed for decision making and the harmonisation of collision avoidance procedures.”

'Ensuring safety and efficiency with e-Navigation traffic surveillance', page 98

# Ensuring safety and efficiency with e-Navigation traffic surveillance



Prof Michael Baldauf, *World Maritime University, MaRiSa Research Group, Malmö, Sweden & Institute of Innovative Ship-Simulation and Maritime Systems (ISSIMS), Warnemuende, Germany*

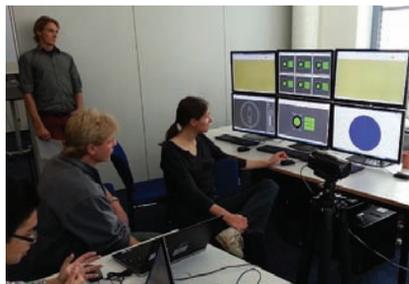
Prof Knud Benedict, *Hochschule Wismar, University of Applied Sciences - Technology, Business and Design, Dept. of Maritime Studies Warnemuende, ISSIMS, Germany*

Dr Michael Gluch, *Hochschule Wismar, University of Applied Sciences - Technology, Business and Design, Dept. of Maritime Studies Warnemuende, ISSIMS, Germany*

The International Maritime Organisation (IMO) and the International Association of Marine Aids to Navigation and Lighthouse Authority's (IALA) e-Navigation initiative has stimulated and inspired a number of ambitious research projects and technological developments in the maritime field. The global transportation of goods is not only facing rapidly growing ship dimensions but also increasing industrial off shore activities, limiting the available navigable spaces and concentrating traffic flows, especially in coastal waters and port approaches.

Enhanced systems and technical means with added functionalities are under development, providing new opportunities for traffic surveillance and interaction.

Integrated Navigation Systems on board modern ships not only support the bridge teams and pilots on board, but also allow for more comprehensive shore-based



Left: Mock-up of an operator's work station used during simulation test trials of the MUNIN project;

Bottom: Sample of a shore-based Fleet Operation Centre



Photo courtesy of Internshull Maritime Systems AC

traffic monitoring, and even allow for the re-thinking of existing regimes and procedures of traffic management.

A sophisticated manoeuvring support tool using fast time simulation (FTS) technology will be introduced in this article. The application of this tool for on board support as well as for its potential integration into enhanced shore-based monitoring processes when linked with the 'Maritime Cloud' will also be explored. The potential contribution to safer and environmentally-friendly manoeuvring regimes will be discussed and explained by means of a critical case study.

**Introduction**

The IMO's e-Navigation concept has provided the impetus for a range of research projects focusing on the utilisation and integration of new solutions in ship-shore communication and information exchange, providing novel solutions to the challenges facing the industry today.

The Accessibility for Shipping, Efficiency Advantages and Sustainability (ACCSEAS) project aims to advance maritime access in the North Sea region by developing intuitive tools to enable seafarers to make safe and effective navigational decisions. The areas of shipping congestion and limitations have been identified, and novel solutions are able to be developed, prototyped and demonstrated in e-Navigation test beds in the North Sea region. The aim is to harmonise maritime information and its exchange and in addition address training provision to support the real-world implementation of the solutions.

ACCSEAS works in tandem with the much larger MONALISA project that contributes developments to the 'Motorways of the Sea' initiative. This project focussed around ecologically efficient e-Navigation solutions supportive of EU strategy for the Baltic Sea region. The project laid the groundwork for the future international implementation of innovative solutions. The follow-up, MONALISA 2.0, seeks to develop the concept further by the implementation of measures in line with EU transport policies.

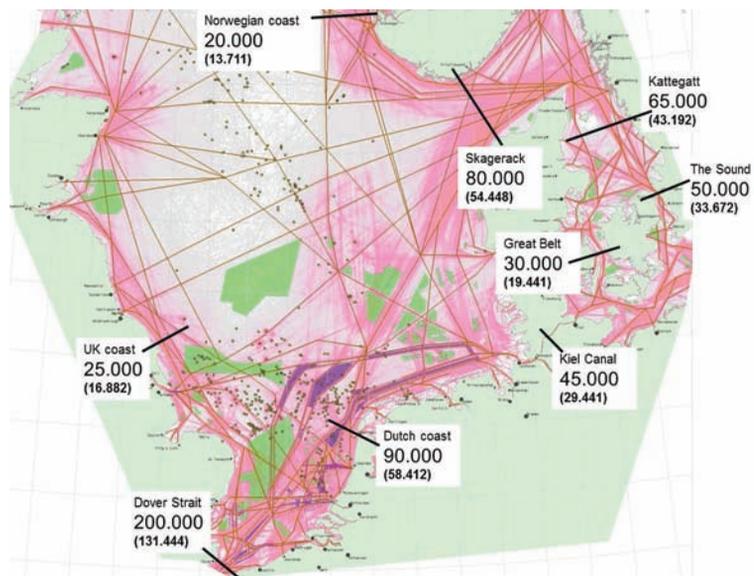
Supportive of the vision of the e-Navigation concept is the so called 'Maritime Cloud'. This can be utilised to populate pertinent data and information related to the ship domain (particularly manoeuvring characteristics beside length, breadth, draft and trim); voyage related details (voyage plan comprising waypoints, speed and course); and environmental/hydro-meteorological information (wind, sea state, waves, visibility).

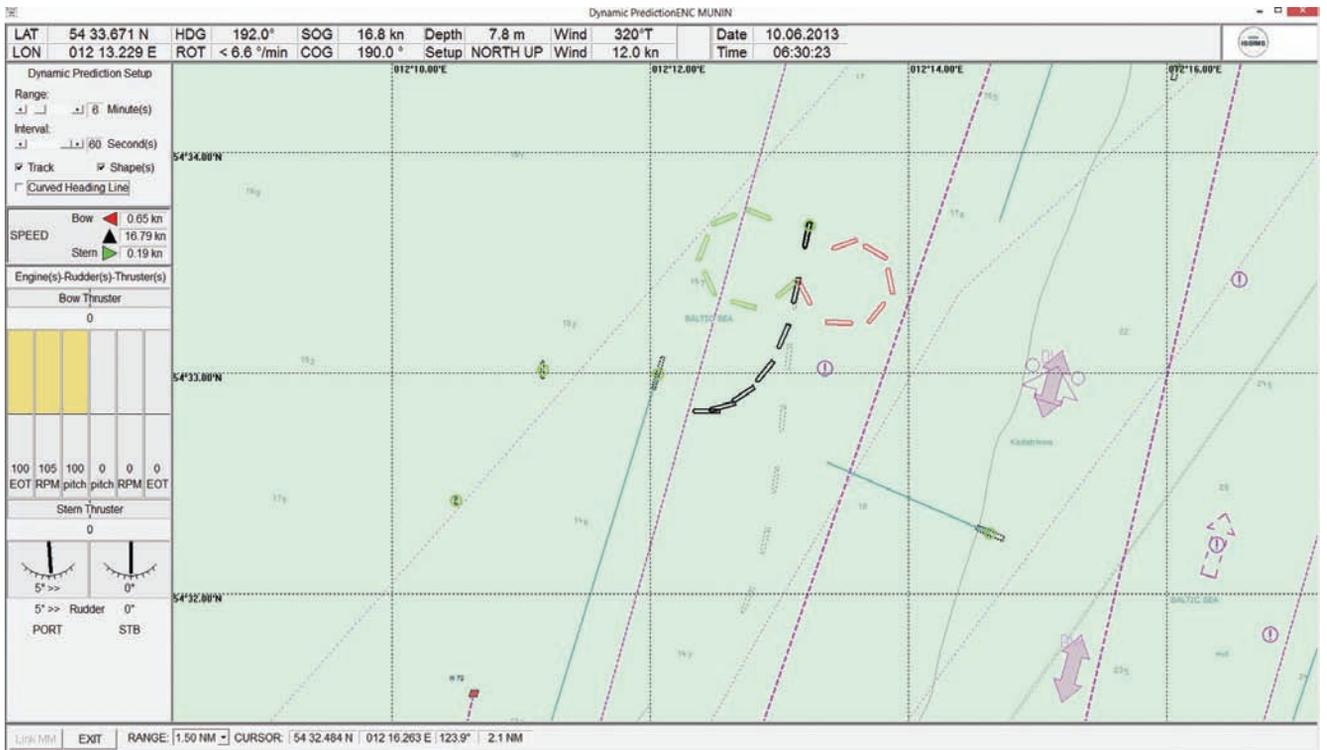
This information can be utilised both on-board the ship domain and by any shore based control centre like a VTS for information sharing and effective decision-making. The security and integrity of information would need to be addressed; however, the 'Maritime Cloud' can perform an integral service for the implementation and achievements of future e-Navigation services.

**Present situation**

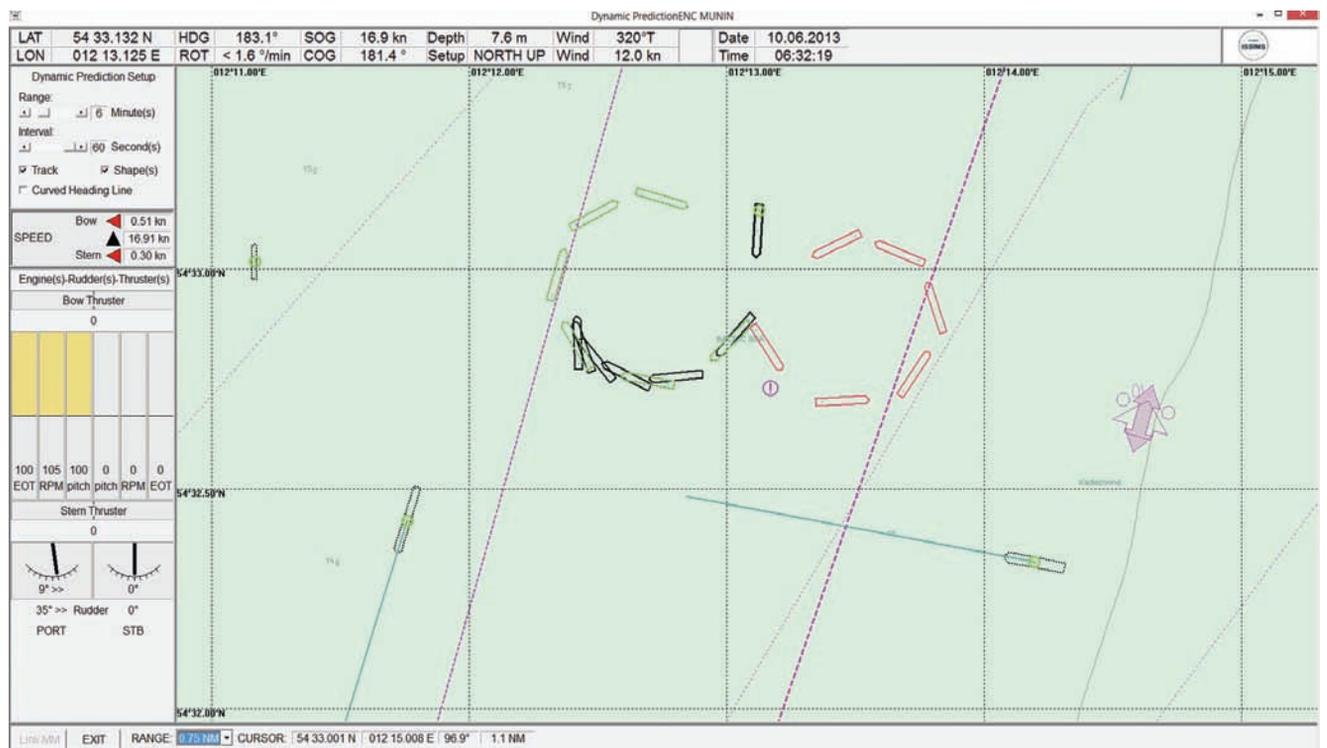
Ship dimensions are constantly growing, and ship sizes have gone from carrying a capacity of 500-800 TEU in the 1950s, to the modern-day Maersk 'Triple E' class, which has capacities of over 18,000 TEU. In the near future, we can expect to see container ships with a capacity of 22,000 TEU with a length of 430m. On the one hand

Top: ACCSEAS Baseline Scenario of vessel traffic in the North Sea area, showing AIS based indication of the traffic situation in 2012, as well as prognosticated traffic figures for 2020+. Coloured areas indicate established and planned wind mill farm areas - clearly showing that they will impact present shipping routes; Bottom: Humber TSS: Display of intended route facilitating shore-based suggestion





Top: Visualising a vessel's actual situation-dependent operational limits in an ECDIS by means of FTS actual manoeuvring track (grey-dotted contours) and additional manoeuvring tracks for turning circle hard to starboard (green) and turning circle hard to port (red) as well as for crash stop (black) from actual motion parameters; Bottom: Vessel ordered hard starboard rudder - the display shows the contours of actual dynamic prediction (grey) are coinciding with the contours for the calculated turning circle to starboard side (green). The black shapes show the prediction for the alternative action of a combined turning and stopping manoeuvre (application developed by HS Wismar, ISSIMS in EU-funded MUNIN project)



are the increasing ship sizes that defy imagination, while on the other we have ever increasing levels of offshore activity for oil exploration, drilling, installation

of wind farms, floating production storage and offloading (FPSO) units, oil rigs and platforms. There is a lack of harmonisation in the exclusion zones

surrounding such installations which can range from as much as 500m to 10 miles. Marine exclusion zones are set up and particularly sensitive sea areas (PSSA) are



## ARE YOU MEGA-SHIP READY?

# www.port-directory.com

The key concerns for shipping lines are whether your terminal can handle the sheer volume of containers that they bring to the quayside and how fast your terminal can get a ship turned around. There is ample choice in the market place, so how do you steal a march on your competition? The common denominator has to be the development of terminal infrastructure: dedication to this proves that your latest technologies and strategic operations are at the cutting-edge of optimising terminal processes and increasing productivity. PTI has created a platform that bridges the gap between key shipping executives and port and terminal operators, so no information is lost at sea.

### Now the only question to ask is: What can your port do about this?

Answer: Utilise the PTI Port Directory & Technical Papers

This offers:

- Unrivalled global exposure to industry executives for your port or terminal
- Unlimited content on your listing for one whole year
- Displays unique company information through dynamic multimedia outlets
- Case studies, white papers and specialist features for facilities and practices across the port and terminal arena
- Contributing allows you to record a piece of history and gain industry notoriety in print and online
- All content is carefully archived online and distributed through various expanding channels
- All content is search engine optimised by our in-house experts to ensure maximum online exposure

Guarantee your presence and allow our audience to source you as their next client.

It's not just about advertising, it's about **Content in the right Context** which drives **"Inbound Marketing"** through all of your touch points for greater lead generation.

In a world of far too much overwhelming and often random information which is unprocessed, often with little meaning and no value, Port Technology remains **'Selective, Arranged and Measured'** 24/7/365.

designated. The advancement of fishing activity further offshore also leads to the restriction of the navigable space available to shipping.

Finally, the present situation is further compounded by a shortage of officers. The current and future availability of senior officers is also a cause for concern. Another aspect to be noted is casualty statistics in shipping. Of the total number of accidents in 2013, 75% took place in ten world regions, of which nearly 46% were related to European waters. e-Navigation has a crucial role to play in mitigating risk, particularly in collision and grounding accidents near the shore.

### **e-Navigation services as risk control options**

Simulation trials were conducted to test the efficacy of futuristic e-Navigation solutions as risk control options. Two pertinent services related to the ship-port interface – ‘shore based route suggestion’ and ‘display of intended route’ – were tested in simulation trials and are presented here exemplarily. Five different scenarios were designed and tested twice over the course of four consecutive days. At any one time, two bridge teams on simulation bridges participated in the simulation runs. The bridges were manned by experienced pilots, as well as mariners, and shore based support was provided by personnel from the Humber VTS, a monitoring and regulation service for the River Humber based in England.

The bridge teams changed after two days participating in all five scenarios. In a scenario pertaining to the approach to the River Humber, the VTS operator said that prior to the establishment of the Traffic Separation Scheme (TSS), vessels would approach from all directions like ‘bees to a honey pot’ and would depart ‘like a starburst’.

The VTS operator further went on to note that the functionality that enables them to see the intended route of vessels was extremely valuable to them as, based upon the route, they could suggest a suitable approach to the TSS if required. The Humber personnel added that they would miss the functionality upon their return to England. A very similar response was received from Danish pilots referring to their area of operation.

### **Enhanced collision avoidance using dynamic predictions**

Conventional shore-based services, as provided in the frame of a recognised VTS, are based on traffic data collected and analysed in shore-based centres. Operators influence traffic by sending

out information, warning or advice and instruction on a regular basis, on demand or when deemed necessary according to an operator’s judgement.

e-Navigation will significantly change the landscape and the status quo of existing regimes of shore-based service provision. New information and communication technology (ICT) allows the collection of extensive data which is expected to be more reliable and can provide almost real-time information. Voyage Data Recorders (VDR) and Automatic Identification Systems were the first options to collect and provide more data on the actual situation on-board ships falling under the IMO’s Convention for the Safety of Life at Sea (SOLAS) than information from only the radar and very high frequency (VHF) communication. Today, shipping companies seek to establish company fleet operation centres (FOC) onshore. VDR manufacturers have developed sophisticated solutions for data collection far beyond the minimum performance standard of VDRs, and even provide data exchange to company-owned FOCs via enhanced satellite data communication links. This includes even rudder, engine and thruster data, as well as ordered steering values. Presently there is on-going research work making use of such data for dynamic path predictions for on-board decision making and shore-based monitoring.

Cruise and container shipping companies are already using enhanced capabilities and are aware of the potential of virtual online monitoring and decision support. This already includes route monitoring, keeping a certain corridor considering actual ship status, and forecasting weather and sea state data. The added shore-based monitoring acts as a kind of additional safety barrier and moreover allows for the optimisation of the operational regimes of a company fleet.

### **Conclusion**

The trials demonstrated that in certain situations the newly developed functionality of displaying intended routes and shore based route suggestion were extremely valuable. The functionality of dynamic path prediction can be utilised for calculating the operational limits of manoeuvring needed for decision making and the harmonisation of collision avoidance procedures. In relation to the future e-Navigation services, it was noted that the legal aspects of such services would need to be addressed, as would training requirements from the point of view of involved stakeholders.

### **About the authors**

Michael Baldauf is Associate Professor at the World Maritime University in Malmö, Sweden, and Deputy Director of the Institute of Innovative Ship Simulation and Maritime Systems Rostock-Warnemünde in Germany. He graduated from the University of Rostock in 1990 and achieved his Doctoral Degree in Safety Sciences in 1999.

Knud Benedict graduated from the Faculty of Naval Architecture at Rostock University in 1972. He achieved his Doctoral Degree in Ship Hydrodynamics/ Manoeuvrability in 1978 and his Habilitation on Ship Operation Technology/Advisory Systems in 1990. Currently, he is Director of ISSIMS, Professor in Ship Theory at the Wismar University. He is also a visiting professor at the World Maritime University.

Michael Gluch graduated from the Maritime Academy Warnemuende in 1991 and achieved his Doctoral Degree in Automation Sciences in 2008. He is Chief Coordinator for Research at the Hochschule Wismar and Head Co-ordinator of Manoeuvring Prediction Software at ISSIMS.

### **About the organisation**



The World Maritime University (WMU) in Malmö, Sweden, is a postgraduate maritime university founded by the IMO. The aim of the WMU is to further enhance the objectives and goals of the IMO and the IMO member states around the world through education, research, and capacity building to ensure safe, secure, and efficient shipping on clean oceans. The university operates on the basis of a charter adopted by the IMO Assembly and is accountable to the IMO Secretary-General, Council and Assembly as well as to the international Board of Governors.

### **Enquiries**

WMU  
PO Box 500  
S- 201 24 Malmö  
Sweden  
Tel: +4640356300  
E-mail: mbf@wmu.se

# Safe navigation in the straits of Malacca and Singapore



Thomas Timlen, *Asia Liaison Officer, Baltic and International Maritime Council (BIMCO), Singapore*

The straits of Malacca and Singapore (SOMS) remain one of the busiest and most important shipping lanes in the world. It is a vital sea line of communication, carrying about one third of the world's traded goods, and used by ships voyaging from west to east. Safety of navigation and the protection of the marine environment in the SOMS are of paramount importance.

## The pamphlet

In May 2014, a pamphlet entitled 'Safe Passage: The Straits of Singapore and Malacca', was officially launched at the ninety-third session of the International Maritime Organisation's (IMO) Maritime Safety Committee, held in London. The Safe Passage pamphlet is the result of an initiative pursued within the Co-operative Mechanism, a framework established in 2007 in which the littoral states of Indonesia, Malaysia and Singapore and the users of the SOMS, pool their respective resources and expertise in an effort to enhance navigational safety and protection of the marine environment in the SOMS.

The Safe Passage Pamphlet was first proposed by the international shipping association BIMCO in 2012. It is intended to be a handy tool for the users of the SOMS offering navigational guidelines and best practices to be observed, as well as the importance of adhering to the International Regulations for Preventing Collisions at Sea (COLREGs).

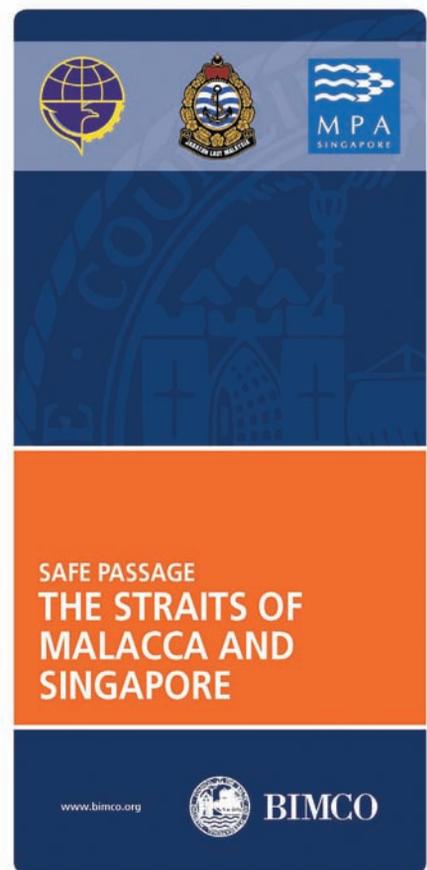
The Safe Passage pamphlet also presents useful information on collision prevention measures, night signals for vessels crossing the Traffic Separation Scheme in the Singapore Strait, local rules for ships transiting the SOMS,

advice on anchoring and notifications of weather conditions affecting visibility such as haze and heavy rain.

## Close co-operation

Since its inception in 2007, the Co-operative Mechanism has co-ordinated many projects to promote safety of navigation and environmental protection. The completion and launch of the Safe Passage Pamphlet complements the many good systems and tools that have been put in place by the Co-operative Mechanism. It also underscores the close co-operation between the three littoral states and the organisations representing the users of the Straits of Malacca and Singapore such as BIMCO, INTERTANKO and the ICS.

Prior to the completion of the pamphlet, two other industry-driven projects had been conducted successfully. The first was an analysis of incidents and near-misses within the SOMS, a project led by the ICS. This provided indications of the potential causes of such events and available corrective measures that could be considered. The second industry-led project produced a directory of port reception facilities that are available to vessels navigating in the SOMS. This project was led by INTERTANKO, and drew heavily from information found within the IMO Global Integrated Shipping Information System (GISIS), as well as databases maintained by BIMCO and INTERTANKO. The three littoral states were then invited to provide any missing details, as well as update any inaccurate information before the directory was published. The port reception facility directory will remain as a 'living document', so any changes regarding the availability of such facilities



2014-Safe Passage Pamphlet-cover-page-001

can be taken on board.

Like the earlier projects, the development of the pamphlet is a good illustration of how like-minded stakeholders can work together efficiently and expeditiously to achieve a common goal. It is a way to contribute towards protecting the marine environment by improving navigational safety in the



Ships in close proximity on the Singapore Strait

straits of Malacca and Singapore.

### Proliferation

The work on the pamphlet was initiated in 2012 by means of a correspondence group steered by Singapore and BIMCO. Working closely with the other two littoral states of Indonesia and Malaysia, the framework of the pamphlet was developed, followed by the drafting work aimed at providing concise guidance with many references to related regulations and information resources.

Initially made available as a downloadable PDF file which ship owners and other interested parties could print and distribute, in the short time it has been available, several companies have already embraced its advantages. For example, a major Malaysian ship-owner has distributed the pamphlet to its entire fleet, including all tankers navigating in the region.

The Singapore Pilots' Association has also taken the initiative of providing all ships calling at Singapore with a copy of the pamphlet. The Maritime and Port Authority of Singapore has held several Safety at Sea events during which participants are provided with a copy of the pamphlet in addition to other related material. The pamphlet was also distributed during the recent Singapore International Bunkering Conference and Exhibition (SIBCON) conference.

### Video pamphlet

During the Co-operative Mechanism Meetings that were held in September 2014 in Malaysia, it was agreed that

Singapore could work with BIMCO in an effort to produce a video for seafarers that will capture the main points covered in the pamphlet.

The video, which may be made available for both streaming online viewing as well as via distribution on DVD, is intended to maximise access to the advice found in the pamphlet, and at the same time enhance the message by including actual footage of the view from the bridge during the most critical points during the passage of the SOMS.

Users of the pamphlet can find quick reference on the following topics:

- Collision prevention
- Routeing measures: covering the topics of the Traffic Separation Scheme (TSS), night signals for crossing traffic, and rules for vessels navigating through the SOMS
- The STRAITREP reporting requirements outlining the reporting sectors, participation in STRAITREP and the vessel traffic service
- Anchoring advice covering areas where no anchoring is allowed and emergency situations
- Local traffic considerations and visibility concerns stemming from seasonal haze and weather conditions

The Safe Passage pamphlet has been made available as a downloadable PDF from the Co-operative Mechanism's website and BIMCO's website ([www.cooperativemechanism.org.my](http://www.cooperativemechanism.org.my) / [www.bimco.org](http://www.bimco.org)). Users of the Straits are encouraged to get a copy.

### About the author

BIMCO appointed Thomas Timlen as the organisation's Asia Liaison Officer in November 2008. Previously he has served as Head of BIMCO's Security and International Affairs Department. Amongst positions held in Singapore he has served as a visiting research fellow at the S. Rajaratnam School of International Studies. He has represented BIMCO during sessions of the IMO Maritime Safety Committee and Facilitation Committee as well as at sessions of the World Customs Organisation and the International Organisation for Standardisation. He holds a BSc in Business Administration from Boston University.

### About the organisation



BIMCO is the world's largest international shipping association with 2,300 members in around 130 countries. BIMCO provides a wide range of services to a global membership which includes shipowners, operators, managers, brokers and agents. BIMCO's core objective is to facilitate the commercial operations of members by developing standard contracts and clauses and providing quality information, advice and education. BIMCO is accredited as a non-governmental organisation (NGO).

### Enquiries

Thomas Timlen  
Asia Liaison Officer  
BIMCO Asia Representative Office  
Singapore  
[www.bimco.org](http://www.bimco.org)



Environment and  
Sustainability



In Partnership with:

**Schneider**  
 **Electric**<sup>™</sup>

# Superstorms and rising sea levels: the new challenges for seaports



Dr. Becker, Assistant Professor of Coastal Planning, Policy, and Design in the Department of Marine Affairs at the University of Rhode Island, Rhode Island, USA and John Englander, Oceanographer, Consultant and Sea Level Rise Expert, Florida, USA

Seaports have a special need to look ahead, assess their risks and begin adapting to climate change. Scientists project that events such as Superstorm Sandy, Hurricane Katrina and Super Typhoon Haiyan could become more frequent as oceans warm. It is much more certain that global sea levels will rise every decade as glaciers and ice sheets continue to melt, possibly raising water levels by as much as two feet by 2050.

Major storms, extreme tides and sea level rise can all pile on top of each other, and planners must consider a worst-case scenario when sea levels are high and a major storm hits at extreme tide. Though tides recede in hours and storm surge recedes in days, sea level will not go down for centuries. Like the proverbial tortoise that wins the race, rising seas will eventually have a much greater impact than the other two issues.

Over the last hundred years, the global average sea level rose about eight inches,

mostly due to thermal expansion as seawater warmed (although locations vary widely due to local factors). Geologists know that average ocean levels cycle up and down by about 350 feet roughly every 100,000 years, yet without even considering the worst-case scenarios, the latest projections show global average sea levels potentially rising as much as six feet this century. This is primarily due to the melting of glaciers and the Greenland ice sheet.

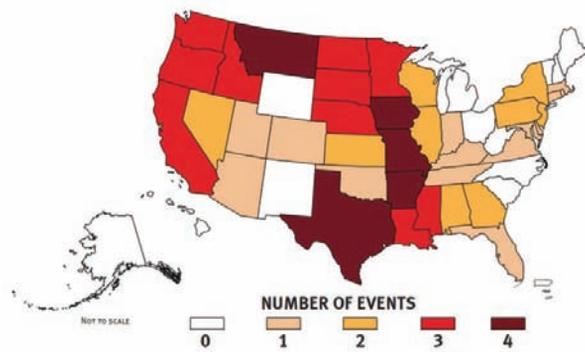
### The need for action

Yesterday's sea levels and storm patterns served as the benchmark for designing most coastal infrastructure. Developers built ports based on historical conditions that changed little in the last few millennia. However, as environmental conditions change, many ports will find themselves exposed to rising risk levels. Ports already have strong incentives to build for resilience, as storms result in

operational delays and huge costs from damage and cleanup. Worse yet, shippers forced to find alternate supply routes may never return. In our recent survey, to which many American Association of Port Authority members contributed, 80% of port operators said that the industry needs to address climate change challenges head on.

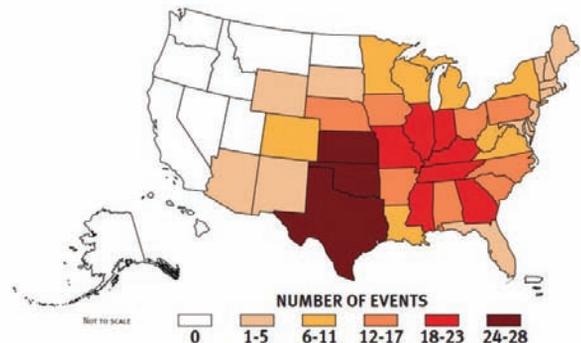
Fundamentally, these challenges require those involved with ports and harbours to consider new planning time horizons. Often, five to ten years constitutes long-term planning. Yet basic port infrastructure usually lasts half a century or longer. With the realisation that environmental conditions in three or four decades will be quite different, the financial community is starting to ask questions about long-term coastal vulnerability, risk, and the security for their debt. To get a good return on investment, planning today must look beyond the finance and amortisation

**U.S. BILLION-DOLLAR WEATHER AND CLIMATE DISASTERS: 1980-2013\* FLOODING**



PLEASE NOTE THAT THE MAP REFLECTS A SUMMATION OF BILLION-DOLLAR EVENTS FOR EACH STATE AFFECTED (I.E., IT DOES NOT MEAN THAT EACH STATE SHOWN SUFFERED AT LEAST \$1 BILLION IN LOSSES FOR EACH EVENT). SOURCE: NOAA'S NATIONAL CLIMATIC DATA CENTER

**U.S. BILLION-DOLLAR WEATHER AND CLIMATE DISASTERS: 1980-2013\* SEVERE LOCAL STORMS**



PLEASE NOTE THAT THE MAP REFLECTS A SUMMATION OF BILLION-DOLLAR EVENTS FOR EACH STATE AFFECTED (I.E., IT DOES NOT MEAN THAT EACH STATE SHOWN SUFFERED AT LEAST \$1 BILLION IN LOSSES FOR EACH EVENT). SOURCE: NOAA'S NATIONAL CLIMATIC DATA CENTER



Mandeville Wharf in New Orleans after Hurricane Katrina

period to the useful life. That applies not only to ports and terminals, but also to utilities, roads, rail and structures.

Historically, ports considered storm resilience in a somewhat siloed manner: engineers and consultants developed construction guidelines for structures, and local coastguard or emergency management agencies worked with ports to ensure safe navigation and the protection of lives. Essentially, ports and their tenants had their own storm preparation procedures designed to minimise damage. The emerging new reality warrants a more comprehensive, visionary approach to plan for long-

term changes in sea level, which will surely exacerbate extreme tides and extraordinary storms.

### **Building resilience**

Interviews and case studies that we have conducted have identified more than 100 storm resilience strategies for ports. These strategies ranged from changes to building codes and land use regulations, further planning beyond 20 years, better construction, better designs for defensive structures; all the way to insurance policies and robust emergency response plans for individual tenants of the port. It is crucial that ports accurately

assess and quantify their risks, so more research is required in order to build stronger networks between the various stakeholders in ports and terminals.

Port operators do not need to go it alone when it comes to building resilience. All stakeholders can invest in the common goal of a more resilient port. Community and residential groups can help generate the political will necessary for government investment in storm barriers, whereas researchers in academic institutions can conduct impact assessments and work with ports to determine best practices. Furthermore, government agencies can include



Gulfport in Mississippi ravaged after a superstorm

system-level planning that addresses the port in the context of its multi-modal connections. Long-range coordinated planning efforts involving many port stakeholders can foster a stronger sense of unity around the common goal of port resilience.

### Leadership

Leadership is vitally important in implementing the far-reaching strategies necessary to defend ports against the elements. Port operators have a key role to recognise and manage potential risk and thereby spearhead strategic adaptation planning. In some cases, a neutral organisation can also play an important role by bridging industry with government and research by creating forums for information sharing and coordination.

Superstorms of the magnitude witnessed in recent years and sea level rise requires a new paradigm of thought surrounding resilience planning for ports and port stakeholders. With risk levels increasing for all, a more holistic

approach can serve the interests of both the port and the community in which it operates. Port stakeholders outside of the port authority also need to better understand what is at stake.

Storms can be expensive in myriad ways: cleanup costs, business interruptions, environmental damages, rebuilding and lost business are all outcomes. And with sea level rise, some land areas will eventually disappear entirely, not only in low-lying areas of the port, but also in the access roads and in the surrounding community. It is time to plan further ahead. A 'sea change' is happening. Those that recognise it will reduce losses, render their operations more resilient should disaster strike, and enhance value for all their stakeholders.

*This is an abridged version of an article co-written by Austin Becker and John Englander. It first appeared in the 2014 summer issue of AAPA's Seaports Magazine and is reproduced by kind permission of the American Association of Port Authorities ([www.aapa-ports.org](http://www.aapa-ports.org)).*

### About the authors

Dr. Becker is assistant professor of Coastal Planning, Policy, and Design in the Department of Marine Affairs at the University of Rhode Island. As an interdisciplinary social scientist, he works across the fields of planning, policy, design and engineering. His research contributes to untangling complex problems involving uncertainty, consequences of large-scale shifts in climate over time horizons, and the resulting challenges in policy and planning. Dr Austin's work is recognised globally and he is a regularly invited speaker at meetings of the United Nations Conference on Trade and Development.

John Englander is an oceanographer, consultant and sea level rise expert. His broad marine science background coupled with degrees in geology and economics allows him to see the big picture on climate and look ahead to the large-scale financial and societal impacts, particularly as they relate to sea level rise.

### About the organisation



Founded in 1912 and based in Alexandria, Virginia, US, the American Association of Port Authorities (AAPA), is a trade association representing more than 130 public port authorities in the US, Canada, Caribbean and Latin America. Additionally, it represents more than 300 sustaining and associate members with an interest in the seaports of the Western Hemisphere. The AAPA promotes the common interests of the port community, and provides leadership on trade, transportation, security, environmental and other issues related to port development and operations.

### Enquiries

Austin Becker, PhD  
[abecker@adi.edu](mailto:abecker@adi.edu)

John Englander  
[john@johnenglander.net](mailto:john@johnenglander.net)

# Plug in to green power



## Pre-designed ShoreBoX solution for a lean shore connection system integration in your port

Cut emissions in your port the most simple and cost-efficient way:

### Minimised engineering time and costs

- Pre-packaged solution made of standard, proven components
- Easy installation and commissioning
- Easy maintenance
- Compact footprint for minimum impact at berth
- Available worldwide

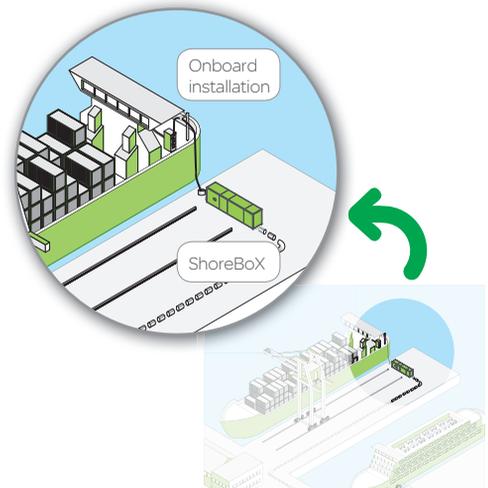
### Scalable and mobile

- Minimise your energy consumption by optimising the available power
- Adapt your investment to evolving power needs

### Experts in onshore and onboard solutions

- Benefit from more than 90 years' experience in the marine industry
- Get best-in-class performance in both your onshore and onboard shore connection systems
- Receive the support you need thanks to our worldwide presence and standardised solutions and architectures

### Get best-in-class berth operations



The ShoreBoX™ onshore solution has a minimised footprint to allow for maximum free space at berth.



Optimise your energy management and usage, and minimise your operational costs and carbon footprint with our energy management systems and services.



Learn more about the shore connection technology and download our **FREE** white paper! Visit [www.SEreply.com](http://www.SEreply.com) Key Code **46266P**



# Shipping emissions in ports: overview, impact and prognosis



Olaf Merk, Administrator Ports and Shipping, the International Transport Forum (ITF) at the Organisation for Economic Co-operation and Development (OECD), Paris, France

This article gives an overview of shipping emissions in ports in 2011 and the projected levels in 2050 per continent and ship type. Air emissions from shipping are considerable. Various studies have estimated CO<sub>2</sub> emissions from shipping to be around 2-3% of total global emissions, 5-10% for SO<sub>x</sub> emissions, and 17-31% for NO<sub>x</sub> emissions. These emissions have increased at a large pace over recent decades and are expected to increase rapidly in the future.

Ports are the places where the impacts of shipping emissions are most noticeable. NO<sub>2</sub> and CO<sub>2</sub> emissions in ports have been linked to bronchitic symptoms, whereas exposure to SO<sub>2</sub> emissions is associated with respiratory issues and premature births. Calculations suggest that shipping-related particulate matter emissions are responsible for approximately 60,000 cardiopulmonary and lung cancer deaths annually, with most deaths occurring near coastlines in Europe, East Asia and South Asia.

Surprisingly, little is known about ship emissions in ports, as there remains a scarcity of studies covering the topic. This article wants to fill this gap by providing a comprehensive overview of the subject. The ITF has calculated the extent of shipping emissions in ports using data from the Lloyd's Marine Intelligence Unit on vessel movements in 2011. The database is replete with insight concerning information on the turnaround times of ships in ports and various ship characteristics. In these calculations, various policy measures implemented in ports to mitigate air emissions have been taken into account, such as the EU regulation to use low sulphur fuel at berth, shore power and various fuel switch programmes. Further information on methodology and the dataset used for the calculations is soon to be published by the ITF (please go to the ITF website to view the working paper).

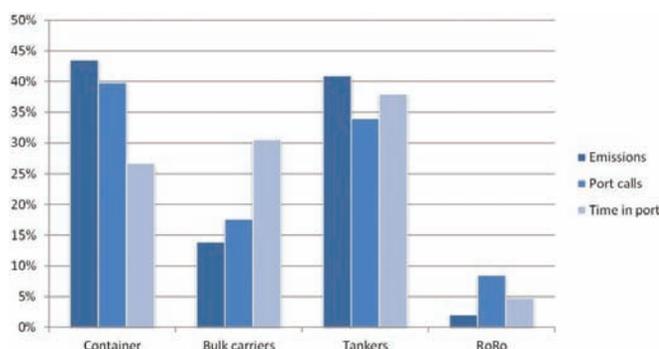


Figure 1

Shipping emissions in ports (million tonnes)	
Carbon dioxide (CO <sub>2</sub> )	18.3
Nitric oxide (NO <sub>x</sub> )	0.4
Sulphur oxide (SO <sub>x</sub> )	0.2
Particulate matter (PM <sub>10</sub> )	0.03
Particulate matter (PM <sub>2,5</sub> )	0.03
Carbon monoxide (CO)	0.03
Methane (CH <sub>4</sub> )	0.002

Table 1: Estimated shipping emissions in ports (2011)

According to ITF calculations, shipping emissions in ports are substantial and accounted for 18 million tonnes of CO<sub>2</sub> emissions, 0.4 million tonnes of NO<sub>x</sub> emissions and 0.03 million tonnes of PM<sub>10</sub>.

Around 85% of these emissions come from containerships and tankers, which is partly explained by their dominant presence in terms of port calls - around three quarters of all calls in ports are by containerships and tankers, and both emit more emissions than would be expected based on the number of port calls. For tankers this is due to their relatively long turnaround time in ports. However, this is not the case for containerships: their time in port is approximately 27% of the port time of vessels, whereas these represent 40% of the calls. So containerships have

relatively short stays in ports, but have high emissions during these stays.

The reverse is the case for bulk carriers; they have long turnaround times, but have less emissions during their stay in port. Also, Roll-on/roll-off (Ro/Ro) ships are relatively clean; representing 8% of port calls and 5% of port time. They only represent 2% of the total shipping emissions in ports (see figure 1).

Shipping emissions in ports are concentrated in Asia and Europe, approximately three fifths of CO<sub>2</sub>-emissions are found in these regions. This is logical if one considers Asia and Europe represent 70% of the world's total port calls. However, both Asia and Europe have relatively time efficient ports considering that their calculated time for ships in port is considerably less than their share of

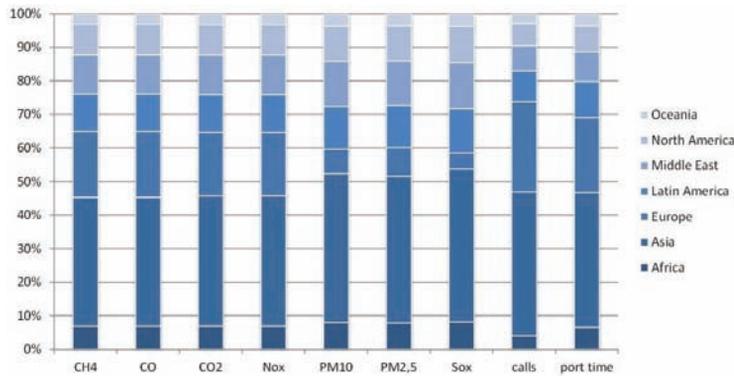


Figure 2

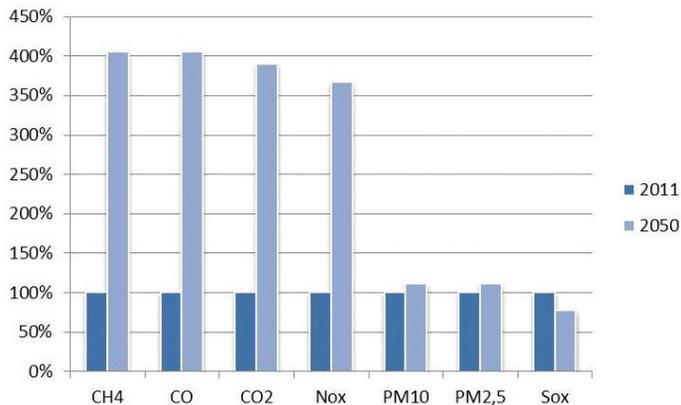


Figure 3

port calls. Moreover, European ports have much less emissions of SO<sub>x</sub>, PM<sub>10</sub> and PM<sub>2,5</sub> than their share of port calls would suggest. This can be attributed to EU regulations which stipulate vessels must use low sulphur fuels at berth. Ports with high emissions relative to their port traffic can be found in Africa, the Middle East, Latin America, and North America (Figure 2).

Shipping emissions in ports have a large impact on the population of their cities: the ITF calculated that approximately 230 million people are directly exposed to the emissions that the top 100 world ports in terms of emissions generate. Around 40 million people are directly exposed to the ten ports with the largest SO<sub>x</sub> emissions, which concentrate 22% of the total shipping-related SO<sub>x</sub> emissions in ports. Shipping emissions also have considerable external costs in ports - around US\$15 billion per year in the 50 largest ports in the OECD for NO<sub>x</sub>, SO<sub>x</sub> and PM emissions; and that is based on conservative assumptions.

Shipping emissions in ports are expected to grow fourfold by 2050. This is the case for CH<sub>4</sub>, CO, CO<sub>2</sub> and NO<sub>x</sub> emissions. This would bring CO<sub>2</sub> emissions from ships in ports to approximately 70 million tonnes by 2050, and NO<sub>x</sub>-emissions up to 1.4 million tonnes. The level of PM<sub>10</sub> and PM<sub>2,5</sub> emissions from ships in ports remains at the level of the emissions in

2011, while SO<sub>x</sub> emissions are expected to decline slightly compared to that of 2011 (see figure 3).

Asia and Africa will see the sharpest increases in emissions due to their projected strong port traffic growth from now until 2050, as well as the lack of regional mitigation measures such as emission control areas. Asian port traffic is projected to reach half of the global total in 2050, which corresponds to the share of projected shipping emissions in Asian ports. European and North American ports show relative declines in emissions due to slower traffic growth and to stricter regulatory measures. For example, due to the emission control areas and the 0.1% maximally allowed sulphur content in these areas from 2015, SO<sub>x</sub> emissions in European and North American ports are projected to be 5% of the total SO<sub>x</sub> emissions in ports, whereas their total port traffic would account for 24% in 2050.

In order to reduce these projected emissions, strong policy responses will be needed. This could take the form of global regulation, such as more stringent rules on the sulphur content of ship fuel, or more emission control areas than the four that are currently in place. In addition, shipping could be included in global emissions trading schemes and climate finance schemes. A lot could also be gained by policy initiatives coming from ports themselves. Various ports have

developed infrastructure, regulation and incentives that mitigate shipping emissions in ports. One example of an infrastructure project that reduces ship emissions is shore power facilities that allow ports to shut of their engines when berthing in a port. Port regulations have so far only covered vessel speed reductions in proximity of the port and mandatory fuel switches. Incentives applied by ports include lower tariffs for ships that use cleaner fuels, are more energy efficient, or reduce their speed when close to a port. In various cases, these instruments are combined or applied subsequently, such as when incentive schemes facilitate a transition to stricter regulation. The policy instruments would need wider application in order for ship emissions in ports to be significantly reduced, however.

### About the author

Olaf Merk is Administrator, Ports and Shipping, at the ITF at the OECD. He has directed studies on ports, port-cities, port regulation, and governance. Olaf Merk is the author of various OECD books, most notably "The Competitiveness of Global Port-Cities". He is also lecturer on the Governance of Port-Cities at the Institute for Political Science (Sciences Po) in Paris. Prior to working with the OECD he worked for the Netherlands Ministry of Finance. He holds a Master's degree in Political Science from the University of Amsterdam.

### About the organisation



The International Transport Forum at the Organisation for Economic Co-operation and Development is an intergovernmental organisation with 54 member countries. It acts as a strategic think tank for transport policy and organises an Annual Summit of Ministers. The next Annual Summit will take place 27-29 May 2015 in Leipzig, Germany.

### Enquiries

ITF/OECD  
2, rue André Pascal  
75775 Paris Cedex 16  
France  
Tel: +33.1.45241660  
Email: olaf.merk@oecd.org  
twitter: @o\_merk

# One planet, one chance: let's get it right



Alpesh A. Sharma, CEO, Laem Chabang International Terminal, Laem Chabang, Thailand

Laem Chabang International Terminal (LCIT) is a part of DP World's global footprint in Thailand and is proactively playing its part in preserving the environment for the future. Care for the environment is one of the fundamental core values guiding every aspect of LCIT.

## Energy efficient RTGs

At LCIT, the rubber-tyred gantry cranes (RTGs) are equipped with Lithium-ion batteries which enable the effective storage and reuse of regenerated power. Furthermore, the main RTG engine has been downsized to half of the original diesel engine size, and this has directly reduced fuel consumption in an immediate and long-lasting fashion.

With the implementation of an engine variable speed control (EVSC) system, engine speed has also been optimised to match unique operational conditions, thus saving on unnecessary expenditure. With

an EVSC, a fuel saving of more than 50% has been achieved.

## RTG Hybrid Retrofitting System

The Mitsui Engineering & Shipbuilding Co (MES) Hybrid Retrofitting System has multiple benefits for end-users. Beside the huge fuel saving potential, reductions in emissions and noise can alter the paradigm of the RTG container handling business.

Currently, many terminals around the world have the same problem regarding the idling time of RTGs. An EVSC, which is implemented with an MES Hybrid System, is an excellent method to control the idling time of RTGs.

## Testing the Hybrid Retrofitting System

The MES Hybrid Retrofitting System has been monitored for a period of sixty consecutive days. The fuel consumption data of twelve RTGs are listed as follows (Table 1):

RTG no.	Total litres	Total hours	Total Moves	Litres/Hours	Litres/move
13	19,500	1,174	13,596	16.61	1.43
14	15,500	1,085	12,757	14.29	1.22
15	18,000	1,048	11,691	17.18	1.54
16	16,500	1,021	12,681	16.16	1.30
17	14,300	883	10,342	16.19	1.38
18	11,400	720	8,523	15.83	1.34
19	10,500	1,328	15,265	7.91	0.69
20	10,000	1,275	15,002	7.84	0.67
21	10,400	1,176	12,432	8.84	0.84
22	10,100	1,330	14,842	7.59	0.68
23	10,700	1,356	15,013	7.89	0.71
24	10,100	1,293	14,209	7.81	0.71

Table 1: Hybrid Fuel consumption performance data

One can see that it is difficult to compare the performance of one RTG to another. We have calculated that the average fuel consumption of an MES Hybrid System throughout the testing period was 7.98 litres per hour. Considering that a conventional RTG at 1500rpm consumes about 15-17 litres per operational hour, this is a significant decrease. Furthermore, we can see a correlation between the total moves and the consumed litres per move. The more containers that are handled, the better the relative performance (indicated in litres per move).

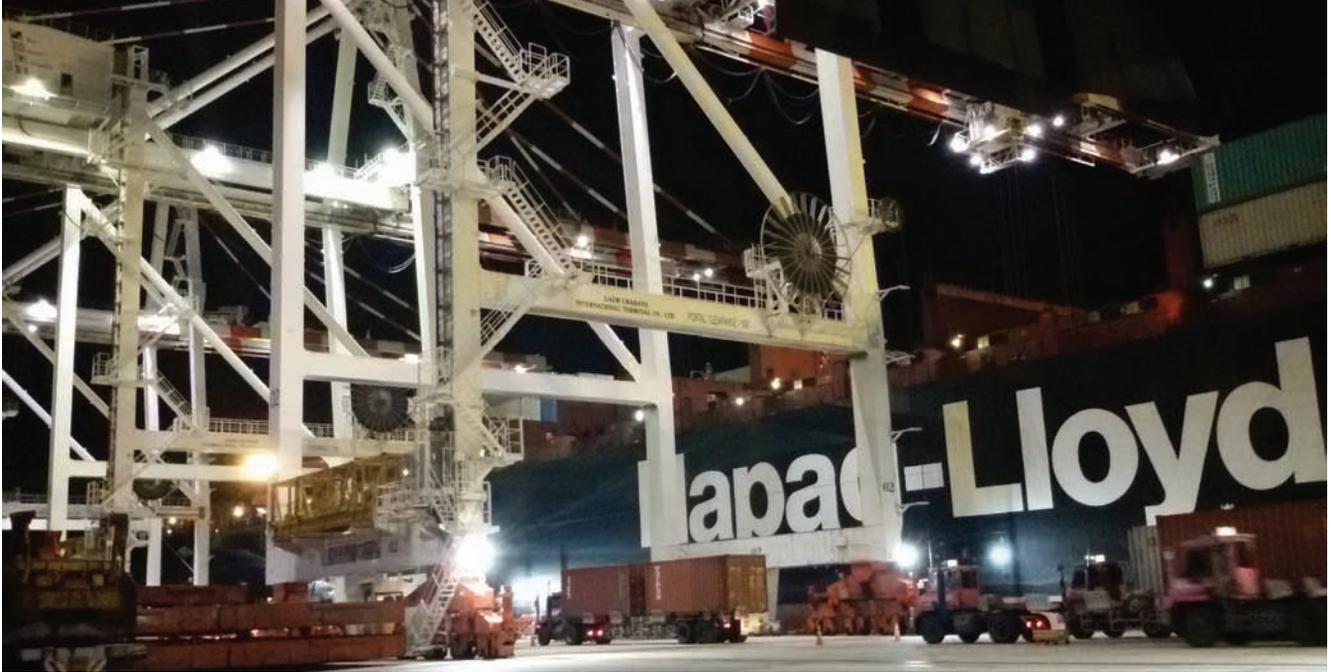
In short, the advantages of the MES Hybrid RTG are:

- Fuel saving performance
- Reduction of engine noise
- CO2 emission reduction
- Large battery life
- Decreases annual running costs

## Prismalence light

A prismalence light is a multipurpose light used for outdoor and indoor purposes. The technology behind it is an innovative prism optic lens that ensures efficient use of all light produced and hence reduces energy expenditure. The lens design comes with different angles, cut to cater for different needs. Prismalence light uses a ceramic discharge metal halide light source with a board spectrum that results in a clear and bright output of light that is around 90% equivalent to daylight.

Light fixtures installed on port cranes endure constant vibration, moisture and corrosion elements consistently present in marine environments. These extreme conditions result in premature lighting fixture failure which in turn demands constant maintenance, bringing ever-increasing material and labour costs. Installing properly designed prismalence



Top: Prismalence lights installed on quay cranes at LCIT; Bottom: Alpesh Sharma accepting the Green Award on behalf on LCIT

fixtures on port container cranes can immediately reduce energy usage, reduce crane maintenance costs and increase operator safety.

A traditional RTG lighting package includes at least 16 fixtures at 450-500 watts each which totals around 6,300 watts of power consumption. A prismalence light fixture is around 150 watts which reduces power consumption to around 3,900 watts – considerable saving.

A traditional quay crane lighting package includes at least 27 fixtures at 1,000 watts each, totalling 27,000 watts of power consumption. Prismalence lights for quay cranes are around 315 watts, which, with a combination of proprietary optics, can match the light levels of traditional light fixtures and reduce power consumption to around 18,500 watts – again, a considerable saving.

The advantages of prismalence lights are

as follows:

- Diesel fuel savings
- Reduced CO2 emissions
- Improved working environment
- Standardisation of lighting used on port equipment
- Saving of annual running costs

Prismalence lights are installed on all quay cranes and RTGs at LCIT. Standardisation of the wattage and fitting are streamlined without compromising light intensity, and therefore a saving of more than 60% energy has been achieved.

### Green Award

LCIT has been awarded the Green Award 2013 by the Port Authority of Thailand. LCIT was awarded this for the Hybrid RTG initiative discussed earlier. The initiative has reduced the terminal's carbon footprint and fuel consumption by around 50%.

### About the author

Alpesh Sharma is the CEO of LCIT. His previous positions include CEO at DP World Nhava Sheva and CEO at DP World-owned rail company DPW CRRS. He was also an operational head for Maersk Line, India and Sri Lanka Region, as well as Head of Operations for OOCL in India.

### About the company



Laem Chabang International Terminal was registered on January 16, 1996, under the Civil and Commercial Code of the Kingdom of Thailand. On April 11, 1996, the company was granted a thirty year concession by the Port Authority of Thailand to "construct, operate and manage" Container Terminal B5 at Laem Chabang Port.

### Enquiries

Laem Chabang  
International Terminal  
P.O. Box 11, Laem Chabang Port,  
Sriracha, Chonburi, 20231 Thailand

Tel: +66 (0)3840 8200 Ext 5301  
Fax: +66 (0)3840 1028

Email:  
somchai.widhayapichetsakul@lcit.com  
Web: www.lcit.com

# Environmental innovation at the Port of Long Beach



MaryKate McHardy, *Media Relations,*  
*the Port of Long Beach, California, USA*

The Port of Long Beach aims to be a model for seaports around the world with its innovative environmental policies and programs. Known as the 'Green Port', the Port of Long Beach has worked hard to become recognised as a world leader in seaport sustainability.

## A 'Green Port Policy'

It all started with the Green Port Policy, approved in 2005 by the port's governing body, the Long Beach Board of Harbor Commissioners. The policy is a guide for decision-making and establishes a framework for environmentally friendly port operations. The policy is an aggressive, comprehensive and coordinated approach to reduce the negative impacts of port operations. Its adoption marked a shift for the port from compliance-oriented programs to proactive environmental initiatives. In 2015, the port will celebrate the Green Port Policy's tenth anniversary, and the current board and new CEO Jon Slingerup have every intention of carrying through with the policy's environmental promise.

Along with pioneering programs such as the Clean Trucks Program, green leases, and the San Pedro Bay Ports Clean Air Action Plan, the Port of Long Beach has also implemented the 'Green Flag' and 'Green Ship' programmes in accordance with the Green Port Policy. Cargo vessels are major contributors to air pollution in and around a port, and Green Flag encourages vessel operators to slow their ships when calling in at Long Beach in order to reduce emissions.

Green Flag is in its tenth year and participation is nearly universal. The programme rewards vessel operators for slowing down to 12 knots or less within 20-40 nautical miles of Long Beach, as

slower ships produce fewer emissions. In 2013, 98.9% of all ships calling at Long Beach slowed within 20 nautical miles, and 87.9% slowed within 40 nautical miles. Green Flag participants were awarded US\$2.9 million in 2013 for the efforts they made. At a ceremony in May 2014, seven of the world's largest vessel operators were honoured as top performers, achieving at least 90% participation and earning special Green Flags.

Following the success of the Green Flag Program, Long Beach introduced the Green Ship Incentive Program in 2012. The programme rewards vessel operators for bringing the newest and cleanest ships to Long Beach. This clean-air initiative targets smog-causing nitrogen oxides, thereby rewarding qualifying vessel operators for deploying today's greenest ships to the Port of Long Beach and accelerating the deployment of tomorrow's vessels. Newer ships have engines meeting environmental standards and they are at least 15% cleaner than earlier generations. This program also offers dockage fee incentives and for the year of 2013, \$460,000 was awarded.

## Shore power

Long Beach has also led the way in utilising shore power. Shore power allows ships to tap landside electricity for their power needs at berth – lights, pumps, communications, and refrigeration can all be ran by shore power – instead of running polluting diesel-fueled auxiliary on-board engines. Moving briskly to outfit its container terminals with shore power, Long Beach has required terminal and vessel operators to use shore power through its green leases since 2006, and it continually seeks out opportunities to increase the use of shore power beyond

regulatory requirements. Long Beach is also the first and only port in the world to use shore power at an oil tanker facility.

In order to meet the California Air Resources Board's shore power regulation deadline of 50% of container ships plugging in by January 2014, Long Beach completed \$175 million worth of dockside power hookups. Vessel operators retrofitted older ships for shore power and electricity supply company Southern California Edison worked to install a new transmission system to meet the increased power demand. The state requirement rises to 80% of container ships plugging in by 2020, and Long Beach is on pace to exceed this requirement. Shore power cuts air pollution from ships at berth by up to 95% and plugging in one container ship for one day is the equivalent of taking 42,000 cars off the road. As of January 2014, at least one berth at every container terminal at the Port of Long Beach has shore power. By 2020, all container berths will be connected.

## Universal cuts in emissions

With the combined efforts of shore power and slowing down ships, the Port of Long Beach has taken a major stand to improve air quality in Long Beach and beyond. Other ports around the world are following Long Beach's lead and requiring ships to slow down as they come into harbour as well as requiring the use of cleaner ships.

In the most recent Air Emissions Inventory, which compares current levels to the baseline year 2005, when the Green Port Policy was adopted, Long Beach has posted impressive air quality numbers. Over the past ten years, during which the amount of cargo coming into the port has increased by 0.3%, nitrogen oxides are



down 54%, diesel exhaust emissions are down 82%, sulfur oxides which mainly come from ships are down 90%, and greenhouse gases are down 20%.

### New technologies

Besides implementing sustainable measures, an integral part of the Green Port Policy is a commitment to invest in new technology. Long Beach is now funding the testing of a new air pollution-control technology for docked cargo ships. The new system could provide an alternative to shore power for when it's not possible for ships to plug-in. The barge-based Alternative Maritime Emission Control System (AMECS) diverts a docked ship's emissions into an air-pollution filter-and-treatment device.

Long Beach is also contributing \$2 million toward a \$13.5 million project by the South Coast Air Quality Management District to test an overhead 'eHighway' catenary system for powering trucks. A demonstration project of the all-electric technology, used for fixed-route transportation such as San Francisco's cable car and light rail commuter lines in Los Angeles County, is due to be built in 2015 alongside a 1-mile stretch of land near the port in 2015.

### Environmentally friendly projects

Long Beach is investing \$4 billion in capital improvement projects in this decade alone. One part of this investment is the \$1.3 billion Middle Harbor

Terminal Redevelopment Program which involves the rejuvenation of two ageing terminals and the morphing of them into one of the world's most technologically advanced and greenest container shipping facilities. In keeping with the Green Port Policy and the San Pedro Bay Ports Clean Air Action Plan, the project will minimise, and possibly eliminate, negative environmental impacts from shipping operations. At the same time, this project will double the capacity of the existing terminals.

To reduce further environmental impacts, the project includes shore power, an expanded on-dock rail to shift more than 30% of cargo shipments from truck to train, zero-emission (or very low emission) yard equipment, electric-powered rail-mounted gantry cranes, Vessel Speed Reduction programme requirements, use of low-sulphur fuels for the main and auxiliary engines of ships, green building certification for all structures, storm water pollution prevention, solar panels and the reuse or recycling of waste materials such as concrete, steel, copper and other materials during construction.

With these bold initiatives and projects, Long Beach is dedicated to improving air quality more quickly and aggressively than has ever been attempted by any seaport anywhere in the world. For these reasons, the Port of Long Beach is recognised internationally as one of the world's best seaports, and locally as a partner dedicated to helping the community thrive.

### About the author

MaryKate McHardy is a Media Relations Specialist for the Port of Long Beach. She focuses primarily on green and environmental topics. After a brief stint as a marketing coordinator for a green architecture firm in Los Angeles, MaryKate came to the Port of Long Beach in January 2014. MaryKate obtained a BA in Communications from the University of Arizona, as well as an MA in Arts Management and an MBA in marketing from Claremont Graduate University.

### About the organisation



The Port of Long Beach is one of the world's premier seaports and a leading gateway for trans-Pacific trade as well as a trailblazer in innovative goods movement, safety and environmental stewardship. With 140 shipping lines connecting Long Beach to 217 seaports, the port handles cargo valued at \$180 billion each year, supporting 1.4 million jobs in the US. In 2014, Long Beach was named the world's "Best Green Seaport" by its customers in Asia in recognition of the port's industry-leading environmental sustainability projects. The Port of Long Beach is the second-busiest container seaport in the US.

### Enquiries

Port of Long Beach  
4801 Airport Plaza Drive  
Long Beach, CA, 90815  
info@polb.com

# SUBSCRIBE TO PORT TECHNOLOGY INTERNATIONAL

- ▶ The quarterly technology journal for ports, harbours and terminals
- ▶ Exclusive analysis on emerging technologies from leading industry experts
- ▶ Online access to over 700 technical articles from the journal archives

Simply complete and return the form below by fax or post, email us at [info@porttechnology.org](mailto:info@porttechnology.org) or subscribe online at [www.porttechnology.org/subscription](http://www.porttechnology.org/subscription)

- 1- Fax this form: +44 (0) 20 7871 0101
- 2- Post this form: Port Technology International, 5 Prescot Street, London E1 8PA UK
- 3- Telephone: +44 (0) 20 7871 0123
- 4- Email: [info@porttechnology.org](mailto:info@porttechnology.org)

I would like to receive the following copies of Port Technology International

<b>4 editions (1 year):</b>	<b>USD \$250</b> <input type="checkbox"/>	<b>EUR €200</b> <input type="checkbox"/>	<b>GBP £150</b> <input type="checkbox"/>
<b>8 editions (2 years):</b>	<b>USD \$450</b> <input type="checkbox"/>	<b>EUR €360</b> <input type="checkbox"/>	<b>GBP £270</b> <input type="checkbox"/>

Back issues can be ordered, please call or email for more details and are subject to availability.

Your details / delivery address

Name: \_\_\_\_\_ Job Title: \_\_\_\_\_  
 Company/Port/Organisation: \_\_\_\_\_  
 Full Address: \_\_\_\_\_  
 \_\_\_\_\_  
 Zip/Post Code: \_\_\_\_\_ Country: \_\_\_\_\_  
 Telephone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_  
 E-mail: \_\_\_\_\_ Web URL: \_\_\_\_\_

Payment details

Payment enclosed (please make International money order/cheques payable to Maritime Information Services Ltd.)

Bank transfer completed

Account Name: Maritime Information Services Limited; Account Number: 40765155; Sort Code: 20-39-53;  
 Swift Code: BARC GB 22; IBAN Number: GB 78 BARC 203953 40765155;  
 Bank: Barclays Bank Plc, 10 Hart Street, Henley-on-Thames, Oxon, RG9 2AX.

Please charge my credit card

Visa  Amex  Mastercard



Card holder's name: \_\_\_\_\_

Card number: \_\_\_\_\_

Last 3 digits on the back of the card: \_\_\_\_\_

Expiry date: \_\_\_\_\_

Card holder's full postal address: \_\_\_\_\_

If you do NOT want to receive our free weekly e-newsletter tick here

If you do NOT want to receive our free daily email news alerts tick here

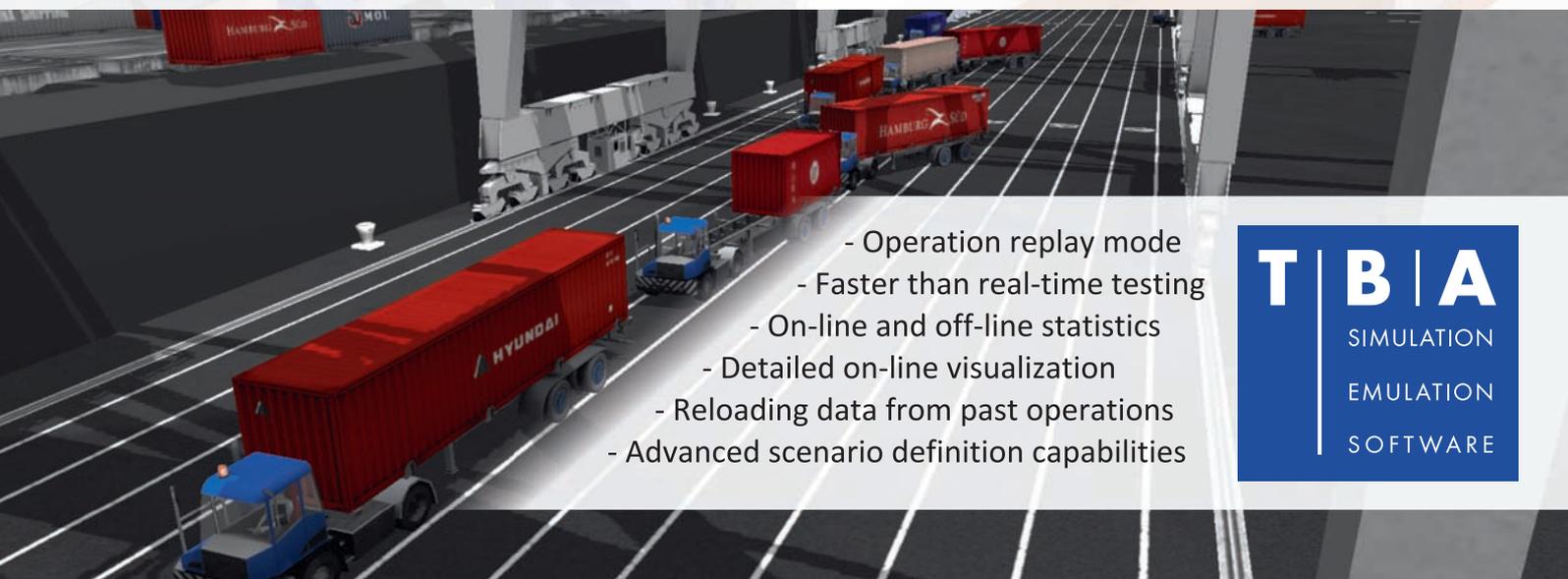
**Signature** \_\_\_\_\_ **Date** \_\_\_\_\_

# Improving terminals together using advanced technologies



## Optimising your Terminal Operating System

By acting as a 'virtual terminal' to which the TOS is connected, CONTROLS enables a TOS to be tested before go-live to prevent start-up problems, and to be tuned to specific characteristics of the terminal's operation to deliver its full potential. Furthermore, the TOS operators can be trained in isolation from the real operation to facilitate key learning experiences without hindering to terminal operations.



- Operation replay mode
- Faster than real-time testing
- On-line and off-line statistics
- Detailed on-line visualization
- Reloading data from past operations
- Advanced scenario definition capabilities



# Marine ingenuity



Get more info with



## Dredging

In just two words, marine ingenuity, we express that we are passionate dredging and marine contractors with a worldwide innovative approach to meet your challenges. Our people - who manage a versatile fleet - specialise in dredging, marine engineering and offshore projects (oil, gas and wind).

[www.vanoord.com](http://www.vanoord.com)

## Offshore Oil & Gas



## Offshore Wind Projects

