Fifty-Fifth Edition
www.porttechnology.org

PORT TECHNOLOGY INTERNATIONAL

THE POST-PANAMAX ERA

Are global ports ready?

Page 37

ARCTIC SHIPPING

A navigable polar region

Page 10

TERMINAL AUTOMATION

Upgrading to AGVs

Page 70

LOGMARIN
ADVISORS

Taking marine logistics one step further

Our strength lies with versatility and customized solutions for waterborne transport and logistics

- Feasibility studies
- Process simulation modelling
- Hazard and operability study
- 3D animating
- Devise and Design
- Commercial, Operational and Technical Assistance

WHAT WE DO:
We fill the gap between dry-bulk commodity suppliers and end-users.

A valuable support for either greenfield projects or existing facilities for cost-effective, customised and environmentally sustainable dry-bulk terminals (onshore and offshore) and associated waterside facilities.

World leader in floating cranes/terminal design

Success doesn't happen by chance. Thanks to all our clients for putting their trust in us

Princesse Chloe
Experience doesn't lie

Ore Fabrica
Going large

Princesse Abby
Tough little girl

Toros Terminal
A Representative on shore project

Australia, Bahrain, Brazil, Colombia, France, India, Indonesia, Italy, PNG, Qatar, Russia, Romania, Senegal, Sierra Leone, Spain, Suriname, Sweden, Thailand, UAE, USA, Vietnam

Some of our achievements

RINA

We compete against our clients' bottlenecks together towards a common goal, not against rivals

PORT TECHNOLOGY INTERNATIONAL

Published by:
Maritime Information Services Ltd
Trans-World House, 100 City Road
London EC1Y 2BP

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

Publisher:
Bernard Henry

Online Editor & Editorial Assistant:
Linton Nightingale

Editorial Coordinator:
Claire Farrell

Design & Production:
Tina Davidian, Stuart Wright, Daniel Brown

Sales Manager:
Michael Stewart

Distribution and Print organised by:
Head to Head Limited

Front cover:
Coeclerici Logistics Floating Transfer Station (FTS) Bulk Borneo during loading operations at Muara Pantai – Indonesia

Picture courtesy of Luca Forno (Genoa-Italy) for Coeclerici Logistics Spa/ All rights reserved

Fifty Fifth Edition, Summer 2012
ISSN: 1358 1759

Introduction

The expansion of the Panama Canal is now just two years from completion, and the race to be ready for the post-Panamax era is gathering pace.

The major ports of the Far East have been quick to react with both expansion and dredging projects well under way or completed, while European ports including Rotterdam, Hamburg and France's Le Havre have already started to receive post-Panamax vessels.

However, as IADC secretary general René Kolman explains on page 37, ports in the US, and in particular those located on the East Coast and Gulf Coast, are lagging behind. By 2014, Port Miami is expected to be one of just three Atlantic ports capable of handling post-Panamax cargo ships. On page 35, Bill Johnson, the director of Port Miami, describes how the newly widened waterway will completely change how US shippers move their goods to market, while public relations manager for the South Carolina Ports Authority Alison Skipper, on page 54, reveals how the Port of Charleston plans to modernize its infrastructure to cope with the influx of larger ocean carriers.

Also in this edition, Malte Humpert and Andreas Raspotnik of the Arctic Institute discuss how the rapidly melting Arctic sea ice could transform the polar region into a navigable seaway over the coming decades, highlighting the economic challenges and obstacles that will have to be overcome before the route becomes a cost-effective route for shipping lines. (page 10)

Furthermore, Vicky Kaselimi and regular PTI contributor Dr. Theo Notteboom analyze the value of opening terminals to private operators (page 14), while Jim Devine, president and CEO of Global Terminals Inc, talks to us about the container terminal operator's plans to both expand and introduce automated technology at its New Jersey facility. (page 132)

In our Mooring and Berthing Section, Captain Ben van Scherpenzeel of the European Harbour Masters' Committee explains why 'safe mooring starts at sea' (page 117), and the founders of the Dry Bulk Experts Group assess the potential of dry bulk terminals. (page 95)

We also look at how two ports on the English South Coast, Dover (page 26) and Portsmouth (page 32), are preparing for their respective futures.

To keep up-to-date with the latest industry news log on to our website www.porttechnology.org, which attracts over 25,000 visitors per month, and features our free-to-access Journal Archive, our essential Business Directory, and details of how to sign up to our bi-weekly newsletter.

Finally, on behalf of everyone at PTI, I would like to thank all of our authors and partners for their invaluable contribution to our fifty-fifth edition.

Linton Nightingale
Online Editor & Editorial Assistant
Email: lnightingale@porttechnology.org
Twitter: @PortTechnology

Visit our new-look website at www.porttechnology.org

Network with other PTI readers on our LinkedIn group: http://linkd.in/porttech

Contents


24


28


33

martin®

“PROBLEM SOLVED” ISN’T JUST OUR TAGLINE, IT’S WHO WE ARE.

Spillage, airborne dust and carryback problems aren’t simply annoyances. They put productivity, employee safety and your organization at risk.

Here at Martin, we focus on completely understanding and assessing your problems up front to deliver comprehensive solutions that work; on time and on budget, ensuring your bulk material handling problems stay solved. With Martin, consider it done.

PROBLEM SOLVED.™

visit **martin-eng.com** | call **800-544-2947** | email **info@martin-eng.com**

A Global Company.

Contents

HITT

Realize your port's potential

Ports play an essential role in the global supply chain. In today's ports, fast and efficient turnaround of ships drives competitive advantage, while delays cost money and irritate customers.

Fast turnaround requires careful monitoring of traffic and efficient planning of berths and services. To do this, your port depends on accurate, up-to-date information.

HITT's suite of solutions provide what you need to maximize safety and efficiency.

Solutions that include the V3000 Vessel Traffic Services System, and the KleinPort Port Management Information System.

Individually, V3000 and KleinPort are market leaders. Together, their tight integration provides an unbeatable combination, constantly synchronizing the latest information to propel any size port to maximum efficiency.

See how HITT's solutions can help you take your port the next level.
Visit us at www.hitt-traffic.nl/wave to learn more.

Contents


71


86


92

The eyes and ears of the terminal.

Leading the Way with the Proven TOS for Optimizing Terminals

Today's leading terminals are moving to state-of-the-art technologies to enhance the productivity and efficiency of their operations. With Navis, terminal operators find the right partner to make smart choices which maximize return on investment and mitigate risks associated with implementation of new technologies.

Next generation terminal solutions must integrate the core TOS with other process technologies for optimized results. Navis has been a key player in making this a reality for more than 250 terminals of all sizes across the globe.

This is just one more reason why Navis is the global technology standard for managing the movement of cargo through terminals.

See what our customers have to say.
Visit **www.navis.com/eyesandears10/** to learn more.

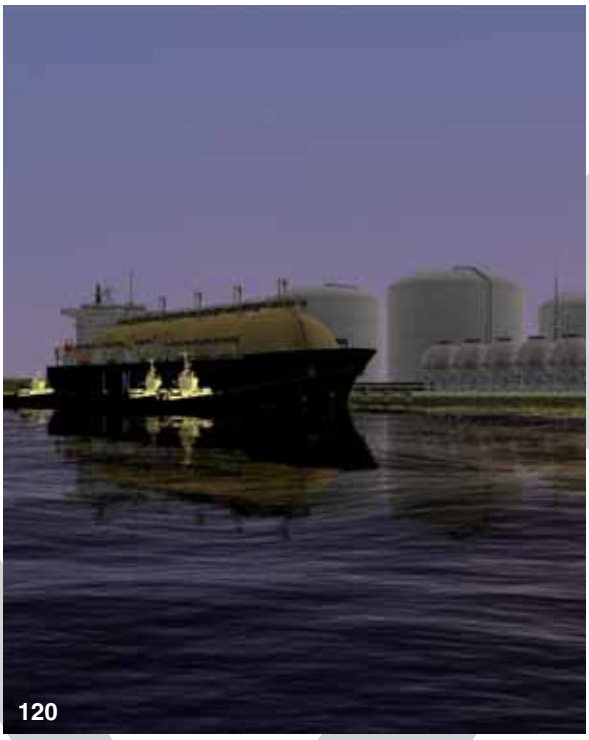
navis®
PART OF CARGOTEC CORPORATION

navisworld 2012
October 7-10, 2012
San Francisco, California
www.navis.com/NavisWorld

The Global Standard

Contents


115


120

Global Issues

Source: Wikimedia Commons | US Coast Guard Atlantic Area

"Over the past decades the Arctic has witnessed a much faster than anticipated decline of sea-ice and the continuation of this trend will transform the Arctic Ocean into a navigable seaway over the coming decades."

'The future of Arctic shipping', page 10.

The future of Arctic shipping

Malte Humpert, founder and executive director and **Andreas Raspotnik**, analyst, both at The Arctic Institute, Washington, DC, USA

Arctic sea ice is melting rapidly, and within the next decade the effects of global warming may transform the Polar region from an inaccessible frozen desert into a seasonally navigable ocean. The summer of 2011 saw a record 33 ships, carrying 850,000 tons of cargo navigate the Northern Sea Route (NSR) off Russia's northern coast. This year's shipping season may see up to 1.5 million tons of cargo, as Germany's Alfred Wegener Institute predicts the NSR to be ice-free and passable for ships by early summer.

The North West Passage (NWP), first ice-free in 2007, and the Transpolar Sea Route (TSR) may also open up to shipping traffic over the coming decades. An in-depth assessment of the viability of shipping along the TSR will be published in the upcoming Arctic Yearbook 2012, which will be available from the Northern Research Forum's website from October 2012. The development of Arctic offshore hydrocarbon resources and related economic activities will also improve the integration of the Arctic economy in global trade patterns. Multi-year ice and the limited seasonal window for trans-Arctic voyages however, will for the foreseeable future remain formidable obstacles to the development of Arctic shipping and its economic viability. Trans-Arctic shipping routes will thus not serve as a substitute for existing shipping lanes, but will instead provide new and additional capacity for a growing transportation volume.

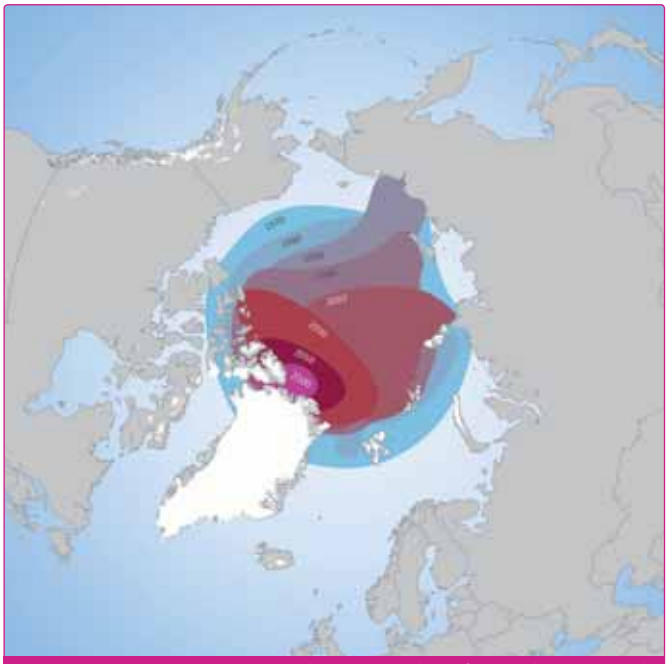


Figure 1: Sea ice extent observations (1970 to 2007) and forecast (2030 to 2100) reproduced using data from the NOAA GFDL model. Yearly extent represents an average 80 percent sea ice concentration (courtesy of wunderground.com).

A navigable Arctic Ocean?

Summer ice extent has declined by 40 percent since satellite observation began in 1979, and over the same period sea ice has thinned considerably, experiencing a decline in volume of 70 percent. Studies differ widely in their predictions of when summer sea ice will melt completely. The latest findings suggest that Arctic sea ice may have entered into a new state of low ice cover The article: A recent article by Valerie N. Livina and Timothy M. Lenton on the bifurcation of Arctic sea-ice cover describes it as "distinct from the normal state of seasonal sea ice variation." Arctic sea-ice may have crossed a tipping point which could soon make ice-free summers an annual feature across most of the Arctic Ocean.

Longer ice-free periods

A new study by the National Aeronautics and Space Administration (NASA) suggests that multi-year ice, which is the oldest and thickest Arctic sea ice and the principal obstacle to shipping in the Arctic Ocean, is disappearing at a faster rate than the younger and thinner ice. The ice-free period along the Arctic's main shipping routes is expected to increase from around 30 days in 2010 to more than 120 days by the middle of the century. Furthermore, the distribution of the remaining summer ice will not be uniform across the Arctic Ocean. Studies suggest that sea ice will collect and persist longest along the northern flanks of the Canadian Archipelago and Greenland while the central and eastern part of the Arctic will see the most significant decline of ice, further extending the shipping season along the NSR. In 2011 the navigational season along the NSR lasted for 141 days, from early July until mid-November (see figure 1).

Significant obstacles remain

Nonetheless, significant obstacles to shipping remain such as icing from sea spray, wind chill, remoteness as well as their implications for rescue and emergency operations, and the lack of reliable weather forecasts. During the winter and spring months ice conditions along Arctic shipping routes will remain heavy, and the amount of floating sea ice and number of icebergs - a hazard to the safety of marine transport, may increase during the early melt season as more ice floes break apart and drift across the Arctic Ocean.

Shorter sailing distances

Routing shipping traffic through the Arctic allows for shorter sailing distances resulting in shorter trips. Shipping operators can achieve cost savings through a reduction of number of days at sea, energy efficiency improvements due to slower sailing speeds, or a combination of both.

Distance savings along Arctic shipping routes can be as high as 40 percent compared to the traditional shipping lanes via the Suez Canal. Shorter sailing distances allow for considerable fuel cost savings. The reduced number of days at sea allows a ship to make more return trips resulting in increased revenue and potentially greater profits.

Instead of realizing time savings, operators can also adopt super-slow sailing. A vessel traveling from China to Murmansk can reduce its speed by 40 percent and still arrive in Japan at the same time as a ship sailing at full speed traveling through the Suez Canal. Super-slow sailing can also double a vessel's energy efficiency performance, resulting in a significant reduction of greenhouse-gas emissions. If a future emissions control framework was to include global maritime traffic, this reduction of emissions could thus also result in significant cost savings.

Figure 2: Arctic shipping routes (courtesy of the Arctic Portal).

Economic feasibility of Arctic shipping

Global shipping operations are dependent on three key factors: predictability, punctuality, and economy-of-scale, all of which are currently limited in Arctic shipping. Consequently, the lack of schedule reliability and highly variable transit times along the Arctic shipping routes represent major obstacles to the development of Arctic shipping.

The majority of cargo ships that travel the world's oceans operate on regular schedules, known as liner service. In total more than 6,000 ships, most of them container ships, follow a set route calling at a number of ports to load and unload cargo, which consequently supplies the concerned country's hinterland. Profitability can only be achieved with large-scale shipping based on stable and predictable (year-round) operations. The ability to schedule journeys a long time in advance and to guarantee uninterrupted service is considered key for container ship operators. Bulk dry and wet carriers, on the other hand, follow less predictable schedules and their routes depend more on changing supply and demand of less time-sensitive items. Of the four kinds of Arctic voyages undertaken in the Arctic Ocean - destination transport, intra-Arctic transport, trans-Arctic transport and cabotage - trans-Arctic shipping may face the most significant hurdle to becoming part of the global trade patterns.

Draft and beam restrictions

Arctic shipping routes, especially the NSR, are subject to significant draft and beam restrictions. Ships along the NSR must pass through a number of narrow and shallow straits in the Kara and Laptev Sea. The Yugorskiy Shar Strait at the southernmost entrance from the Barents to the Kara Sea follows a channel 21 nautical miles long and 12-30 meters deep. Along the eastern section of the NSR, ships must navigate either the Dmitry Laptev Strait or the Sannikov Strait to pass through the New Siberian Islands and travel from the Laptev to the East Siberian Seas. The eastern approach of the Laptev Strait has a depth of less than 10 meters, restricting the draft of ships to less than 6.7 meters. In addition, Russia's government only permits ships with the highest ice classification – 1A Finnish Swedish, to sail the route. Currently, only three vessels out of more than 2,000 Panamax ships have that classification.

Arctic shipping infrastructure

A key characteristic of Arctic shipping routes is the limited number of ports of call. According to the Arctic Logistics Information Office, 16 ports, most of them ice-covered for part of the year, are located along the NSR. The port of Murmansk and the port of Petropavlovsk on Russia's far-east Kamchatka peninsula are considered essential for the development of the NSR. Both ports are expected to serve as terminals and hubs of the NSR. In November 2011 Vladimir Putin announced a major overhaul of the entire Russian transport system with special attention to maritime traffic in the Arctic. Russia plans to build up to 10 emergency centers focused on meteorological and rescue services as well as border patrol along the NSR. The capacity of Russia's seaports is scheduled to increase 50 percent by 2015 and the country plans to invest 134 rubles (€3.4 billion) into developing maritime traffic over the next 10 years.

The port of Kirkenes, Norway and the port of Vopnafjörður, Iceland may serve as major future Arctic hubs. Iceland's strategic location at the entrance and exit to the Arctic Ocean and Vopnafjörður's suitability as a deep-water port with depth up to 70m, may allow development into a transshipment hub. Future development and investment will however, depend significantly on the country's financial and economic situation and foreign investments. Over the past decade China has continuously increased its economic cooperation with the small island nation and China's premier Wen Jiabao recently visited Iceland to further strengthen the economic ties between the two countries. A Chinese delegation also visited the Faroe Islands, a small group of islands under the sovereignty of the Kingdom of Denmark, where domestic policy makers have also identified the island's role in future Arctic shipping as a priority.

Conclusion

Over the past decades the Arctic has witnessed a much faster than anticipated decline of sea ice and the continuation of this trend will transform the Arctic Ocean into a navigable seaway over the coming decades. Yet due to the region's unique navigational and economic challenges Arctic shipping will, for the foreseeable future, only be cost effective for a limited number of operators.

ABOUT THE AUTHORS

Malte Humpert is the founder and executive director of The Arctic Institute. He has been working on Arctic issues since 2007, focusing primarily on shipping along the Northern Sea Route, oil and gas developments in the Bering and Chukchi Seas, and the impact of climate change on Arctic sea ice.

Andreas Raspotnik is an analyst at The Arctic Institute and currently a research fellow at the University of Cologne (Marie Curie ITN EXACT). He is primarily dealing with the European Union's regional engagement, Arctic shipping and related environmental protection, and the interaction between policymaking and public international law.

ABOUT THE COMPANY

The Arctic Institute

The Arctic Institute is an interdisciplinary and independent research platform for information and in-depth analysis about the developments in the Arctic based in Washington, DC, USA.

ENQUIRIES

The Arctic Institute
Center for Circumpolar Security Studies
P.O. Box 32175
Washington, DC 20007,USA
Email: info@thearcticinstitute.org
Web: www.thearcticinstitute.org

IAPH refreshes its vision at mid-term conference

Susumu Naruse, secretary general, International Association of Ports and Harbors (IAPH), Tokyo, Japan

Attended by over 200 delegates from 31 countries, the mid-term conference and board meeting of the International Association of Ports and Harbors (IAPH) was successfully held in Jerusalem, Israel from21-24 May, hosted by Israel Ports Company. IAPH's mid-term conference/board Meeting is held in even-numbered years between the IAPH World Ports Conferences, which are held in odd-numbered years.

IAPH adopts new vision and mission statements

The event was significant in that, at the IAPH board of directors meeting on 22 May, agreement was made to adopt a new vision and fresh mission statements along with their supporting objectives. These redefine who we are and what we intend to do in the future within and beyond the organization.

The new IAPH vision has been defined as: 'the global ports' forum for industry collaboration and excellence'. The new IAPH mission statement is: 'promoting the interests of ports worldwide through strong member relationships, collaboration and information-sharing that helps resolve common issues, advance sustainable practices and continually improve how ports serve the maritime industries.

In order to achieve this mission, a range of objectives were identified. These are: to strengthen relationships among the member ports by facilitating interaction, dialogue, problem-solving and formulation of best practices; leverage member expertise through strong technical committees and programs that create platforms focused on resolving complex port and maritime industry concerns and building greater efficiency and sustainability for ports worldwide. Also, to promote and demonstrate IAPH members' leadership and commitment to a cleaner, safer and more environmentally sustainable industry for the benefit of the global community; and to proactively coordinate with other international maritime and related organizations and advocate for global solutions to issues that impact upon IAPH members.

Since its inception in 1955, IAPH has always strived to be the world's leading international maritime body in terms of bringing the ports of the world together to collaborate, share best practice, and protect the legitimate interests and rights of ports and harbors. To that end, these updated vision and mission statements and their supporting objectives have reaffirmed our continued commitment to bringing ports together and providing a common industry voice pertaining to global port-related issues and maritime regulations.

IAPH Women's Forum launched

This occasion also played host to the inaugural meeting of the IAPH Women's Forum. This was attended by over 20 female IAPH members and non-IAPH members alike who were present in Jerusalem for the IAPH mid-term conference, under the chairmanship of Dr. Geraldine Knatz, President of IAPH, who leads her port of Los Angeles, CA, USA, as its executive director.

FIGURE 1: IAPH mid-term conference, Jerusalem, Israel

The meeting provided an ideal opportunity to exchange ideas and experiences on how women in the port industry can be boosted, advanced and empowered. The Women's Forum is scheduled to meet at future IAPH conferences and meetings to continue discussing women's issues in the maritime industry, ways to encourage women to join the industry and to promote training programs enabling women to better compete for positions at all levels, including those previously not open to women.

IAPH concludes a Memorandum of Understanding (MoU) for cooperation with ESPO

At the closing of the board of directors' meeting on22 May, a MoU was signed between IAPH and the European Seaports Organization (ESPO) to reinforce cooperation between the two organizations in promoting and representing port views at international forums of the European Union (EU), International Maritime Organization (IMO) and others. The MoU will facilitate the process of sharing best practices and experiences on topics of mutual interest and concern. In a similar context, IAPH previously concluded MoUs with the International Navigation Association (PIANC) in 2001, American Association of Port Authorities (AAPA) in 2004 and the Inter-American Committee on Ports (OAS-CIP) in2005, with the MoU signed with ESPO becoming the fourth one.

Highlights of IAPH technical committee meetings in Jerusalem

IAPH survey on container weights

In January 2012, the IAPH's Committee on Port Safety and Security conducted a survey of its member ports to determine what measures are being taken to address the critical issue of

overweight or incorrectly declared containers, including the availability of facilities for scaling containers, the existence of verified weight certificates, etc. A total of 74 responses from 25 countries were received, which were analyzed and compiled as a report for posting on the IAPH website. It is fully accessible by the IAPH members and partially by non-IAPH members. Among others, over 90 percent of the respondents indicated that the issue poses a serious danger to port operations and needs to be dealt with properly by way of new rules to be established at the international convention for the Safety Of Life At Sea (SOLAS) held by the International Maritime Organization (IMO).

Prior to this survey, IAPH had adopted a resolution on 'The safety of containers in the supply chain' at its Busan Conference in May 2011, urging the (IMO) to adopt requirements for shippers to declare and document cargo correctly with actual weighing at origin. In December 2011, IAPH along with other associations of maritime carriers namely the World Shipping Council (WSC), the International Chamber of Shipping (ICS), and BIMCO (Baltic and International Maritime Council), issued a press release to encourage the IMO to amend its rule to require shippers to declare the actual weight of containers before loading.

Most recently in June 2012, IAPH joined the governments of Denmark, the Netherlands and the United States and several maritime industry associations including BIMCO, ICS, WSC and the International Transport Workers Federation (ITF) in submitting a proposal entitled 'Development of measures to prevent loss of container - Verification of Container Weights' to the IMO's Sub-Committee on Dangerous goods, Solid cargoes and Containers (DSC) for consideration at its 17th session, 17-21 September 2012. The proposal discusses whether and how to amend SOLAS to require verification of containers' actual weight before loading onto a ship regulated by SOLAS, in response to the DSC.

World Ports Climate Initiative (WPCI)

The WPCI launched in 2008 by the IAPH Port Environment Committee in Los Angeles, USA, is committed to fighting global warming, more specifically the reduction of greenhouse gas emissions in ports. Since 2008, several project groups have been established within the WPCI to perform specific tasks and to achieve specific goals. Accordingly we can now see tangible results achieved by such project groups as Environmental Ship Index (ESI), Onshore Power Supply (OPS) and Carbon Footprinting. These can all be seen on the IAPH website. .

Ongoing projects within WPCI address such topics as intermodal transport, cargo handling equipment, terminal lease agreement template and the latest project group concerns Liquefied natural gas (LNG) Fueled Ships and dealing with the storage and bunkering of LNG.

Port Planning and Development

Two ambitious research projects are now undertaken by IAPH port planning and development committee – firstly, an analysis of the demand and requirements of specialized port infrastructure for the offshore wind industry that has so far made available information as to where off-shore wind farms are now in operation, under construction and planned in the world. Secondly, a project looking into the effects of the navigability of the North Sea Route (NSR) and the Northwest Passage (NWP) in the context of global warming and the resultant climate change.

A final report on the above mentioned projects is scheduled to be submitted to the IAPH World Ports Conference, Los Angeles, USA, 6-10 May 2013.

An interesting presentation entitled 'The impact of the tsunami on port infrastructure and the recovery efforts to restore port services'" was made by a Japanese government official responsible for ports and harbors, in which how port infrastructure in the earthquake/tsunami devastated area was destroyed and damaged and how they have so far been recovered.

Port Forum Sessions

The second and third days of the IAPH mid-term conference featured open sessions dealing with stimulating themes of global trade trends, their impact on the shipping and port infrastructure requirements and the funding of such development projects. Interesting topics presented at the sessions included the evolving role of the port authority, capacity evaluation, competition, customer service, port-community relations and the latest port environmental issues.

Professor Stanley Fischer, governor of the Bank of Israel, delivered a keynote speech and updated the audience as to where we were in the recent past and where we are going in the future in terms of GDP, interest rate, inflation, government debt, growth rates, unemployment, etc., putting us in a macroeconomic perspective.

In addition, a parallel workshop session was held to wrap up the sessions in Jerusalem on the topics of: preparing a strategic master plan; port economic contributions to local economy; women in the port industry; and port security technology.

Almost all the presentations made in Jerusalem are available online at the dedicated conference website and also on the IAPH website.

ABOUT THE AUTHOR

Susumu Naruse graduated from Tokyo University in 1975 and furthered his education at Stanford University, earning a Master's degree in infrastructure planning and management in 1986. He has accumulated extensive experience in working with port authorities in foreign countries as well as Japan through working in various offices of the Government. He first participated in IAPH activities in 2000 as one of the members of the executive committee, a position he held until 2006. In 2009, he assumed his current position as Secretary General.

ABOUT THE COMPANY

Founded in 1955, **IAPH** is a global alliance of some 200 ports and 150 maritime companies represented from 90 countries. IAPH member ports altogether handle nearly 80 percent of world container traffic and more than 60 percent of world seaborne trade. Our aim is to foster cooperation among member ports, promoting a vital role ports in the world trade. Based in Tokyo and recognized as the only voice speaking for ports around the globe, IAPH is given Consultative non-governmental organization (NGO) status from the United Nations agencies, including the IMO.

ENQUIRIES

Mr. Susumu Naruse, Secretary General
The International Association of Ports & Harbors (IAPH)
7F, South Tower New Pier Takeshiba
1-16-1 Kaigan, Minato-ku, Tokyo 105-0022, Japan
Tel: +81-3-5403-2770
Fax: +81-3-5403-7651
Email: info@iaphworldports.org
Web: www.iaphworldports.org

The value of opening terminals to private operators

Vicky Kaselimi and **Dr. Theo Notteboom,** Institute of Transport and Maritime Management, Antwerp (ITMMA), University of Antwerp, Antwerp, Belgium

The South African container terminal governance model

Most ports around the world are governed following the landlord port authority scheme. Under this management model, terminal operations are awarded to private companies using long-term concession agreements that are signed between the (public) port authority and the private terminal operator. South African ports constitute an exception to this rule. All major ports in South Africa are owned and operated by state-owned Transnet, and its respective divisions such as the port authority Transnet National Port Authority (TNPA) and terminal operator Transnet Port Terminals (TPT). TPT is responsible for the cargo handling and logistics management solutions at the container terminals of the ports of Durban, Port Elizabeth, Ngqura and Cape Town. This governance model created a factual monopoly in the container terminal operating business in South Africa. TPT only faces competition from global terminal operators active in seaports located in neighboring countries such as Maputo (Mozambique), Walvis Bay (Namibia) and the ports on the islands of Mauritius and Madagascar. Still, both competition in the market and competition for the South African gateway cargo market remain limited. Opening up container terminal operations in one or more terminals in South Africa to outside terminal operators could change competitive dynamics in the region.

The use of game theory for the study of South African port competition

Game theory offers insights into the possible effects of the mobilization of private capital and management skills in South African ports. We use a game theory model to examine the implications for the stakeholders of a possible decision by Transnet to open up the container terminal business to outside operators. A non-cooperative model was developed to compare the current situation in South African ports with hypothetical scenarios of opening up one of the terminals to private business. A linear market area of unit length is assumed, with identical consumers evenly spread over this interval. We consider two ports in this simulation: we assume that TPT continues to operate terminals in Durban while one terminal of the Port Elizabeth/Ngqura cluster is opened up to private terminal operators following a form of landlord management system. The ports considered compete for inbound and outbound gateway cargo.

The model presented in this study is based on the Cournot model of competition in the terminal handling industry (figure 1). Quantity competition is perceived as a choice of scale that determines the firm's cost functions and thus determines the conditions of price competition.

The competition that is expected to take place when one of the terminals is concessioned will be concentrated on the terminals. The competition modeled is inevitably between the four container terminals: two in Durban, one in Port Elizabeth and one in Ngqura. For simplification reasons, we model the ports of Port Elizabeth and Ngqura as one. Apart from the fact that these two ports organizationally belong to the same authority, they are also in close physical proximity of around 19 kilometers. The analysis is based on the examination of the changes in the direction of the values (increase/decrease) of the policy choice variables rather than the absolute values.

Opening up the South African terminal business

The competition that is supposed to take place after Transnet opens up the container terminal handling operations to private interests is expected to bring new balances in the port business in the South African region. Although the game is a simplification of reality with a number of assumptions, it manages to grasp the vital components that need to be taken into account by Transnet. The pay-offs for Transnet can be translated into profits but also into other rewards that might follow the decision of concessioning one terminal. Besides, Transnet is a public entity and is not expected to have profit maximization as the first and only objective.

The results of the model show that it is in Transnet's best interest to open up the terminal business to outsiders. In doing so, Transnet's profits increase considerably in both ports even though now it operates three rather than four terminals. The increase in operational efficiency stemming from imminent port competition seems to outweigh the fact that TPT will operate one terminal less.

In addition, terminal and thus port efficiency, interpreted as a function of capacity, increases in the port of Ngqura. This will have a positive impact not only on the port but also on its users who will have the chance to enjoy better quality services. Positive impacts are also expected on the distributional channels and corridors, especially the ones connected to the port of Ngqura. Eventually all of this should invoke a boost in the economy of the area surrounding the ports and their hinterland which is one of the intentions and goals of the authorities of the region.

The private terminal operator of Ngqura is also expected to have an advantage from the new setting. The model results show it would have high profits, especially when compared to the profits of Transnet from operating two terminals.

The model investigates the port system of the South African region by focusing on the operating conditions and the imminent competition of the container ports of this area. However, the South African port system faces competition from neighboring ports. This research could be further refined in the future by expanding the model in order to capture competition faced from ports outside South Africa.

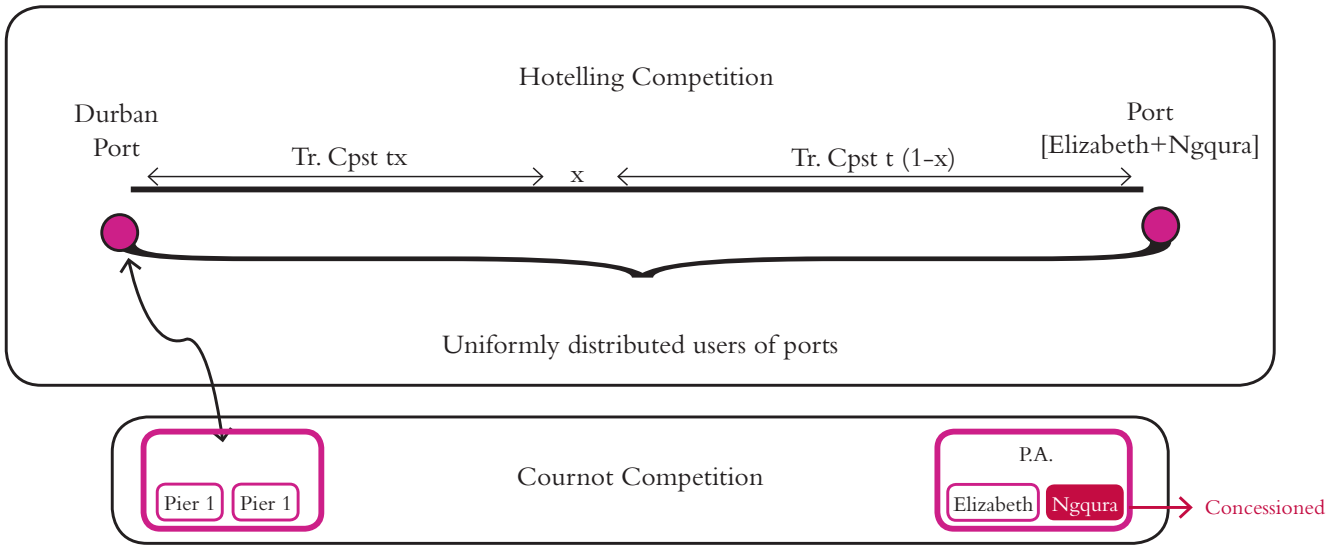


Figure 1: The linear city model under the Cournot model of competition adjusted to the South African ports case study.

ABOUT THE AUTHORS

Ms. Evangelia (Vicky) Kaselimi is a research fellow at University of Antwerp. She is currently completing Ph.D. research on port and terminal competition. Ms. Kaselimi is also a civil servant at the General Secretariat of Ports and Port Policy, Hellenic Ministry of Maritime Affairs, Islands and Fisheries. Her scientific interests include port economics and policy, port and terminal competition with application of game theory and statistical analysis. Ms. Kaselimi is a member of PortEconomics.eu, a web-based initiative aiming to advance knowledge exchange on port economics, management and policies.

Dr. Theo Notteboom is President of ITMMA (an institute of the University of Antwerp), professor at the University of Antwerp, a part-time professor at the Antwerp Maritime Academy and a visiting professor at Dalian Maritime University in China and World Maritime University in Sweden. He published widely on port and maritime economics. He is also President of International Association of Maritime Economists (IAME), Chairman of the Board of Directors of Belgian Institute of Transport Organizers (BITO) and co-director of PortEconomics.eu.

ENQUIRIES

Evangelia (Vicky) Kaselimi
Institute of Transport Maritime Management Antwerp (ITMMA)
University of Antwerp
Kipdorp 59, 2000, Antwerp, Belgium
Tel.: +32 (0) 3 265 51 55
Fax: +32 (0) 3 265 51 50
Email: vicky.kaselimi@ua.ac.be
Web: www.itmma.ua.ac.be and www.porteconomics.eu

Theo Notteboom
Institute of Transport Maritime Management Antwerp (ITMMA)
University of Antwerp
Kipdorp 59, 2000, Antwerp, Belgium
Tel.: +32 (0) 3 265 51 52
Fax: +32 (0) 3 265 51 50
Email: theo.notteboom@ua.ac.be
Web: www.itmma.ua.ac.be and www.porteconomics.eu

Skill shortage leaves port industry all at sea

Howard Flint, managing director, Omni RMS, Manchester, England.

Introduction

As port equipment and operations have adapted to and incorporated more advanced processes, the sector's ability to place competent, well-trained staff familiar with the technology has not kept pace. Sophisticated operating systems demand that in-house teams possess a wider range of knowledge and ability than ever before, which means that the sector relies heavily on young graduate talent. Howard Flint discusses upcoming challenges this reliance poses for the industry, and looks at how recruitment process outsourcing could provide a more efficient recruitment model for ports.

Graduate decline

Highly specialised and technical industries face fierce competition for a talent pool that appears to be diminishing. News that many experts have highlighted looming shortages of graduate talent with technical skills will surely worry recruiters within the port industry, who have depended on people possessing those unique abilities to drive innovation. The Confederation of British Industry and Education Development International conducted a survey in 2011 which highlighted a key concern among employers of graduates, namely that Science, Technology, Engineering and Mathematics (STEM) skills shortages are widespread.

According to the report, 43 percent of UK employers had difficulty recruiting staff, with more than half of employers (52 percent) expecting difficulty to rise in the coming three years. This is by no means limited to the UK, with other domestic markets similarly competing for prized talent. From general operations and safety to marine services, staff with specialised skills are at a premium for dock operators. Those ports that discover an immediate solution to the shortfall will undoubtedly gain a competitive advantage, allowing the operator to compete on an international level.

Uneven keel: inefficiencies in recruitment

Traditional methods of recruitment are of little use when faced with such a widespread deficiency in talent. Recruitment agencies, which historically have not been ideally placed to find suitable candidates for specialist sectors such as the port industry, cannot be expected to unearth upcoming talent which, increasingly, is not there.

Recruitment processes that have previously proved successful are outmoded in the face of the global shortage of suitable candidates. Driven by the allure of cheaper web-based recruitment, many organisations task their HR department or recruitment agency to advertise roles on the multitude of job websites available. This usually leads to being inundated with large numbers of candidate CVs, with a miniscule percentage suitable for the job. Additionally, if HR teams are given independent authority to recruit, inconsistencies in the application experience will inevitably arise, leading to poor brand perception.

The International Labour Organisation writes that, once a sector relying on "mostly occasional and low-skilled labour, dock work now requires more highly skilled workers". Historically, unskilled stevedores and dockers could be recruited offline with relative ease, and the cohesiveness of the process was not a priority. But the sector has rapidly advanced, and so has its need for sophisticated recruitment. It is both time and cost-inefficient to search for skilled employees in the traditional way, especially when considering the upcoming critical shortage of suitable candidates. Such static processes are no longer enough to fulfil the flexible, adaptive shipping industry's needs.

Full steam ahead: outsourcing as a solution

While the outsourcing of administratively intensive HR functions is not a new concept, niche industries such as ports have been notoriously reluctant to engage. But the leap to outsourcing is not as difficult as many imagine. A quality Recruitment Process Outsourcer (RPO) should be able to provide end-to-end, flexible, scalable recruitment, crucial for the continuing growth of port businesses.

With the right person for the position harder to find than ever thanks to a decreasing pool of talent and more competition over those candidates that are suitable, port companies need to tap into RPO expertise to move away from being HR generalists to recruitment specialists. An organisation can completely overhaul its recruitment process either in-house, through consultation with a RPO, or by outsourcing the work to them directly. From the initial search, through candidate filtering and potential selection, to actually onboarding staff, RPOs are incentivised to achieve unprecedented levels of direct recruitment on behalf of clients, dramatically reducing agency reliance and cost.

An outsourcing company will be able to place the best possible candidates for the most demanding, skilled specialist roles such as those increasingly required to design, operate and maintain port machinery. Essential to this is the understanding of the importance of the unique requirements of the port sector, maximising the use of direct sources and effectively managing agencies to provide a tailored list of ideal candidates. This begins with extensive market analysis on the availability of the best type of candidate, producing a bank of talent exclusive not only to a sector, but to a company, allowing for a far more efficient recruitment model.

Choppy waters: coping with economic uncertainty

In addition to a more efficient recruitment model, RPOs provide a malleable approach that flexes to cope with the peaks and troughs of demand. The current global economic climate makes such a fluid approach attractive to specialist industries, such as the port sector, as they are likely to experience the greatest swings during such periods of instability. Recruitment outsourcing can upscale or downscale in line with a company's needs, while ensuring the very best talent is maintained and

FIGURE 1: Developing young talent (courtesy of Maritime and Engineering College North West).

monitored. Such flexibility and control ensures that, despite the number of skilled graduates shrinking, contact is maintained with a core group whether the need to hire is urgent or not. The most impartial recruitment companies are 'pure-play' RPOs, which are independent of agency ownership and therefore offer clients greater objectivity in the sourcing and selection of talent.

Although RPOs have the ability to pick from the best talent available, they are not restricted by association with any one agency. This means that they are able to unify what could potentially be a disjointed process, ensuring that all potential employees have the same positive candidate experience, fostering a positive working environment and attracting the best possible talent.

While RPO seems the ideal solution to port businesses looking to grow or improve a team in the face of a global talent shortage, it should be made clear that there is no 'one-size-fits-all' approach to RPO. Solutions are affected by emphasis on different recruitment performance indicators, which need to be evaluated before moving forward.

First port of call: tailoring outsourcing for specific needs

While RPO provides an efficient solution to the impending talent shortage which traditional methods of recruitment might not, not all outsourcers will tailor their approach towards a specific sector or organisation. Before embarking on a recruitment drive, Omni works with its clients to define their key objective, be it cost reduction, time to hire or quality of talent.

If the goal is to reduce costs, then the solution will likely exploit the lowest cost sources for candidates possible. This would probably mean that time to hire would be considered less important, therefore an outsourcer may suggest an exclusive focus on web-based recruitment, drawing back from utilising agencies in a drive to cut costs.

If the priority is time to hire, the solution may focus on approaching as many sources as are available. This is a more costly process and requires the filtering of candidates, usually by using an automated process based on robust technology which is supported by a well-staffed team.

If the aim is to recruit the highest quality staff, the focus will centre on a well-formulated assessment and selection process. This would have to be carefully managed, with recruiting managers prepared for a longer wait than they may ideally like. Solutions are not always mutually exclusive, and it is rare that one priority will completely override the others, which is why a tailored approach provided by an outsourcer often represents the best option.

Digitising docks: web-based recruitment and passive talent

No sector has been transformed by the technological advances made in computing and the advent of the internet quite like the port industry. It has revolutionised the way in which ports operate and do business, from digitally tracking cargo and updating schedules online to the increasingly sophisticated technology operators need to be able to use.

Anticipating that the majority of job searching would take place online, Omni invested significantly in digital recruitment. This has led to the development and honing of cutting-edge recruitment technology, which delivers unprecedented levels of control and visibility over all key recruitment metrics. Software is able to streamline each stage of the recruitment process, including initial advertisement, candidate filtering according to predetermined key skill, rejection and feedback, and interview arrangements. Not only can this unique program vastly improve

FIGURE 2: Specialized skills in high demand (courtesy of Maritime and Engineering College North West).

efficiency by generating a high performance "engine" that provides the best people, in the quickest time, at the least possible cost, it also brings the flexibility to be implemented as a stand-alone system, or as part of a wider RPO service.

A strong digital focus gives companies the capability to recruit for short-term contractors and permanent staff, and to passively monitor outstanding candidates with a view to long-term team expansion or improvement. The ability to nourish passive talent will be crucial for the successful execution of a longer-term strategy for ports; investment in online assets now will reap dividends offline in the future.

Conclusion

In the current economic climate, it is more essential than ever that businesses in specialist sectors adopt a malleable recruitment policy that flexes to cope with the peaks and troughs of the industry, all the while ensuring that the very best talent is retained or monitored. Looking ahead, the UK and Europe-wide deficit in talent needs to be addressed by a sustained drive to make technology and related subjects a more appealing career option. If this doesn't happen, domestic governments risk losing prized positions to foreign workers. RPO represents the most efficient solution to those in the port sector looking to reshape their workforce to meet the fluctuating demands of the industry. Any organisation should select its RPO partner carefully, and work with them to design the most appropriate solution to meet their own requirements. RPO is not a commodity and the development of the ideal solution necessarily demands a consultative approach.

ABOUT THE AUTHOR

Howard Flint is an expert on recruitment process improvement and RPO, having successfully implemented many process and technology-led business change projects into leading FTSE companies across Europe. Howard joined Omni to head the growing consultancy and business development teams and was appointed Managing Director in January 2012.

ABOUT THE COMPANY

Omni Resource Management Solutions is a leader in RPO, recruitment improvement and social recruiting. Omni became a pioneer in web-based recruitment, developing one of the most experienced job board resourcing teams in the UK. Omni's RPO division provides organisations with their own expert resourcing function, ensuring that clients get the right talent, at the right place, at the right time, in the most cost effective way.

ENQUIRIES

Omni Resource Management Solutions
Tel: +44 (0) 161 929 4343
Email: enquiries@omnirms.com
Web: www.omnirms.com

Under the Patronage of
His Excellency/Dr. Rashid Ahmed Bin Fahad,
Minister of Environment and Water

Minister of Environment and Water

TOC CONTAINER SUPPLY CHAIN MIDDLE EAST

www.toc-events.com

1 – 3 October 2012
Sheikh Rashid Hall, DWTC, Dubai

Your exclusive access to latest technologies, innovations and suppliers for Middle East ports and terminals.

- ☆ Executive Level Conference
- ☆ Free Trade Exhibition
- ☆ Free TOC Technical Seminars
- ☆ Free Multimodal Seminars
- ☆ Networking

Book delegate place before 30th August and save $200!

Exclusive Government Seminars

Host Sponsor: موانئ دبي العالمية DP WORLD

Sponsors: holman fenwick willan hfw | IPS | TT CLUB established expertise

Official Sponsoring Publication: WorldCargo news

Key Media Partners: CONTAINERISATION INTERNATIONAL | Lloyd's Loading List.com

Cargo Newsprint Partner: MENA Cargo News

Premier Association Partner: PEMA

Arabic Maritime Media Partner: السفينة

Supporting Organisations: The Chartered Institute of Logistics & Transport International | cisaa | DUBAI EXPORTS | NAFL

Media Partners: arabianSUPPLY CHAIN.com | logistics | LOGISTICS AFRICA | TRANSPORT & LOGISTICS

Official Logistics Network: WCA Family of Logistic Networks

www.tocevents-me.com/pt

New standard on ship-to-shore electrics brings improvements

Morand Fachot, communications team, International Electrotechnical Commission (IEC), Geneva, Switzerland

Ships are like floating cities: they produce and distribute their own electricity. Generators driven by the main engines when sailing, or less polluting auxiliary units when in port, provide the necessary electric power. More and more ports are installing High Voltage Shore Connection (HVSC) systems to supply electric power to docked ships to meet tighter harmful emission limits and curtail the impact of fluctuating fuel prices. This development will be helped by the publication of the first International Standard for HVSC systems.

Out of sight, out of mind, but not out of lungs

Unlike airliners or motor vehicles, ships are absent from most people's daily life and pollution from the shipping industry has long been underestimated. Ship engines burn bunker fuel or heavy fuel oil (HFO). This petroleum product was once described by Christian Eyde Møller, CEO of Dutch-based shipping technology company DK Group, as "just waste oil, basically what is left over after all the cleaner fuels have been extracted from crude oil. It's tar, the same as asphalt. It's the cheapest and dirtiest fuel in the world". It has a high sulphur content and its combustion results in excessive levels of sulphur oxide (SOx), nitrogen oxide (NOx) and particulate matter (PM). PM are tiny particles of soot and sulphuric acid about 500 times finer than a human hair that can travel 30 to 50 kilometres inland from the ship smokestacks and be inhaled by humans.

Ships may burn huge quantities of bunker fuel. The world's most powerful and most efficient marine engine, the 14 cylinder, 2,300 tonne turbocharged two-stroke Wartsila-Sulzer RTA96-C diesel engine, consumes more than 7,500 litres of HFO per hour at its most efficient power setting. The adverse environmental impact of merchant ships is very significant. A 2007 report from the University of Delaware's College of Marine and Earth Studies claimed that shipping-related PM emissions were responsible for up to 64,000 deaths worldwide.

Tighter regulations

The International Maritime Organization (IMO) – the UN agency with special responsibility for the safety and security of shipping and the prevention of marine pollution by ships – introduced international limits to the maximum sulphur content in bunker fuel in Annex VI of its 'International Convention for the Prevention of Pollution from Ships' maritime pollution (MARPOL) standards, that fixes limits on SOx and NOx emissions from ship exhausts. The maximum sulphur content of bunker fuel was set at 4.5 percent prior to 1 January 2012, then 3.5percent until January 2020, (and possibly as late as 2025).

Some regions (Baltic, North Sea, North America, Caribbean Sea area) have introduced tighter limits in so-called Emission Control Areas (ECAs) where limits to sulphur content were set at up to 1.5 percent prior to 1 July 2010, up to 1 percent after, and 0.1 percent after 1 January 2015. Most ships sailing both outside and inside these ECAs have to operate on different fuel oils in order to comply with the respective limits.

Cutting emission and noise in ports

If ships' auxiliary generators used to provide electric power to docked ships do not burn bunker fuel but cleaner fuels, they still emit SOx, NOx and PM. During a 10-hour stay in port, the diesel engines of a single cruise ship burn around 20 tonnes of fuel, producing some 60 tonnes of CO2. On average ships spend 100 days a year in port, using several tonnes of fuel a day to power ancillary systems. Ports are often located in densely populated cities and the environmental impact on the local population may be severe. Cutting these emissions in ports has become a priority worldwide and led to the introduction of Onshore Power Supplies (OPS), which allow ships to shut down their diesel engines and connect to a land-based grid while they are docked. For instance, Port Metro Vancouver, one of around two dozen ports in the world to have introduced HVSC, has cut its greenhouse gas emissions by 3,000 tonnes in 2010 by installing shore power for cruise ships. Using HVSC also reduces noise and vibration from ships, benefitting crews, dockside workers and nearby residents.

Providing electric power from shore to ships at berth is not a recent process, in fact the term commonly used to describe it, 'cold ironing' , dates back to the time when ships had coal-fired engines that were allowed to go completely cold when in port, as power was supplied from shore. Navy ships, which on average stay in port much longer than commercial ships, make extensive use of 'cold ironing'. The US Navy, for instance, has been using cold ironing for several decades and has developed a unique electrical cable connection system to avoid compatibility issues with different ports of call.

The need for HVSC standards

Currently there are over 20 ports in North America and Europe implementing OPS but systems across the world are not interoperable, owing to the lack of standardization and the difference in system frequencies (60 hertz in North America, 50 hertz in Europe and most of Asia), voltage and structural design. Voltage levels differ among ports. Generally speaking, the first-generation OPS systems operate on low voltages (400-690 volts). More recently, high voltage (6-11 kilovolts) has become the standard. Electrical frequencies and power requirements also differ among vessel categories and sizes. Ocean-going vessels calling at European ports tend to have more 60 hertz electrical systems on board. Peak power demand varies from 1 megawatt (for container vessels smaller than 140 metres) to 11 megawatts (cruise ships over 200 metres). These different systems and the particular local situation determine whether or not frequency converters and/or on-board transformers are needed and may affect the overall costs of an OPS system for port authorities and ship owners.

First international standard for HVSC published

The International Electrotechnical Commission (IEC) is the world's leading organization that prepares and publishes International Standards for all electrical, electronic and related technologies, including for the shipping industry. Its 'Technical Committee (TC)18: Electrical installations of ships and of mobile and fixed offshore units', issued a Publicly Available Specification (PAS) for HVSC systems in 2009, giving requirements for such systems. This PAS was prepared in consultation with IEC 'TC 20: Electric cables' and IEC 'Subcommittee 18A: Electric cables for ships and mobile and fixed offshore units'.

It was further developed into an International Standard in cooperation with IEC 'subcommittee 23H: Industrial plugs and socket-outlets', 'ISO TC 8: Ships and marine technology', and the Institute of Electrical and Electronics Engineers (IEEE) Petroleum and Chemical Industry Committee (PCIC).

This standard, IEC/ISO/IEEE 80005-1, 'Utility connections in port – Part 1: High Voltage Shore Connection (HVSC) Systems – General requirements' was published in July 2012.

It describes HVSC systems on board ships and on shore and defines "requirements that support, with the application of suitable operating practices, efficiency and safety of connections by compliant ships to compliant high-voltage shore power supplies through a compatible shore to ship connection." It is intended to allow different ships "to connect to HVSC at different berths with the benefits of standard, straightforward connection without the need for adaptation and adjustment at different locations that can satisfy the requirement to connect for as long as practicable during stays in port. Ships that do not apply this standard may find it impossible to connect to compliant shore supplies."

Comprehensive features

To meet these demands IEC/ISO/IEEE 80005-1 addresses:

HV shore distribution systems; shore-to-ship connection and interface equipment; transformers/reactors; semiconductor/rotating convertors; ship distribution systems; and control, monitoring, interlocking and power management systems.

The standard tackles important safety aspects such as Emergency Shut Downs (ESD), when the ship moves past a range of allowable motion forward, aft or outward from the dock, and special provisions concerning ESD at Liquefied Natural Gas (LNG) terminals.

The standard also lists additional requirements for Ro-Ro cargo and passenger ships, cruise and container ships, tankers and LNG carriers.

The relevant IEC, ISO and IEEE committees are currently preparing an International Standards for HSVC communication interface description.

Gathering momentum

From an environmental perspective, the use of HSVC is compelling. Compared to 0.1 percent low-sulphur marine gas oil used in EU ports, onshore power supply cuts NOx, PM and volatile organic compounds emissions by 94 percent, 89 percent and 94 percent, respectively. Tighter environmental regulations incite more and more ports to install HVSC systems. However investment costs on the shore side and on ships, such as the cost of supplying HV power and the possible need for transformers, frequency converters, switchboards and control panels on both shore and ships may slow down HSVC adoption.

Quayside investments may vary significantly with investments for cruise ships likely to be around €6 million per berth, according to studies by the port of Amsterdam and by the European Commission, whilst the cost of installing HVSC for two berths for Ro-Ro ships in the port of Gothenburg amounted to €255,000 only. So far more than 20 ports in Europe and North America have operational HSVC systems and more are installing them. The new IEC/ISO/IEEE International Standard should help drive a wider adoption.

ABOUT THE AUTHOR

Morand Fachot is a technical writer with the International Electrotechnical Commission. Before that, he worked as a BBC journalist, and has previously written for the Financial Times Business Group and several international publications on political, security, media, technological and transportation issues.

ABOUT THE ORGANIZATION

International Electrotechnical Committee (IEC)

The IEC [www.iec.ch] is the world's leading organisation that prepares and publishes International Standards for all electrical, electronic and related technologies. Over 10,000 experts from industry, commerce, government, test and research labs, academia and consumer groups participate in IEC Standardization work. When appropriate it co-operates with its two global sister organisations, ISO and ITU, which also develop International Standards for the world, and with other organisations to ensure that International Standards fit together seamlessly and complement each other.

ENQUIRIES

International Electrotechnical Commission
3, rue de Varembé
CH-1211 Geneva 20
Tel: +41 22 919 0305
Email: mfa@iec.ch
Web: www.iec.ch

Port Focus

“The vision for the port is ambitious and should deliver benefits for stakeholders, employees, customers and the UK in general.”

'Managing the Port of Dover: Operating and developing one of the world’s busiest ferry ports', page 26.

Port of Oakland completes shore power project's first phase

Jill Borner-Brown, Mohamad Ibrahim, Tim Leong, Delphine Prevost, Marilyn Sandifur, Richard Sinkoff and **Anne Whittington** of Port of Oakland, CA, USA

Why shore power?

Diesel emissions are associated with public health risks and new regulations have been established to require reductions of those emissions, not only from diesel-fueled trucks that operate at California ports, but also from ships docked at the ports.

Shore power is an emissions-control measure that allows ocean-going ships to run their auxiliary engines while at berth using grid-based power, thereby providing a mechanism to reduce diesel and other air pollutants from ships while they are at berth. Reducing emissions from ships is a key element of California's Goods Movement Emission Reduction Program. Shore power is one of the principal methods of compliance with the California Air Resources Board (CARB) regulation for 'vessels at berth'. One-half of a fleet's vessel calls at California ports will be required to use shore power beginning in 2014. Over time, an increasingly higher percentage of each fleet is required to use shore power.

Shore power regulation

In December 2007 CARB approved a regulation to reduce emissions from diesel auxiliary engines on container, passenger, and refrigerated-cargo ships while berthing at a California port. This new California regulation requires that all operators of container vessels, that have more than 25 cumulative visits annually to California ports, employ an emission reduction system to reduce emissions from their fleets. Fleet operators visiting California ports will be required to reduce vessel emissions by either turning off the vessel auxiliary engines and connecting to a clean source of power or using alternative control technique(s) that achieve equivalent emission reductions while docked.

While a ship is at berth, it requires electricity for minimal functions (called 'hoteling'). Shore Power (also known as 'cold-ironing') is a land-to-vessel connection that provides electri cal power to the ship. It enables the ship to switch off its onboard diesel-powered generators while docked. Under the regulation, 50 percent of a fleet's visits to a port must be shore power visits by 2014. 80 percent of a fleet's visits must be shore power visits by 2020.

Description of project

The Port's shore power project consists of design and construction of high voltage electrical infrastructure in the Port of Oakland (Port) Maritime area. The infrastructure generally runs from the Port's main substations to on-terminal substations and, from there, to the terminal wharves. Power is extended down to the wharves, where vaults with electrical connections will provide the interface (outlets) for ocean going vessels to connect to the electric grid. Improvements for the shore-side electrical and control system at the Port include: industrial substations to receive power transmitted from the Port's existing 12.47kilovolt grid (kV - kilovolt); 7.5 MVA (MVA= power) transformers to bring the voltage down to a level compatible with the ship's electrical requirements (6.6 kilovolts 3 phases, 60Hertz)

The power connection at the Port of Oakland is a 6.6 kilovolt electrical connection with an energy demand of up to 7.5 MVA power. The shore power design will follow IEEE/ISO/IEC standard P80005-1 (engineering and electrical standard). This standard addresses: high voltage shore distribution system; shore-to-ship connection and interface equipment; Transformers; ship distribution system; control, monitoring, interlocking and power management system.

Benefits of shore power

The Port of Oakland assumed the cost to install a shore power system not only to assist carriers with the financial burden to com ply with California's new regulation but also to minimize diesel emissions to residents of neighborhoods adjacent to the Port. Shore power also reduces greenhouse gases in addition to all other combustion byproducts. These reductions in emissions significantly improve air quality and reduce health risk from diesel and other air pollutant emissions at the Port.

At the Port of Oakland, Eagle Marine Services (EMS) completed its shore power infrastructure and Ports America will soon be building its own shore power system. Additionally, the Port of Oakland's project includes 11 berths. By 2020, the Port estimates at least a 75 percent reduction in both diesel Particulate Matter (PM) and nitrogen oxide (NOx) emissions while ships are docked.

FIGURE 1: PROJECTED EMISSIONS

Year	Diesel PM	(tons/year)/NOx (tons/year)
2005	(Baseline emissions)	PM 60.6/NOx 767
2014	(Projected emissions)	PM 30.3/NOx 384
2020	(Projected emissions)	PM 15.2/NOx 192

Costs

The Port of Oakland's shore power program is estimated to cost approximately US$70 million. The total combined cost of the Port's project and the private sector shore power improvements at the Port is estimated to be more than US$100 million. Additionally, the maritime industry may be investing roughly up to US$2million per ship to retrofit a vessel for plugging into the power grid when docked at California ports.

Funding

To cost-effectively construct shore power infrastructure, the Port has employed a broad spectrum of funding sources, including looking beyond traditional funding sources, such as operating revenue and debt secured by such revenues, in order to implement this important initiative. The Port, and its tenants,

FIGURE 3: Ships in estuary.

FIGURE 4: Port of Oakland.

FIGURE 5: Shore powercables.

FIGURE 6: Shore power sub station.

FIGURE 2: THE THREE PLANNED PHASES OF THE PORT'S SHORE POWER PROGRAM

	Berths	Construction Start Date	Construction Completion Date	Commissioning Date
Phase 1	56, 57, 58	March 2011	June 2012	July - August 2012
	Common Utility System Upgrade	November 2011	June 2012	July 2012
Phase 2A	25, 35, 37, 55, 59, 68	May 2012	June 2013	August - December 2013
Phase 2B	30, 32	May 2012	June 2013	August - December 2013

have pursued new funding and financing mechanisms, particularly grant funding, and have been successful in accessing federal, state, and local grants. The Port has been awarded approximately US$33 million in grants, including an approximate US$8 million Transportation Investment Generating Economic Recovery (TIGER) grant.

Since 2009, the Port of Oakland's Maritime, Environmental Programs and Planning, Engineering and Finance divisions have collaborated in planning, funding and implementing this critical component of the Port's overall Maritime Air Quality Improvement Plan or MAQIP. The utility upgrade program and the first three berths of the shore power program are completed and ready for the Port's shipping partners that call at Berths 56, 57 and 58.

Project schedule

The Port's shore power program schedule is governed by three principal factors comprising of: regulatory deadlines established by the California Air Resources Board; grant deadlines and time required to procure, manufacture, install and commission the equipment/infrastructure. The program is being constructed in three phases, as outlined below.

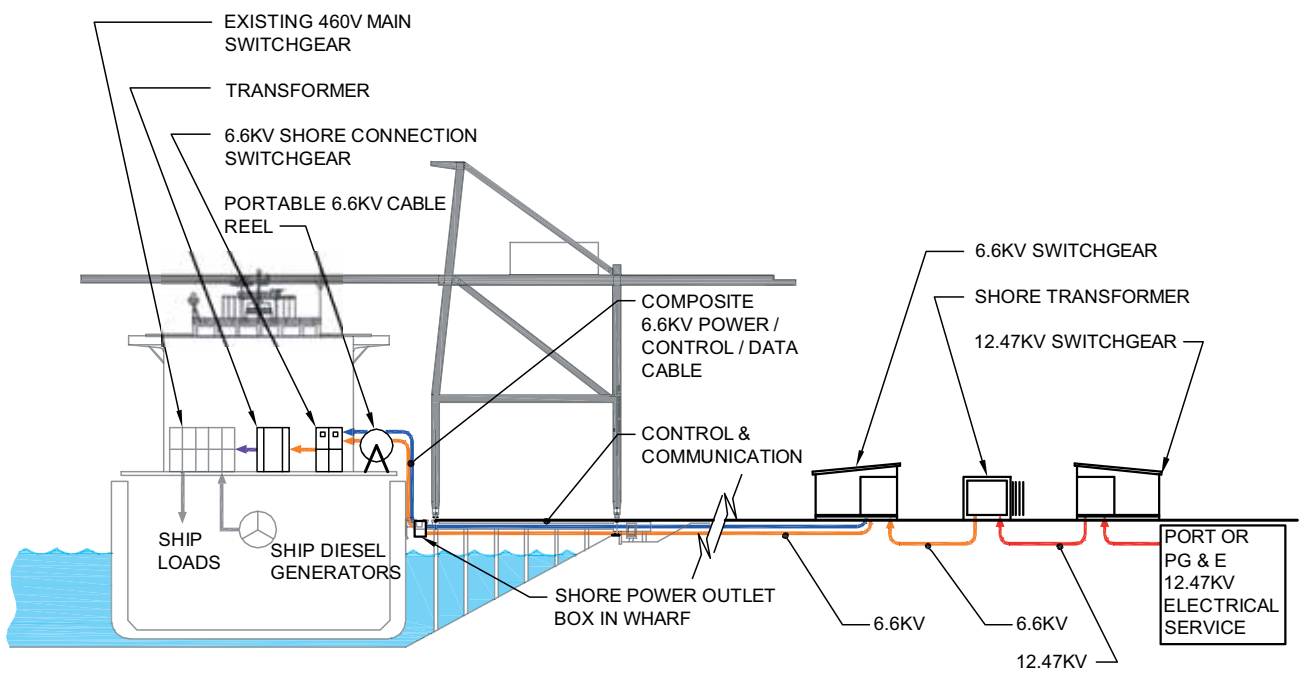


FIGURE 7: Cold ironing graphic.

Challenges

The biggest challenge was the initial cost estimate of US$90 million for the Port of Oakland's portion of the cost of shore power. However, since starting the program, Port staff were able to achieve significant cost savings from a variety of sources, including the efforts of personnel to value-engineer the design for each project and their due diligence in performing investigations that sought to leverage previous infrastructure investments on and off the terminals; the reduced the program from 12 to 11 berths; the benefits of an extremely competitive bid environment (indicative of the economic downturn in the current construction market); and the effective negotiations of staff with the contractors and consultants that helped to contain costs for change orders, design-scope changes, and diligent monitoring and tracking of project charges.

Another significant challenge is managing the complex and varied grant requirements. Reporting requirements can be extensive. Ensuring that grant assurances are met and preparing documentation in support of grant reimbursement continues to be a major task involving staff from multiple Port divisions and departments.

Maritime to grow as emissions decline

The Port of Oakland's maritime business is projected to grow through 2020 and beyond. Concurrently, air pollutant emissions and health risk to workers in the seaport area and residents in the neighboring community are projected to decline dramatically, largely due to emissions reductions projects like shore power, the Port's drayage truck programs, and other MAQIP emission reduction programs and projects.

Collaboration is key to project completion

The Port and its tenants will continue to collaborate and coordinate to complete implementation of the shore power project. The Port also continues to work closely with its funding and regulatory agency partners to navigate project challenges as they arise and ensure cost-effective and timely completion of the project. This important project will provide the necessary infrastructure to keep goods moving through the seaport in an environmentally sustainable manner.

ABOUT THE AUTHORS

Contributors:

Jill Borner-Brown: Port supervising engineer

Mohamad Ibrahim: Port associate engineer

Tim Leong: Port associate environmental scientist

Delphine Prevost: manager, financial planning

Marilyn Sandifur: media/public relations specialist

Richard Sinkoff: director of environmental programs and planning

Anne Whittington: Port environmental assessment supervisor

ABOUT THE PORT

The Port of Oakland oversees the Oakland seaport, Oakland International Airport, and 20 miles of waterfront, including commercial developments and hundreds of acres of public parks and conservation areas. The Oakland seaport is the fifth busiest container port in the United States. You can connect with the Port of Oakland through the website www.portofoakland.com or on Twitter, Facebook, and YouTube.

ENQUIRIES

Marilyn Sandifur - Port of Oakland Spokesperson Port of Oakland
530 Water Street, Suite 324
Oakland, CA 94607
USA
Tel: 510-627-1193
Email: msandifur@portoakland.com
Web: www.portofoakland.com

Managing the Port of Dover

Operating and developing one of the world's busiest ferry ports

Barbara Buczek, head of external and corporate affairs, Port of Dover, UK

Context

The Port of Dover is a significant asset locally, regionally and for the UK. It has enormous national and international importance as one of the UK's main trade gateways with continental Europe. Goods to the value of £80 billion (about $129 billion) pass through the port in any one year.

The Port of Dover is one of the world's busiest international ferry ports, handling almost 13 million passengers and around 5 million vehicles annually. It is also the second busiest UK cruise port and the fourth largest UK port for fresh produce imports. It complements these core activities with an award winning marina. The port supports around 22,000 jobs, many in the local community.

The port has submitted plans to the UK Government to privatize the port in January 2010. This will enable the port to access private capital in order to fund major development plans and to expand the business at home and abroad, using the port's strong business position and expertise to develop elsewhere. The vision for the port is ambitious and should deliver benefits for stakeholders, employees, customers and the UK in general.

Safety

After many years of working with Royal Society for the Prevention of Accidents (RoSPA) to externally verify the port's safety management system and being the only recipient of its top award (the QSA Diamond Award) in 2010, the Port of Dover has been successful in achieving the OHSAS 18001 standard – an internationally recognized management system for occupational health and safety.

The port has have also bettered the port industry average for staff accident incident rate. Such an achievement has been very challenging historically because of the Port of Dover's intensive operations both ashore and afloat, which see numbers of vehicles and ships that are orders of magnitude greater than any other ports. The port's investment in modern equipment and its emphasis on introducing internationally recognized safety management systems, coupled with the development of an increasingly competent, technically and professionally focused workforce has steadily enabled this challenge to be met successfully.

Environmental management

The Port of Dover is committed to delivering a sustainable port operation that will minimize environmental impacts and ensure the service of the port's future generations. As part of this commitment, the port has produced its first Climate Change Adaptation Report. This report carries out a risk assessment that considers how climate change could affect port operations, assets, staff and the interface with the transport network and other stakeholders.

Thanks to the work and innovation of the port's environmental experts, the Port of Dover outperformed all other UK ports in the Carbon Reduction Commitment Energy Efficiency Scheme, the first mandatory UK Government scheme aimed at improving energy efficiency and cutting emissions in large public and private sector companies in the UK. Furthermore, the Port achieved a place in the top 3 percent of all of the organizations which participated.

Port of Dover.

Development – now and future

As well as ensuring that the port is operated to the highest safety and environmental standards, the port must also have the ability to manage passengers and traffic efficiently, providing adequate and reliable modern infrastructure and the capacity to ensure that this part of the trans-European transport network can cope with the volume of people and goods using it.

During the middle of the last decade, Dover was seeing phenomenal growth in predominantly RoRo freight traffic, peaking at over 13 percent year on year growth in 2006. This led to a major 30 year masterplanning exercise to consider long-term traffic forecasts, port capacity and the drivers of future demand. The Port of Dover was the first UK port to carry out such a far reaching and comprehensive exercise.

Terminal 2

The result of the above exercise was the proposal to build a second ferry terminal, the biggest ever single development to be proposed at Dover.

Much focus over the last few years has therefore been on developing the proposals for the £400 million (about $646 million) Terminal 2 at the port. Towards the end of 2011, the port welcomed the news from UK Government that the plans had been approved.

Since the Port of Dover began developing its plans, the world has of course been hit by a recession and a prevailing economic climate that remains extremely challenging. The approval of Terminal 2 nevertheless ensures that the port has the necessary permissions and consent in place to make that investment, when market conditions again require it. Furthermore, such an approval, which paves the way for a doubling of Dover's ferry port capacity,

SIEMENS

E20001-F280-P620-X-7600-A4

SIMOCRANE

Making a crane control reliable and flexible

Preconfigured crane control modules to automate and control any crane

Siemens forged 90 years of worldwide experience in a ready-to-run crane control platform which contains configurable standard function modules. These modules are integrated within a SIMOTION D controller: the most performant motion controller available on the market.

With SIMOCRANE, we provide 'off the shelf' proven technology to secure reliable crane performance, simple engineering and fast commissioning. Besides all the proven crane control solutions in SIMOCRANE, you still have the flexibility to customize the solution to meet your requirements.

siemens.com/cranes

Port of Dover – environmental team.

Freight at the Port of Dover.


Port of Dover – Terminal 2.

the port believes is a clear sign that the UK Government expects growth in traffic through this key gateway to return to previous levels once the economy begins to recover.

Terminal 2 was unopposed when the Secretary of State made the decision to approve the scheme and this reflects the unprecedented scale and detail of consultation that has been undertaken at all levels over the past few years.

Eastern Docks (Terminal 1) Upgrade

Despite the plans for Terminal 2, the port has a strong focus on ensuring that the current facilities remain fit for purpose and are continually updated. The port is keen to keep up with the latest technological developments and the past year has been spent developing and beginning to deliver a substantial programme of investment in Terminal 1 (Eastern Docks). The investment profile is aimed at engineering and capacity improvements that will ensure the Port of Dover continues to provide first class state of the art facilities and infrastructure, supports its customers, maintains its position as the premier ferry port in Europe and utilizes its existing assets to their maximum capacity.

As well as a general refurbishment programme, attention has focused on the older RoRo berths in order to 'relife' and also, where necessary, replace them. Within the major refurbishment programme for berths 2, 3 and 7, the scope includes the replacement or overhaul of winch machinery and hydraulic equipment, the installation of self supporting fingers, the extension of the linkspan bridges and passenger access brow to maintain compatibility with larger stern fenders, the capacity upgrade of the overhead gantry crane, Ultrasonic Impact Treatment, repainting and resurfacing of the vehicle decks, and new cladding for the winch house and passenger access structures.

Design work has also started on the complete replacement of the superstructure on berth 6. The project includes the provision of new bridge decks, portals and a new passenger access. Replacing the berth completely will provide the opportunity for introducing new design safety code improvements.

Alongside the berth relifing and replacement programme, we have been extending piers and upgrading side and stern fenders.

Two piers have already been extended in length to accommodate longer ships. A third pier between berths 2 and 3 is currently being extended. A four meter diameter monopile, weighing 246 tonnes, recently arrived at the port on board a coaster. In an operation that took almost 12 hours it was lifted from the vessel and lowered to the seabed. Divers attached straps and the unit was raised vertically and lowered into position in a pre-drilled socket in the seabed. The monopile was then locked into position by filling the annulus around the pile with aggregate. All those works will further improve safety, increase berth resilience and ultimately increase capacity to support the needs of customers as they introduce new larger ferries to the port.

2011 saw the start of the Traffic Management Improvement project (TMI), aimed at improving the ability of Terminal 1 to handle more traffic. TMI has been designed to provide an internal buffer zone or vehicle assembly space that will improve traffic management, provide greater efficiency in the operation and thereby increase the capacity of the terminal overall, through improving the port's processing capability. Unlike Terminal 2, which could be designed in its entirety on a blank piece of paper, Terminal 1 has developed incrementally over several decades. TMI effectively strips out as many of the buildings and other infrastructure that is not now considered to be essential to the operation, or can be configured and provided in a better way in order to free up additional space within the Port.

Situated at the entrance to the Eastern Docks, the 'buffer zone' will have capacity for around 220 freight vehicles, which will enable the outbound traffic flows to be regulated not to exceed the available capacity at the point of check in, maximizing the capacity of internal roadways and preventing queuing traffic from tailing out of the port and onto the highway.

A rolling programme of major resurfacing of assembly park areas and roadways throughout Terminal 1 has commenced. Maintaining the parks and roadways in a sound condition will ensure the terminal can be utilised to its maximum capacity.

Other deverlopments

The board has maintained its long-term strategic view of managing and investing in its assets whilst ensuring the selected solutions are in line with the changing needs of the organization. Staying at the forefront of port management issues is essential for a port as intensively used and operated as Dover.

Over a number of years the port has invested in the very latest port technology and have been focused on developing a highly technical and professional organization, developing people and technology that is unprecedented in similar ferry ports.

The recently established Port of Dover Consultancy Service enables Dover to share its unique experience and insights to help other port and infrastructure managers in their focused planning and delivery for the future.

Port of Dover

ABOUT THE AUTHOR

Barbara Buczek is head of external and corporate affairs and has been at the port for the past two years having previously worked for the South East of England Development Agency (SEEDA).

ABOUT THE PORT

The Port of Dover is administered by Dover Harbour Board, which is responsible for the administration, maintenance and improvement of the harbor at Dover. As a Trust Port, the Board does not have any shareholders and most Board Members are appointed by the Department for Transport. The history and origins of the Port of Dover can be traced right back to Roman times. Since then, the Port has grown and evolved through the centuries to what it is today - one of the world's premier ports.

ENQUIRIES

Dover Harbour Board
Harbour House, Marine Parade,
Dover, Kent CT17 9BU
Tel: +44 (0) 1304 240400
Email: pr@doverport.co.uk
Web: www.doverport.co.uk

Portsmouth International Port extended to meet demand

Portsmouth International Port, Hampshire, UK

Portsmouth International Port has seen some big changes over the last year. Not only has the name changed (it is no longer known as the Continental Ferry Port - a move designed to reflect an increasing number of cruise ship visits), but its new terminal is now fully finished and operational - a very public statement of the port's positive view of the future.

The case for investment

Unlike the gleaming new terminal, passengers are unlikely to pay much attention to another key piece of new infrastructure at the port - an extension to one of its oldest berths. Berth two was last extended in 1994 to accommodate P&O's Pride of Bilbao. Since then of course, ships have grown quite considerably in length. It was decided that the berth needed to be extended by 50 meters to allow much longer vessels to tie up safely. Before the extension, a ship using berth two could have a maximum length of up to 205 meters, now vessels of up to 240 meters can easily use it.

The port is owned and operated by Portsmouth City Council. Managers successfully made a case for the multi million pound investment in the extension project, arguing that it would help secure current customers and attract additional trade as ships continue to grow in size. It was agreed that by making berth two longer, the port would be able to have a greater number of larger vessels docking at any one time, improving flexibility for operators.

Plans and providers in place

Once given permission to proceed with the project, management at the port obtained the necessary harbour revision order and other consents and then went out to tender for the design and build contract. Using a standard Portsmouth City Council pre-qualification questionnaire, modified to suit the particular requirements for this scheme, six companies were chosen to bid. To make the process fair and transparent each submitted tender was then judged against set criteria. The company with the highest score was chosen. This was TRANT, a Southampton-based firm that has worked at the port before. Structural design was carried out by CSC Engineers of Southampton. Fender design was by the manufacturer QuayQuip Ltd and the Galvanic Anode Cathodic Protection System was designed by Impalloy Ltd UK. The aim for managers at Portsmouth International Port and TRANT was to get the work done as efficiently as possible, without interfering unduly with day-to-day operations at the port. With five berths available for use it was possible to close berth two for the four month duration of the work, allowing clear access for construction.

Constructing dolphin structures

The berth was extended by constructing two new dolphins seaward of the existing berth with interlinking access footbridges, while still allowing port operations to function normally. The form of construction, size, shape, position and fenders were part of the design to achieve a 50 year life, together with a specified automated mooring (and quick release hook) system.

Figure 1: Portsmouth International Port.

Figure 2: The modern new terminal.


Figure 3: Manufacturing the new dolphins.

5th VIETNAM PORTS&LOGISTICS

29 October – 1 November 2012 | Sheraton Saigon, Ho Chi Minh City, Vietnam

Confirmed Government Speakers from

- **Ministry of Transport**
- **Ministry of Planning and Investment**
- **Directorate for Roads, Vietnam**
- **VINAMARINE**

Shippers, Ports & Logistics Experts

- **Brian Hoa Nguyen**, *Customer Relations Director*, **Cai Lan International Container Terminal**
- **Phan Dinh Cuong**, *Head of Foreign Customer Team*, **Hiep Phuoc Industrial Park Joint Stock Company**
- **Tran Khanh Hoang**, *Vice General Director*, **Saigon Newport Corporation (SNP)**
- **Shaun Houston**, *Country Supply Planning Manager*, **Nike Vietnam LLC**
- **Nguyen Hung Viet**, *General Director*, **Port of Haiphong**
- **Teo Yak Long**, *Chairman*, **Hanjin Shipping Vietnam Co. Ltd** and *Executive Director*, **SGN Logistics Vietnam Co. Ltd**

Conference Highlights:

- Co-hosted by VINAMARINE
- New Government initiatives to fast track port and road projects
- Priorities for co-coordinating and balancing port / infrastructure developments
- Creating a level playing field for port operators
- Port Operators Panel on Port efficiency initiatives
- Shippers Dialogue on true costs of logistics, improving efficiency and best practice case studies
- Port & Transport Infrastructure project updates, and partnering opportunities
- Spotlight on Roads – priority projects, new investment, and interconnectivities
- Government clarification, and progress on Public-Private Partnership regulation

Pre Conference Workshop | 29 October 2012

Container Terminal Operations Management

Post Conference Workshop | 1 November 2012

Supply Chain Management – Improving Operational and Cost Efficiencies

PLUS! Post Conference Site Tour to Hiep Phuoc Industrial Park

www.vietnamportslogistics.com

REPLY FORM

☐ Yes, please send me a brochure on: **5th Vietnam Ports & Logistics** 29 Oct – 1 Nov 2012, Sheraton Saigon, Ho Chi Minh City, Vietnam

☐ I am unable to attend this time but please put me on your mailing list.

P51366PT

Name: Job Title:

Tel: Fax:

Mobile: Email:

Company: Business Activities:

Address:

Produced by:

For more information, please contact Customer Service Hotline
Tel : +65 6508 2401 | Fax: +65 6508 2408
Email: register@ibcasia.com.sg
or mail to IBC Asia (S) Pte Ltd, 111 Somerset Road, TripleOne Somerset #10-06, Singapore 238164

Hosted by: VINAMARINE

Supported by: VPA, VCCI

Media Partner: PORT TECHNOLOGY

Figure 4: The structures come together in the port.

Figure 5: The dolphins are put into place.

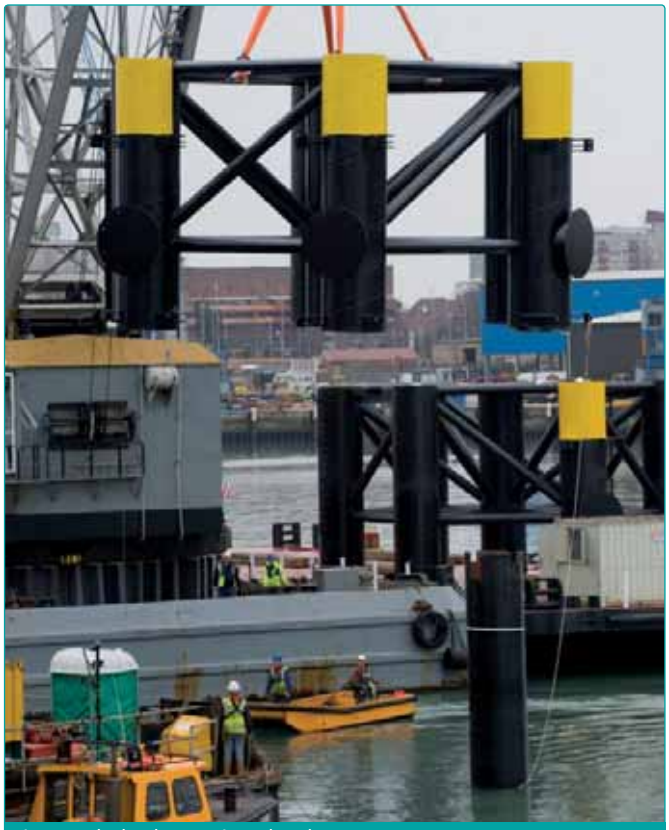


Figure 6: The berth extension takes shape.

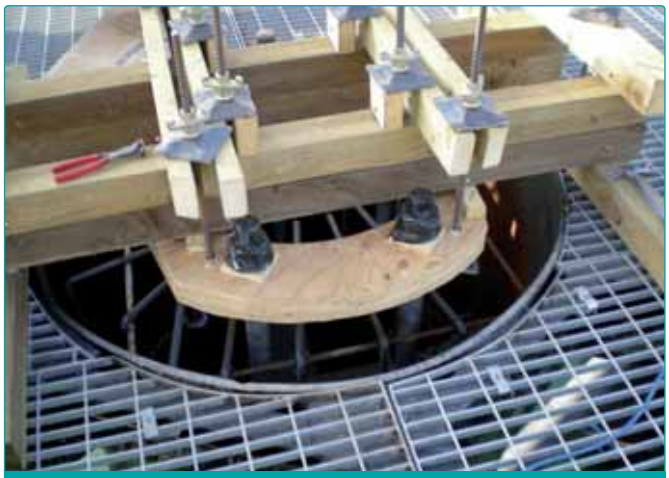


Figure 7: Steel reinforcement structures for concrete.

The fender panels were positioned and sized with regard to the belting arrangement of the various vessels expected to utilize the berth. The reaction loads from the fenders were transferred to the supporting dolphin structure and piles designed to resist the expected loads from mooring and accidental impact.

Each dolphin sits on seven piles made of steel. The tubes are each 30 meters long, with a diameter of 1.2 meters and a weight of 17 tonnes. The 14 piles were delivered on the back of flatbed lorries and craned off next to berth one, before being transferred to a barge. The dolphin platforms were fabricated by Testbank Ltd in Portchester, and were too big to be moved by road. These were brought in by barge.

It is normal practice for each pile to be sunk in place before the dolphin platform is assembled on top. However, in 2009 staff at the port developed an innovative new method which was used again for the extension of berth two. The central pile was driven about 14 meters into the sea bed. The completed steel platform was then lifted from a pontoon and lowered over the central pile, to rest on a support. The steel platform was then used as a guide for the remaining six piles. Each was inserted through sleeves in the deck and driven into the seabed. Once all the piles were correctly located the dolphin platform was welded in place. Any remaining steel above deck level was removed.

A steel soffit form was then installed inside the piles, to enable concrete to be placed in the top five meters of the tube. The top of each pile was then connected to the platform using a shear connector cross brace and steel reinforcement was installed. Concrete was then poured into a tremie tube placed inside the piles, pumped fifty metres from the dock side by a lorry parked on the jetty of berth two. The dolphin closest to berth two was constructed first, followed by the outer dolphin.

The finishing touches

Once the dolphin platforms had been fully constructed, the connecting foot bridges were craned into position. These were also fabricated by Testbank Ltd in Portchester. Each is 16 meters in

Figure 8: Concrete is pumped in.

Figure 9: The first vessel to use the extended berth.

Figure 10: A successful result.

length, and effectively 'clips' to the dolphin before being securely bolted in place. Three new mooring machines were also installed as part of the extension project. One sits on the existing jetty, the other two are bolted to each of the new dolphins. The Trelleborg Easymoor system has quick release hooks and brings numerous advantages to port operations. Heavy ropes are brought ashore using a gantline around the capstan through a set of leads which self-tail the eye onto the hook. This is a one man operation. The release of lines is achieved by the push of just one button and all three machines can be operated from a single control panel, dock crew don't need to access the dolphins to let go the lines of a ship. This increases the safety of the workforce, and with no heavy ropes to handle reduces instances of back injuries.

Successful outcome

Work started on the extension project in February and finished at the end of May. With almost perfect weather for the duration of construction, it was completed on schedule. The first vessel to use the extended facility was MS Marco Polo. She arrived on 31 May, a first time visitor to Portsmouth with 700 passengers on board keen to explore the city. It was also completed in time for one of the busiest cruise weeks in the port's history. Eight cruise ships visited in a seven day period, the added flexibility offered by berth two was crucial in delivering a seamless service for ferry and cruise ships alike.

Phil Gadd, Ferry Port Manager of Portsmouth International Port, says, "We can never afford to rest on our laurels, and must continue to develop our facilities. Doing nothing was not a viable option as it has become clear that ferry and cruise ship operators are keen to bring bigger ships to Portsmouth. The newly extended berth offers them a chance to grow their business, and help us sustain jobs in the city. This project has already proven itself as successful, coming into full use within days of completion. We would like to thank TRANT and its subcontractors for delivering the extension on time and on budget."

ABOUT THE AUTHOR

Phil Gadd joined Portsmouth International Port, formerly Portsmouth Commercial Port in 1986. Responsible for the overall management and operation of the cruise and ferry terminal and its operational staff as well as being deputy to the Port Manager. Plays a key role in the development of Port infrastructure, appointment of main contractors and strategic development.

ABOUT THE PORT

Portsmouth International Port is the UK's premier Port for the western channel and second-busiest cross-Channel ferry port overall, including Brittany Ferries, LD Lines and Condor Ferries with sailings to France, Spain and the Channel Islands. A new terminal for cruise and ferry customers opened in April 2011 as part of a £16.5 million investment to improve passenger facilities. Prestigious cruise operators including Swan Hellenic, Fred. Olsen and Silversea have luxury cruise ships serving a wide range of destinations. Portsmouth City Council has owned the Port since 1839. It is the most successful municipal port in the UK.

ENQUIRIES

Technical Enquiries:
Rory Bramwell, Port Engineer
Tel: 021392855915
Email: rory.bramwell@portsmouth-port.co.uk
Web: www.portsmouth-port.co.uk

Media Enquiries:
Emma Gaisford
Tel: 01730 235666
Email: emma.gaisford@navigate-design.com
Web: www.navigate-design.com

Port Planning, Design and Construction featuring Environment

"In most of Europe and the Far East, the major ports have already been dredged and prepared for post-Panamax shipping vessels. The same cannot be said of the US."

'Dredging: are global ports getting ready for the new Panama Canal?', page 37.

More than just deep water - Port Miami gears up for post-Panamax Ships with Trifecta of projects

Bill Johnson, director of Port Miami, Miami, Florida, US

Ports around the US are scrambling to prepare for expected growth from one of the largest transportation projects in decades and what could be an economic game changer – the expansion of the Panama Canal. Expanding port capacity will be most critical along the US Southeast and Gulf coasts, according to a report issued recently by the US Army Corps of Engineers. As the closest port of call to the Panama Canal, Port Miami has forged ahead with three projects to handle post-Panamax cargo ships: dredging to -50 feet of water, restoring on-dock rail and building a tunnel to provide trucks direct highway access.

The deep dredge

By 2015, the canal expansion will make way for cargo vessels of 8,000 TEUs to 13,000 TEUs. Port Miami is preparing for shifts in trade patterns, bigger ships and increased cargo traffic from Asia by dredging from its current water depth of 42 feet to 50-52 feet. Slated to be completed in tandem with the completion of the canal expansion, Port Miami will be one of only three US Atlantic ports to be at -50 feet and the only one south of Norfolk, Va.

Port Miami's trade with China and other Asian countries is expected to grow after the canal expansion is completed, and although these post-Panamax ships make up only 16 percent of the world's container fleet, they have nearly half that fleet's carrying capacity.

However, deep water and an "open" sign are not enough to distinguish a port as a viable hub and attract these larger ships. Post-Panamax shippers will be looking for ports that can facilitate fast, reliable and efficient access to major markets. The infrastructure available at the port is every bit as crucial as the water depth.

The post-Panamax containers have arrived! Now what?

Unloading quickly and efficiently is a key consideration for shippers. Port Miami is an oceanfront port with only 2.5 miles from buoy to dock, making for reduced pilot costs and improved turn-around times. Additionally, special Super Post-Panamax cranes are required to handle the cargo coming into ports on the larger post-Panamax ships, and Port Miami has purchased four additional fully electrified Super Post-Panamax gantry cranes which will be in service by 2014. Currently, the Port has nine cranes, two of which are Super Post-Panamax cranes. Also, Port Miami is in the process of strengthening its cargo bulkhead to accommodate the deeper water and to accept the four new Super Post-Panamax cranes. It is the first US deep water port to incorporate precast fascia panels on this project to expedite construction and provide a clean uniform appearance of Port Miami as viewed from Biscayne Bay.

Increasing speed to market – intermodal rail

In the post-Panamax world, the "four corners strategy" shippers use to avoid too much reliance on one single port will likely see logistical shifts as tacticians map out economical delivery patterns along with altered trade routes. Steady product flow from the west and northeast coast ports, coupled with increased infrastructure investment from key southeast ports, will allow merchants to attack the American market with more efficiency from multiple distribution points.

Port Miami is partnering with the Florida East Coast Railway (FEC) to re-introduce on-port rail service. The restored tracks will link the port to the FEC mainline, providing direct cargo access to the national rail system. The on-dock intermodal rail service will provide shippers 9,000 feet of working track. The convenience of port-to-ramp service with absolute lead times that match or exceed those of trucking, with service reliability and reduced carbon emissions. It will offer rail connectivity via interconnections with CSX and Norfolk Southern to 70 percent of the U.S. population, and the Port Miami-FEC connection offers the fastest access to Southeastern U.S. consumer markets.

Rising transportation costs and tight truckload capacity are creating more opportunities for intermodal rail, especially since any lost time at sea can be quickly made up with improved rail service. Recently, some shippers have elected to take a slower sea route just to elude the high price of diesel.

Port tunnel – reducing road congestion and idle time

Scheduled for completion in spring 2014, the Miami Port Tunnel will improve access to and from Port Miami, serving as a dedicated roadway connector linking port facilities with Florida's Interstate Highway System. In addition to providing quicker access for port-bound trucks and automobiles, the Port Tunnel is designed to reduce traffic congestion on downtown Miami streets.

The tunnel is comprised of two side-by-side tubes that will carry traffic underneath Biscayne Bay. The project includes roadway work on adjacent roads and the widening of the MacArthur Causeway Bridge that links downtown Miami to Miami Beach.

The public-private partnership project includes the following participants: the Florida Department of Transportation; Miami-Dade County; the City of Miami; and the private consortium managing the project, Miami Access

Florida investing in itself for jobs and growth

The budget crisis has made federal funding for port projects extremely tight, and while other ports are fighting for federal funding, Port Miami, with its state, federal and private-sector partners, is investing more than $2 billion into its own projects. Besides benefiting early on from increased Asian trade, the port's projects will create numerous new permanent jobs. Florida's ports moved 100 million tons and three million TEUs of cargo last year. The 15 seaports contributed to Florida's record year for international trade - $149 billion. With the new and improved port, rail and tunnel projects at Port Miami, cargo growth is expected to double over the next decade.

Tunnel. The French Company, Bouygues S.A., is the prime contractor for construction.

Legislation supporting ports and infrastructure

Florida Governor Rick Scott recently signed two bills related to transportation infrastructure that include an increase of available funds for the state's seaports, railroads and associated freight mobility, with the intention of sending a message to the world that Florida is the ideal location for the transfer of goods into and out of the eastern US.

It is still unclear, even to industry analysts, major retailers and the World Shipping Council, to what extent the expansion of the Panama Canal is going to affect US Southeast ports, but what we do know is it is going to transform the way US shippers move their goods to market, and Port Miami and FEC will be ready.

ABOUT THE AUTHOR

As director of Port Miami, **Bill Johnson** oversees the top container port in the State of Florida and the 11th largest in the nation. Under his stewardship, Port Miami has maintained its leadership position as the busiest cruise port in the world with more than four million passengers traveling through its terminals last year. Under Mr. Johnson's management, the Port has strengthened its financial position to its highest level in 12 years and, despite challenging economic conditions worldwide, Port Miami has seen both its cargo and cruise traffic grow over the past two years.

ABOUT THE PORT

Port Miami is among America's busiest ports and is recognized across the globe with the dual distinction of being the Cruise Capital of the World and the Cargo Gateway of the Americas. The Port contributes more than $18 billion annually to the South Florida economy and helps provide direct and indirect employment for more than 180,000.

ENQUIRIES

Contact: Phone: 305-347-4844 For more information about Port Miami please visit: www.miamidade.gov/portofmiami.

Dredging: are global ports getting ready for the new Panama Canal?

René Kolman, secretary general, International Association of Dredging Companies, the Netherlands

In the last 25 years the maritime traffic industry has changed tremendously. The exponential increase of cargo traffic between the various continents has motivated shipping lines to build vessels with ever larger dimensions. The Panama Canal and its locks were designed for vessels with maximum dimensions of 294.1 meters (965 feet) long, 32.3 meters (106 feet) wide with a maximum draught of 12.40 meters (39.5 feet), the so-called Panamax vessels. Vessels that surpass these dimensions, the so-called post-Panamax vessels, cannot actually transit the Canal.

As a result of the increased number of post-Panamax vessels and the growing demand for Canal transits (according to market studies a gradual increase of 40 percent in demand for Canal transits of up to 19,600 a year by 2025 is expected), the operator of the Canal, the Autoridad del Canal de Panamá (ACP), decided to give priority to increasing the Canal's capacity as well as making it possible for post-Panamax vessels to transit the Canal.

Despite the ongoing financial and economic crisis in Europe and the US, dredging works for widening and deepening the Panama Canal continue full speed ahead. These improvements will bring the Canal up to the requirements of the present-day post-Panamax fleets. Simultaneously it will put demands on ports that are not yet up to post-Panamax requirements.

Far-reaching impacts in the US

The post-Panamax era has inherent impacts on ports and harbors worldwide. In most of Europe and the Far East, the major ports have already been dredged and prepared for post-Panamax shipping vessels. The same cannot be said of the US.

Although the larger West Coast US ports can handle post-Panamax vessels, the bottleneck is the most active "all water routes" to and from the East Coast and Gulf Coast of the US to Asia. The ports on those routes are feeling the most pressure to expand. These East Coast and Gulf Coast ports tend to be insufficiently deep to receive the newest post-Panamax ships and such ships must be light-loaded to access these ports, a time-consuming and costly exercise.

Recent presentations and discussions at the National Dredging Meeting in Washington, DC in late May 2012 indicate an acute awareness of the insufficient depths at many US ports. The Harbor Maintenance Trust Fund, which is a major source of federal funding for port maintenance and expansion in the US, has been a political hot potato. Fortunately, the urgency to release these funds is now gaining momentum.

The National Dredging Meeting was followed with the release of the US Army Corps of Engineers report to Congress, US Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels at the end of June. The report addresses the critical need to modernize US ports and inland waterways to accommodate post-Panamax vessels. According to Maj. Gen. Michael J. Walsh, USACE deputy commanding general for Civil Works and Emergency Operations: "Post-Panamax vessels today make up 16 percent of the world's container fleet, but account for 45 percent of the fleet's capacity. Those numbers are projected to grow significantly over the next 20 years".

In brief, the report (http://www.iwr.usace.army.mil/portandwaterways/) observes that world trade and US trade are expected to continue to grow, with imports growing more than fourfold and exports expected to grow more than sevenfold over the next 30 years. Although some post-Panamax size vessels currently call at US ports, by 2030 post-Panamax vessels will account for 62 percent of the capacity of the world's container fleet. These vessels will call in increasing numbers at US ports that can accommodate them – but most ports along the Eastern and Gulf coasts cannot accommodate post-Panamax vessels. These ports are prime targets for investments in expansion and dredging.

In addition, the report notes, the potential transportation cost saving of using post-Panamax size vessels to ship US agricultural products to Asia through the Panama Canal may lead to an increase in grain traffic on the Mississippi River for export at Gulf ports. According to the report, the current Mississippi River capacity is adequate to meet potential demand— if the waterways serving the agricultural export market are maintained.

The primary challenge with the current process to deliver navigation improvements is to ensure adequate and timely funding to take advantage of potential opportunities. USACE estimates that total investment opportunities could be in the range of $3 to 5 billion. This will, of course, have a significant impact on the US dredging industry, as funds are freed up to implement these improvements.

As of January 2012, ports from Miami to New York are considering renovations including dredging, blasting and bridge-raising – on the East Coast only Norfolk, Virginia is completely ready for these larger ships. That represents a huge amount of dredging. If the proposed legislation is passed, US ports in the fiscal year 2013 would get $1 billion for maintenance dredging, the largest annual federal award for navigation work in recent years. This represents the second challenge: will US dredging companies have the capacity to actually implement the necessary improvements?

At some ports, action is already underway. For instance, the Port of Houston, Texas, is overseeing $3 billion in updates to its berths and cranes and other facilities, partially as a reaction to the completion of the Canal's 2014 deadline for expansion. According to port executives, the port had a record 8,073 ships call in 2011 and expects to see bigger and more frequent dockings of container ships in the near future. And in Baltimore, Maryland in late June, four Super Post-Panamax cranes were delivered to the Seagirt Marine Terminal, where they are scheduled to begin operation in September at the terminal's new 50 foot deep berth.

In addition, other legislation has recently been introduced in the US Congress, the "DREDGE Act of 2012" - Dredging for Restoration and Economic Development for Global Exports. This bill would authorize the USACE to dredge the Mississippi River to 50 ft so that larger vessels transiting the expanded Panama Canal can access the river. At present more than 1,800 cargo

Ships waiting in the Hudson River, New York. In the background the Bayonne Bridge which is the entrance to the Ports of Elizabeth and Newark.

Ships waiting at Colón, Panama, the Caribbean/Atlantic entrance to the Panama Canal.

vessels with a draft of 40 feet or more transit the Mississippi River annually and the five ports on the lower Mississippi River move more than 400 million tons of cargo annually.

Globally speaking

By contrast, in Europe and Asia dredging and port-expansion activities have already taken place. These ports are well equipped for the post-Panamax era, although to keep pace with growing seagoing traffic, maintenance and improvements will always be necessary. European ports such as Rotterdam, Hamburg and Le Havre, to name just a few, are already receiving the post-Panamax vessels. The Port of Hamburg's Eurogate Container Terminal, for instance, covers 140 hectares and contains over two thousand meters of quays with alongside depth of 16.7 meters and 18 post-Panamax quayside gantry cranes. And that is only one terminal.

At Far Eastern ports in China, Singapore and elsewhere, the same is true. Still the anticipated increase in shipping traffic is causing these harbors to also re-examine and expand. For instance, the Port of Melbourne Expansion Project has recently secured $400 million for its expansion project to enhance Webb Dock's import and export auto trade, raising the total amount for the re-development of the Port of Melbourne to $1.6 billion. The re-development of Melbourne Port includes the construction of a new container terminal at Webb Dock and infrastructural upgrades at Swanson Dock to increase the capacity of the port's existing container terminals.

Shanghai is aiming to increase container port traffic by 4 percent by 2015 from last year's level. The city expects annual container turnover to reach 33 million TEU by 2015, up from last year's 31.74 million TEU. Officials also indicate that one of the city's efforts in the period through to 2015 is to enhance the capacity of inland waterways connecting Shanghai's ports and neighboring areas in the Yangtze River Delta region to reduce the use of already congested road traffic. About 42 percent of Shanghai's port cargo is now shipped via waterways rather than by road or rail. The port aims to raise that to 45 percent by 2015.

Turning to South America, in 2008 the Brazilian government published its study for the Brazil Port Dredging Program and identified 34 major public ports. Focusing on seven specific harbor groups, maintenance dredging of access channels, turning basins and berths for these seven areas, was estimated to cost $15,300,000. Expansion and deepening, however, require a far greater investment and estimates are in the range of S$91,500,000 to dredge the Port of Rio Grande to a maritime access to 55 feet; S$78,300,000 to dredge the Port of Santos and $49,000,000 to dredge the Port of São Francisco do Sul to 42 feet.

Dredging prognosis

The commitment to dredging and deepening harbors worldwide is clear. Harbors such as Antwerp, Hamburg, Le Havre, Busan in Korea and Shanghai, Hong Kong and Yantian in China are already near or more than 50 feet deep but will have to continue to dredge to maintain their depths. Other ports, primarily in the US, are playing catch-up.

Given that the new Panama Canal will have a 60-foot depth and will handle ships drafting up to 50 feet and that the Suez Canal has a depth of up to 76 feet and can handle ships drafting up to 66 feet, one can only assume that the need for dredging deeper harbors will continue. As the opening date for the new Panama locks in 2014 – coincidentally a century after the canal was first opened – draws closer, more and more investments in dredging and port expansion seem to be forthcoming.

REFERENCE

Pedro Brito (2008). Brazilian Port Dredging Program. PowerPoint presentation.

Stefan Moens and Stijn Verplanken (2011) "Dredging for the Panama Canal's New Locks at the North Entrance of the Pacific Access Channel". Terra et Aqua, Number 124, September.

U.S. Army Corps of Engineers (June 2012) U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels. http://www.iwr.usace.army.mil/portandwaterways/

ABOUT THE AUTHOR

As secretary general of the International Association of Dredging Companies, the umbrella organization for the worldwide private dredging industry, **René Kolman** takes a leading role in promoting the industry's long standing commitment to environment and sustainability. Mr. Kolman studied at the Nautical School in Rotterdam and holds a degree in Economics from the University of Groningen, The Netherlands.

ABOUT THE ORGANIZATION

IADC stands for International Association of Dredging Companies and is the global umbrella organization for contractors in the private dredging industry. As such IADC is dedicated to promoting the skills, integrity and reliability of its members, as well as the contributions of the dredging industry to worldwide prosperity in general. IADC has over one hundred main and associated members. Together they represent the forefront of the dredging industry.

ENQUIRIES

IADC Secretariat: +31 (0)70 352 33 34
Email: info@iadc-dredging.com
Web: www.iadc-dredging.com

Sochi heralds new era in Russian port construction

Andrey Elinson, Deputy Chief Executive Officer of Basic Element

The Sochi Olympics have presented a once-in-a-lifetime opportunity to develop Russia's Black Sea region, boosting the country's construction sector and the local economy. However, getting the materials needed for the Olympic construction to the site efficiently required massive investment in transport infrastructure.

One of Russia's largest diversified business groups, Basic Element, has recently completed the construction of the Sochi Imeretinsky Port – crucial to ensuring construction materials make their way to the 2014 Winter Olympics site. It is the first port to be constructed since the end of the Soviet Union, and the first to begin using advanced technologies to meet 21st century standards.

The Sochi Imeretinsky Port

The port has eight universal docks of up to 9.2 meters in depth, three of which are equipped for tankers. With a cargo berthing front of 1280 meters and a total cargo loading area of 31.8 hectares, the port is well-equipped and has the capacity to receive five million tonnes of cargo annually.

The port is scheduled to receive all the materials necessary to build the Sochi Olympic sites, including ballast, sand and cement. The docks can receive ships with deadweight of up to 10,000 tonnes. Four Liebherr mobile cranes are available, one versatile LHM-280 model and three fast LHM-180s; as well as forklift trucks to ensure that cargo is processed quickly. Stevedoring and customs services, freight forwarding, towing, surveyor maintenance and agency services are all available on site to facilitate the efficient handling of all cargo. Throughout the construction of the port, Basic Element were confronted with a number of issues that required them to implement the industry's latest technology and engineering methods.

Storm disrupted early progress

In December 2009, just over a year after construction of the port began, a rare storm with gale force winds rocked the Black Sea. The storm damaged the port, and the team had no other option than to start some of the construction again from scratch, while simultaneously disassembling and reconstructing other parts of the port. This unfortunate event caused the port's launch to be delayed by a year. Basic Element companies ordered the construction of protective barriers that are high enough to resist waves of up to 10 meters and also reinforced the entire port infrastructure to prevent such damage from occurring again.

Engineering adapts to environment

The Black Sea is one of the world's largest landlocked bodies of water, and is dissected by the Danube Canyon. This underwater canyon is a major erosional trough, which adds to the seismic activity in the area. The strong tidal patterns and varying underwater flows compounded the engineering complexity required for construction activity. Basic Element companies launched a comprehensive investigation into the seismic nature of the Black Sea basin, and catalogued all nearby rivers, coastal waters and deep-water flows. The engineering plans were adapted to accommodate these findings, and ensure the stability of the port infrastructure.

Lowland marsh re-engineered

Historically, construction of the area around the port, the Imeretinskaya Lowland of Sochi, had not been possible due to its marsh environment which is prone to flooding. However, Basic Element companies were able to re-engineer the surrounding land to make it suitable for road construction. This ensured that the port could be connected to Russia's infrastructure network. Basic Element companies undertook a unique, advanced drainage and engineering protection project, which aimed to turn 1200 hectares of swamp land into a site suitable for construction. Previously, high ground water levels, which were predominantly made up of mud flows had made this seem impossible.

The drainage network covers 30 kilometres of territory, and was required to meet strict environmental protection standards to avoid waste water emissions into the Black Sea coast. The project involved partial peat extraction, land filling and consolidation to raise the ground level by three meters across this exceptionally large expanse. In total, the scheme required five million cubic meters of soil. The project was under tight deadlines and needed to be executed quickly. As a result, daily landfill activity reached 27,000 cubic meters of soil brought in 1,700 truck loads with the remainder coming to site by sea.

In order to protect the environment as well as reduce the burden on the region's congested roadways, the company used innovative delivery methods to get the soil in place. For example, vessels carrying sand and gravel mixtures from sea quarries in Abkhazia, further south along the Black Sea coast were unloaded using a pipe 1,000 meters in length. This allowed the transport vessels to remain 270 meters away from the shore. To address the concerns of environmental agencies, Basic Element companies ensured the project complied with all environmental regulations and worked in close cooperation with scientists to monitor the complex geological environment including soil and ground water.

Opportunities for Sochi

The port and the restructuring of the lowland area around it have created new opportunities for the residents of Sochi, as the development has reduced the time required to deliver building materials to the Olympic sites, cutting costs and enabling efficient construction of the entire infrastructure. The port serves to shield the Olympic Village along the coast from waves during storms. This, in combination with the lowland restructuring, has made this part of the Black Sea coast more attractive to developers, keen to take advantage of the region's reputation as a health and wellness resort. The Olympic Village will become an all-seasons resort, called Sochnoe, after the Games, providing further jobs for the local population.

After the Olympic Games, the port will also become a tourism hub. It will be retrofitted as a first-class marina. It is estimated that the marina capacity will reach around 600-700 boats.

Approximate investment into the port retrofitting is estimated at €50 - 100 million, depending on the outcome of the final design plans which are currently under development. Basic Element companies are now working with leading European marina management operators Island Global Yachting on the project. It will handle the marina management, promotion, service development, as well as thetechnical maintenance of yachts.

The future of Russian ports

Sochi is not only located on the Black Sea coast, but also close to the Azov Sea. Together, these two bodies of water process over 35 percent of imports to Russia. Key rail networks and road ways are linked to the region. With Russian imports set to increase cargo turnover by 46 percent by 2016, additional port capacity will certainly be needed. Basic Element, which also has a stake in Vanino Port on Russia's eastern coast, plans to expand its port construction and operation activities to meet this demand.

ABOUT THE AUTHORS

Andrey Elinson joined Basic Element in August 2007 as a Director of Corporate Governance and Internal Control. Before joining the company, he worked for Deloitte & Touche CIS where from 1997 he led various consulting projects and audits at Russian and international companies and subsequently headed an advisory group on financial investigation and economic disputes. From 2004, he supervised the establishment of effective internal control and risk management systems.

Andrey Elinson graduated with honors from the Russian Government's Finance Academy with a degree in Accounting and Auditing. He is a U.S. Certified Public Accountant and a U.S. Certified Fraud Examiner. He holds a Certificate in Company Direction and a Russian certificate in auditing. Andrey Elinson is a member of the Board at the Russian Institute of Internal Auditors and co-chair of Quality commission at the Russian Institute of Professional Accountants.

The Sochi Imeretinsky Port, Russia.

ABOUT THE COMPANY

Basic Element (www.basel.ru) is one of the Russia's largest and most dynamic diversified business groups. Basic Element's companies are within the scope of Oleg Deripaska's business interests. Basic Element, through its affiliates, owns significant stakes in and operates dozens of companies in many sectors, such as energy, manufacturing, financial services, construction, aviation and agriculture. Over 250,000 people work at the Group's companies in Russia, the CIS, Africa, Australia, Asia, Europe and Latin America. Many of them play key roles in their respective market sectors in Russia and internationally, including En+ Group, GAZ Group, Glavstroy, Basel Aero among others.

ENQUIRIES

30, Rochdelskaya Street, Moscow, Russia 123022
Tel: +7 (495) 720-50-25; +7 (495) 720-50-25
Fax: +7 (495) 720-53-95
Email: info@basel.ru

Jamaican cruise ship terminal respects environment

Astrid Kramer, Royal Boskalis Westminster N.V. & **Ivana Kennedy,** Maritime and Transport Services

Creating a new, modern cruise ship terminal in a Caribbean paradise where the waters are filled with unique, vulnerable marine life is no easy task. Still, this was the task at hand. And in early 2011, thanks to extensive planning and innovative solutions, the project became a reality. The new J$180 million cruise ship port in Jamaica, able to accommodate the newest and largest class of cruise ships was delivered.

The town of Falmouth is located on the northern coast of Jamaica. Founded in 1769, Falmouth was a flourishing market and port in those days. Today, it is known to be one of the Caribbean's best-preserved Georgian towns and an important tourist destination.

The waters surrounding the island nation of Jamaica are home to a diverse marine habitat and the Martha Brae river runs just southeast of the town, ending in a luminous lagoon. On land, the town is surrounded by red mangroves, and at sea by coral reefs and seagrass beds making it an extremely sensitive ecosystem. To develop a deep harbor for cruise ships where the dredge footprint covered wide areas of coral reef and seagrass vegetation required skill, care and a well-thought-out, environmental management plan.

Building in an environmentally sensitive site

The Falmouth Cruise Ship Terminal (FCST) is an initiative of the Port Authority of Jamaica (PAJ) and Royal Caribbean Cruise Lines (RCCL) to host the largest cruise ships in the world: the 'Oasis of the Seas' and the 'Allure of the Seas'. In 2009 the project was awarded to E. Pihl & Son A.S. as the main contractor and Boskalis as subcontractor for marine works. The project included dredging and reclamation works as well as creation of the cruise ship terminal itself. The marine works consisted of the dredging of an access channel to -12.5 meters Chart Datum and two berthing pockets alongside the terminal to a depth of -11.5meters Chart Datum (north-western side) and -10.5 meters Chart Datum (south-eastern side).

Boskalis was also responsible for the development of an Environmental Management Plan (EMP) to mitigate and monitor environmental impacts as a result of dredging and reclamation activities. The EMP consisted of water quality monitoring, including turbidity, dissolved oxygen and water temperature; the installation of silt screens; the relocation of benthic flora and fauna; the installation of a submerged pipeline for sediment-laden excess water; and the installation of reef havens and reef towers.

Falmouth has a shallow, natural harbor, ranging in depth from one to 12 meters, bounded to the north by an extensive fringing reef, to the east by Oyster Bay and to the west and south by the town of Falmouth and the mangrove system of the Martha Brae estuary. The environmental impact assessment (EIA) conducted by Mott MacDonald indicated the presence of sensitive benthic marine resources within and adjacent to the footprint of the proposed structure, namely the coral reef system and Oyster Bay. Some 112 species were identified in the area (22 scleractinian corals, 29 algae, eight sponges, 15 invertebrates and 45 fish), coral cover was as high as 30 percent and Diadema antillarum, the keystone invertebrate herbivore, had densities of eight–13 individuals per square meter according to previous studies.

Oyster Bay, also called 'Glistening Waters', is one of only four bioluminescent bays in the world. The bay's bioluminescence is a result of high densities of Pyrodinium bahamense reportedly ranging from 44,000 to 273,000 individuals per liter. Studies indicated that the dominance of this bioluminescent plankton could be threatened by changes in water circulation and chemistry.

Delicate dredging processes

Boskalis was responsible for all marine works involving deepening and broadening the access channel to the harbor. This meant that Boskalis was also responsible for the protection and care of the coral reefs, seagrass and benthic fauna which were abundantly present.

To achieve the dredging requirements to modernize the port, and still respect the sustainability of the marine environment, Boskalis organized and supervised a massive campaign of coral relocation and seagrass transplantation. Although this role was stipulated in the contract for marine works, the extent of the removal and relocation efforts was far greater than anticipated based on the estimations in the EIA.

Among the dredging contractor's responsibilities were monitoring water quality, such as turbidity, Total Suspended Sediments (TSS), dissolved oxygen and water temperature; the installation of silt screens around the work area of the dredging vessels; the use of a High Density Polyethylene (HDPE) pipeline to pump excess water from the reclamation area to the disposal area; coral, seagrass and benthic fauna relocation and the installation of reef havens and reef towers. As a compensation measure, 1200 Ecoreef modules were also installed.

The range of activities undertaken by Boskalis was made possible because of the broad expertise that the contractor has in-house. Specifically, Hydronamic, the engineering department of the company, played a major part in underwater monitoring, feasibility studies, design and installing the special HDPE pipeline and the intense liaison between the different parties around the coral relocation. Hydronamic also assisted with the installation of silt screens to ensure the environmental compliance with the standards established by the National Environmental Protection Agency (NEPA) of Jamaica.

Dredging and reclamation works for the cruise ship terminal were conducted in two different stages. Dredging started in September 2009 with the removal of the softer topsoil layer in the dredge footprint with the grab dredger – 'Packman', and lasted until January 2010. Disposal of dredged material took place offshore with three barges at a dedicated placement location. Occasionally material was side-casted in the pier footprint to be used by the main contractor with the start of the construction of the pier.

Removal of the medium dense and the harder layer underneath was executed with the cutter suction dredger - 'Ursa', which started in March 2010 and lasted until the middle of June 2010.

Lowered-basket ready for planting

Dredged material was then transported with a floating pipeline onshore to the reclamation area located southeast of Falmouth. Return water from the reclamation area was transported through a HDPE pipeline with a discharge point below -50 meters Chart Datum northwest of the work area, as studies and monitoring indicated that this would reduce impacts on the majority of nearby coral reefs and seagrass beds which are located at shallower water depths of between five and 25 meters.

Coral, seagrass and benthic fauna relocation

In order to reduce the impacts of the dredging and relocation activities, benthic flora and fauna were relocated during the project activities. Each of the relocations demanded a different approach and planning. Coral was detached from the area to be dredged prior to dredging and attached in a more suitable marine environment on hard substrate outside of the access channel; when one area was cleared dredging began and coral relocation continued in tandem at a subsequent area.

The seagrass removed from the dredge footprint in fact, had no suitable reception area around Falmouth and was therefore sacrificed. However in nearby towns bare patches in the seagrass beds caused by ship's anchors or sand harvesting were discovered. A transplantation technique was used where plugs were taken from healthy parts of the seagrass beds at those locations and planted in the bare patches as a compensation measure. This method facilitates quick recovery of damage to seagrass beds before erosion can increase the damage.

And last, but certainly not least, the dredge area was swept every single day for benthic fauna such as lobster, starfish and conch. These were then placed in a nearby location beyond the range of the dredging operations.

At the start of the project, 15 divers were contracted and trained to conduct the necessary underwater relocation activities. These divers were then used to train a larger group of divers as it became clear that the quantity of coral to be relocated was more than 200 percent of the amount initially calculated in the EIA.

To meet this challenge, within a month the diving force was increased to 50, then 60 skilled divers. During an eight month period, in an area of about 11 hectares, a team of 93 trained divers, using both surface supply and scuba, were working in four teams harvesting, transporting, reattaching and monitoring. Ultimately, these teams successfully relocated 147,947 organisms, including 8,975 soft corals, 137,789 hard corals and 1,183 sponges.

At the start of the project, time series photographs were taken of what was believed to be a large enough representative sample size. Upon the completion of the project, the exact representative sample size was determined and time series photographs were taken on two additional occasions at the end of the project (2010) and a year later (2011). The relative health was thus monitored over a period of 19 months (October 2009 – April/May 2012).

With years passed since the completion of the project, monitoring indicates that the coral is healthy with a low percentage of diseased corals or corals with partial mortality and a very low total mortality of four percent. An independent agency also monitored the activities before, during and after the relocation exercises and confirmed the results of the relocation.

Lessons learned

Working in the exotic waters of the Caribbean was a learning experience for all parties and demanded the highest levels of expertise. Boskalis tackled the environmental challenges every step of the way, finding innovative solutions where necessary, in collaboration with well-known scientists. The use of a specially designed HDPE pipeline to bring the return water

Plug in to green power

Predesigned 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

- Prepackaged solution made of standard, proven components
- Easy installation and commissioning
- Easy maintenance
- Compact footprint for minimum impact at berth
- Available worldwide

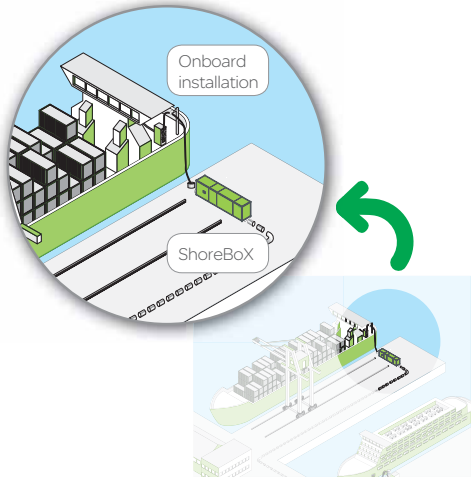
Scalable and mobile

- Minimise your energy consumption by optimising the available power
- Adapt your investment to evolving power needs

Experts in onshore and onboard solutions

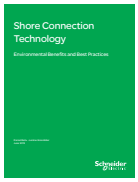
- Benefit from more than 90 years' experience in the marine industry
- Get best-in-class performance in both your onshore and onboard shore connection systems
- Receive the support you need thanks to our worldwide presence and standardised solutions and architectures

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 Key Code 22575p

Schneider Electric™

35 rue Joseph Monier, CS 30323, 95506 Rueil Malmaison Cedex (France) • Tel. +33 (0) 1 41 29 70 00 • 998-1156277_A_GMA-GB

Removal of the softer topsoil layer in the dredge footprint with the Grab Dredger Packman.

from the reclamation area and discharge it at extreme depths of between –50 and –60 meters had not previously been done. But a scientific feasibility study established that at this depth the discharged material would not reach the coral reef located above the discharge point. Continuous monitoring established that this was indeed the case.

Also of great importance was the safety record. In nine months of operation, with an enormous amount of dive time and very complex logistics, only one diver got ear problems after having a cold. No accidents occurred, which is a remarkable achievement.

Boskalis also took its responsibilities a step further by consulting multiple coral reef scientists for their expert opinions on specific ecological problems. Their expertise added to the already extensive arsenal of scientific knowledge of the dredging contractor, information that can well be applied to future operations.

Consultation with these experts is in line with the 'Building with Nature' (BwN) program actively being pursued in the dredging industry. The aim of BwN is to preserve or even strengthen the ecosystem as a starting point, to design alternative work methods and mitigation measures that are effective and efficient and reduce project risks, all aimed at fostering greater levels of sustainable development.

Although worldwide, benthic relocations and mangrove restorations have become a common mitigating measure required by governance bodies, large-scale coral relocation such as conducted in Falmouth is logistically and financially very complex and survival success is not always certain. By using the BwN approach for the Falmouth cruise ship terminal, Boskalis was able to reach a successful outcome where the impact on the marine environment has been extensively minimized.

Conclusion

Ultimately the experience in Falmouth proved that a close partnership between governmental organizations, dredging contractor and scientists, who together have the capability and authority to monitor and adjust, can lead to results in which both an economic goal and an environmentally sound solution can be effectively achieved.

ABOUT THE AUTHORS

Astrid Kramer has an MSc in Ecology from Leiden University, The Netherlands. She has been working as a project engineer for Hydronamic, the in-house engineering company of Boskalis for over five years. She advises projects in ecologically sensitive areas and is involved in large-scale environmental monitoring programmes. She has been working on Boskalis projects in a variety of countries such as Angola, Kenya, Canada, Abu Dhabi, The Maldives and Suriname.

Ivana Kenny studied Zoology at the University of the West Indies, Mona Campus. After undergraduate work she moved on to an M.Phil in Scleractinian Coral disease on Jamaica's South-East Coast. Ivana has been studying coral disease and reef organisms for over five years and has undertaken marine assessments for an assortment of environmental companies like coral relocations with Maritime and Transport Services (MTS), including that of the Falmouth Cruise Terminal, potentially the largest relocation globally (to date).

ABOUT THE COMPANY

Royal Boskalis Westminster N.V. is a leading global services provider operating in the dredging, maritime infrastructure and maritime services sectors. The company provides innovative and sustainable all-round solutions in the maritime, coastal and delta regions of the world with the construction and maintenance of ports and waterways, land reclamation, coastal defense and riverbank protection. Boskalis offers a wide variety of marine services through SMIT including harbour towage, salvage, subsea, transport and heavy lift services. It also has strategic partnerships in the Middle East (Archirodon) and in terminal services (Smit Lamnalco). Boskalis has a versatile fleet of over 1,100 units and operates in around 75 countries across six continents. Including its share in partnerships, Boskalis has approximately 14,000 employees.

ENQUIRIES

Diana van Minnen/Astrid Kramer
Royal Boskalis Westminster nv
PO Box 43, 3350 AA Papendrecht, The Netherlands
Telephone: +31786969372
Email: Diana.van.minnen@boskalis.com
Web: www.boskalis.com

Diaphragm wall quays for Myanmar Mega-Port (Dawei Seaport)

Christopher Carr and **Maki Onodera,** Halcrow (Thailand) Ltd., Bangkok, Thailand

Figure 1: Artist impression of the future Dawei Sea Port and the industrial estate (courtesy of Italian-Thai Development Public Company Limited).

Introduction

The Dawei Sea Port (DSP) is the centerpiece of a multi-billion dollar infrastructure and industrial development project in Myanmar. Major elements of the project include a new port and industrial zone located in southern Myanmar (near the town of Dawei) and highway and rail systems connecting the port to central Thailand, to provide access to transportation infrastructure to South China and other regions within Southeast Asia. The developer will be the Dawei Development Company Limited (DDC) and the general contractor will be the Italian-Thai Development Public Company Limited (ITD). The DDC was established by ITD after being awarded a 75-year concession by the Myanmar government to develop the Dawei Development Project, an ambitious project comprising an industrial estate covering nearly 204 square kilometers, oil and gas facilities, a deep sea port, power plants, steel mill, shipyard, a new township, and a transborder road/rail/power link with neighboring Thailand.

The port development will ultimately include 55 berths, including terminals for containers, general cargo, liquid cargo, LNG, coal and iron ore. In 2011 the Halcrow-Aurecon Design Consortium (HA) was awarded a contract by ITD for master planning, data acquisition, feasibility and optimization studies, and the detailed design of the port. This article provides a brief overview of the DSP project and a detailed discussion of the unique quay wall system that will be used, with concrete diaphragm walls (slurry walls).

Port layout

The layout of the port features a breakwater-protected Outer Harbor and an L-shaped Inner Harbor. The Outer Harbor will be used for berths with open pile supported structures, including the liquid and Dry Bulk terminals, the LNG terminal, and the tug base. The Inner Harbor will be used for the container and general cargo terminals, and will have closed quays constructed using diaphragm walls. The Inner Harbor will have a depth of 16meters while the Outer Harbor will have a depth ranging from 14meters to 20meters.

The first phase of construction includes facilities for the Outer Harbor and the initial portion of the Inner Harbor, together with dredging, reclamation, and shore protection works, see figure 4.

The breakwater system has an overall length of approximately five kilometers and will be constructed with dynamically stable rock breakwaters ('berm breakwaters'), using widely graded armor stone produced from a quarry located adjacent to the site. Extensive 3D physical model tests were performed in order to optimize the port layout and breakwater design, at the Canadian Hydraulics Centre (CHC) and the Council for Scientific and Industrial Research (CSIR) in South Africa. Comprehensive coastal numerical modeling studies were also performed in support of the design work and to assess environmental impacts. Modeling issues of special concern include the potential for deep scour holes near the tip of the breakwaters, and the potential for excessive wave agitation at the container terminal caused by the

penetration of long period (infra-gravity) waves, due to prolonged periods of high swells during the Southwest monsoon.

Diaphragm wall quays

Conceptual designs and comparative construction cost estimates were developed for a number of alternative quay wall design concepts, for both in-the-dry and in-the-wet scenarios for the basin excavation and quay wall installation. Anchored wall options included steel sheet pile walls with king piles, and diaphragm walls with single and multiple rows of tiebacks. Gravity wall options included steel sheet pile cells, concrete block walls, concrete caissons, and slip-formed concrete gravity walls. Platform quays were also considered, including various types of pile supported platforms with revetments.

The selected concept uses a concrete diaphragm wall with a single row of tie rods. This scheme was selected because it offers relatively low lifecycle costs, and provides important advantages from both design and construction standpoints. The diaphragm wall system consists of 1.5 meters thick wall panels with T-section panels at the locations of the fenders and bollards, which are spaced at 12.5 meters. The wall superstructure, above Low Astronomical Tide (LAT), features a precast concrete fascia wall system that is connected with cast-in-place elements. The tieback system consists of 110 millimeter diameter x 46 meter long tie rods, spaced at approximately 2.1meters, connected to a precast concrete deadman. Bored concrete piles are used for the foundation of crane beams at the container quays.

Typical cross-sections of the quay wall are shown on Figures 5 and 6.

Geotechnical analysis and structural design

A large number of load combinations are considered in the design, and fall into three general categories: construction load scenarios (with full dewatering of the basin); service load scenarios (including backfill live loads and the fender and mooring loads); and the contingency level seismic event. Loads and deflections are determined by soil-structure interaction analysis using PLAXIS, (see Figure 7), taking into account each phase of the construction sequence. The wall is subject to extremely large concentrated loads at the bollards, which are transferred into the T-sections of the diaphragm wall using counterforts.

Extensive sensitivity analysis has been performed to optimize various elements of the design, including the depth of penetration of the diaphragm wall into bedrock, the elevation and diameter of the tie rods, and the setback distance for the deadman. Stringent criterion was adopted for allowable deflection at the top of the wall: 3 centimeters for service loads and 30 centimeters for the contingency level earthquake. These are relative deflections at the top of the wall following the initial deflections caused by the basin excavation.

Serviceability and durability design

The concrete structures are designed for a nominal service life of 100 years to the initiation of corrosion of reinforcing steel. An extremely long service life is required because of the long lease terms being offered to ITD, after which period the port facilities must be turned over to the Myanmar Government.

Conceptual designs and comparative cost estimates were developed for two general alternatives: 1) cathodic protection; and 2) high performance concrete (HPC). The selected approach is to use HPC but also include provisions for implementing a cathodic protection system at some point in the future.

Concrete mix designs to achieve the 100-year design life were assessed based on computer modeling studies of chloride migration. 'Triple blend' concrete mixes will be used consisting of type 1 Portland cement, fly ash, silica fume, and corrosion

Figure 2: Location of the Dawei Sea Port.

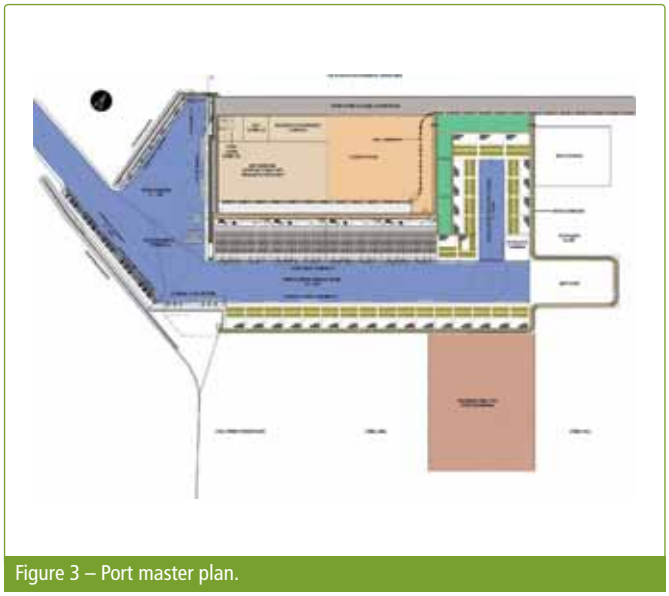


Figure 3 – Port master plan.

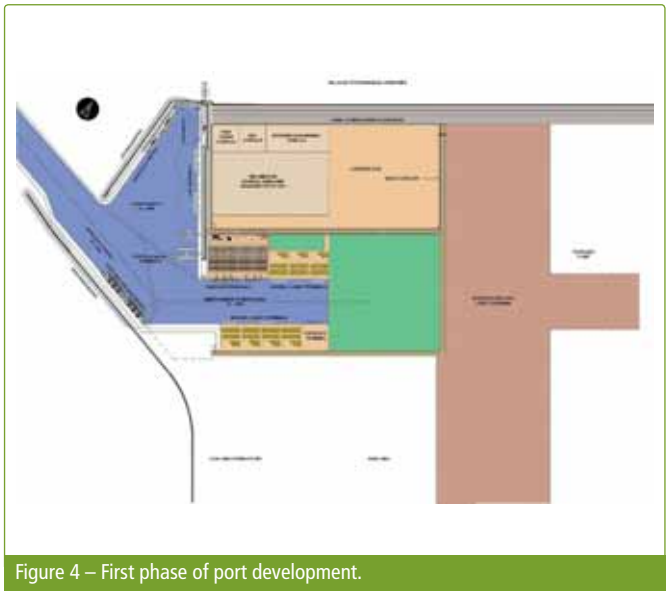


Figure 4 – First phase of port development.

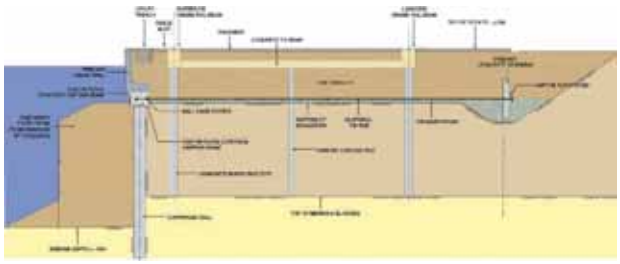


Figure 5 – Typical cross section of quay wall between T-section panels.

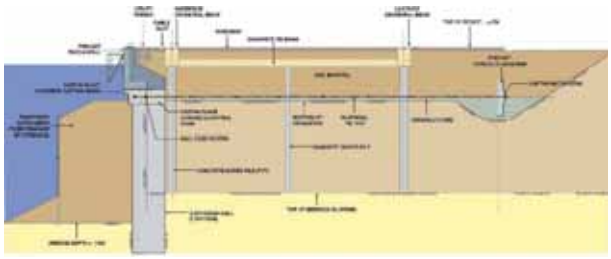


Figure 6 – Typical cross section of the quay wall at diaphragm T-section panels where fenders and bollards are located.

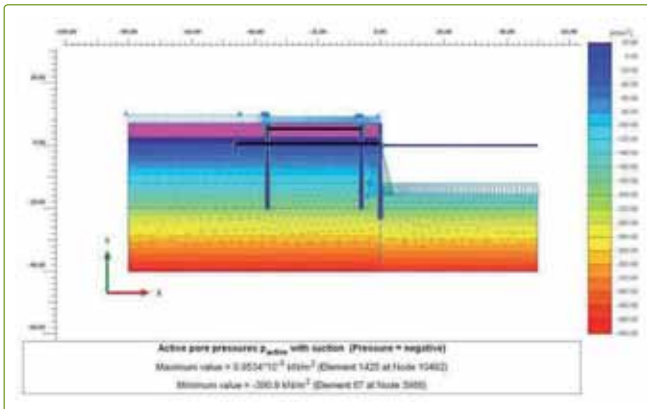


Figure 7 – Typical output of PLAXIS soil interaction analysis model.

inhibitor will also be used for elements with more severe exposure. Low water-cement ratios are needed (in the range of 0.37) and super-plasticizers and other admixtures will be required for workability. Based on the results of corrosion modeling prescriptive specifications have been developed for indicative concrete mixes, but performance testing will be required to confirm that the target chloride diffusion coefficients can be achieved for the selected mixtures and aggregates.

The outer reinforcement of the diaphragm wall is designed for a nominal cover of 100 millimeters and it is conservatively assumed that the placement tolerance of the reinforcing cage is +/- 50 millimeters. Accordingly, for the corrosion modeling a minimum cover of 50 millimeters is assumed, whereas for crack control checks a maximum cover of 150 millimeters is assumed.

The top of the diaphragm wall is set below LAT and will be permanently submerged. This was done in order to keep the tie rods at an optimum and relatively low elevation, and to avoid exposure of the diaphragm wall in areas where it would be visible at times and subject to highly corrosive conditions of the intertidal and splash zones. The precast concrete fascia is used to provide a clean and uniform appearance to the concrete, and provide the highest quality reinforced concrete in areas where the corrosion risks are highest.

Recommended solution

Diaphragm walls require land-based operations for all of the quay wall construction and for this reason are not commonly used for port development. However, the method is quite suitable for dry dock construction and for port development in cases where harbor basins are to be excavated from existing land or from reclaimed areas. One example where a rather similar diaphragm wall construction has been used is at the Shahid Rajaee Port (Bandar Abbas) in Iran.

At DSP the developer/contractor strongly preferred land-based quay wall construction operations and in-the-dry basin excavation techniques in order to maximize the use of local labor and subcontractors and to make optimum use of their available construction plant and in-house experience. Offshore reclamation options were deemed problematic due to unfavorable soil conditions. Diaphragm wall construction becomes attractive under these circumstances and offers other important design and construction advantages.

Overall, the diaphragm wall system is an optimum albeit somewhat unique solution for the quay wall construction at DSP.

Acknowledgement

The authors wish to express their thanks and gratitude to Dawei Development Company (DDC) and in particular to Dr. Somchet Thinnapong, Managing Director of DDC, for their contribution and permission to publish this article.

ABOUT THE AUTHORS

Christopher Carr is structural and coastal engineer with more than 35 years of experience in planning, design, and project management of marine facilities for major port projects in Dubai, Qatar, Israel, Mexico, and Australia.

Maki Onodera has 10 years of experience in the analysis, design, and inspection of marine facilities. His specialties include underwater inspection and structural condition evaluation, as well as design, construction supervision, and project management.

ABOUT THE COMPANY

Halcrow delivers planning, design and management services for developing infrastructure and buildings worldwide. With its roots as a ports practice over 140 years ago, Halcrow has remained at the forefront of maritime and coastal engineering. Halcrow has over 250 maritime specialists around the world, including project managers, port planners, coastal scientists, simulation and modeling experts, and engineer divers. Halcrow is a company of CH2M HILL, the global full-service consulting, design, construction, and operations firm. With almost 30,000 employees, the combined group is a world leader in water, environmental, transportation, and other infrastructure markets.

ENQUIRIES

Payam Foroudi, Director, Ports and Maritime
Halcrow Group Ltd (A CH2M Hill Company)
Burderop Park, Swindon, SN4 0QD, United Kingdom
Tel: +44(0)1793-816313
Fax: +44(0)1793-812479
Email: foroudip@halcrow.com
Web: www.halcrow.com

Wiriya Pienchob, Managing Director
Halcrow (Thailand) Ltd (A CH2M Hill Company)
173/14, 15, 17 Asia Centre Building, 16th Floor, South Sathorn Road,
Khwaeng Thungmahamek, Khet Sathorn, Bangkok, 10120 Thailand
Tel: +66(0)2 6790070
Fax: +66(0)2 6790071
Email: pienchobw@halcrow.com
Web: www.halcrow.com

First Latin American port to certify carbon footprint

Eric Maulén Viancos, environmental chemical engineer, Chile

Figure 1: Terminal Puerto Arica (TPA).

Figure 2: TPA team that led the estimation and certification process for the carbon footprint.

A landmark first has positioned the Terminal Puerto Arica (TPA) as an innovative and sustainable port and helped it achieve international standards. The port has attained The Carbon Footprint Certification for applying the Greenhouse Gas (GHG) estimation system to its usual operations. This initiative, pioneered within the port business, has allowed TPA to detect aspects that contribute to global warming, allowing it to take informed mitigating actions to reduce emissions in a responsible, clear and efficient way.

This accomplishment was celebrated on Tuesday 3 July in a ceremony headed by the Chilean environmental sub-secretary, Ignacio Toro Labbé and attended by representatives of some of the highest authorities in employment, economy, port constructions, maritime transport and business. At this event, TPA CEO, Pedro Jaramillo extended a thank you message to employees and suppliers for the assistance provided during the whole process: "In the old days the port was usually seen as a contaminating area, today we can happily say that we are leaders in environmental matters. This is the first port certification in Chile and in Latin America; this fact shows that in our city, employees are able to comply with international standards. We have a detailed map of the most important emissions for our port tasks and have a management plan to reduce them and become the friendliest Chilean port to the environment." Mr Jaramillo summarized that the objective is "to reduce and manage the CO2 emission, by the identification of the biggest emissions process, their costs and potential savings, to harmonize the company, the society and the environment."

Detailed estimation activities carried out

The GHG estimation mechanism was developed with the assistance of the sustainability team at PricewaterhouseCoopers and validated by the international company ABS Consulting. The verification scope extended to all emissions generated in the port chain of value, including the four main operators, TPA, Ultraport, Agunsa and Contopsa and estimated the total amount of emission as 21.827 tonnes of equivalent CO2 (tCO2e).

The number is shown according to direct emissions (4.036 tCO2e) composed mainly of the usage of oil operating equipment at the port; indirect emissions (1.182 tCO2e) including electric light and consumption at offices and refer containers; and other indirect emissions (16.609 tCO2e) include the indirect emissions from ships and trucks that arrive to the port. As this third figure of indirect emissions is out of the port's operational reach, they will focus on reducing the emissions of the first two figures – direct and indirect emissions at the port itself.

Creating a green port

In order to position itself as a green port, TPA joined the World Ports Climate Initiative (WPCI) in 2011. This is an international organization that integrates all the leading ports that have environmental initiatives and are concerned about global warming. Also in 2007, TPA was certified with the international standard ISO 14.001, the first and main step that now allows the company to comply with environmental policies and apply a process of continual improvement.

ABOUT THE AUTHOR

Eric Maulén Viancos is an environmental chemical engineer and graduate of environmental science. In Terminal Puerto Arica he served as the Environmental Coordinator, having responsibility for environmental management system ISO 14001, sector environmental permitting, environmental monitoring plans, environmental management plans and the port's carbon footprint.

ABOUT THE COMPANY

Terminal Puerto Arica S.A is a modern multipurpose port that adheres to high environmental standards which have positioned it as the first port in Latin America to verify its carbon footprint. Its transfer services include: containers, bulk, break bulk and project cargo. TPA is the leading port in the Macroandean region.

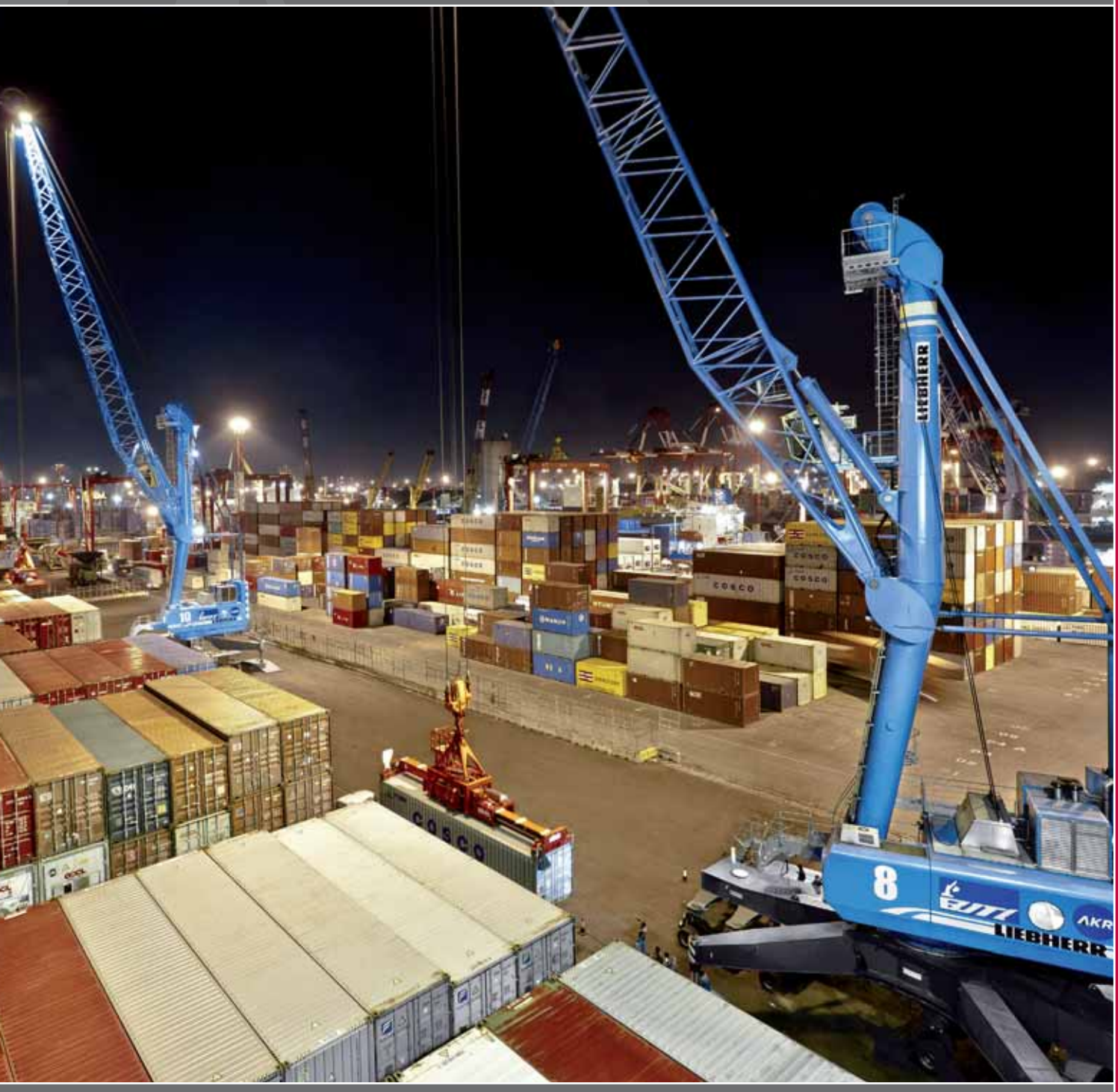
ENQUIRIES

Terminal Puerto Arica
Máximo Lira Av . Nº389, Arica, Chile
Tel: 56-58-202000
Email: tpa@tpa.cl
Web: www.tpa.cl

Container Handling

Section sponsored by:

LIEBHERR



North American maritime gateways logistics

Dr Jean-Paul Rodrigue, Hofstra University, New York, USA, & **Dr Theo Notteboom,** Institute of Transport and Maritime Management Antwerp (ITMMA), University of Antwerp, Antwerp, Belgium.

North American gateways in the age of globalization

Gateways play a strategic role in connecting, organizing and managing freight flows between regional markets and therefore impacting upon the global economy. Rail and highway systems have long been the main support for the North American freight distribution market. This conventional system has now been expanded by the North American Free Trade Agreement (NAFTA), as well as by the globalization of production. This has created an environment where the transport sector is coping to adapt to higher volumes, particularly at major gateways, as well as adhering to more stringent requirements in terms of frequency and reliability of these expanded supply chains. Parallel to this growth; the need to reconcile spatially diverse demands for raw materials, parts and finished goods has placed additional pressures on the function of North American freight distribution and logistics. In the current context, North American maritime gateways are facing several challenges. They are coping with acute trade imbalances resulting in very different freight flows between imports and exports, which are impacting terminal operations and inland logistics. This is associated with a prevalence of transloading where the contents of maritime containers (typically 40 foot) are transloaded into 53 foot domestic containers; a characteristic unique to North American gateway logistics. North American gateways are confronted with largely deregulated freight markets (eg. the Staggers Rail Act of 1980), although pockets of restrictions remain, such as the Jones Act, which imposes strict conditions on coastal shipping between US ports.

Trade synchronisms: China in the balance

The emergence of trans-Pacific trade and China in the global manufacturing market had profound impacts in terms of the volume and pricing of a wide variety of goods. During that period, China mostly focused on the lower range of the added-value manufacturing process in addition to having low labor costs. The usage of China as a privileged location in the global manufacturing system has thus been linked with low input costs (mainly labor) as well as low long distance transport costs brought by containerization. The longer distances of shipping freight from China were positively compensated by lower input costs, as well as the setting of massive economies of scale in maritime shipping through larger container ships. This explains why integration processes in North America, namely the use of Mexico as a low cost manufacturing base, were mainly bypassed in the last decade. Also bypassed was the setting of regional North American supply chains in light of the dominance and efficiency of global supply chains. However, the comparative advantages of China are starting to become eroded eroding in part because of inflationary pressures in input costs, such as labor, as well as higher energy prices and environmental pressures. North American supply chains may be positively impacted by such a trend which will put a greater emphasis on NAFTA as a comparative advantage structure. Changes in the structure and direction of freight flows in North America are to be expected with a higher level of regional orientation.

American containerized trade is characterized by an asymmetry between the nature of its imports and exports. North American retailers account for a substantial share of containerized imports, mostly involving finished consumption goods bound to major

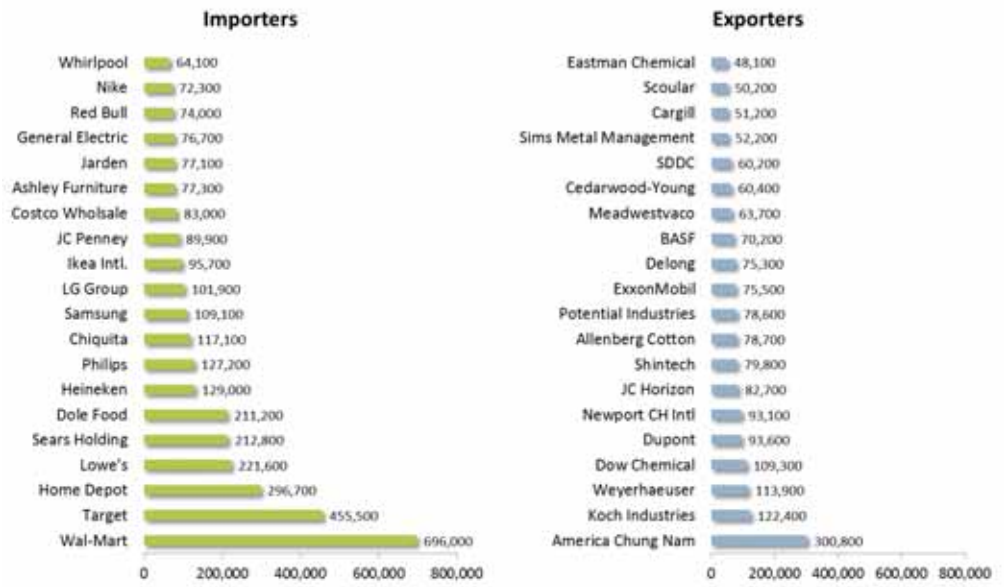


Figure 1: American Foreign Trade by maritime containers, 2010 (in Twenty-foot Equivalent Units (TEUs) sourced from the Journal of Commerce.


TMEIC
We drive industry
We drive performance.
TMEIC has been a driving force in crane controls and automation for more than 60 years, delivering reliable industrial drive and automation systems.
TMEIC designs, tests and commissions complete crane automation systems:
• Maxspeed® Crane Control for fast and reliable crane operation
• Maxview® for Yard Automation – unmanned container stacking cranes
• Maxview Smart Landing® System – increases ship-to-shore productivity
• MaxFuelSaver™ System – energy-saving RTG
www.tmeic.com
+1-540-283-2250
Roanoke, Virginia USA
mh@tmeic.com

inland freight distribution centers. The largest importers, such as Wal-Mart, Home Depot, Target, Sears, Costco, Ikea and Lowe's, are all mass (Big Box) retailers relying on high volume and low margin goods, which are dominantly produced in China.

Exporters show a completely different profile. A major category of containerized exports concerns recycles with exporters such as America Chung Nam, Potential Industries or Cedarwood-Young. Other major exporters include diversified resource-based (Koch Industries) forest and paper products (e.g. Weyerhaeuser, International Paper), agribusiness (e.g. Cargill, Archer Daniels Midland) or chemicals (e.g. Dow, DuPont). Yet, a significant containerized trade imbalance remains. For the major trans-Pacific and trans-Atlantic trade routes, while in 2010 17.1 million TEUs were imported in the United States, only 11.4 million TEUs of laden containers were exported. Thus, about 5.7 million TEUs needed to be repositioned empty.

Trade asymmetry has significant impacts on North American inland logistics. The import-driven segment involves a series of stages to reach a multitude of outlets with a freight density correlated with population density. Since the retail trade is essentially unidirectional, a great deal of retail goods are transloaded at gateways into domestic containers while the maritime International organization for Standardisation (ISO) containers are re-exported empty. The export-driven segment relies on the massification of shipments at major gateways and inland ports. Since many resources (chemicals, forest products, food) are extracted inland at locations that rarely correspond to significant population centers, the reconciliation of containerized import and export logistics is a challenging task. While millions of TEUs will leave American ports empty, many inland locations are facing container shortages.

North American box logistics: transloading and stuffing

In North America, longer distances and the availability of a load unit greater than the standard 40 foot maritime container, has favored an active transloading function in distribution centers at gateways. The equivalent of three 40-foot maritime containers can be transloaded into two domestic 53 footers, which is the largest inland load unit in North America. After being transloaded, maritime containers can be brought back to the port terminal and the maritime shipping network. Rail terminals charge by the number of lifts, which means it costs the same to handle a 40 foot or a 53 foot container. The additional costs incurred by transloading are compensated by a consolidation of inland load units with the outcome of anchoring an added value function at gateways, which can be in the range of 30 percent compared with the option of moving maritime containers inland.

Transloading enables a more efficient use of both container assets (international and domestic) and can facilitate international trade by freeing transport capacity. For instance, moving maritime containers over long distances in the North American transport system can be considered a suboptimal usage of transport equipment, particularly from the perspective of maritime shipping companies. Conversely, the global maritime shipping industry is mainly designed to handle 40 foot containers and cannot accommodate domestic containers. However, a large amount of transloading for inbound shipments may reduce the availability of maritime containers available for export at inland locations. This is a salient problem for the export of containerized commodities.

Container terminal operations in gateway ports

According to figures from the American Association of Port Authorities (AAPA), the North American container port system (US and Canada) handled about 45 million TEUs in 2011, just below the record volume of 46 million TEUs in 2007. The San Pedro Bay ports of Long Beach and Los Angeles together handled about 14 million TEUs in 2011. Other major cargo centers include the port of New York/New Jersey which reached 5.5 million TEUs in 2011 and the northwestern seaport cluster (Seattle, Tacoma and Vancouver) representing some 6 million TEUs. In contrast to Asia, Europe or the Caribbean, North America does not count any transshipment hubs (transshipment incidence of only 5.8 percent), in spite of expectations from some ports to capture this role. The transshipment function takes place in a few offshore hub terminals along the Caribbean (Freeport, Bahamas or Kingston, Jamaica for instance) well positioned to act as intermediary locations between major shipping routes (Asia-Europe, Europe-Latin America) and offering lower costs. The expansion of the Panama Canal by 2014 may trigger more transshipment activities in the Caribbean (see our Panama Canal contribution in issue 51 of Port Technology International).

The dominance of inbound logistics imposes a focus on the availability of import containers and gate operations. The specific nature of the container flows in North America had an impact on the terminal operating industry. Hence, the US West Coast has quite an extensive penetration of shipping line terminal operators, mostly Japanese and Korean. The involvement of Asian shipping lines in the North American container terminal industry is strongly entwined with the first wave of Asian export-oriented strategies with Japanese and Korean interests able to secure terminal assets in the 1980s and 1990s. In spite of their importance, Chinese carriers are less represented as there were few assets left to be acquired or developed with the export-oriented strategy of China came in full force in the late 1990s.

The diffusion of slow steaming (ships reducing their average cruising speed from the 23-25 knots to 18-19 knots) as a prevalent practice for containerized maritime shipping will tie up a greater quantity of containers in transit and incite transloading at gateways. Containers (the majority owned by shipping companies) are thus kept within maritime circuits.

Inland Logistics

The North American freight distribution system conveys several opportunities to extract added value from distribution efficiencies. One notable form is cross-docking where a distribution center essentially acts as a high throughput sorting facility where inbound shipments are reconciled with various outbound demands. Big box stores are heavy users of this form of sorting of inbound freight flows to a multitude of large stores. For instance, the world's biggest retailer, Wal-Mart, delivers about 85 percent of its merchandise using a cross-docking system. This structure takes advantage of the massification of shipment along long distance rail corridors: a decomposition of shipments at a regional warehouse /cross-docking facility services an array of stores with daily trucking services.

North American inland logistics are also increasingly influenced by the setting of large inland logistics facilities, notably inland ports where a logistics zone is co-located with an intermodal terminal facility. Infrastructure investments tend to reinforce the existing efficiency of the inland transport system where long distance is dominated by rail and where limited, if any, inland barge services are possible. As additional economies of scale are achieved inland, a rebalancing between gateway and inland logistics is expected to take place conveying a greater share of added value for inland facilities. The new heartland corridor linking the terminals of Norfolk to the Chicago hub is a salient example. The benefits of double-stacking are expanded with double (or triple) tracking and the setting of inland load centers servicing their respective market areas. This also permitted the

setting of large scale intermodal rail terminals because such economies of scale were feasible. Thus, North American inland terminals tend to service large market areas.

Moving towards a new port system geography?

From a historical perspective, the geography of North America has led to route specialization among gateways. The bulk of Asian cargo flows is handled in the West Coast ports, in particular Long Beach and Los Angeles, but the use of the all-water route through the Panama Canal has accounted for a growing share in recent years. Caribbean cargo finds its way in North America via the container ports in Florida and Georgia (Miami, Savannah). Liner shipping services between Europe and North America are primarily calling at ports north of Hampton Roads. The construction of a new lock system in the Panama Canal, which would allow vessels of up to 12,500 TEUs, is expected to lower this geographical specialization.

There are few new ports in North America with the exception of Prince Rupert, British Columbia, exploiting a niche market of shorter trans-Pacific distances and long distance rail access to the Chicago hub, and the Mexican Pacific coast that has seen the setting of new terminal facilities such as in Lazaro Cardenas. APM Terminals recently secured a 32-year concession contract for the designing, financing, construction, operation and maintenance of a new container terminal at the latter port. Several ports have expansion projects that may capture a greater share of the traffic (eg. Mobile, Jacksonville, Norfolk), but it remains to be seen to what extent these additional capacities will be used in freight distribution.

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. Area interests involve North America and East and Southeast Asia, particularly China. Specific topics which he has published extensively about cover maritime transport systems and logistics, global supply chains and production networks, gateways and transport corridors, international trade and regional development.

Dr. Theo Notteboom is president of the Institute of Transport and Maritime Management Antwerp (ITMMA), professor at the University of Antwerp, a part-time professor at the Antwerp Maritime Academy and a visiting professor at Dalian Maritime University in China and World Maritime University in Sweden. He published widely on port and maritime economics. He is also President of International Association of Maritime Economists (IAME) and Chairman of the Board of Directors of Belgian Institute of Transport Organizers (BITO), an institute of the Belgian Federal Government.

ENQUIRIES

Dr. Jean-Paul Rodrigue
Dept. of Global Studies & Geography - Hofstra University
Hempstead, New York (United States)
Email: jean-paul.rodrigue@hofstra.edu

Prof. Dr. Theo Notteboom
ITMMA – University of Antwerp
Kipdorp 59, 2000 Antwerp (Belgium)
Email: theo.notteboom@ua.ac.be

South Carolina's Ports Riding Wave of Momentum

Allison Skipper, Manager, Public Relations for the South Carolina Ports Authority.

Introduction

Thanks to recent new service announcements, aggressive business development efforts, high productivity and major investments in port-related infrastructure, the South Carolina Ports Authority is riding a wave of positive momentum. In the first half of 2012, container volume in the Port of Charleston was up five percent while breakbulk tonnage was up 17 percent over the same period last year. During the coming year, the Ports Authority predicts an increase of about eight percent in container traffic at its facilities in Charleston.

Rising cargo volumes

Aggressive efforts to bring additional cargo and shipping services are helping to boost volume numbers, which are returning to pre-recessionary levels. In fact, March of this year was the strongest month for box volume in more than three years. The South Carolina Ports Authority has announced four new shipping services thus far in 2012, including a North Europe service with twice-weekly calls in Charleston, as well as two Asia services, with one featuring the port's first direct Vietnam call. The Port of Charleston will also welcome a direct Australia container service this fall, with weekly calls at the port's Wando Welch Terminal.

Central to this business growth is the Port of Charleston's sales pitch: the deepest harbor in the region, the highest productivity and a $1.3-billion capital plan funding investments over a ten-year period.

Billion dollar investment

As the world's ocean carriers continue to deploy larger and larger ships on a parallel path with the expansion of the Panama Canal, representing billions of dollars in investment, the South Carolina Ports Authority is responding with comparable investments to modernize port infrastructure.

The South Carolina Ports Authority recently completed about $23 million in improvements to Columbus Street Terminal, converting the facility from a container to a premier breakbulk and ro-ro facility to handle the growth of customers like BMW, which manufacturers its X-series line of vehicles in Greer, South Carolina and exports at least 70 percent of its production through the Port of Charleston.

In this decade alone, the South Carolina Ports Authority plans to invest about $1.3 billion in new and existing facilities. In fiscal year 2013 alone, the South Carolina Ports Authority plans to invest around $147 million in capital projects, representing the largest single-year expenditure in the agency's 70-year history.

Near term investments, such as a $17-million new terminal operating system expected to improve productivity on the terminals, are expected to further drive business development efforts. Another major project – the construction of an inland port in Greer, South Carolina, approximately 200 miles from the coast – will drastically improve the efficiency of freight movement to and from an area proximate to a significant portion of the Port of Charleston's customers.

Provided, South Carolina Ports Authority.

Charleston Harbor has the deepest channels in the Southeast region today, and plans to deepen the harbor to 50 feet or greater are under way.

The move represents the restarting of a concept three decades in the making. In 1982, the SCPA acquired a 100-acre site in Greer for the purposes of building an inland port, but it never gained significant traction and has been largely dormant over the last 25 years. The SCPA's fiscal year 2013 capital plan included approximately $23.5 million in capital spending for this public-private partnership.

Over a longer-term, the Port of Charleston is developing a new, 280-acre container facility, which represents the only new, permitted port facility under construction on the U.S. East and Gulf coasts. The new terminal, located on the former Charleston Navy Base, will boost total container capacity in the port by 50 percent. Thus far, several major demolition and large-scale projects have been completed, including the $44-million construction of a 5,000-foot-long containment wall structure that, once filled, will

Provided, South Carolina Ports Authority.

South Carolina-based BMW Manufacturing produces every X-series vehicle in the world and exports some 200,000 vehicles annually through the Port of Charleston.

Provided, South Carolina Ports Authority.

The Port of Charleston's largest container facility, the Wando Welch Terminal has been named the nation's most productive facility by a survey of shippers.

become the face of the terminal's dock. The facility's construction is on-track and is expected to open its first phase during the latter part of this decade, or on a demand-driven basis.

Harbor Deepening Project

In addition to landside infrastructure improvements, the South Carolina Ports Authority is pursuing a next-generation harbor deepening project to further improve the port's waterside capabilities.

With 45 feet of water at mean low tide, the Port of Charleston is already the deepest port in the Southeast region and routinely handles the biggest ships calling the East Coast today, albeit on a tidally restricted basis.

In coordination with the U.S. Army Corps of Engineers, the South Carolina Ports Authority is pursuing a Post 45-foot Harbor Deepening Project to take Charleston's shipping channels from 45 feet to a depth of 50 feet or greater, effectively removing the tidal restriction and opening the port to the largest ships 24 hours a day. The Corps stated in its Reconnaissance Study in 2010 that Charleston is likely "the cheapest South Atlantic harbor to deepen to 50 feet."

Progress toward a deeper Charleston Harbor has gained significant momentum since the project's study phase began in the summer of 2011. In July 2012, the U.S. Army Corps of Engineers announced that Charleston's deepening project would be the first in the nation using new streamlined measures. This headquarters-level initiative effectively shortened the project's total timeline by about four years, and reduced the estimated cost of the study by $5 million.

The following week, President Obama, recognizing the importance of the Southeast to realizing his plan to double the nation's exports, named Charleston's deepening project one of the most important infrastructure projects in the nation. The project was included as one of seven projects in five ports as part of the Administration's new, nationwide priority infrastructure list, which removes another year of the overall timetable.

These vital steps means that Charleston's deepening project will be completed as expeditiously as possible, so that at least one port in the U.S. Southeast may be deepened to at least 50 feet to accommodate the largest ships, allowing for a true post-Panamax harbor with two-way vessel traffic.

In February 2012, the Obama Administration included $3.5 million toward the project's feasibility study in the President's Budget for fiscal year 2013. The deepening of Charleston Harbor to 50 feet is predicted to provide significant economic benefit to the Southeast region and the entire nation, with $106 million in net benefit to the nation estimated on an annual basis.

In July 2012, the South Carolina Legislature committed $300 million in the state budget to fund the construction of a post-45-foot harbor project for the Port of Charleston. This allocation could cover the entire estimated cost to deepen the harbor to 50 feet or greater, once the project receives authorization from Congress.

ABOUT THE AUTHOR

A native of Lexington, South Carolina, **Allison Skipper** earned a bachelor's degree in public relations from the University of South Carolina, where she was inducted into Phi Beta Kappa and graduated magna cum laude and With Honors from the South Carolina Honors College. She joined in 2004 the South Carolina Ports Authority, where she serves as public relations manager, handling external communications, media and community relations.

ABOUT THE ORGANIZATION

The South Carolina State Ports Authority, established by the state's General Assembly in 1942, owns and operates public seaport facilities in Charleston and Georgetown, handling international commerce valued at more than $58 billion annually while receiving no direct taxpayer subsidy. An economic development engine for the state, port operations facilitate 260,800 jobs across South Carolina and nearly $45 billion in economic activity each year. For more information, visit www.scspa.com.

ENQUIRIES

PO Box 22287
Charleston,
SC 29413 USA
Email: scspainfo@scspa.com
Web: www.scspa.com

Brazilian ports invest to increase productivity

Maxwell Rodrigues, vice-president of HTS Brazil

There is constant pressure for increased operational efficiency, cost reduction and service quality improvement among Brazilian ports from a purely commercial standpoint; however, there is currently also a legal requirement in Brazil for the automation of ports that must be met by the end of 2012.

By December 2012, all port terminals in Brazil must be equipped to scan 100 percent of containers, using Optical Character Recognition (OCR) for the automatic recognition and identification of containers and trucks, on arrival and on departure, without human intervention. Those terminals that fail to comply with these requirements won't be able to operate without penalty.

This regulation comes on the heels of a transformation from a domestic inward type of policy to a more outward looking international policy, following the trends in the world economy. Port automation has become crucial in Brazil, and experts have said that even if the legislation had not been forced, the ports would have needed to introduce automation to remain competitive in the marketplace.

The new port legislation is part of a Brazilian customs effort to be in control of all goods as they enter and leave the country. Technology is the enabler for this move towards full tracking and tracing of containers carrying goods. The previous model, with taxation was subject to errors and corruption, and has become impractical, inefficient, and most importantly, substandard based on the global trend towards automation.

Latin America's premier port

The Port of Santos is Latin America's largest port and a vital link in global trade. Currently, more than 90 percent of Brazilian exports are transported by sea and in recent years the movement of containers has grown 350 percent.

Within the Port of Santos, there are 18 specialized terminals including bulk, containerized cargo, vehicles and special loads. Santos places first in containerized cargo in Latin America at 2.5 million twenty-foot equivalent units (TEUs) in 2010, and it should be noted that actual container movement in Brazil outpaced gross domestic product and foreign trade between 1996 and 2010.

A new dawn

The evolution of this growth in container terminals began in 1995 when the transfer of operations was initiated from the public sector to the private sector with the Modernization of Ports Act. This was followed, not only by new terminals, but by international terminal operators who brought new equipment and processes to reduce labor and operating expenses as well as increasing major Key Performance Indicators (KPI). This resulted in a 158 percent expansion in units from 1.9 million in 2000 to 4.8 million in 2010. This is all units of shipments, not only containerized. The increased throughput is an outcome of over US$2 billion invested in infrastructure, physical works and modernization equipment.

Some of the primary areas of investment were driven by the level of service demanded by customers, especially ship-owners who determine and specify the level of service required to be provided by the terminal. This service requirement included increased use of information technology for planning and management of administrative and operational activities of the container terminal as well as organizational and scaling factors in work flow and organization. This resulted in a decrease in truck turnaround time, increasing the ability of pickup and delivery of containers through the terminal gates, and relief of congestion due to the investment in access infrastructure. Currently only one terminal features OCR on its gates.

OCR enables automated identification of containers, therefore increasing safety and decreasing the need for human intervention. The terminals will equip the gates with automated input and output control, effectively eliminating the long-standing manual processes that generate unwanted safety risks, as well as problems with theft and disappearance, and create a huge demand for labor. Instead of visually analyzing receipt and delivery of each container near truck traffic, the automated process will require exception handling in a safe, remote location.

Technology's role

There are many challenges faced by the ports of Brazil, and on a strategic level, many can be met via the information technology infrastructure of the ports and via automation equipment. These solutions must be agile, safe and innovative in order to support business processes. Terminals will need to evaluate current operations and may need to reengineer business processes to optimize the use of automated systems such as OCR.

Investment into automation will lead to significant gains for port operations, including financial and operational, as well as quality of service. Streamlined business processes will enhance trucker experience while inspection by exception will move workers inside, and out of the harsh terminal environment. Once automated systems are in place, we expect individual terminal operators to continue investing in further automation systems, such as capturing images for damage inspection, seal detection and tracking movement of containers inside the terminal. Once OCR portals are installed on the gate, utilizing those structures to capture additional information such as International Maritime Dangerous Goods (IMDG) labels is a very straightforward enhancement with an existing product.

Brazil's competitive edge

Within a few months, this automation project will lead Brazil into another level in terms of global competitiveness. Brazil will be on an equal footing with other nations that have already invested in their national ports infrastructure, Automation and ports in Brazil will then experience similar operational agility, control, and security.

Exporters and importers will have more choices of automated terminals, which will be better equipped as a result of this legislation, leading to competition among them for domestic business. Brazilian business people will be able to consider the optimal choice of terminal operation, taking into account cost, distance, and quality of service.

HTS' turnkey project in Mexico at the Port of LCT Lazaros Cardenza.

Everyone wants to expand their businesses, and the terminals are investing to win new business based on service and productivity. Many terminal administrators are already aware that physical expansion is not possible, and as a result they need to win on service and productivity, which is considerably enhanced through the use of technology. The requirement of the legislation alone would not result in radical change unless there were commercial reasons as well. The increased demand by domestic and foreign markets has created a perfect mix of factors for Brazil to occupy a more prominent position in the world.

ABOUT THE AUTHOR

Maxwell Rodrigues is vice-president of HTS Brazil. He formerly served as vice president operations for Ergos Technologia, headquartered in Sao Paulo - who deliver innovative and integrated solutions for the Brazilian market in the automation and security sectors.

ABOUT THE COMPANY

HTS is a leading developer and supplier of proprietary optical character recognition (OCR) and computer vision systems for a wide range of applications in the security, automation and management fields for the ports and traffic markets.

HTS has successfully implemented commercial ContainerCode Recognition (CCR) and License Plate Recognition (LPR) systems in ports, traffic and security sectors in over 40 countries worldwide, and has established partnerships with top-tier global companies.

In the terminal market, HTS has an installed base of more than 1,000 OCR systems in over 50 facilities and 17 countries.

ENQUIRIES

Tel: +55-13-9764 3231
Email: Maxwell.rodrigues@htsol.com
Web: www.htsol.com

Bringing crane operations down to earth

Remotely controlled STS cranes increase efficiency, improve working environments and boost productivity

Fredrik Johanson, ABB Crane Systems, Västerås, Sweden

The remote controlled Ship to Shore (STS) cranes are making a major breakthrough in container terminals. Recently two terminal operators decided to adopt remote control of STS cranes with the help of ABB Crane Systems' technology.

The first step towards remotely controlling cranes was the introduction of remotely controlled stacking cranes. Since then, the technology has been further developed to enable the remote control of STS cranes as well. Thanks to the close cooperation between ABB Crane Systems and Manzanillo International Terminal (MIT) in Panama, the technology can now be used on a wider scale. In Panama, the first remotely controlled STS crane is already in commercial operation.

The introduction of remotely controlled STS cranes in container terminals is not only expected to bring remarkable improvements in productivity, but also provide the crane operators with a more comfortable, ergonomic working environment thus allowing them to improve their performance.

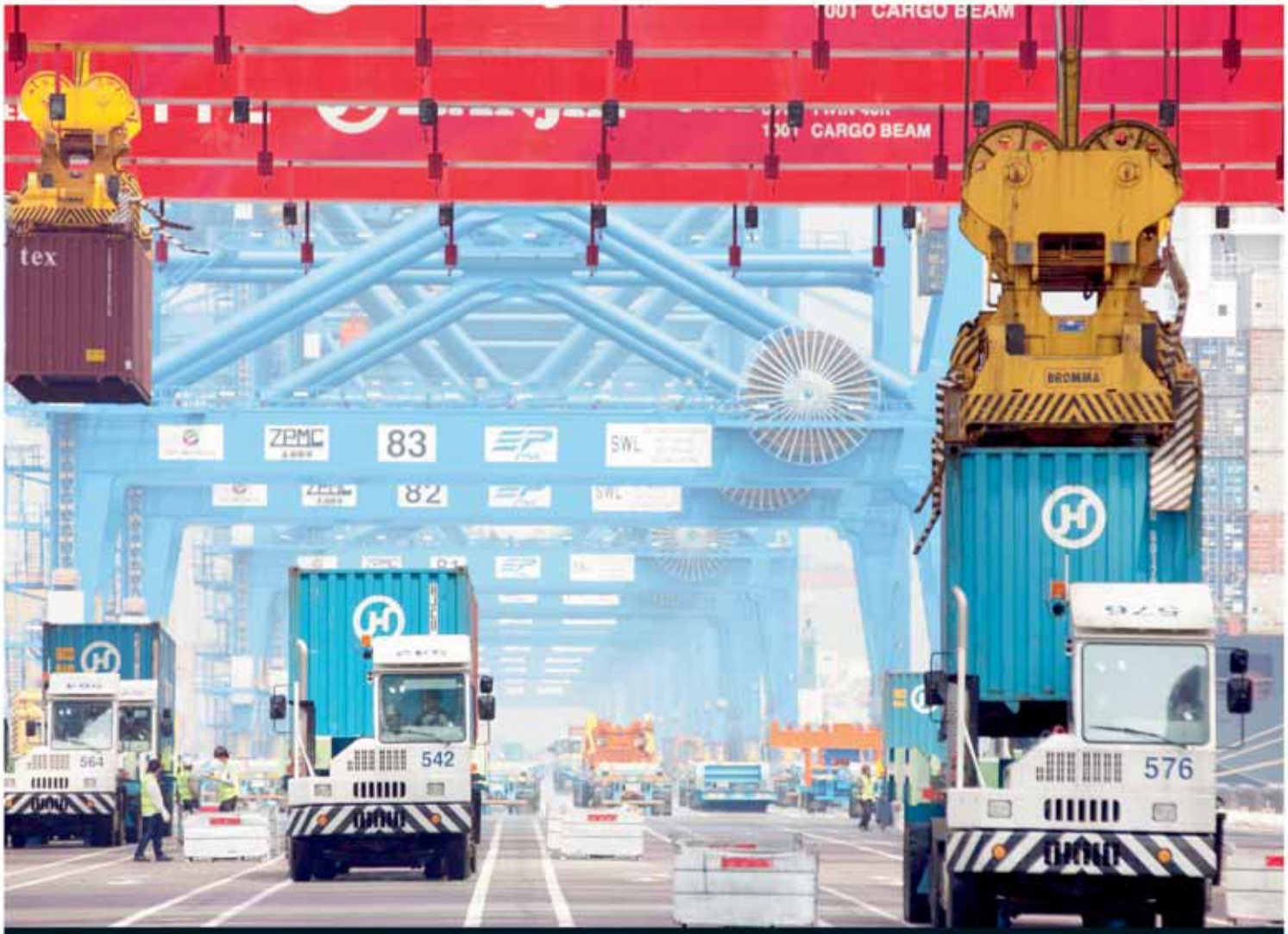
Development of the technology

ABB has developed a comprehensive range of automation features to enhance the safety and performance of STS cranes and currently, nearly 400 remotely controlled stacking cranes equipped with ABB technology are in operation. Based upon this experience, it was clear that the ability to control STS cranes remotely could yield significant improvements in vessel turnaround times and increases in the productivity of terminal operations.

To demonstrate the feasibility of remote controlled STS crane operations, and their ability to achieve consistent, long term improvements in productivity, it was necessary to maintain the confidence of the terminal operator and of the operating, maintenance and supervisory personnel, therefore, a pilot project was undertaken. This demonstrated not only that it is possible to control the crane from a Remote Control Station (RCS) located more than 600 meters from the crane, but also that the associated improvements were highly appreciated by crane operators. The RCS is similar to those used and proved effective on ABB's Automatic Stacking Cranes (ASC).

Factors influencing the performance of STS cranes

In common with many systems, the performance of an STS crane is dependent upon minimum cycle times achieved consistently over long periods. The achievement of low cycle times requires



Remotely controlled STS cranes?

Absolutely.

Container terminal operators are increasingly facing the challenges posed by bigger vessels and requirements for higher productivity. ABB's electrification and automation solutions for remotely controlled cranes are designed in response to these requirements, and more. The remote operation of cranes also provides an ergonomic working environment for the crane driver and increases the energy efficiency of the terminal. It all started with remotely controlled stacking cranes and led to solutions for remotely controlled STS cranes. Today, there are already hundreds of stacking cranes equipped with ABB's remote operation technology. www.abb.com/cranes

ABB Crane Systems
Tel. +46 21 32 50 00
Fax. +46 21 34 02 90
E-mail: cranes.sales@se.abb.com
Internet: www.abb.com/cranes

Power and productivity
for a better world™

ABB

advanced automated control systems with features that are designed to attain minimum times at all stages of the cycle. ABB Crane Systems has the most comprehensive range of control features including Automatic Container Landing and Vehicle Guidance systems.

In general, there are limitations on acceleration/retardation rates imposed due to the presence of operators on board the crane. Issues such as avoiding the likelihood of motion sickness and of course, health and safety considerations for the operator need to be accounted for. However, with the crane driver relocated to a comfortable office environment it becomes possible to increase speeds and shorten ramp times.

The limitations on rates for cranes with operators on board also affects the principal movements of the crane when loaded and unloaded during return journeys and extends the planned cycle times. Cycle times must provide for corrective movements for sway control, skew control and corrections for vehicle alignment. These corrections are highly automated with ABB remote control systems and with no operator on board, more aggressive corrections can be made, further reducing cycle times.

Ergonomics and operator performance

Maintenance of low cycle times is also dependent on operator performance. Performance varies between individuals and it also varies significantly over the duration of a shift. For operators on board STS cranes, fatigue is appreciable. When controlling an STS crane from a cabin the operator must lean forward and look down between his feet whilst subjected to continuous, rapid movements. This is hard on the neck and the back; it causes fatigue and can lead to high rates of absenteeism.

This has to be compared with the remote option of the operator sitting in an ergonomically designed chair and desk fitted with joysticks and buttons, while looking at monitors showing images from cameras and control information. In this situation fatigue is greatly reduced and overall performance improves accordingly. Additionally, often camera outlooks are more helpful than views available from the cabin, especially when considering modern STS cranes with lifting heights of well over 50 meters. It may be said that this ergonomic option is essential for increased productivity on the quay.

The higher levels of automation plus more consistent performance of the operators not only reduces cycle times but makes performance more consistent and predictable. Thus even higher levels of actual performance are achieved.

Production and planning

The operator is sitting in a control room alongside other operators of STS and ASC units. This is good for morale but also has more tangible benefits. Each crane can be controlled from any desk so that it is possible for an operator to be relieved for short breaks without interrupting operations. This provides considerable scope for more flexibility among the operators on duty.

Since the crane remote control room can be located in or near the central terminal control room, there is also scope for improvement in communication. This also provides the opportunity for closer integration into the Terminal Operating System (TOS). Thus, if a crane delivers to a lashing platform or to an unmanned vehicle, the landing part of the cycle can be fully automated.

On new cranes built for remote control no cabin is supplied. Thus there is a reduction in the live load and savings can be made in the capital costs of the trolley as well as the cabin itself; also power consumption is reduced.

Larger vessels, higher cranes, further challenges

There is a constant trend towards larger vessels and therefore higher cranes with longer outreach.

This adds to pressure on the STS crane operators. The average path length of each cycle will increase and the visibility from the cabin will be less favourable.

This move towards higher cranes further increases the demands made on terminals and the significance of overall performance. The more favourable views available from cameras and the reduced cycle times permitted by remote control will make a significant contribution to the higher levels of productivity necessary to meet this challenge.

Remote control yields significant positive results in all of these aspects of performance.

FIGURE 1: No more uncomfortable working positions for crane drivers. The introduction of remote control in STS cranes allows the crane drivers to move to an ergonomic office environment.

Conclusion

The features and benefits of remote control of STS cranes have been firmly established and will have significant effects upon the performance and reliability of terminal operations over the next decade.

ABB Crane Systems believes that when terminal operators appreciate the aggregate benefits of remote control, there will be a surge of interest similar to the situation when they introduced remote control of stacking cranes.

ABOUT THE AUTHOR

Fredrik Johanson has a Bachelor of Science degree in Energy Engineering from Mälardalen University in Västerås, Sweden and an MBA in Project Management from Linköping University of Technology in Linköping, Sweden. Fredrik joined ABB in 1984 as a Systems Design Engineer and has long and versatile experience on electrification and automation of cranes.

ABOUT THE COMPANY

ABB Crane Systems offers electrical and automation solutions for controlling the motions of container cranes, ship unloaders and industrial cranes, for new installations, upgrades and modernization of existing crane systems. Combined with ABB's long and vast experience on crane system projects throughout the world over decades these solutions and industry leading innovations enable terminal operators and industrial plants to increase both productivity and energy efficiency of their operations.

ENQUIRIES

ABB AB
Crane Systems
Email: cranes.sales@se.abb.com
Web: www.abb.com/cranes

Seismic considerations for new quay cranes

Michael Jordan, Yoshi Oritatsu and **Erik Soderberg**, Liftech Consultants Inc., Oakland, CA, USA

Our article in the summer 2012 edition of Port Technology International, 'Seismic protection of quay cranes', addressed the application of friction dampers in quay cranes. This is the second article of a three-part series on crane seismic issues. This article focuses on seismic design considerations for new cranes. A third article, to appear in the winter 2012 edition, will address seismic retrofit for existing cranes.

Earthquake forces and crane evolution

The size and weight of quay cranes has nearly tripled since the introduction of the first cranes in 1959. Early cranes servicing Panamax vessels weighed 500 tonnes with a 15 meter rail gauge. Modern cranes, capable of servicing post-Panamax vessels and larger vessels weigh 1,200 tonnes or more, with a 30 meter or wider rail gauge. Since cranes are now much larger, seismic forces are much larger as well.

While cranes have evolved during the last 50 years, in most cases the seismic design has not. For decades, industry specifications required that crane structures resist lateral seismic forces of 20 percent of gravity, 0.2 g. The seismic forces on smaller cranes are limited to the forces required to tip a crane and lift the legs off the rail. Consequently, they performed well during moderate and major earthquakes. For larger cranes, the seismic forces required to lift a leg are much larger. As a result, the seismic forces in the wharf are much larger as well.

For most modern cranes with a 30 meter rail gauge, it takes 0.4 g to 0.6 g of lateral inertia to cause crane leg uplift. Clearly, the 0.2 g lateral force traditionally used is no longer adequate. Cranes designed to the old criteria are likely to sustain damage, even in moderate earthquakes.

Performance-based seismic design

Ports in seismically active regions, such as Port of Los Angeles and Port of Long Beach, have established performance-based criteria for the design of wharves. Their criteria define the performance objectives for wharf structures for three earthquake levels (see Table 1). The primary goals of such performance objectives are limiting interruptions to port operations due to a moderate earthquake and preventing the collapse of structures due to a major earthquake.

While seismic performance criteria have been developed for wharves, most port authorities have no seismic requirement for cranes. In the absence of regulatory requirements, stakeholders should determine the acceptable risk of damage. For some, it may be acceptable to have serious downtime after an earthquake. For others, little or no downtime is acceptable.

Figure 2 is a concept stakeholders can use to determine the seismic performance level of their cranes. If they choose to purchase cranes with low seismic performance, the additional initial cost will be small. However, the damage cost, i.e. the crane repair cost and financial loss arising from disruption to port operations, will be large. On the other hand, if they choose to procure cranes with high seismic performance, the initial cost will be large but the damage cost will be small. By carefully examining what it costs now to obtain a certain performance level versus what the expected earthquake damage will be at that performance level, stakeholders can find an optimal performance level where the total

Early crane and modern crane.

TABLE 1: EARTHQUAKE LEVEL AND PERFORMANCE OBJECTIVES.

Earthquake level	Probability of exceedance	Performance objective
Operating Level Earthquake (OLE)	50 percent in 50 years	No significant structural damage. Minimum or no interruption to port operations.
Contingency Level Earthquake (CLE)	10 percent in 50 years	Limited structural damage. Temporary loss of port operations is acceptable.
Code Level Design Earthquake (DE)	"Design Earthquake" as defined in ASCE 7-05	Life safety and collapse prevention.

cost, initial cost plus anticipated damage cost, is minimized.

There are several design approaches available to obtain acceptable seismic performance at relatively little cost for new cranes. One approach, 'rocking frame', is to make the lower portal frame strong enough to allow a crane leg to lift off the rails, or the crane to rock, without damage (see Figure 3). A second approach, 'ductile frame', allows the lower portal frame to deform plastically but not collapse (see Figure 4). A third approach, 'seismic mitigation system', involves adding seismic isolators or energy dissipaters to reduce the seismic forces (see Figures 5 and 6). These design approaches are discussed in detail below.

Rocking frame

In regions where the design storm wind speed is low, such as the West Coast of the United States, cranes are generally never tied down to the wharf. In the absence of tie-downs, the crane legs can lift off the rails, allowing the structure to undergo a rocking motion during an earthquake. While the rocking motion appears undesirable at first glance, it interrupts the dynamic motion of the crane and reduces the seismic forces on the crane. In other words, the rocking limits the seismic force that the crane experiences in an earthquake. In the rocking frame approach, a crane structure is designed to remain elastic, i.e., no yielding, for the lateral force that causes it to rock. For modern cranes, this lateral force typically ranges from 0.4 g to 0.6 g.

Since the structure is designed to remain elastic, operations can resume relatively quickly after an earthquake. The crane may need to be reset onto the rails; however, this can be done in a matter of days. This approach may not be suitable when the vertical load or lateral capacity of the wharf is limited.

Since the rocking frame approach relies on a strong portal frame, strong structural sections are required in the portal frame. Compared to a crane designed to the earlier 0.2 g seismic design loading, the additional cost is about US$180,000 per crane, primarily due to additional material in the portal frame.

Ductile frame

Unlike the rocking frame approach, which resists the seismic force by rigidity and strength, the ductile frame approach relies on the structure's ability to deform plastically and undergo large displacements without diminished capacity. With proper detailing, crane structures can tolerate large lateral movement.

Portions of the crane legs, designated as the 'ductile yielding zone', are designed to yield before other parts of the structure (see Figure 4). By doing so, all plastic bending occurs only in the yield zone. The yield zone plates are reinforced with closely spaced stiffeners so that the leg section can develop its plastic strength without significant local buckling. In typical crane construction, tee or angle stiffeners are used. For the ductile frame approach, u-shaped stiffeners can be used to efficiently increase the local buckling strength (see Figure 4, Section A-A).

Since the ductile frame approach relies on the crane's ability to deform plastically, there will be permanent deformation. The crane frame may need realignment; bent plates may need to be restored by heat straightening, or sections may need to be cut out and replaced. Repairs and downtime will be longer than for the rocking frame approach. The ductile frame approach may only be suitable when the wharf capacity is small, and limiting the lateral loading is important.

Compared to a crane designed to the earlier 0.2 g seismic design loading, the additional cost for the ductile frame approach is about US$120,000 per crane.

Seismic mitigation systems: isolation and energy dissipation

One of the most effective ways to improve the seismic performance of a crane is to provide a seismic isolation system. The system isolates the crane so the wharf moves under the crane without developing large seismic forces. Figure 5 shows one method of isolation that uses post-tensioned steel strands as restoring springs at the leg-portal interface. The isolation joints are held closed by pre-tensioned tendons. The joints open during the earthquake when the pre-tension is overcome. The tendons stretch elastically with no residual deformation so they can pull the joint closed again. The cranes will remain on the rails, and there will be little to no damage, so the cranes are likely to be immediately operable after an earthquake.

An energy dissipation device can also be used to effectively

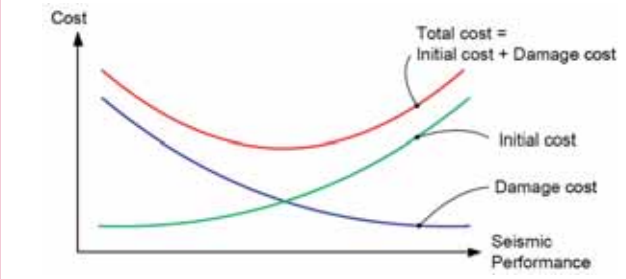


Figure 2: Initial cost and damage cost curves.


Figure 3: Rocking frame.

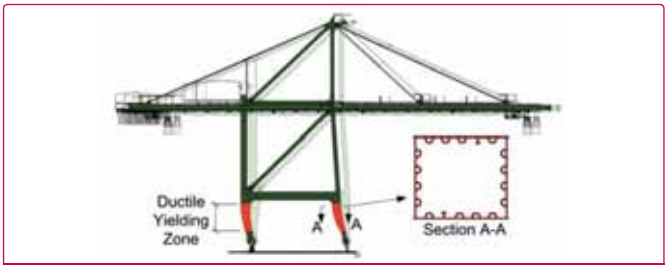


Figure 4: Ductile frame.

Figure 5: Isolation.

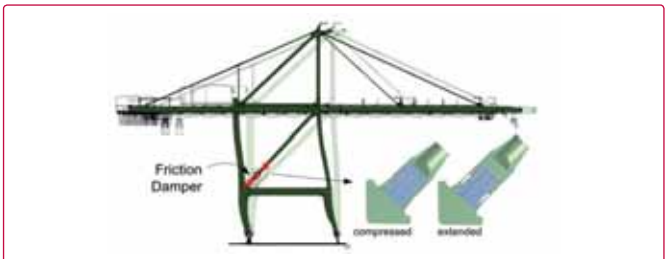


Figure 6: Friction damper.

reduce the internal forces in the crane. A device such as a friction damper, which was discussed in the summer 2012 article, can be installed in the lower diagonal (see Figure 6). Friction dampers convert the seismic energy into heat as the joints slide during an earthquake, limiting the internal forces in the crane. The friction dampers also isolate the crane's upper structure when the joints slide. Hydraulic cylinders may be used in place of the friction damper, but at greater cost.

A number of seismically isolated cranes have been developed and used in Japan. These cranes typically have isolation systems located at the gantry level. Some seismic isolation systems use elastomeric rubber bearings while others use ball bearings. These cranes have performed well in large earthquakes.

The cost of isolation varies considerably depending on the system used. Isolation is the most costly approach. The cost of incorporating a friction damper in the lower diagonal is minimal, estimated at US$100,000 per crane.

Summary and recommendation

Stakeholders should consider the seismic risk for their quay cranes. A number of design approaches are available to achieve acceptable seismic performance at relatively little cost. More protection will cost more initially but the damage and repair costs will be less later. The questions that stakeholders should consider when purchasing new cranes are how much does protection cost and what is it worth.

ABOUT THE AUTHORS

Michael Jordan is a Liftech structural engineer and CEO with over 50 years of experience. He is an internationally recognized expert in the container crane industry. He has been involved in the container industry evolution since participating in the structural design of the first container crane for Matson in 1958. Since then, he has designed the structures of hundreds of duty cycle cranes, prepared numerous specifications for the design of duty cycle cranes, and investigated fatigue damage problems and major failures caused by fatigue crack growth and brittle fracture.

Yoshi Oritatsu is a Liftech structural designer and registered professional engineer with five years of experience in the design, analysis, and modification of container cranes, large derrick cranes, bulk loaders, and wharf structures. His work includes the analysis of crane and wharf seismic response, including the effect of isolation and energy dissipation systems.

Erik Soderberg is a Liftech structural engineer and vice president with 18 years of experience in the design, review, and modification of a variety of structures including container cranes, wharves, buildings, heavy lift equipment, and various rigging structures. He has consulted on hundreds of cranes, participated in the design of several wharf structures, and has designed many crane transfer systems ranging from curved rails to shuttle systems. He has engineered repairs for dozens of container crane structures and for several bulk loaders. His field skills include an understanding of heat straightening techniques and the ability to develop repair procedures on site.

ABOUT THE COMPANY

Liftech Consultants Inc. is a consulting engineering firm, founded in 1964, with special expertise in the design of dockside container handling cranes and other complex structures. Our experience includes structural design for wharves and wharf structures, heavy lift structures, buildings, container yard structures, and container handling equipment. Our national and international clients include owners, engineers, operators, manufacturers, and riggers.

ENQUIRIES

Liftech Consultants Inc. 344 – 20th Street, #360, Oakland, CA 94612-3593, USA
Tel: +1 (510) 832 5606
Fax: + 1 (510) 832 2436
Email: liftech@liftech.net
Web: www.liftech.net

Automated cranes at container ports

Simultaneously transferring multiple containers between ships and barges

Harry Valentine, Transportation Research Engineer, Cornwall, Canada

Present port operations

The majority of intermodal container movement involves transfers between ships and trains or ships and trucks and major ports. Recent innovation has increased the efficiency by which a crane moves a single container on or off a ship. At some ports, operators can now remotely control a crane via a telecommunications link from a ground-level play station. The technology uses multiple cameras and computer assisted control to reduce container transfer time for a single crane.

Precedents for future innovation

New technical developments usually involve improving earlier technology, or by borrowing precedents from related technologies to produce a useful product. Future crane technology may be based on developments from bridge technology and may include cantilever bridge spans. Operators may remotely control cranes via telecommunications lines and play stations while computer programming would allow automated cranes to greatly increase the number of containers being transferred per single movement and within a specified time duration.

Technical improvements in barge-train technology on the Mississippi River enhance the viability of future container-on-barge transport that would interline with oceanic ships at ports where rivers meet the ocean. The V-notch stern allows barges to be coupled into a rigid train that a tug may push and steer from the stern. The design allows for rapid coupling and uncoupling of barges to and from the barge train during stops. The combination of improved barge technology and automated crane technology promises to greatly improve the efficiency and cost competitiveness of ship-barge intermodal transportation at several major ports.

Ship-barge intermodal prospects

Barge trains operate along such rivers as the Yangtze, Mississippi, Danube, Parana and the European barge canal network. They interline with oceanic container ships at ports such as Rotterdam, New Orleans, Buenos Aires and Shanghai. Barge trains offering viable container-on-barge transportation already prevail along the Mississippi, Danube and Yangtze Rivers. Evolving technology has the potential to greatly increase the competitiveness of ship-barge intermodal transport against ship-railway and ship-truck intermodal operations.

Depending on the allowable beam, barges may carry between 3 and 11 barges abreast with 3 to 7 barges placed lengthwise, on multiple levels. The economics of container-on-barge transport depends on the ability to move very large numbers of containers by barge, along selected routes. Barge trains of up to 15 coupled barges have sailed on Canada's Mackenzie River. Extended length barge trains could sail such rivers as the Parana and Ganges, which are both without navigation locks. Future ship or barge intermodal ports would be designed to moor barge trains parallel to container ships.

Crane design basis

Precedents from bridge design involving piers and cantilever spans may be incorporated into future crane design. Ships and barges would be moored between extended parallel bridge-type piers that duplicate as a dock that carries several parallel rail lines on which the crane moves. The design would be compatible with the parallel mooring of ships and barges that carry containers parallel to their keels. Groups of automated cranes would be assigned to each ship and simultaneously transfer of multiple containers in single movements between ocean ship and inland ship.

A group of 3 vertical support cantilever structures mounted on rail wheels would carry the weight of the cantilever span that would straddle over the barge, ship and the outer piers. The crane may move parallel to the ship. Rails built into the cantilever span would carry a suspended carriage, similar to the overhead-suspension train at Wuppertal, Germany. The carriage would house cables linked to multiple sub-carriages with locking pins that would connect to shipping containers to raise and lower them. The suspended carriage would move sideways over the ships and piers as it simultaneously transfers multiple containers in a single movement between ship and barge, guided by automated computer control.

Automated conveyors

Automated computer control would direct and coordinate the operation of cranes and conveyors built on the central pier and placed between the rails at the base of the vertical support structure. The computer would contain the ship's manifest. Via camera, it would read the number on each container that a crane picks up, know its destination port and direct the crane to either transfer it to the adjacent ship or place it on the conveyor. The conveyor would move it to a different location along the pier, where another crane would transfer the container on to a designated barge.

Containers destined for inland ports would automatically be loaded onto the barge destined for a particular port and would be uncoupled from the barge train at or near that port. In the reverse direction, the barges would load containers at various inland ports, then sail downriver to an international intermodal port. Automated cranes and conveyors may also load containers aboard ship in a sequence based on final port of destination. Upon arrival at the destination port, automated cranes would rapidly transfer groups of containers in single movements from ship to designated barges on a barge train.

Port location

Plans are afoot in several nations to enlarge existing intermodal

ports and build new ports. The port area designated for ocean-inland maritime transfers may be built at a natural or at a man-made offshore island. An offshore location would allow for a terminal based on piers as parallel navigation locks in which ships and barge trains would moor. That location would provide space at the port's shore section to accommodate additional ship-train and ship-truck intermodal operations. Staff would work the cranes remotely from shore-based locations, using play-station computer terminals and telecommunications technology to direct the efficient transfer of containers.

Security

There may be scope to build scanning technology built into crane sub-carriages and placed next to the conveyors to discretely inspect the contents of containers that move through the terminal. The computer system may be programmed to alert customs officials to containers carrying suspicious contents. Inspectors may divert such containers to special inspection areas, where the containers may be opened. Legitimate containers may be returned to the conveyor system and loaded aboard ship or barge.

Conclusions

Maritime container traffic is projected to increase over the next few decades, requiring additional space and many more ports. The ability to simultaneously transfer multiple containers in a single movement would greatly increase port efficiency and would be compatible with ship-barge intermodal operations. New developments in barge train technology are helping to decrease transportation cost per container, while improving the viability of river transport and its cost competitiveness against railway and truck transport.

Advances in remotely controlled automated crane and conveyor technology promises to improve the efficiency, viability and cost-competitiveness of ship-barge intermodal transport. The appearance of the post-Panamax size of container ships coincides with advances in barge train technology that improves its navigability, efficiency and versatility. The carrying capacity aboard barge trains makes them very compatible with large oceanic ships, complimented by ongoing advances in automated crane and conveyor technology.

A "convergence of technologies" is underway in ship-barge intermodal operations. That trend would become evident in future ship-barge intermodal operations as larger numbers of containers transfer more rapidly between ocean and inland marine transportation. The economies of land-locked countries such as Uruguay, Hungary, Austria and Czechoslovakia would benefit from improved efficiency in ship-barge intermodal container transportation.

ABOUT THE AUTHOR

Harry Valentine was born in Cape Town, South Africa and lives in Cornwall, Canada. He holds an engineering degree from Carleton University, where he pursued postgraduate studies in transportation and undertook extensive research at the University's Transportation Research Centre. He has research experience in the passenger and freight transportation sectors.

ENQUIRES

Harry Valentine Research
205 529 14th Street West
Cornwall, Ontario, Canada K6J-3J5
Telephone: 1-613-933-5616
Email: hvalentine1@cogeco.ca

Retrofit market for cranes gains power

Klaus Sprekelmeyer, head of sales, Franz Wölfer Elektromaschinenfabrik, Osnabrück GmbH, Osnabrück-Sutthausen, Germany

In terminals all over the world, old cranes are the main reason for standstill and high service cost. Additionally, the energy costs for these cranes are much higher than necessary because of inefficient motors. More and more terminal operators are recognizing this and would ideally like to exchange the cranes. However, the cost to replace them with a new crane, is often too high. Based on this, the operators modify the existing cranes and build new, modern and efficient equipment into the old cranes. This allows a higher number of containers to be handled, minimizes standstill time, and lowers energy costs.

Efficiently upgrading existing cranes

A lot of existing cranes are equipped with old technology, like DC-technique or AC-slipring-technique. These motors have very high maintenance costs, however, if they could be equipped with modern technology such as the AC-inverter-technique, it would not only be necessary to exchange the whole electrical part of the crane, as the mechanical part would also have to be modified, as the mounting dimensions of the new electrical motors differ from the ones of the existing motors. Franz Wölfer Elektromaschinenfabrik Osnabrück GmbH has a solution for this. The company develops and manufactures custom-built three-phase asynchronous squirrel cage and slipring motors with a power range of 2.0 kilowatts to 2.2 kilowatts. These motors are used in all types of cranes throughout the hoisting equipment and marine sector. If a crane is to be modified, Wölfer designs an electrical motor which is optimized in design relating to moment of inertia, weight, pull-out torque and efficiency. The company calculates the required power and duty cycle based on the crane specification, which is given from the terminal operator. By this, the size of the motors can be optimized and therefore also the moment of inertia. This minimized moment of inertia reduces the energy demand of the motor and therefore the energy cost for the terminal during operation.

Customized designs save energy, time and money

In addition to this reduction of energy cost, the total cost for the retrofit can be reduced as Wölfer is also flexible concerning the mechanical mounting dimensions. For example, if a new AC-squirrel-cage-motor can be delivered in frame size 315, but the existing motor with the old technology is frame size 400, normally the whole machinery house would have to be modified, as the motor feet as well as the shaft height and shaft dimensions are different. Also, a new coupling would have to be used and the motor basement retrofitted. However, with a motor from Wölfer, this is not necessary. The company offers a motor with the electrical data of frame size 315 with minimized inertia and reduced energy cost, but with the identical mechanical mounting dimensions of the old motor – in this example, frame size 400. This is achieved by creating a customized steel welded housing. The change of the motors can be done in one day with this customized solution. When the whole machinery house has to be modified, it can take up to a week to exchange the motors. So the modification work can be done much more quickly with, meaning that the cost of the downtime of the crane is lower.

Figure 1: A 610 kilowatt main hoist motor in frame size 355 from Wölfer with an IP23 rating and IC06 cooling system (courtesy of Kuhl/Frenzel GmbH & Co.KG).

Figure 2: A 260 kilowatt main hoist motor in frame size 280 from Wölfer with an IP23 rating and IC06 cooling system (courtesy of Franz Wölfer Elektromaschinenfabrik Osnabrück GmbH).

Recent retrofit work includes supplying new motors for a mid-life upgrade of a Morris crane at the Port of Felixstowe. GE Energy's Power Conversion business units were awarded the contract for this job which included replacing the old DC main hoist with a new full AC system. Wölfer supplied new hoist motors for the project, which was completed in March 2012.

Smaller inner-cooled options

This customized design is available in inner-cooled design, which means degree of protection to international standard IP23, as well as in outer-cooled design, for example IP56. If a Rubber Tyred Gantry (RTG) crane is to be modified with an outside mounted motor, Wölfer delivers the relevant exchange motor. Or for a Ship to Shore (STS) crane, where the motor is mounted in the machinery house Wölfer offers an IP23-solution, that means an inner-cooled motor, where the cooling air is directly blown into the motor, where the heat occurs. The heat is blown out of the motor much faster with an IP23-motor. It delivers up to 80 percent more power in the same frame size compared to IP56-motors from other brands. So Wölfer can offer a smaller STS hoist-inner-cooled motor than other companies.

Meeting government requirements

Terminals that have to fulfill energy saving requirements made by their government will have to modify their cranes for reaching the required level. New components help in this process by providing an optimized ratio of energy demand and given power. With more

Retrofitting has a green side – with electric motors from Wölfer

The retrofitting of cranes with custom-made motors by Wölfer offers a green advantage: you increase the performance of your systems while reducing emissions and noise pollution. Our three-phase electric motors achieve energy savings up to 8 % and a very quiet operation, thanks to special rotors. There is always a good reason for the change.

Franz Wölfer Elektromaschinenfabrik Osnabrück GmbH is developing and manufacturing high quality electric motors for use in hoisting equipment, in and on ships as well as in general mechanical engineering for more than 60 years now.

Feel free to put us to the test.

Franz Wölfer
Elektromaschinenfabrik
Osnabrück GmbH®

Wölfer moves the world

www.woelfer-motoren.com

than 60 years of experience, Wölfer manufactures electrical motors with exactly those characteristics. By special construction of the motor, the moment of inertia is lower than standard motors so a lower current is needed for acceleration. With this lower starting current, it is often possible for the electrical manufacturer to use smaller inverters and cables with smaller diameters, which reduces the investment cost for the terminal, as well as the energy cost over the years of operation. Furthermore, smaller brakes can be also used, depending on each crane specification.

Significant energy savings

For many cranes it is specified that the hoist motor especially, has to handle an overload of, for example, 230 percent for 60 seconds from time to time. With a normal pull-out torque of 200 percent to 250 percent, standard motors of the required size cannot fulfill this part of the specification and therefore a bigger frame size has to be used, just for the overload case. The special construction of Wölfer motors provides a pull-out torque of more than 350 percent, allowing the overload case to be driven without using a bigger motor. This is a further way in which Wölfer motors help the terminal operator to fulfill energy saving requirements, as a smaller motor needs less energy. Wölfer has done calculations on energy consumption for the whole hoist operation. The range of energy saving with Wölfer motors was actually between two percent and eight percent compared to other motor brands. With some cranes having two 1,000 kilowatt hoist motors even a two percent energy saving is significant. With regard to capital cost, custom-built motors might cost more, but the difference is not actually that significant and Wölfer is actually very price competitive. The market is responding to this opportunity. Wölfer has delivered motors to ABB, TMEIC, GE Energy and to crane manufacturers including ZPMC, Terex, Cargotec, Liebherr and Doosan. Recent projects include hoist motors for eight ZPMC cranes for DPW's London Gateway project and six ZPMC cranes for DPW's Embra Port as well as 22 RTGs for the same terminal.

ABOUT THE AUTHOR

Klaus Sprekelmeyer is the head of sales of Franz Wölfer Elektromaschinenfabrik Osnabrück GmbH. He has worked for the company for more than 13 years with over 10 of these years in the sales department. In 1999 Mr Sprekelmeyer started an apprenticeship for three years as a blue collar employee and white collar employee in parallel. After achieving several technical and commercial skill enhancements, Mr Sprekelmeyer took over the responsibility for the sales department in 2007.

ABOUT THE COMPANY

Franz Wölfer Elektromaschinenfabrik Osnabrück GmbH produces electric motors with a performance up to 2,000 kilowatts. The high capacity motors are produced exclusively at the business location in Osnabrück-Sutthausen, Germany. Wölfer is constantly expanding this location and modernizing the production technology. In 2007 it acquired a modern testing station for electric motors.

ENQUIRIES

Franz Wölfer Elektromaschinenfabrik Osnabrück GmbH
Industriestraße 14, 49082 Osnabrück
Tel: +49 (0)541-990 22-0, Telefax +49 (0)541-990 22-22
Email: info@woelfer-motoren.com
Web: www.woelfer-motoren.com

PORT TECHNOLOGY INTERNATIONAL

PORT TECHNOLOGY INTERNATIONAL ONLINE

Join the thousands who already make us their favourite one-stop information portal: Port Technology International Online is the invaluable companion to our journal

- one of the most visited and fastest growing websites in the industry with currently over 25,000 visitors per month
- now even more user friendly and easier to navigate
- tracks daily news updates, industry news and developments as they happen
- keeps you informed of all important events
- lets you browse our most recent journal and all back issues by subject and keyword search
- gives you free access to our Business Directory of key players within the industry and the products and services they offer
- lets you access the E-newsletter we send to thousands of your colleagues

Port Technology online is the 'must-have' companion to our widely respected journal and one-stop information source preferred by thousands of port and harbour executives

www.porttechnology.org

Upgrading to automated guided vehicles

VDL Containersystemen, Hapert, Netherlands

VDL's AGV Team (left to right): VDL Steelweld's Karel Smits, , ECT's Paul Middelburg, and VDL Containersystemen's Frans van Dommelen.

Strength through cooperation

The short development time is realized by the strength through cooperation which is the VDL credo. The synergy between the user ECT and the manufacturer VDL is the first strong cooperation. The second cooperation is the combined forces of three companies within the VDL group, all the required expertise to build a high performance AGV is present.

- VDL Containersystemen with experience in the field of spreaders and the new improved design and production facilities, this branch of VDL can guarantee a product that complies with the highest of standards.
- APTS specializes in engineering electrical controls, power packs and automatic guidance systems, as used in the bus industry. Solutions in the field of hybrid power trains, induction and hydrogen power trains are available within the company.
- VDL Steelweld is the expert in the field of production automation, assembly and engineering services. They design, manufacture and install robotic production systems; one of its strengths is the structured approach in integrating modular solutions.

The unique strength of these companies combined is the ability to share knowledge of the market, technology and organization without boundaries. This together with the cooperation of all parties involved secured the short development time while maintaining a high quality level.

A modern container handling terminal requires more and more use of automated technology. Aspects like efficiency and impact on the environment set difficult targets for engineering a terminal. Two years ago the need arose for a new generation of automatic guided vehicles (AGVs) that could fully meet today's standards and values, with a focus on life cycle cost reduction, improved reliability and less impact on the environment.

VDL was approached with the question whether it was possible for them to develop an AGV, according to the wishes of the customer and which would meet the environmental requirements. By using all available knowledge and production techniques based on existing technologies, sourced from within the VDL Groep, and several key suppliers, VDL succeeded in 12 months to create their first hybrid AGV. In October 2011 this AGV was delivered at the ECT Delta terminal in Rotterdam. Three months of extensive testing, 24 hours a day outside the regular operation to guarantee the quality and reliability targets had to be met, then the VDL AGV was deployed in the operational Port in Rotterdam.

The hybrid AGV is capable of transporting ISO containers of 20 foot, 40 foot, 45 foot or two 20 foot containers at once. It is also able to handle loads up to 70 tons, and can run at speeds of up to 6 meters per second.

VDL developed an electrically driven diesel hybrid AGV to ensure the required performance in combination with reduced fuel and maintenance costs. A small diesel engine drives a generator powering the electric motors and when peak power is required, ultra capacitors provide additional energy. For several months now,

the Hybrid VDL AGV has been running successfully in operation at the ECT Delta terminal with strongly decreased fuel consumption and the highest MTBF rate of their entire AGV fleet.

The close cooperation with ECT allowed early feedback in the design as well as intensive testing and validation possibilities which helped to improve the design quality.

Quality and cost

The design and construction of an AGV is the first step. For a terminal operator, fuel consumption, maintenance and life cycle is just as important as the initial investment in the vehicle. Because the VDL AGV has a hybrid drive, the diesel consumption (and hence the emission of harmful gases) is significantly reduced. Another cost reduction is achieved by maintaining a friendly design of the vehicle. Examples of such design features include completely replaceable diesel generator power pack units and a liquid cooling unit for all electric drive components. The suspension system that is used in the AGV VDL is capable of absorbing four times more shock than any other AGV. Thanks to the improved damping, less wear and a reduction in maintenance costs is realized. Finally, the VDL AGV is designed with as much as possible standard components to ensure the highest quality and to keep prices for spare parts to a minimum.

Modularity

Characteristic of the AGV VDL is the modular construction of the vehicle. With this flexible design, terminal operators don't need to buy a completely new vehicle, when technical components are defective; only replacing the worn item is sufficient. The VDL AGV is built so that new techniques such as induction and hydrogen drives, or GPS navigation, can be incorporated without major modifications. In addition, with the modular structure of the vehicle the wishes of the customer are easy to apply.

VDL's prototype AGV.

ABOUT THE COMPANY

The **VDL Groep** is an international industrial company focused on the development, production and sale of semi-finished products, buses and coaches and other finished products. It is a conglomerate of flexible, independent companies, each with its own specialty. The strength of the VDL Groep lies in the mutual cooperation between the companies. Since its founding in 1953, the VDL Groep has grown to include 80 operating companies, spread over 17 countries, with approximately 7,400 employees.

CONTACT DETAILS

VDL Containersystemen
Industrieweg 21, 5527 AJ, Hapert, Netherlands
Tel: +31 497 - 38 70 50 or fax: +31 497 - 38 68 55
Email: info@vdlcontainersyst.nl
Web: www.vdlcontainersystemen.com

Customized simulation: your world – our world

Shravan Rewari, MD, Applied Research International (ARI), India

Background

Simulators are today widely accepted as cost effective, efficient and immersive training tools, providing safe, non-destructive and environmentally friendly environments for skills development and management.

Early simulators – and the computers required to run them – were prohibitively expensive but developments in computing over recent years has given rise to an emerging trend towards the use of customized simulation technologies to deliver specific training objectives at a reasonable cost and in short periods of time.

In the context of container terminal operations, operational safety is paramount but productivity is the key to business success. Terminal operators now have a solution to this paradox: customized simulation-based training in a virtual environment that is custom built to emulate the specific equipment and layouts of an individual terminal. Today's technology allows for the rapid development of customized virtual environments and extremely high fidelity and accurate models of equipment. High definition, real time visualization and detailed physics modeling when integrated with hardware offer solutions of unprecedented power in training and feasibility studies for current and future terminal equipment and layouts. The inherent flexibility and versatility of simulation technology has paved the way for this paradigm shift, transforming the general to the specific; accuracy to precision and rigidity to flexibility.

Communicating with clients

As a global provider of deeply customized simulators, ARI is often asked about the extent of customization that can be provided in a simulator. Clients often require their terminal facilities to be simulated in the minutest detail; all functionality of their cranes to be realistically reproduced; simulator consoles which exactly mirror the actual consoles installed – completely recreating the human-machine interface.

Our clients also require accurate loading and discharge plans and expect detailed replica models of actual vessels.

ARI's customized simulation solutions can meet all these objectives and more, with our unique dynamic simulation architecture providing transparency, conformity with quality standards and a fully upgradeable and extensible simulation solution which can grow and develop with our client's business.

ARI is well positioned to fulfill all of these high level customer demands.

Physical realism

Delivering a customized simulation solution starts with identifying an individual customer's needs and then carrying out product modifications, and world and equipment modeling to those specifications. ARI's ability to carry out such development work in a timely and cost efficient manner places us in a unique position to create a significant advantage in designing, developing and delivering the most effective learning environments. At ARI we integrate software and the hardware into our customized solutions in a seamless and blended fashion. Customized hardware components include plug and play swappable control systems, visual displays for instructor control, 3-DOF and 6-DOF motion platforms as well as custom built crane cabins. Our customized hardware solutions create a completely realistic mimic of the crane cockpit reproducing the actual working environment in minute detail. The level of accurate detailing extends from the chairs and consoles to the indicators, alarms and physical controls. For our customers, this results in a completely realistic solution incorporating their own chairs, cabins, controls and panels packaged into our high definition customized simulation solution.

Visual and behavioral realism

Beyond physical realism, ARIs customized simulators offer unprecedented visual and behavioral realism, reproducing the look and feel of our customer's own facilities, the behavior and operating characteristics of their own cranes and infrastructure and integrating to provide a deeply immersive, completely realistic experience for the trainee.

ARI's customized cranes look, feel and behave in exactly the same way as the actual equipment. Customized terminals and yards are populated with the same objects, structures, buildings, and

Advanced crane simulator.

Customized yard.


Real.


Simulated.


Real.


Simulated.

other features as are present in the real world, and are painstakingly constructed using CAD drawings. All objects in a custom facility are dimensionally accurate, and appear as they would appear in real life, across a range of Light and environmental conditions.

ARI customized simulators can also be provided in any local language as required by our clients, and this language support extends to the software interface, hardware panels and labeling, gauges and dials, documentation and trainee assessment reports.

At ARI we recognize the importance of customer involvement in all elements of the design, manufacture and delivery of simulation solutions and we encourage a high level of participation throughout the project.

ARI customized simulation solutions allow terminal operators to overlay their own internal processes and assessment frameworks and have the system automatically assess compliance with these. Simulation assessment results and data can further be integrated into industry standard HR information systems and through these provide deep analytics and insightful skills tracking reports for personnel within the enterprise, and also for benchmarking against others.

Today's simulation technology offers the ability to build custom solutions for training across every aspect of port operations and port management including pilotage, tug handling, ship maneuvering, vessel traffic service systems, port development, feasibility studies and a variety of cargo handling and crane operations.

ABOUT THE AUTHOR

Shravan Rewari is the managing director at Applied Research International (ARI). Mr Rewari has a background in marine engineering (MERI Calcutta) and robotics and control systems (Stanford University, CA, USA). He has long specialized in virtual reality and robotics technologies and their application in the creation of innovative immersive learning solutions to enhance human potential. As a co-founder of ARI, he has pioneered the development of indigenous simulators and led ARI on the path to becoming the world class simulation technology company it is today.

ABOUT THE ORGANIZATION

ARI is a leading global developer of advanced simulation systems across multiple industries including marine, defense, offshore, ports, terminals, energy, logistics and airports. Using 3D virtual blended reality technologies and immersive solutions, ARI has delivered more than 350 large scale simulation installations all over the world, tailored to industry requirements and customized to incorporate customer specific features and requirements. Applied Research International Pvt. Ltd.

ENQUIRIES

Mr. Manish Pundir, Senior Manager, Corporate Coordination
Tel: +91 9717493953
Cell Phone: +91 9717493956
Email: info@arisimulation.com
Web: www.arisimulation.com

Terminal automation for the 'rest of us'

Michael C. Dempsey, general manager ports & terminals, IDENTEC SOLUTIONS

Figure 1: Truck gates are one of the 'big three' process automation applications that should be considered fundamental.

How can the vast majority of manned container terminals achieve the same performance benefits now being realised by the small minority deploying driverless equipment? New process automation technologies, integrated within a terminal asset management platform, may hold the key.

Big automation projects with unmanned cranes and transport vehicles grab media headlines. But the reality today is that less than 2 percent of the world's container terminals are fully or semi-automated. Building new terminals or converting existing ones to robotic handling is costly and requires a long planning and construction horizon. For most, an automated facility of this type may simply not be a viable option for the foreseeable future.

So what can the 'rest of us' – the vast majority of terminals using manned container handling – do today to automate on a smaller, more affordable scale yet achieve the same benefits as a full automated operation? These terminals will need to focus on new process automation and execution technologies that they can adopt now for better visibility and control, driving increased operational performance.

The 'rest of us' dilemma

Both shipping lines and terminal operators see the new breed of unmanned automated terminals serving their needs better through three core advantages: reliability, productivity and efficiency. Reliable in that performance can be more consistently predicted and executed at the promised level. Productive in that automated handling helps address bottlenecks in conventional terminal logistics and enables higher operational densities. Efficient in that automated facilities are designed to maximize asset utilization and operational performance, while reducing energy consumption and environmental impact.

To compete in this market, 'rest of us' terminals will have to be smarter and more agile. Process automation is, in part, the answer. Today, there are three core technologies for process automation. These can be roughly grouped into identification, locating and sensing.

Identification technologies

Terminals need to seamlessly and efficiently identify containers, personnel and equipment to drive their business processes. The automation of identification currently relies on three main technologies:

Optical Character Recognition (OCR) is the core technology for container identification. Based on a common industry standard, OCR allows an optical read of the alpha numeric ID

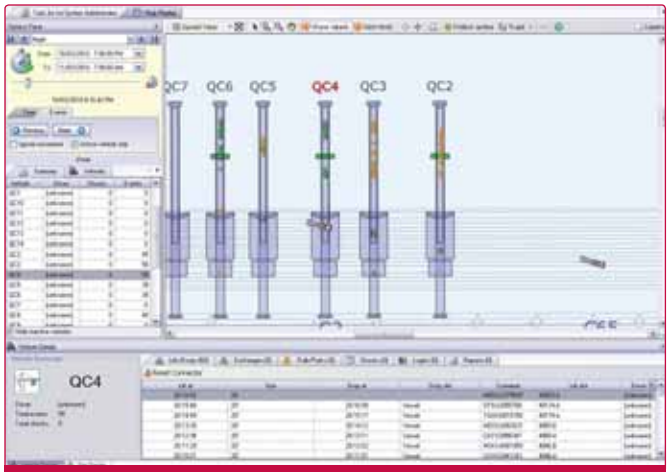


Figure 2: Using GPS or other locating technologies to give real-time information on actual vehicle positions supports today's advanced assignment solutions and pooling logic.

on the sides and top of a container and converts this to usable digital data. These data are then fed to a Gate Operating System (GOS). Also, OCR can be used to capture street truck license plate data eg. License Plate Recognition or (LPR), chassis and genset information. Closely tied to OCR are imaging systems using camera data to evaluate damage, seal presence, placarding and door direction.

Radio Frequency Identification (RFID) is a pervasive technology which consists of a chip encoded with an ID for the object or person being identified. The chip is typically encased in a protective housing which is commonly an ID card for personnel or a purpose built tag for assets such as trucks. The RFID card or tag may be passive or active, referring to the energy source to power the tag. The difference is that passive RFID requires energy from a reader to power up the tag and allow it to send encoded data. This tends to limit the read range to less than 10 meters. On the other hand, active tags have an internal battery and can be read from up to 500 meters.

Bar code is still used in terminals for identification. Several OCR vendors are in fact using 3D bar codes rather than RFID to identify terminal tractors at quay cranes.

Positioning and locating technologies

Knowing where assets are, eg. visibility, is fundamental to efficient terminal operation. Two core technologies are used today.

Satellite-based Geospatial Positioning Systems (GPS) are the backbone of most tracking and locating applications in the port and terminal industry, as the outdoor nature of terminal operations makes GPS a cost effective option. A GPS receiver is mounted on an asset and tied to a processor and communications device. As the asset moves, the GPS receiver receives positional data from multiple satellites, processes this information and sends it to a server running a business software application. Today, Wi-Fi is the most common backhaul medium, although narrowband is also still used. A 'base station' may also send a land-based correctional signal to mitigate atmospheric interference and improve the accuracy of the receiver. GPS systems can provide accuracy up to 2.5 centimeters. This level of accuracy is generally only used for Rubber Tired Gantry (RTG) crane auto-steering applications.

In general, GPS for equipment tracking requires one to three meter accuracy. For container positioning, sub meter accuracy is required. Where GPS technology cannot be used successfully is in deep stacks and under large steel structures such as Ship-To-Shore (STS) cranes, where satellite signals are blocked or obstructed. In these situations, GPS may be

augmented by inertial guidance systems or Real Time Locating Systems (RTLS). Inertial systems rely on additional sensing and measuring technologies such as gyroscopes and counters to extend the tracking capability of GPS.

RTLS are technically RFID-based systems using triangulation to locate an asset. An RTLS tag is combined with special locating infrastructure and positioning software to determine the position of an asset. The tagged asset communicates with readers or other positioning devices and the Time of Flight (ToF) between the tag and the positioning devices is measured. These data are then processed by an RTLS server, which determines the location of the asset. The benefit of these systems is the low cost per asset for tracking and the ability to track where GPS-based systems are ineffective.

Today, the term RTLS has taken on a broader context and is generally used to mean any non-GPS based positioning system which results in an asset location. These include ranging radio, laser and infrared.

Sensing technologies

A large number of activities on the terminal involve data capture for measurement of equipment performance metrics such as tire pressure, fuel levels and battery life. Both wired and wireless sensing technologies have now progressed to a point that today many equipment manufacturers provide these with their hardware or make them available as aftermarket features.

Where should terminals focus first?

Overall, process automation solutions can drive significant productivity increases and have an immediate and dramatic bottom line impact. But where should terminals start? Certain applications should be considered fundamental. Today the 'big three' are automated gates, Position Detection Systems (PDS) and automated job stepping/promotion. Together, these three applications will raise the bar on terminal efficiency. Automated gates and PDS create the high level of inventory accuracy and traceability required for efficient operations. RFID/RTLS or GPS-based automated job stepping and promotion increases throughput.

After the core applications are installed, terminals should look to the 'next level'. Two solutions that show strong returns on investment are combining crane OCR with automated hand-off under quay cranes using RTLS technologies, and terminal tractor assignment optimization. The OCR/RTLS combination effectively automates the quay, significantly reducing operator risk and improving productivity.

Terminal tractor optimization is more complex. With the advent of Terminal Operating Systems (TOS)-based advanced assignment solutions and pooling logic for quay and yard cranes, real-time information on actual terminal tractor positions is critical. GPS or other locating technologies on terminal tractors allow these software applications to truly optimize the decision engine for tractor assignment. Increases in throughput of 20 percent or more are expected.

The next big thing in automation

Most operators will easily identify with terminal operating systems and references to 'the TOS'. The TOS is the core of all operations today within the four walls of the terminal and into the extended port community. These have been deployed for over 20 years and remain the essential application. However, from their inception, TOSs were focused on planning, not on execution.

A new genre of application software, Terminal Asset Management Systems (TAMS) is now starting to emerge. Just as the TOS is responsible for the planning of terminal operations, the TAMS is designed to help terminals execute the events that make up their business process flow. Mainly, the role of the TAMS is to enable visibility and control of all of the mobile assets of a terminal, automatically and in real time, including container handling equipment, containers and workforce.

In the past, terminals have had to source, and integrate multiple process automation applications and technologies to get all the functionality they want. TAMS solutions unite wireless identification, locating and sensing technologies under a cohesive central platform. As a software category, the TAMS concept is now gaining momentum. Today, some leading IT and equipment suppliers have endorsed the concept and commercial off-the-shelf packages are increasingly available, reducing the cost, complexity and risks of adoption.

ABOUT THE AUTHOR

Michael Dempsey is general manager, ports & terminals for IDENTEC SOLUTIONS. He has over 25 years of experience in process automation technologies and is an industry thought leader in the automation of container terminal and port operations. His previous roles include vice president of automation technologies at Navis, and vice president, strategy & business development at RedPrairie.

ABOUT THE COMPANY

IDENTEC SOLUTIONS is a global provider of wireless solutions that improve efficiency, productivity and safety in harsh marine and underground environments. Deployed on every continent, IDENTEC SOLUTIONS' technology and business applications deliver real-time visibility and control of mission-critical operations. Working in some the world's most challenging conditions for customers in the oil and gas, ports and terminals, and tunnels and mining industries. Our industry-specific solutions, expertize and support systems are built on the award-winning SensorSMART platform – a proven, robust and reliable wireless sensor network that is also used by the world's leading systems integrators and governments. An IDENTEC GROUP company, IDENTEC SOLUTIONS is privately held with its corporate office in Austria, and regional offices in Australia, Germany, Norway, the UAE and USA.

ENQUIRIES

Michael Dempsey
General Manager, Ports & Terminals
IDENTEC SOLUTIONS
Tel: +1 (214) 714 3475
Email: mdempsey@identecsolutions.com
Web: www.identecsolutions.com

The Fourth Revolution – long-term developments of containerized shipping

Dr. Asaf Ashar, Research Professor, National Ports & Waterways Initiative (NPWI), LA, US

Evolution and revolutions: scale and scope economies

A conceptually convenient way of depicting the history of liner shipping is as a combination of one, continuous evolution and several, successive revolutions. The evolution relates to the continuously increasing size of ships and ports in the pursuit of economies of scale. The revolutions relate to a series of technological breakthroughs, expanding the boundaries of the shipping system in the pursuit of economies of scope. The first revolution was the unitization of cargo, or containerization, focusing on the ship to shore transfer process and inducing the development of specialized ships and ports. The second was the expansion of containerization to land transport modes, or intermodalism, using the marine boxes for the entire ship to door transport process. This revolution was facilitated by the development of unit-trains with articulated, double stack railcars, on or near dock intermodal yards to handle them, domestic containers (in the US) and near dock transloading terminals to transfer the content of marine to domestic boxes, and hinterland "dry" ports, serving as extensions of the marine ones. The third revolution included the development of transshipment, or ship to ship transfer, linking together different shipping services and expanding the reach of container shipping to smaller ports.

The recently completed third revolution marked the final stage of the scope expansion of container shipping. Hence, the forthcoming Fourth Revolution, unlike the previous ones, is not predicted to center on technological breakthroughs for further expanding the system, but on re-arranging the existing system. The Fourth Revolution was described by this author in a series of papers published in 1999 and updated in 2003 . The revolution, as depicted there, revolves around a far reaching rationalization of the worldwide service pattern of shipping services intended to create a comprehensive, integrated network, defined there as the global grid. The core service pattern of this grid is cross-Panama, bi-directional (counter rotating) equatorial round the world (ERTW), functioning as the "ring road" for the major east/west trades, with the service only calling at six or seven global "pure transshipment ports" (PTP), strategically located at the intersection points with north/south routes. Complementary north/south services would have the dual role of handling their own traffic and feedering the east/west traffic. Additional feeder services might be needed for the final regional distribution to smaller ports. Accordingly, the total origin/destination trip might involve a total of up to five different services and five transshipments, two of which at the ERTW's PTPs. The main advantage of this service system would be the effective use of ships and ports; its main disadvantage would be the multiple handling of boxes (transshipments).

ERTW and PTPs

The two main components of the above depicted Fourth Revolution are the circular service pattern, the ERTW, and its ports of call, the PTPs. The advantage of a circular service pattern stems from the continuity of its route, which has no end points and respective switch backs. The circularity eliminates the need for double calling at ports at the end regions (east and westbound), resulting in a better utilization of ships' space and shorter transit times. The round the world rotation consolidates multiple trades into one service with a high traffic volume, which, in turn, provides for the deployment of the world's largest and most cost effective ships. The employment of counter rotating services also provides for better adjustment of ship size to the directional flow of traffic volumes. It was estimated that the ERTW based shipping system could handle about half of the total world's east/west trade.

The second component of the Fourth Revolution, PTPs, is critically important for the transshipment intensive shipping system. Since these PTPs are expected to only handle transshipment or ship to ship transfer, it was predicted that they would be based on a specialized handling system resulting in a much higher productivity and lower cost than in existing ports.

Obstacles to the Fourth Revolution

The Fourth Revolution, despite its radical name, seemed to be the logical next stage in the evolution/revolutions development path of liner shipping. The 2014 expansion of Panama Canal was expected to serve as its trigger. However, as early as 2006 it was observed that the revolution might be stalled because of two obstacles:

- The emergence of ships substantially larger than the new Panama locks; and
- The failure to develop cost effective, specialized PTPs.

The New Post-Panamax (NPX) ships defined by the new and expanded Panama locks, with 12,500 TEUs, are almost three times larger than the 4,500 TEU Panamax. But Maersk's new 18,000 TEU, Triple-E ships, soon to be deployed on the Asia/Europe trade route, are almost 50 percent larger than the 12,500 TEU NPX. Moreover, it is quite likely that the continuing evolution in ship size will not stop at 18,000 TEUs and larger ships might emerge within a few years (see discussion below). A second expansion of the Panama Canal to accommodate larger-than NPX ships is not envisioned for many years and, perhaps, might even be technically infeasible. Hence, the ERTW would not be able to deploy the largest and most cost effective ships of the future. Likewise, the massive transshipment to be generated by the Fourth Revolution could not be efficiently handled by existing ports, which are geared toward handling gateway traffic. Altogether, it seems that the bold concept of consolidating a large chunk of the world's east/west trades in a single, comprehensive ERTW service pattern is unlikely to be realized.

Continuation of direct services

The Fourth Revolution predicted a transformation of the current service pattern, mainly based on direct calls by mainline (mother) ships, to a pattern mainly based on indirect calls by feeder ships with extensive use of transshipment. Presumably, such a transformation should have taken place as a "natural" consequence of the substantial increase in ship size, even without the Fourth Revolution and its ERTW based global grid. Larger ships promote transshipment by: (a) allowing better exploitation of the size differentials between mother and feeder ships; and (b) reducing the number of ports that can handle them either due to

insufficient traffic-generation or insufficiently large facilities.

Interestingly, despite the introduction of larger ships, no meaningful transformation in service pattern has taken place thus far. The service pattern of the shipping services on the world's largest trade route, Asia/Europe, is still based on direct calls at all major regional ports as it has been when ships were much smaller. Moreover, Maersk Line's AE10 service, which employs the largest ships presently in operations, the E-class with 15,000 TEU, has recently added a "detour" into the Baltic Sea. As a result, this service includes direct calls at 14 instead of 10 ports by the more common Asia/Europe services. Likewise, most recently, the G6 alliance has announced an extension of its Asia/Europe service to Gothenburg. As a result, this mid-size remote port, which previously was only served by feeders, has two direct weekly calls by Asia/Europe mainline services.

Emerging bi-regional shuttles services

While the overall pattern of the Asia/Europe services, based on direct calls, has been kept unchanged for many years, an interesting modification has been taking place recently, eliminating calling at ports en route. The traditional multi-trade services commonly referred to as pendulums, have been gradually converting into single-trade, bi-regional shuttle services. For example, a few Asia Far East/North Europe services have eliminated en route calls in South Asia, the Middle East and the Mediterranean and only calling at ports in the two end regions. The en route regions, in turn, are also served by dedicated bi-regional shuttle services such as Asia Far East/Mediterranean, or south Asia/North Europe. The latest addition to this trend is the Southeast Asia/Middle East dedicated service announced by UASC (AGX). This transition from multi-trade to single trade services was triggered by the general growth in trade volumes and, especially, the recent creation of "super" alliances, producing sufficient traffic volumes to fill large ships.

Revised Fourth Revolution based on bi-regional shuttle services

The revised Fourth Revolution, the subject of this paper, is based on the same principles of the original Fourth Revolution, except that the ERTW is replaced by bi-regional shuttles as the core service pattern. The principle guiding both revolutions remains the same: comprehensive rationalization of the service pattern. In fact, the need for such rationalization is more urgent today, when ship size is reaching 18,000 TEUs, than in 1999, when the largest ship was Maersk's S-class with nominal capacity of "only" 6,600 TEUs.

The Revised Fourth Revolution is based on further transformation of existing bi-regional shuttle services. The present shuttles are multi-port, with the mother ship calling directly at several ports at each end region. In contrast, the envisioned shuttles of the Revised Fourth Revolution will only call at a single PTP in each end region, whereby the entire ship is turned around, and the regional distribution is provided by feeder services. The revised revolution implies the full application of the "classical" hub and spoke concept, with mainline services only calling at two ports and the rest of the ports served by feeders. This, indeed, is the most cost effective service pattern available; assuming the cost of transshipment at these hub ports can be substantially reduced. Also, the single hub shuttles do away with the multiple transshipments of the original Fourth Revolution. Another advantage is that most of the transshipment is concentrated in specialized PTPs instead of distributing it over gateway ports as is presently the case (see below).

The revised Fourth Revolution, very much like the original one, is dependent on the development of specialized PTPs to quickly and efficiently turn around 18,000 TEU ships, which cannot be accomplished by existing handling technology. Hence, both revolutions require the development of a specialized handling technology for PTPs.

Transshipment in present terminals

Mixing gateway and transshipment traffic

Most of the transshipment traffic is currently handled by ports primarily designed to handle domestic (gateway) traffic. The gateway traffic is, to a large degree, captive and therefore can be charged full cost. In contrast, transshipment is "foot loose" and can be shifted overnight to competing ports, including those located far away. Therefore, transshipment is usually only charged marginal cost and, accordingly, treated as secondary to the primary gateway traffic.

Figure 1 presents indicative data on the share of transshipment in a sample of North European and Mediterranean ports. As shown there, all major ports of North Europe and the Mediterranean handle significant volumes of transshipment traffic; this also is the case in most ports worldwide, with the exception of the US. It is unlikely that these ports will develop a specialized handling system to transshipment, being considered by them as secondary. It is also interesting to observe that transshipment exceeds 90 percent only at three ports (inside the red frame), justifying the definition of then as PTPs.

Ship to ship versus ship to shore handling system

There are important operational differences between the handling systems of transshipment and gateway traffic, or between ship to ship and ship to shore transfers:

- Land interface – Ship to ship transfer does not require a gate for processing trucks, pre-gate parking for trucks, on dock intermodal yard for trains, and major road and rail connections;

North Europe		Mediterranean	
Bremerhaven	61%	Malta	95%
Hamburg	33%	Cagliari	95%
Antwerp	32%	Algeciras	90%
Rotterdam	32%	Taranto	89%
La Havre	26%	Damietta	87%
Zeebrugge	26%	Gioa Tauro	77%
		Port Said DDE	57%
		Barcelona	37%
		Valencia	31%

PTPs

Policy Research Corp 2010; HSH Nordbank 2010; Asher 2012

Figure 1: Share of trannshipment traffic

- Selectivity – Ship to ship, or mother to feeder transfer, involves groups of containers, all sharing the same origins and destinations, while ship to shore transfer involves a single container;
- Control – In ship to ship transfer, the entire handling process is under the control of a shipping line while in ship to shore transfer, the shore side is controlled by cargo owners; and
- Dwell Time – In ship to ship transfer the dwell time between mother and feeder is shorter than in ship to shore transfer, since there is no need for clearing Customs, paying freight and port charges, arranging for land transport, etc.

Terminal automation and transshipment

Despite the differences between the handling systems of transshipment and gateway traffic, most of the transshipment is presently handled in terminals designed for handling gateway

Experience the progress.

Liebherr Container Cranes Ltd.
Fossa, Killarney/Ireland
Tel.: +353 64 6670200
Fax: +353 64 6631602
sales.lcc@liebherr.com
www.liebherr.com

LIEBHERR
The Group

traffic. Because of shortage in waterfront land, these terminals are often created through costly deep-water reclamation. Accordingly, the main objective of the recently introduced automation of yard operations is to reduce the amount of terminal land through densification of the storage area, along with reducing labor cost and increasing productivity.

Figure 2 presents a typical layout of an automated terminal based on automated stacking cranes (ASCs), with two optional yard arrangements, parallel or perpendicular to the berth. The arrows in this figure depict the 3 main transfer processes performed at the terminal berth: (a) ship to yard (import); (b) yard to ship (export); and (c) ship to ship (transshipment). For illustration, the transshipment is presented in this figure by a double-headed arrow between mother and feeder, as if boxes are moving directly between these ships. Such a direct move is unconceivable in automated terminals whereby the dock area is exclusively used for traffic lanes and no interim storage is allowed there. In reality, transshipment in automated terminals is handled exactly like gateway traffic: first, the discharged box is transported from ship-side to the yard and temporarily staged there until being picked up and stored by the ASC; second, the box is retrieved by the ASC, temporary staged and transported back to the ship side for loading onto the ship. Accordingly, transshipment, or a ship to ship transfer in automated terminals, involves double handling.

A second problem of handling transshipment at today's automated terminals relates to the utilization of their most precious resource -- waterfront land. Most of the transshipment is presently handled in terminals designed to handle domestic traffic, since it is by far the most important traffic component. In these terminals, as seen in Figure 2, about 40 percent of the area is devoted to the land-interface. This area has no use for transshipment.

Productivity of automated terminals

A third, and perhaps the most critical problem of automated terminals, is their relatively low productivity. The productivity of the automated terminal shown in Figure 2 is constrained by the yard system. The yard needs to simultaneously support both the ship side and land side operations, which limits the number of yard cranes that can be allocated for the ship side. This limitation is most severe in the more popular perpendicular yard arrangement, even when using nested yard cranes (Hamburg's CTB). Another constrain on productivity is the traffic congestion in the roadways between ship and yard, especially in larger terminals with longer distance traveling, where bulky shuttle carriers (small straddle carriers) are used to transport containers between yard and ship. Turning around an 18,000 TEU ship, as mandated by future shuttle services, would take three to five days if automated terminals reach productivity of 250 too 300 moves per hour (which is considered the upper limit achievable in such terminals). This undermines the feasibility of the entire shipping system Altogether, it seems that automation is not applicable for PTPs.

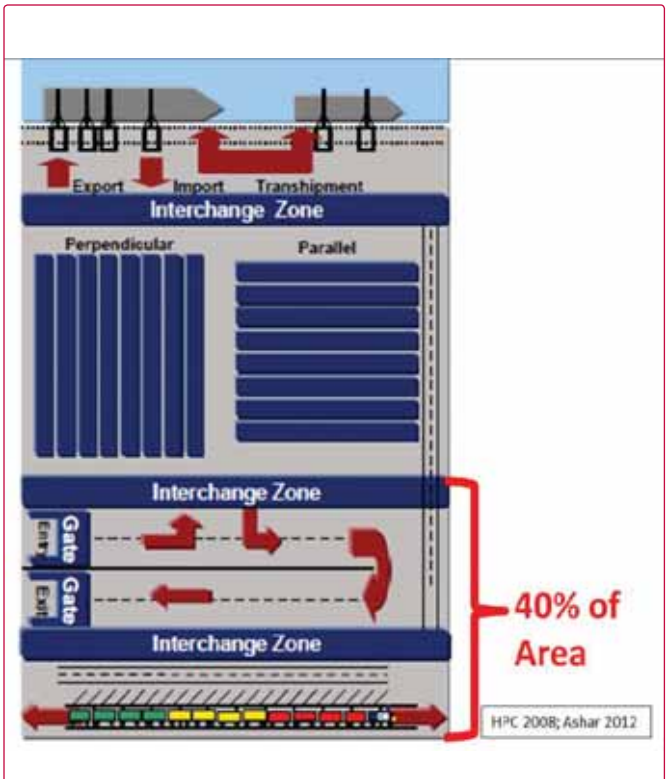


Figure 2 Layout of automated terminal

Floating pure transshipment terminals

Barges for storage and transport containers

As discussed above, automated terminals, designed for handling gateway traffic, cannot serve as the PTPs of the revised Fourth Revolution. For this, there is a need for a specialized handling system, taking advantage of the main characteristic of transshipment traffic -- moving groups of containers between ships. This, in turn, cannot be performed on land but only by water, using barges. Accordingly, future, specialized PTPs could be based on floating yards, or barges, for storing and moving containers.

Figures 3 and 4 depict a section and an elevation of the proposed design of a floating PTP. Figure 5 presents the overall layout of this terminal, using the Port of Algeciras as an example (the proposed layout and location of this terminal is the sole opinion of this author and is used here only as an illustration for the concept).

As seen in Figures 3 and 4, the STS crane is similar to conventional gantry cranes used in land based terminals, except that the roadways between crane legs are designed for barges instead of trucks. Likewise, the yard is not land based but water based, whereby barges are stored. These barges serve the dual role of: (a) horizontal transport vehicles of boxes between mother and feeder ships; and (b) intermediate, inter-ship storage device of boxes. The main advantage of barges is their ability to move groups of boxes together. This indeed is the case in ship to ship transfer, where one mother ship is typically "broken-down" into several feeder ships. For example, in the case of an 18,000 TEU mother served by five feeders each calling five ports, the average number of boxes moving between the mother and each of the 25 ports is 720 TEUs in each direction (18,000 per 25).

The configuration of the barges in the above figures are roughly based on common, square shaped Mississippi River "Jumbo" barges, with an arrangement of 10 by 4 by 4 TEU, or a total of 160 TEUs per barge (about 2,000 deadweight tonnage). Accordingly, a full discharge of an 18,000 TEU ship requires 112 barges (18,000 per 160). The ship to barge gantry cranes are conventional, although with a wider gauge of about 50 meters, which is not much different than the 42 meters of recent cranes. The cranes also have a cantilever of about 35 meters, allowing a total of eight rows of barges. This arrangement seems sufficient to provide the required selectivity, with each barge destined for a specific feeder and, desirably, specific destination port. The barges are moved along the mother ship by a special pulley system, similar to that used in the Mississippi River's grain terminals. The barges are stored (parked) according to their destination ports in a protected water area, referred to in the US as fleeting area. For the shuttling between the fleeting area and the dock, barges

destined to the same ship are tied together, forming a train (called tow in the US) and pushed by a boat. Figure 6 presents an aerial picture of a typical fleeting area in the Mississippi River with hypothetical sorting of barges by feeder port destinations, based on the example of Algeciras. Figure 7 presents a picture of a tow of barges in the Mississippi River. The use of Mississippi River barges here is only for illustrating the floating terminal concept; it could well be that larger barges (six wide) would be more stable and better suited especially if triple tandem STS cranes are used. An operational simulation is required to determine the optimal size of barges, including the possibility of using a modular, flexible design, for example, assuming that two smaller barges can be tied to form a larger one.

The operation of the floating terminal is quite simple. The boxes from the mother ship are discharged onto barges according to their final destinations; the barges are towed away from ship side to the fleeting area and parked there according to destination ports; when the feeder ship arrives, the barges are towed back to ship side and the boxes are loaded onto the ship. Accordingly, the entire ship to ship transfer involves only two lifts, both performed by STS cranes. In comparison, the full ship to ship cycle at a land based, automated terminal based on shuttle carriers and ASC, involves eight lifts: two by the STS, four by shuttle carriers and two by the ASC cranes. Some limited shuffling of boxes may be needed in the floating operation due to changes in box destinations while already en route. These could be performed by floating cranes, such as that shown in Figure 8. It could well be that, as is the case in Algeciras, a small percentage of the traffic, will be gateway (domestic) traffic. The domestic traffic, much like the transshipment one, will be staged on barges, but instead of being towed to the fleeting area, it will be towed to a local, land based barge terminal.

A preliminary calculation indicates that the cost of barges would be much lower than the respective cost of developing a land based storage yard, especially in deep water and installing yard equipment. Likewise, the operating cost of transshipment in the floating terminal is expected to be a fraction of that in a land based terminal, because of the elimination of the double handling. Still, the main saving in the floating design would be in ship cost, as will be seen in the following section on productivity.

Productivity of a floating PTP terminal

The use of barges for horizontal transport of containers facilitates the use of tandem and triple lifting in the transshipment, ship to ship transfer operation, where the matching of boxes is simple, since many boxes have the same destination. Moreover, "dumping" the entire ship in a single terminal simplifies ship handling, allowing the deployment of more cranes per ship and a higher percentage of dual cycling, resulting in significantly higher productivity. For example, employing nine STSs with tandem lift (four TEUs) throughout the entire operation with 50 percent dual cycling, would result in productivity of 1,620 TEUs per hour (nine cranes multiplied by 30 moves per hour multiplied by four TEUs per move multiplied by 1.5). With triple lift, the productivity could reach 2,430 TEUs per hour. At these productivities, an 18,000 TEU ship can be turned around (with twice as many18,000 TEU moves) within one day! A berth dedicated to handling such ships on a daily basis could produce 13 million TEUs annually. Such productivities are way beyond those achievable in land based terminals.

Gibraltar / Singapore shuttle

Figure 9 shows the service route of Maersk's primary Asia/Europe service, the AE10 provided by Maersk's largest, 15,000 TEU E-class ships. As shown in this figure, the AE10, as well as almost all current Asia/Europe services, includes long regional legs in both North

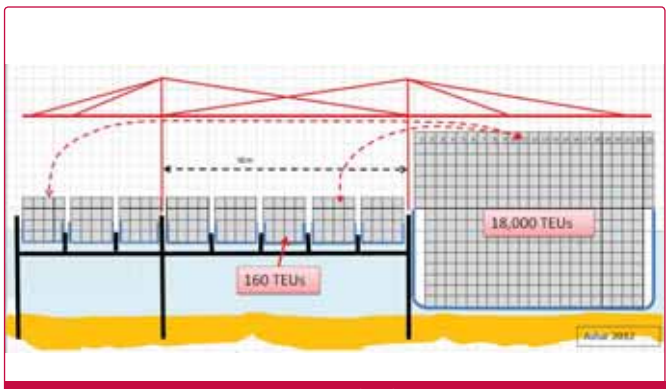


Figure 3 Floating pure transshipment port (PTP) - cross

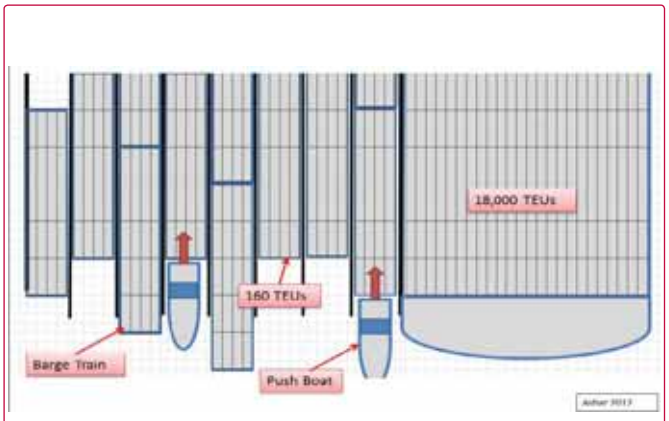


Figure 4 Floating pure transshipment port (PTP) -- elevation

Figure 5 Algeciras' floating pure transshipment port (PTP)

Figure 5 Algeciras' floating pure transshipment port (PTP)

Figure 7 Mississippi's fleeting area

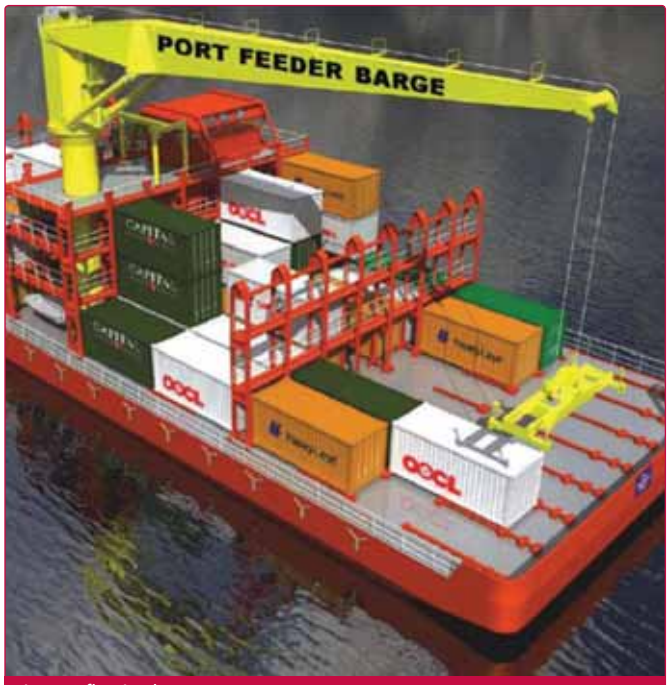


Figure 8 floating barge crane

Figure 9 Maersk Line's Asia / Europe AE10 service

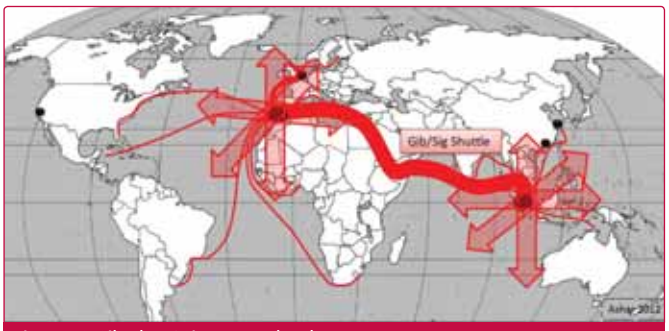


Figure 10 Gibraltar / Singapore shuttle

Europe and the Far East. Indeed, ships spend about half of their rotation time on these legs, most of it at regional ports. Accordingly, a typical Far East/North Europe rotation requires ten ships (AE10 employs 11 ships because of the additional Baltic Sea tour). Moreover, as illustrated by the double headed arrows, because of the switch backs, regional ports are either called once, resulting in long transit times for boxes moving in the opposite direction; or called twice, first for the inbound and second for the outbound traffic, resulting in waste of ship's time and additional port costs. Altogether, the current "milk run" of large, mother ships between fuve or more regional ports on each end is very costly.

The development of high productivity, low cost floating PTPs would allow for a transformation of the current service pattern into a shuttle between two regional PTPs located in Gibraltar and Singapore (or other ports in the Malacca Straits). Such Gibraltar/Singapore (Gib/Sig) shuttle service would require about half (!) the number of ships of an existing full Far East/North Europe rotation, or only five ships. Hence, if Maersk dedicates its fleet of 20 lots of 18,000 TEU on-order and present 10 lots of 15,000 TEU ships to the Gib/Sig express services, Maersk could provide six daily services between Asia and Europe. The annual capacity of these services would be about 10 million TEUs and the respective traffic generated at each PTP 20 million TEUs. A wide network of feeder services should be developed to distribute this traffic both in Europe and Asia. Figure 10 depicts the Gib/Sig shuttle concept, including feeder connections at its two PTPs.

The Gib/Sig will serve the main North European as well as some North American ports via feeders through the Gibraltar PTP. However, the resulting transit time will remain the same as that currently provided by direct service, or perhaps shorter, since the Gib/Sig eliminates en route ports of call and the PTPs shorten the port stay of ships. The reduction in transit time may even be more substantial for smaller North European ports presently feedered via North Europe ports, since the Gibraltar based feeder services, using ships of 3,000 to 6,000 TEUs, will be able to call directly at these ports. This would also apply to the Baltic ports, including the most remote ones, such as St. Petersburg, Tallinn and Helsinki, which could be served directly from the Gibraltar's PTP. All these ports will also be able to enjoy daily services, now confined to the major North European hubs. Altogether, the revised Fourth Revolution will substantially lower transport costs and improve level of services to most ports. The main losers will be the dethroned present hub ports losing their transshipment traffic to the PTPs. However, transshipment is not the primary traffic of these ports.

Similar PTP based shuttle services to the Gib/Sig could be developed between other pairs of global regions. Possible PTPs could be developed in Prince Rupert and Melford, Canada ; Freeport, Bahamas; the ports at entrances to Panama Canal and Suez Canal; Shanghai (Yangshan); and others. The two pre-requisites for PTPs, in addition to a strategic location, are a deep channel and a large, protected body of water for barge fleeting. Eventually, a global network of specialized PTPs and shuttle services connecting them will evolve, similar to the global grid of the original Fourth Revolution, but without the ERTW.

28,000 TEU Malacca-Max Ships

The Gib/Sig shuttle service is a dedicated service between two specialized PTPs; both could be based on a floating design. The floating design allows for locating the PTPs in deep water, since it does not require land reclamation for yard, with crane rails supported on piles or, more probably, caissons. For example, Algeciras' PTP, as shown in Figure 5, is located in water of 30 meters natural depth. The availability of deep water in both PTPs raises the possibility of employing dedicated deep draft ships for the PTP to PTP shuttle service.

In the case of Gib/Sig service, the ships' draft would be defined by the Straits of Malacca, or the ships could be Malacca-Max (MalMax). These MalMax ships could have similar dimensions to Maersk's Triple E, except for their deeper draft. Accordingly, the MalMax dimensions could be 400 by 60 by 21 meters, resulting in 245,000 deadweight tonnage. This is 36 percent larger than the 180,000 deadweight tonnage of the Triple E, and an equivalent container capacity of 24,500 TEUs (18,000 by 1.36) - twice the size of the 12,500 TEU NPX. If the ship length is extended to 460 meters, the capacity of the MalMax could reach 28,000 TEUs (!).

Summary observations

Making predictions for the volatile liner shipping industry is risky for the short-term; it is immeasurably more risky for the long-term, the subject of this paper. A case in point is my 1999 prediction for a forthcoming Fourth Revolution based on ERTW and extensive transshipment triggered by the 2014 expansion of Panama Canal. It seems now that the ERTW is unlikely to be developed because of the size of the expanded Canal. Likewise, my prediction of extensive transshipment also failed to be realized, thus far, despite the dramatic increase in ship size. Multi-porting and direct services still dominate Asia/Europe, the world's major trade routes. I believe that the dominance of direct services is short-term, the result of a temporary excess in ship supply and, mainly, the inability of existing terminals, even the most technologically advanced ones, to provide cost effective services to transshipment traffic due to their focus on gateway traffic.

The general concept underlying the Fourth Revolution is transformation of the current service pattern into a rationalized and integrated network of mother and feeder services. While the concept is still valid, it requires a revision. The revised Fourth Revolution, described in this paper, is based on a series of bi-regional, dedicated shuttle services between specialized PTPs, with each service tailored to the specific needs of its trade route, instead of the inclusive ERTW of the original Fourth Revolution. The separate shuttle services are then linked together at these PTPs, to form a global grid of shipping services, similar to that envisioned by the original Fourth Revolution but, again, without the ERTW and its multiple transshipments. The recent increase in ship size, emergence of dedicated regional shuttles in the Asia/Europe trade and, especially, the formation of "super alliances" appear to prepare the ground for the revised revolution. However, as was the case with the original revolution, the revised one is critically dependent on the development of specialized PTPs for which this paper presents a unique, floating design.

REFERENCES:

Ashar, A., The Fourth Revolution, Containerization International, December 1999 and January 2000. See: www.asafashar.com.

Ashar, A., Revolution #4, Containerization International, December 2006. See: www.asafashar.com.

The concept was presented in a public seminar on long-term developments of liner shipping, which was part of the Port of Algeciras strategic plan.

Michael Jordan of Liftech Consultants Inc. proposed a similar design. See: www.liftech.net.

Prof. Niko Wijnolst and a team at Delft University studied a shuttle service by Malacca-max ships between Singapore and Rotterdam, although Rotterdam is mainly a gateway port. See: Wijnolst, N., Malacca-max 2, Container Shipping Network Economy, DUP Satellite, 2000. Capt. Yigal Maor presented a similar system based on a Mediterranean hub in TOC 2000.

Assuming: 20'000, two days for Suez, two days for PTPs handling and one day for slack.

An interesting application of the floating design will be for a barge to rail transfer terminal.

The dedicated, two port service raises the option of constructing LNG-fueling installations to allow the deployment of LNG-powered ships.

The permissible draft of Suez Canal is 66 foot (20.1 meters) and the largest allowed ship is 240,000 deadweight tonnage, with plans for further deepening, mainly geared toward large tankers.

ABOUT THE COMPANY

The National Ports and Waterways Initiative (NPWI) is a program of the University of New Orleans' Transportation Institute. NPWI was established in 1983 at Louisiana State University and since then has participated in numerous studies and projects, specializing in ports, inland waterways shipping, short-sea and deep-sea shipping, intermodal transportation systems, dry ports, institutional reforms and port legislation.

ABOUT THE AUTHOR

Asaf Ashar, PhD, is Research Professor with the National Ports & Waterways Initiative (NPWI), US and independent consultant for ports, shipping and intermodal transportation. Dr. Ashar has over 30 years of experience in more than 30 countries worldwide, most recently focusing on strategic port planning, port concessions, deep sea fleet forecasts, inland waterways and short sea shipping, and serving as an expert witness in port-related litigations in the US and South America.

ENQUIRIES

Email: aashar@uno.edu

Web: www.asafashar.com

Dry Bulk and Specialist Cargo Handling

"The productivity of bulk terminals is determined by the infrastructure, movable equipment available and the organization."

'Assessing the potential of a dry bulk terminal', page 95.

Floating transfer stations play pivotal role

Captain Giordano Scotto d'Aniello, head of commercial department, Coeclerici Logistics, Milan, Italy

A workable transhipping operation service depends on many factors such as geography, sea conditions, draft restrictions, reliability of the unit and its maintenance.

One of Coeclerici Logistics' reasons for success comes from its ability to face those challenges and offer the client the best solution based on the concept of offshore transhipment units: fast, reliable and environmental friendly. Coeclerici's approach is to provide the client with nothing less than the best possible logistic solution.

Floating Transfer Stations (FTSs) for PT Berau Coal

The coal export growth in Indonesia is mainly driven by big producers, but with plenty of small mines coming into operations too. In the last few years the domestic coal industry has been able to keep pace with the growing market demand, especially from the Asian market. For example, PT Berau Coal is one of the largest coal exporters in Indonesia. Coeclerici designed and built two FTSs named Bulk Java and Bulk Borneo. These are employed in East Kalimantan to serve PT Berau Coal, and were expressly developed to solve the logistic problems linked to a coal production industry that is expected to increase from 15 million metric tons to 22 million metric tons in 2012 and to further grow up to 30 million metric tons in years to come. Bulk Java came into operation in July 2011, while its sister vessel Bulk Borneo started operation in June 2012.

During the first year of operation, the total quantity transhipped by the FTS Bulk Java, was four million metric tons, and in June 2012 alone the quantity transhipped was 426,191 metric tons accounting for over 70 percent of the monthly guaranteed volume of 250,000 metric tons , with a peak loading rate of 49,798 metric tons per day.

FTS Bulk Borneo

The sister vessel FTS, Bulk Borneo arrived and commenced operations at Muara Pantai Anchorage in June 2012. The unit showed an excellent performance since the first commissioning vessel with a loading peak rate of 41,000 metric tons per day during the very first loading operation. The efficiency of the transhipment operation has been achieved thanks to the powerful and reliable equipment installed on board. Particularly during the commissioning period, all the unit's devices must be fixed to guarantee a regular and constant performance, and although this may reduce the loading performances, much to Coeclerici Logistics satisfaction and to the client too, the FTS, Bulk Borneo was able to achieve a satisfactory performance rate. Both the FTSs are in compliance with the latest international code resolutions for ship's safety and security protection of crew and of the environment. Beside the compulsory certificates, recent additional 'statements' have also been attained with the last Coeclerici's units such as:

- *'Statement of compliance for International Sewage Pollution Prevention'* issued under the provision of the International Convention for the prevention of pollution. This document certifies that the units are equipped with a sewage treatment plant and discharge pipeline in compliance with the stringent regulation

Anti spillage plates on board of the FTS Bulk Borneo

- *'Statement of fact for International Oil Pollution Prevention'*. This document certifies that the ships are provided with specialised tanks for the retention of oil residues on board, as well as pipelines for the discharge of residues from machinery bilges, and sludge to reception facilities and fitted with a standard discharge connection.

- *'Statement of compliance for International Air Pollution Prevention'* meaning that equipment, systems, fittings arrangement and materials installed on board are specifically designed to minimize air pollution.

These are examples of the particular care that Coeclerici Logistic takes in dealing with environmental issues.

A continuous relationship

Coeclerici Logistics has been present in the Indonesian market since 2005 with the FTS, Bulk Pioneer, operating for Kaltim Prima Coal and utilized for coal loading operations from barges into Ocean Going Vessels (OGVs) at Tanjun Bara anchorage. The FTS was designed by Coeclerici Logistics and is patented in various countries, including Indonesia.

The Bulk Pioneer has been operating at an average rate in excess of 40,000 metric tons per day against the contractual lower guaranteed daily rate. The best performance has been of 44,545 metric tons per day which is considered as an excellent result. The FTS is utilized for direct transhipment of coal, which is brought alongside in open-top barges. The coal is transferred from the barges by cranes into the strategically situated hoppers, which then transfer it to the conveyors by belt feeders, leading to the two ship-loaders. The two ship-loaders mean that coal can be delivered into five holds of a Panamax vessel without the need for shifting alongside. The availability of buffer storage on board ensures continuous loading of coal even in times when barges are not available. The excellent performance of Bulk Pioneer led the client to extend the contract for a further five years guaranteeing Kaltim Prima Coal, the good performances achieved by the unit until September 2017.

Coeclerici Logistics in Mozambique

One of the most important contracts concluded in the recent past has brought Coeclerici Logistics to Mozambique, where

FTS Bulk Java during operations at Muara Pantai-East Kalimantan

Bulk Java sister vessel FTS Bulk Borneo

The 55,000 DWT Bulk Limpopo transshipment vessel operating in Beira for Vale Mozambique

two transhipper units of 55,000 DWT are employed to provide services to the mining giant – Vale. In particular, Bulk Zambesi started operating in July 2011 while its sister vessel Bulk Limpopo was delivered to Vale in April 2012. Both transshipment units load coal at the loading berth in Beira, and transport the loaded coal to a suitable anchorage 20 miles off the coast, where there are no draught constraints and where coal can be transferred into OGVs up to 180,000 deadweight tonnage. After the delivery to site of Bulk Limpopo in May 2012, Vale succeeded in loading the first Panamax vessel 'Sea Empire'. This was a most important achievement, not only for Vale, but for the Mozambique country as a whole. Thanks to the transshipment units designed by Coeclerici Logistics, a Panamax vessel was fully loaded in Mozambican waters, thus opening new frontiers to the coal export potential of a country with huge coal reserves.

Coeclerici Logistics' features

Coeclerici Logistics has over 30 years of experience in offshore transhipment of dry commodities and handles about 20 million metric tons per year through its transhippers in operations worldwide with current projects in Indonesia, Mozambique, Venezuela, the Black Sea and Italy. Taking advantage of the rich experience gained over a century in the procurement and shipping sectors, Coeclerici Logistics designs and implements innovative offshore logistics systems. These systems are primarily aimed at reducing the seaborne transport figure in the total landed cost of raw material to the end users including power plants and steel mills. Coeclerici Logistics is always involved in the overall development of its projects starting from the feasibility study through to the design, building and operation of the unit. Coeclerici is fully committed to guaranteeing the best possible performance of the service, and the successful long term relationships it has established over the years with its clients is a proof of Coeclerici's successful approach in this niche market.

ABOUT THE AUTHOR

Giordano Scotto d'Aniello is a master mariner and has been employed on dry bulk vessel for more than 10 years. Since 1998 he is working for the Coeclerici Group, at first in the Shipping department and then, since 2004 in the Logistic department. He is presently working in the 'new projects' department and is head of the commercial division of Coeclerici Logistics, where he is involved in the conceptualization of offshore transhipment solutions for clients worldwide.

ABOUT THE COMPANY

Since 1895, **Coeclerici** has been sourcing, marketing and transporting raw materials (primarily coal) from mines to final end users, serving the power and steel industries internationally. The Logistics division has promoted and patented the use of floating terminals and transfer stations throughout the world with far smaller investments, lower management and environmental impact for port terminals.

ENQUIRIES

Coeclerici Logistics S.p.A.
Piazza A. Diaz 7- 20123, Milan, Italy
Tel: +39 02 624 69 451
Fax: +39 02 624 69 444
Email: newprojects@coeclerici.com
Web: www.coeclerici.com

32nd Coaltrans ISTANBUL

WORLD COAL CONFERENCE 2012

Exhibition is organised by expotim
EXPOTIM INTERNATIONAL FAIR ORGANIZATIONS INC.

14th - 16th October 2012
Istanbul Lütfi Kirdar Convention & Exhibition Centre, Istanbul, Turkey
32nd Coaltrans World Coal Conference and Exhibition
www.coaltrans.com/istanbul

Coaltrans Conferences

Lead sponsor

Alinos Enterprises Ltd

Platinum sponsors

ICHORCOAL distributed by HMS Bergbau AG

MECHEL

Gold sponsors

Arch Coal Sales

COECLERICI

Port of Amsterdam

SAIF

SGS

UNICOAL AG

Silver sponsors

argus

CMC Coal Marketing Company Ltd

holman fenwick willan hfw

ice

INSPECTORATE A Bureau Veritas Group Company

platts

Siberian Anthracite

Bronze sponsors

The Baltic Exchange

CARBOSAN

Sociedad Portuaria de Santa Marta

CLARKSONS

Puerto de Gijón

TRANSNET

STEMCOR Every step in steel

United Bulk Carriers International

Join us where Europe meets Asia!

MORE THAN 1500 DELEGATES IN 2011

Scan to see latest conference updates online

COALTRANS CONFERENCES - BRINGING THE GLOBAL COAL COMMUNITY TOGETHER SINCE 1981

THIS FAIR IS HELD UPON THE AUTHORIZATION OF THE UNION OF CHAMBERS AND COMMODITY EXCHANGES OF TURKEY IN ACCORDANCE WITH LAW NUMBER 5174

Loading chutes channel bulk material

Cimbria Bulk Equipment, Sunds, Denmark

For many years, loading chutes have been used for loading dry bulk products into different vessels, such as tanker trucks, open trucks, wagons, ships and barges. The strength of the loading chute has always been its flexibility and versatility, as well as the fact that it is able to load all kinds of dry bulk materials, under virtually all conditions, and in nearly all known applications, ie. in ports, in refineries, in cement and power plants, and in grain terminals.

For 25 years, Cimbria has produced and installed more than 12,000 loading chutes worldwide, branded Moduflex, where the chutes are being used for loading anything from cobber concentrate over fly ash and cement to fertiliser, grain and food stuffs. The chutes are used for loading ships and barges, open back trucks and dumper trucks, stockpiling, tanker trucks and boats as well as train wagons. In many cases, the chutes are loading not only one specific product, but many products through the same chutes – for instance in port terminals. Other systems on the market only offer loading in open back trucks, and only with very specific and homogenous products.

Flexibility in design

This variety of applications can only be supplied due to the versatility of the loading chute, based on the general construction and build. The Moduflex loading chutes are designed with a unique modular construction, which means that the loading chute can be adapted to suit 99 percent of all known applications within the dry bulk industry, although the parts being used are standard components. This ensures that the operators know that the loading chutes are based on well-founded, known technology that provides the user with quick access to standard spare parts if a breakdown occurs, so down times are kept to a minimum. On top of this, the Moduflex loading chutes can cater for capacities up to 4000 t/h in the standard configuration, and a drop of more than 25 meters. This flexibility can only be achieved using a loading chute, and is not possible in alternative loading systems.

Due to the fact that Cimbria manufactures several hundred Moduflex loading chutes every year, the price becomes very attractive, considering the price to quality relationship, and very low life cycle cost for the user. Installation costs for the loading chutes are negligible, as it only requires mounting the chute to the flange of the inlet with a number of bolts and connecting it to power - or pressurised air if the chute is with integral filter.

Adapting to industry

The Moduflex loading chutes can of course be used in light duty industries for loading items such as grain, bran and food stuffs. It can also be used in the heavy duty industries for loading things like cement, limestone, fly ash, clinker and minerals. Again this versatility is founded in the ability to construct the various parts of the chute in – for example, high density polyamides, abrasive resistant steel, stainless steel, liners in Vautid and/or ceramic compound materials. Furthermore, loading products with larger particle sizes or very low densities and little structure is completely impossible, except through a loading chute. No other loading system can offer the same degree of adaption to meet the needs of the users, or the same safety and durability in one piece of equipment.

The proof of this becomes even more evident when looking at toxic products, or products that need to be loaded in a closed system - like food and chemicals, as this again is only possible using a loading chute. The demands of food safety and cleanliness within the chemical industry make it impossible to load products like sugar with any 'open' system that exists on the market. The risk of contamination loading any product for human consumption and almost any chemical base materials in non-sealed systems is unacceptable and in some case dangerous to health. Genetically Modified Organism (GMO) products are another example of materials that need to be loaded within totally concealed systems. In order to avoid contamination, a closed system with a closing device at the outlet, there to ensure active sealing during loading and plugging - when the chute is not in use, is required. Avoidance can be achieved by using accessories, FlexClose and FlexSeal, which are available for the Moduflex loading chutes.

Environmental protection

Looking at it from a different point of view, the overall purpose of the loading chute is to ensure a dust free loading of the products. The environmental authorities in more and more countries are imposing strict legislation on environmental protection. This means that the duties of loading involve - protecting the natural environment: air, water and soil, as well as protecting the surrounding environment and the working environment: health and safety. There is no argument against the fact that only loading chutes are able to fulfil all these tasks, by truly providing a dust free situation. Although other systems claim to do so, dust and particles will inevitably escape in the space between the outlet of the material provider - a silo or similar - and the inlet of the chute, eg. a hopper, a hose or similar. Looking at the products mentioned above, they all have this common characteristic, that they create dust during loading. This dust needs to be confined and dealt with in a safe and efficient way. This objective can only be secured in a well aspirated loading chute, which is either connected to a separate filter or is provided with an integral filter.

The third aspect of modern loading is the varied environments where loading takes place. In some cases the loading does take place inside, in nice enclosed surroundings, but the vast majority of loadings are done outside, where wind, sun and humidity is affecting the material being loaded and the loading equipment. For example when loading is done through a hopper system, the wind will seriously affect the free falling product, creating dust problems, and if loading is done using a simple hose or bag, the humidity in the air will affect the product and cause disruptions in the loading procedure.

Conclusion

The conclusion must be then that loading chutes are for now - and likely to be for years to come, the only alternative within loading systems where you can combine flexibility and versatility with efficient loading, and at the same time adhere to the environmental legislation and work safety. This is a must for companies dealing in the loading and transportation of dry bulk commodities. Alternative systems

Moduflex loading chute with integrated filter loading ammoniumsulphate into flatbed truck

have such a limited usage, and can only be justified in a small number of applications, where the conditions and the product are so homogenous that they will work to the satisfaction of the users. Cimbria Moduflex has built-up a vast experience - due to the huge installed base – in the loading of all kinds of dry bulk materials. This means that whenever we are faced with ever more stringent environmental legislation and new demands from companies, we can draw from this experience and very quickly adapt to fulfil these demands.

ABOUT THE COMPANY

Cimbria was established in 1947 and is today an international organisation with 600 employees in 15 companies located throughout the world. Cimbria offers equipment and processing plants for the grain and seed industry; and transport and conveying equipment for bulk handling. The Moduflex loading chute is designed and sold by Cimbria Bulk Equipment A/S, a part of the Cimbria Group of companies.

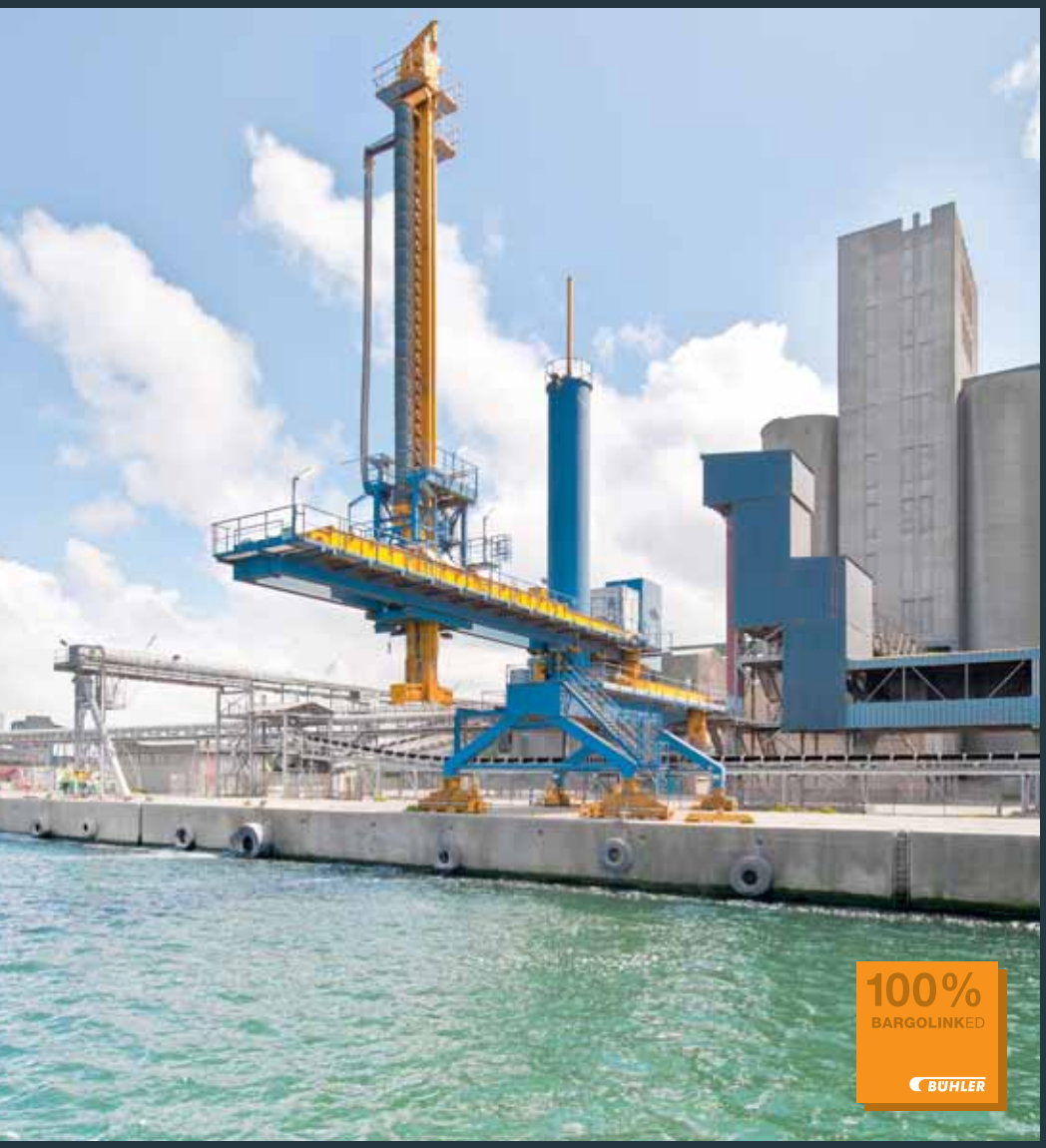
ENQUIRIES

Cimbria Bulk Equipment Member of the Cimbria Group of Companies
Drejervej 10 , DK-7451 Sunds, Denmark
Tel: +45 72 42 24 00
Fax: +45 72 42 24 99
Email: cbe@cimbria.com
Web: www.cimbria.com

Dust free loading of dry malt into open ship.

Bargolink™ – Unload barges more efficiently. Bühler's Bargolink offers an investment-friendly, highly flexible and efficient solution for unloading barges in the genuine Bühler manufacturing quality combined with best in class components. The Bühler Bargolink is the new high-performance unloading system that sets new standards in the areas of energy consumption, gentle product handling and low maintenance, for the unloading of barges up to 5,000 DWT with a throughput rate of 150 t/h to 300 t/h. These state-of-the-art ship unloaders are available as mobile or stationary versions. Get Bargolink now!

Bühler AG, Grain Logistics, CH-9240 Uzwil, Switzerland
T +41 71 955 11 11, F +41 71 955 3949
grain-logistics@buhlergroup.com, www.buhlergroup.com/bargolink



Bargolink™. The future of inland waterway transport.

Efficient unloading
– The semi-automatic driving mechanism allows optimal unloading.
– Thanks to the feeding screws the use of bulldozers can be reduced to a minimum.

Low energy consumption
– Compared to the mechanical unloading technology employed by the Bargolink system, conventional pneumatic barge unloading systems consume up to 100 % more energy.

Low maintenance
– Rugged design and low number of wear parts substantially reduce maintenance cost.

Gentle product handling
– The low conveying speed in mechanical conveyors results in most gentle product transport.
– High product reject rates are avoided.

Save energy and increase profit with the Bargolink.

Innovations for a better world.

BÜHLER

TURBO POWER revolution

NEUERO Industrietechnik, Melle, Germany

The first pneumatic shipunloaders used piston compressors for vacuum generation since the 19th century. A key moment in the evolution process was the use of roots blowers, patented in 1860. NEUERO continually developed a high pressure single stage fan with air regulator. In the 1960s the traditional design was standard, with the fan mounted on a bearing block driven via V-Belts, motor mounted on rail span. The next step was adjusting the tension and alignment using the motor weight via pivoting motor base. The use of frequency inverters also began in the year 2000, using standard motors with bearing insulation.

The development and popularity of the frequency inverters pushed for direct drive. There is a simplicity with using no intermediate connections like, V-Belts, cardan joints, reducers between the motor and turbo drive. The motor shaft and bearings are part of the TURBO POWER . The consequence of the single use was the development of a double stage to achieve the necessary pressure for the unloading work.

The development of the TURBO POWER relies on the simplicity of its design compared with other systems like roots blowers and multistage fans. The reduction in components between the motor and TURBO POWER increases the efficiency and makes it easier to check the remaining parts. The motor winding temperature is monitored, and there are also temperature and vibration sensors are located at the bearings. This is the same for the blower and motor. This information is displayed on the operators panel. Temperature and vibration limits are set to set off an alarm when reaching abnormal

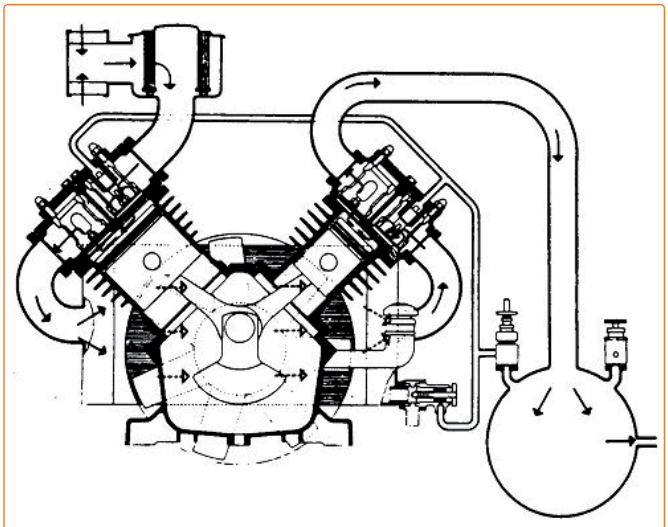


Figure 1: Piston compressor.

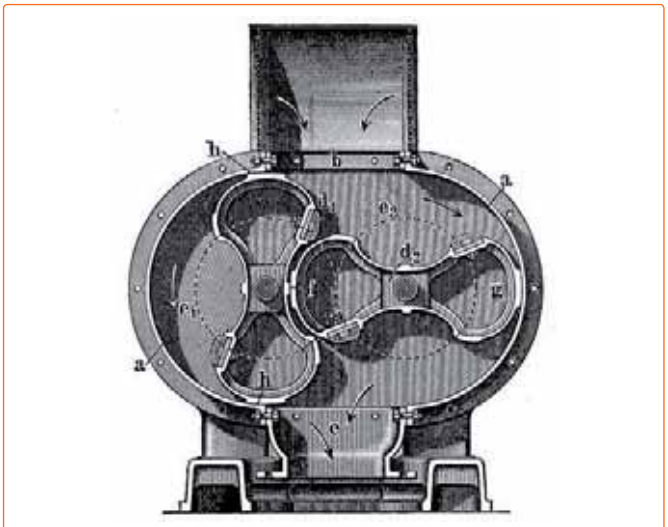


Figure 2: Roots blower.

Figure 3: Fan with air flow regulator.

Figure 4: Fan with frequency inverter and automatic belt tension.

Figure 5: TURBO POWER single stage.

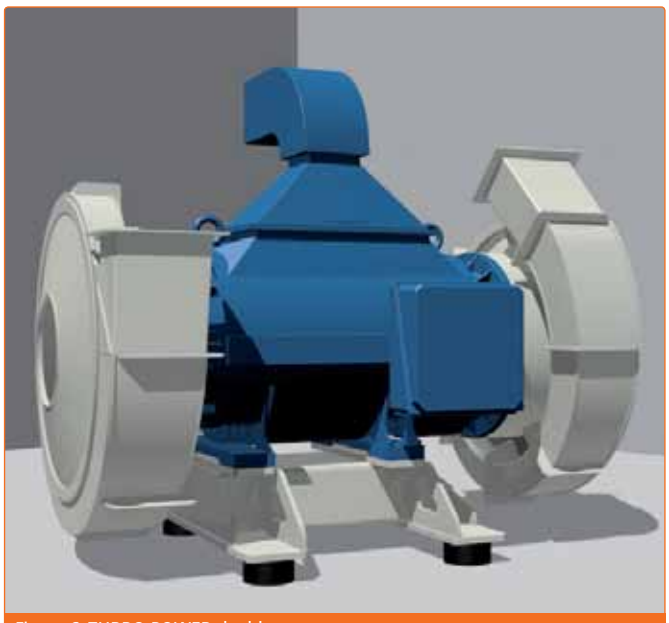


Figure 6: TURBO POWER double stage.

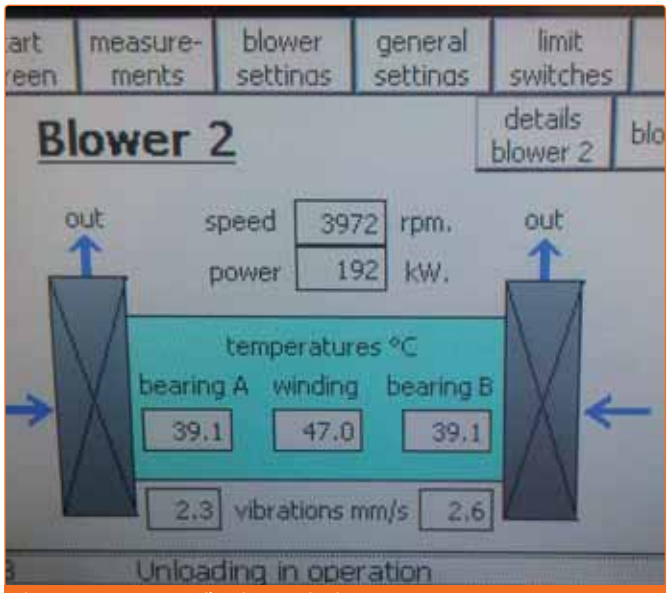


Figure 7: Temperature vibration monitoring.

Figure 8: Ship unloader with TURBO POWER.

ranges. This helps in preventative maintenance by avoiding stoppage during a ship unloading for example.

Advantages of using TURBO POWER pneumatic unloaders:

Reliable - less parts fail, it monitors bearing temperature and vibration. Provides easy maintenance and inspection in a single stage.

Efficient - compared with other unloaders the efficiency is higher because of the high capacity at clean-up. In Panamax ships, achieving an average of 75-80 percent of nominal capacity is normal.

Lower power consumption - the consumption is reduced in two ways. Firstly, there are no mechanical losses between motor and TURBO impeller. Secondly, the speed is adjusted for each operation even in a partial load. The first TURBO POWER measurements showed consumption of 195 kilowatts or 300 tonnes/hour (0.65 kilowatt/tonne).

ABOUT THE COMPANY

Established in 1914, **NEUERO** began manufacturing agricultural equipment, including radial fans - mobile pneumatic conveyors driven with PTO electrical and diesel engines. The mobile units were also used for ship unloading and later, as today, for both ship unloading and ship loading specialization. Today, the capacity of NEUERO's ship unloaders range from 100 t/h to 1,000 t/h, while its ship loaders boast a capacity of up to 3,000 t/h, which can both be used for grain, feedstuffs and alumina.

ENQUIRIES

Tomas Kisslinger
NEUERO Industrietechnik
Neuerostr. 1 - 49324 Melle
Germany
Tel: +49 5422 95030
Fax: +49 5422 950350
Email: tk@neuero.de
Web: www.neuero.de

Removing explosive risks

Rhys Jones, Project Engineer at BMT JFA Consultants, Innaloo, Western Australia

Port of Albany, Western Australia.

Many ports and maritime installations around the world run the risk of explosive ordnance (EXO) contamination as a legacy of conflict, whether as a result of military action, or loss of munitions during transhipment. One such port that has recent experience of this form of contamination is the Port of Albany in Western Australia. As an embarkation point for surplus World War I and World War II munitions, the Port of Albany, Western Australia saw (EXO) being loaded onto barges for offshore disposal during 1947 and 1948. Anecdotal evidence, backed up by the recovery of EXO during subsequent dredging operations, indicated that some items were lost overboard during this process and were never recovered. The Albany Port Authority (APA) recognised that the presence of EXO located within the Princess Royal Harbour posed an unsatisfactorily high risk to woodchip vessels using their Berth 6 and to future development plans to deepen Berths 5 and 6. In a bid to improve safety for vessels and reduce the risk to future marine developments, the APA initiated a project to remove EXO from Princess Royal Harbour. The main objective of this project was to reduce any risk associated with EXO in the port to a level that is As Low As Reasonably Possible (ALARP). In order to carry out this clearance work safely and effectively, the APA commissioned BMT JFA Consultants, with the support of other specialist partners, to develop an appropriate methodology.

Identifying the obstacles

With specialist dredging management expertise, BMT was well placed to provide a comprehensive strategy in relation to the EXO survey and clearance planning and management. Its ability to collaborate with other partners also allowed the successful preparation and management of the procurement process. Due to the unusual nature of the works, BMT recognised that it was important to devote a substantial amount of time to developing a robust EXO clearance methodology which took into account a number of critical site specific factors including several key factors. There were a number of large items of extraneous debris present on the seafloor including remnant jetty piles. These posed a potential barrier to any subsequent dredging operations and had to be accounted for. The presence of metallic items of extraneous debris such as railway bolts, cables and railway track that exhibit magnetic signals would also create significant difficulties in identifying items of EXO due to the high level of background metallic contamination. Soft mobile sediment which overlays a firm clay seabed at both of the demolished jetty sites that exist there creates substantial difficulties as the items of EXO are likely to be present within the mobile sediments on the clay surface, making visual identification impossible. The fine nature of the material is such that any disturbance at the surface would rapidly reduce diver visibility and prevent efficient operations.

Developing a tailored methodology

In order to address these factors effectively, BMT developed a staged methodology prior to the commencement of the works. Firstly, and before dredging operations could begin, it was necessary to undertake diver operations in order to clean up the site. This work focused on the removal of the large-sized debris present on the seabed in order to improve the efficiency of the dredging operations by reducing the number of obstructions present. Following this preparation of the site, the focus of the operations shifted to the removal of the layer of soft mobile sediment that had accumulated within the dredge areas.

A standard suction pipe was used in the early stages of this work but was quickly found to be an ineffective tool as it regularly became blocked as a result of the large amount of debris present at the site. Various operational modifications were trialled, such as the installation of raker bars but unfortunately this did not have the desired effect. As a result, a new rotating cutter head was developed – a much more radical solution to the problem of excessive blockages. The use of a rotating cutter

Diver inspecting a 6 inch shell located on the seabed during the pre-inspection of the site.

Modified cutter head. Note the 70 millimeter maximum aperture between raker bars.

Metal detector being utilised during seabed inspections.

Dredge material being discharged into the settlement ponds.

head had multiple advantages over the 'vacuum cleaner' design of the suction pipe. It provided the capacity to mechanically clear obstructions from the dredging apparatus using the combined effects of the rotational force of the cutter and the frictional force of the seabed. The direction of rotation, which was opposite to the normal direction of operation of comparable cutter heads, had the effect of sweeping debris away from the head rather than 'cutting' into the seabed and entraining the debris. The surface area of the gaps in the rotating cutter head was substantially larger than that of the suction pipe arrangement. This meant that even when objects did become blocked in the cutter head, it took much longer for the number of blockages to build up to the point that dredge productivity was detrimentally affected.

Expert operations

This suction dredging work was undertaken in parallel with diving operations. In particular, the divers were able to review the progress of (and provide assistance to) the dredging operations, providing validation of the effectiveness of this activity on a daily basis. Once the sediment removal work had been completed, a subsequent phase of diver clearance work was also undertaken that involved the comprehensive inspection of the site on a 200 percent coverage basis to locate and identify all metallic objects that remained within the search area. The diver team completed this inspection in pairs, including at least one qualified Explosive Ordnance Disposal (EOD) diver, using a handheld metal detector to locate any objects.

Positive results

As a result of extensive investigation of the two jetty areas where some 15,000 cubic meters of soft mobile sediments were dredged from the work area, only a relatively small number of EXO related items were recovered. This indicates that the likely level of contamination at the site was and is, very low. The robust methodology and implementation of a thorough risk assessment process involving relevant experts ensured that the project risks were minimised. Moving forward, the APA now has the confidence that the likelihood of encountering EXO at the site is as low as can be practically achieved, which will in turn, allow for the development of future projects.

ABOUT THE AUTHOR

Rhys Jones has extensive knowledge and expertise in the completion of a range of dredging and marine works in Western Australia. His experience includes the full scope of project implementation and management tasks including, concept development and design, geotechnical site investigation, contractor procurement including tender preparation and evaluation, contract preparation and implementation, and contract management of the works to completion.

ABOUT THE COMPANY

BMT JFA Consultants is a key player in providing port related engineering services. Founded in 1999, it has played a key role in a number of major port developments in Western Australia. The services offered include full project management from conception to completion on marine, port and coastal engineering projects either leading or working as an integral part of a team, managing all aspects from geotechnical investigation to design, construction and commissioning.

ENQUIRIES

Email: jfa@bmtjfa.com.au
BMT JFA Consultants, PO Box 1027,
Innaloo, 6918, Western Australia
Tel: (08) 9242 7522
Web: www.bmtjfaconsultants.com.au

Assessing the potential of a dry bulk terminal

Dick van Doorn and **Jose de Martino,** founders of the Dry Bulk Experts Group

Dry bulk terminals play a vital role in the chain of transportation linking producers with end users. Their efficiency is influenced by a range of internal and external factors, not least initial design.

Evaluation of a newly built or existing facility's performance by independent experts with hands-on terminal management experience frequently results in enhanced operational efficiency.

Production equation

Terminals play an essential role in the logistical chain. They determine the efficiency and thus the cost of the chain. They are the buffer, the safety valve. If a terminal is not performing well, it has exponential consequences. In most cases this is reflected by the demurrage generated at that specific terminal.

The productivity of bulk terminals is determined by the infrastructure, movable equipment available and the organization. If put into practise by well-trained operators following the right procedures, and backed by a management team able to find the right balance between internal and external factors, it can be successful. Planning is the main issue, and often the biggest challenge. The planning process comprises ships planning, storage and inland distribution. For bigger terminals these elements are organised in separate departments whereby communication among each other is of prime importance.

The better a terminal is able to control the interfaces between sea going vessels, trains, barges and connecting belts and the terminal operation itself, the better its design capacity will be met. Demurrage and throughputs below design level are the main indicators that a terminal is not performing well. Poor financial results and delayed maintenance will further deteriorate the performance leading to the risk of a downward spiral.

Vessel nominations

A crucial external factor is vessel nominations. And although each terminal likes a line of vessels waiting to be loaded or discharged, it will drastically increase the cost of the chain. Therefore nomination systems have been introduced that give some relief. Otherwise the terminal and ship agree a shift of vessels with different nomination dates.

The suitability of vessels remains an issue; a ship with sticky coal between the ribs, or vessels that cannot cope with the terminal's loading speed have quite an impact on the terminal operation and can generate extra cost and demurrage. Another issue is inland distribution, in particular where there are complications with the railways in obtaining timely information on train arrivals. Properly planned monthly schemes are required that are updated regularly and result in fixed weekly nominations. Trains that arrive outside the planning disrupt operations and cause exponential cost. Therefore communication with customers and the railway authorities is vital.

The storage plan is derived from incoming and outgoing cargoes. Given the terminal infrastructure these flows must be planned on the available machines. This is complex, because the pile for a waiting train is often along the same belt on which the stacker/reclaimer is discharging a vessel. Of further impact we can highlight maintenance schemes that hamper the operation. Such as delaying maintenance in order to give priority to loading a vessel, or when customers demand strict separation of grades from discharged vessels - even if the same grade is on stock already.

Design: theory and reality

Grass root terminals are designed by technical engineers, built by engineers and delivered by engineers. Technically the terminal will perform, and in theory the balance between the capacities of the machines will look fine. The proof of the pudding, however, is the real operation. Theory and practice can be completely different phenomena. The consequences might be a design capacity that cannot be reached, an anticipated turnaround time of vessels that cannot be met, or a storage area that proves to be insufficient - resulting in poor financial results. Much of this could have been prevented if those who operated such terminals had been involved in the design phase. This is important, not only with building new terminals, but also for existing facilities. Outside experience can help to install the right equipment or assist in improving productivity.

Generally speaking, terminals evolve very quickly during the first stages after their start up, however, after a certain period they tend to accept that their obtained performances and results are the best achievable, so they become the norm for the terminal's performance. Operation teams at the terminals are generally overburdened with work, and focused on the operation itself. They hardly have the time to analyse problems in a structured way, since they are immersed in the day to day business. This requires evaluation by an experienced independent third party who knows what can be expected from the terminal with regard to the flows handled by that terminal.

Independent evaluation

Such analyses, restricted to a more general investigation, comprises the terminal concept, installed equipment, actual performance and an assessment of the quality and working methods of the terminal personnel. The study can be executed in a short period of time and focus on: the design of the terminal; equipment capacity; the balance between the different components of the terminal; the planning and execution of operations; fine tuning of planning and the control of arrivals and departures of the vessels; training and formation of personnel; adequate maintenance planning, both preventive and regular.

After a general analysis of the terminal as a whole, the next step is to study each component of the terminal individually, determining whether it is fit for purpose.

To give an example; the intake capacity of a receiving terminal is not determined by the design rate of the unloaders but by approximately 47 percent of this. A 50 tonne unloader is said to have a lifting capacity of 2,200 tonnes product per hour (t/h). In ideal working conditions during 'free-digging' it would. But based on general practise this will be reduced to about 1,000 t/h, taking into account full discharge of the hold, including cleaning. Or where two unloaders of 2,500 t/h that discharge onto a jetty belt rated only at 2,500 t/h – hence all advantages of free digging completely disappear. Or where material of 1.8 density is excavated by a 2.4 density grab, thus losing 25 percent of the capacity.

Numerous other examples can be given of potential improvements that can be realised with relatively low investment in assets or with changing working methods.

Conclusion

The value of inviting experienced managers to evaluate the terminal's performance and look at specific issues is that it will generate recommendations based on their experience. Such evaluation need not take much time. Typically, a quick scan of the operation executed in close cooperation with the management during an on-going operation would take about one week at the site.

ABOUT THE AUTHORS

Dick van Doorn has extensive knowledge of logistics and management of international terminals. He has been CEO of EMO, dry bulk stevedore in Rotterdam from 2000 to 2010. Before 2000 director functions in tank terminals and inland shipping. From 2009 he advised on improvement plans for terminals in Spain, Chile, Australia, UK and India. Chairman of the Dry Bulk Terminals Group from 2001 to 2010. Several Supervisory- and Advisory Board memberships and active in a variety of port related associations.

Jose Angel De Martino has extensive knowledge of the operational functioning and design of Dry Bulk Terminals. Finished his career on Bulk Carriers as a Master. Managing the Gijón Bulk Terminals from 1973 to 2006 (as from 1991 CEO), co-ordinating all operations of loading, unloading, trans-shipment and logistics and development of new technological projects, like the "BAT PROJECT" (remote operational control of the unloaders) among others. Chairman of "Asturias Marine Surveyors" until 1991. Co-founder and member of the Executive Committee of the DBTG. Recently he developed several projects of "Productivity improvement plans" and "Redesign of Bulk Terminals". Lecturer at the Politecnica University of Madrid and the University of Oviedo.

ABOUT THE COMPANY

The Dry Bulk Experts Group, grown from the International Dry Bulk Terminals Group – with 250 member terminals - is capable to provide such knowledge. Its members have long standing experience from running coal and iron-ore terminals and focus on quick scan analyses.

ENQUIRIES

Dick van Doorn, Rotterdam, The Netherlands
Mobile: +31 6 53780983
Email: dick@vandoorn-consultancy.nl (CV on Linkedin)

Jose De Martino, Gijon, Spain
jademartino@telefonica.net
Mobile: +34 6 09819279
Dry Bulk Expert Group:
www.drybulkterminals.org/about/dry-bulk-experts-group

Transfer chute upgrades benefit efficiency and the environment

Martin Engineering, Neponset, Illinois, US

Kinder Morgan is the largest independent terminal operator in North America, with 180 locations. The Vancouver Wharves terminal in North Vancouver, BC delivers inbound and outbound services to shippers moving cargo to or from all regions of western Canada. The terminal handles mineral concentrates, liquids (diesel and jet fuel), sulphur and specialty agricultural products.

Kinder Morgan has operated the Vancouver Wharves terminal since 2007; the terminal is leased from BC Railways. Environmental stewardship as well as safety and quality are three of Kinder Morgan's core principles. At the terminal all the minerals concentrate storage and handling facilities are fully enclosed to ensure no mineral concentrate escapes into the environment or migrates into the ocean. Kinder Morgan collects and treats all the water used at the terminal prior to discharge into the Burrard Inlet; which includes rainwater run-off, from building roofs, yards as well as from the decks of vessels discharging mineral concentrates at berth number one.

Attention to detail

In compliance with Kinder Morgan's second core principal of being an 'environmentally compliant and responsible operator', Kinder Morgan's project manager, Al Price-Stephens, knew that rigorous attention to detail was needed on the Copper Mountain Project. The project would install a load out hopper and four belt conveyers capable of running 1,500 metric tonnes per hour of mineral concentrate to the existing ship loader at berth one. The transfer system needed five belt conveyor transfers which must comply to the 'zero spill' principle.

The terminal handles more than 600,000 metric tonnes of mineral concentrate per year across five different storage buildings. Environmental stewardship is a fundamental priority at Vancouver Wharves and the mineral concentrates area is fully enclosed to ensure the cleanest bulk handling possible.

As a result of Kinder Morgan's strict environmental standards, company officials knew that particular attention would be needed on the five conveyor transfers in order to prevent the escape of airborne dust. In addition, the seawall directly across from the port includes a prestigious community and park that required protection from dust and other effluent.

"When we spent some time reviewing the existing transfer points, it became apparent that there was new and better technology available," said Kinder Morgan's engineering & project development manager, Al Price-Stephens. "Rather than using a general engineering contractor to design the new conveyors and transfers, we wanted equipment that could elevate the performance and containment to a new level."

New technologies

During initial meetings, the Martin Engineering team introduced a variety of new technologies to improve efficiency and dust containment. "They helped us reach a good understanding of what's available, and we found additional details on the company's web site," Price-Stephens continued. "We also became very familiar with the Martin Engineering book, Foundations IV, which has become the bible of bulk materials handling."

To address the site's specific requirements and design appropriate containment, Martin Engineering conducted a site survey, which was followed by a conveyor risk assessment in 2010. The strategy that emerged gave Martin Engineering responsibility for the design and fabrication of the five transfers, as well as supervising the installation by an outside contractor.

Figure 1: The Kinder Morgan Vancouver Wharves terminal in North Vancouver, BC delivers inbound and outbound services to shippers moving cargo to or from all regions of western Canada.

"Load zones and discharge points are prime sources for the creation and release of airborne dust," explained Martin Engineering's global projects manager, Greg Bierie. "The amount of dust created in a transfer point depends on a number of factors, including the nature of the material and the height of the drop onto the belt, as well as the speed and angle of the loading and unloading belts."

The project was kicked off with material testing at Martin Engineering's Center for Innovation at the company's headquarters in Neponset, IL. "By testing the customer's specific bulk material and applying those properties as the initial step in chute design, we can develop a transfer that maximizes capacity, while minimizing the potential for build-up and fugitive material," Mr Bierie said.

Optimum design

The new transfer points make use of Martin's Transfer Chute Technology, the entire chute custom-engineered and modeled in 3D to provide the optimum design for the material and flow rate needed. Four of the new transfer points employ a 'hood and spoon' transfer, with the hood discharge chute at the top of the system and a spoon receiving chute to place material onto the belt being loaded. The engineered flow chutes employ special geometries that capture and concentrate the material stream as it travels through the chute. The fifth transfer point required a heavy duty impact area at the bottom of a hopper to handle cargo from two front loaders.

The Martin Engineering team presented the conceptual models during a meeting with Kinder Morgan, in which the topics of discussion included proposed system operation, mechanical requirements, belt cleaners, schedule, site-specific training and project documentation. Kinder Morgan personnel were so impressed that they approved the conceptual models almost immediately.

Weekly meetings were held from the beginning of the project

through final design, which allowed all participants to see and discuss the status of each transfer point as it was being designed. "Every chute design is tailored to suit the specific material characteristics and conveyor systems of the individual customer, rather than using stock products and attempting to make them work," observed Martin Engineering's projects manager, Tim Patrick O'Harran.

"The hood minimizes expansion of the material stream, directing it downward," Mr O'Harran explained. "The spoon provides a curved loading chute for a smooth line of descent, consistently feeding the material at a specific speed and direction to minimize impact in the loading zone."

Objectives

The goals of the Martin Transfer Chute are to confine the material stream and reduce air entrainment, while directing the moving material onto the receiving belt with minimal impact. Successful designs reduce spillage, abrasion, dust and premature wear. This control also helps ensure that material is center-loaded on the belt, avoiding mis-tracking and fugitive dust. Martin Transfer Chutes provide the dual benefits of minimizing aeration and preventing buildup within the chute, which is particularly important when dealing with combustible materials.

To fabricate the transfer chutes and custom load zone components, Martin Engineering was able to take the SolidWorksTM models and develop fabrication drawings directly from them, which accelerated the transition from design to fabrication. Delivery of the transfer chute components was completed incrementally over a period of several weeks from March through June 2011.

Fast track schedule

Initial plans for the material handling system called for ship loading to begin in quarter two of 2012, so Martin Engineering agreed to a fast-track schedule. As the project progressed, Kinder Morgan requested that the schedule be accelerated even further. Although this presented some challenges, the Martin Engineering team met all deadlines.

"Martin engineering works in a 3D model concept, which not all designers do," Mr Price-Stephens said. "It's much easier to look at a 3D model, and easier to resolve some of the potential issues before fabrication. Martin Engineering took on all the fabrication and got the components here to meet our schedule, which was constantly evolving. Then they were here throughout the installation, as well."

The six new conveyors range from 105 feet (32 meters) to 709 feet (216 meters) in length. Three are 42 inches wide (106.68 centimeters), and three are 48 inches (122 centimeters). Average speeds range from 177 feet per minute (0.9 meters per second) on the shortest run to 565 feet per minute (2.87 meters per second) on the longest conveyor. Liner materials were installed on all five transfer chutes to resist abrasion and extend service life. At initial startup, the system provided throughput of 900 metric tonnes per hour, and with some fine tuning, engineers have been able to raise that figure to 1,200 metric tonnes per hour.

Summary

Asked to summarize the experience overall, Mr Price-Stephens said, "We were pleased by the level of support that we received from Martin Engineering, without having to hound anyone. And we were impressed by the fact that when we did the initial startup in December of 2011, it was the guys who helped design the equipment who were there to oversee the startup.

"To some extent, I think bulk terminals like ours have learned to live with a certain amount of spillage and dust, believing that it's unavoidable," he added. "We've proven here that isn't the case.

"When you look at the components and see what's been designed for this facility, you realize the concepts and technology are pretty straightforward," Mr Price-Stephens continued. "It's really about simple things done well."

Figure 2: At the terminal all the minerals concentrate storage and handling facilities are fully enclosed to ensure no mineral concentrate escapes into the environment or migrates into the ocean.

Figure 3: Four of the new transfer points employ a 'hood and spoon' transfer, with the hood discharge chute at the top of the system and a spoon receiving chute to place material onto the belt being loaded.

Figure 4: Martin Engineering designed and installed six new conveyors at the Vancouver Wharves Kinder Morgan terminal, ranging from 105 feet (32 meters) to 709 feet (216 meters) in length.

ABOUT THE COMPANY

Founded in 1944, **Martin Engineering** is the world leader in making bulk materials handling cleaner, safer and more productive. The firm is headquartered in Neponset, IL, USA, offering manufacturing, sales and services from business units in Brazil, China, France, Germany, Indonesia, Mexico, South Africa, Turkey, India and the UK. Global representatives for Martin Engineering can be found at www.martin-eng.com/rep-finder.

ENQUIRIES

For product information, contact:
Martin Engineering USA, One Martin Drive, Neponset, IL 61345
Tel: (309) 594-2384
Toll-free US: (800) 544-2947
Fax: (309) 594-2432
Email: info@martin-eng.com
Web: www.martin-eng.com

Oil, Gas and Chemical Handling

"Effective berth scheduling allows terminals to maximize utilization of their berth space; therefore, berth scheduling is critical to the overall efficiency of the terminal and the associated supply chain."

'Right ship, right berth, right time', page 102.

Validating, de-risking and optimizing landmark LNG project

Steve Hemsley, solutions sales director, Lanner, UK

Canada is the world's third largest producer of natural gas, with approximately 97 percent produced from the Western Canadian Sedimentary Basin, which spans Alberta and British Columbia. Kitimat LNG, which draws on the basin's supplies, represents Canada's first LNG export terminal. Co-owned by Apache Corporation, EOG Resources and Encana Corporation, Kitimat LNG is located on Bish Cove, approximately 650 kilometers north of Vancouver.

The LNG facility is thought to have approximately 19 trillion cubic feet of combined marketable or technically recoverable natural gas resources. The facility will be responsible for natural gas liquefaction, LNG storage and marine ship loading facilities. The site has a planned initial capacity of approximately five million metric tonnes per annum, the equivalent of nearly 700 million cubic feet per day - and a potential capacity of 10 million metric tonnes per annum or more.

The location was originally conceived as an import terminal, however, technological advances in gas recovery and opportunities to supply to the Pacific Rim countries have led to new plans. Created to supply markets in the Asia Pacific region, Kitimat LNG represents the shortest shipping route to Pacific Basin LNG markets compared to other international energy markets. The average laden voyage to Asia is approximately 11 days.

This provides an opportunity for Asian utility companies to diversfiy their portfolio through exposure to one of the largest natural gas supplies in the world. To this end, the project also comprises construction of a 463 kilometer long, 914 milimeter diameter pipeline from Summit Lake, British Columbia to Kitimat and is scheduled to begin export in 2015.

Apache Kitimat LNG facts

- Natural gas will be transported via pipeline from northeastern British Columbia
- The facility will have an initial output capacity of 5 million metric tons per annum of liquefied natural gas
- Small facility footprint to minimize land use
- Lower greenhouse gas emissions through the use of hydroelectric power
- Targeting 2015 for first LNG shipment

Validating decisions, reducing risk

Managing a project of this magnitude, requires testing, evaluating and validating key decisions pertaining to all aspects of the facility. There also needs to be a justification of the feasibility of the project. The level of investment associated with LNG projects, combined with the fact the facility was unprecedented in Canada, meant that Apache required a simulation partner to ensure that investment was channelled appropriately, processes optimized, and risk minimized. Following market evaluation, Apache selected Lanner's WITNESS solution, which delivers a set of professional tools to model and simulate any business process.

shipping routes

Rendering of the proposed site of Kitimat LNG Facility

Model behaviour

At the outset of the project, Apache worked with Lanner's team of consultants to scope a model which would support them in validating their investment case; optimizing processes and procedures, and establishing the appropriate resourcing levels necessary to maximize operational performance and efficiency.

Once established, the WITNESS model simulated all variables affecting the operation of the facility. These included planned and unplanned downtime, the cause and effect of delays and congestion, and the impact of any proposed changes.

Furthermore, WITNESS allowed detailed testing of the system under conditions that reflected any potential increase in demand. Through understanding future performance and risk before implementing prospective modifications, planners were able to effectively 'de-risk' the project, validate decisions and verify investment at every stage of the project's lifecycle.

Specifically, WITNESS performed comprehensive analyses of the complex, interdependent processes involved in optimizing plant production, to assess the rate of the liquefaction process;


Apache environmental auditor – August 19 report

capacity of onsite tank storage; jetty and shipping berth availability; loading rates; voyage time; delays caused by weather variability; in transit boil-off and off load rates.

In turn, this detailed analysis identified a number of parameters and KPIs for the project to include:

- The maximum volume of LNG that can be exported utilizing various shipping schedules, tank and berth configurations
- The critical factors that limit volume and key indicators of this, such as loss of production and berth occupancy
- Scheduling and frequency of shipping required; the profit trade offs of volume against queuing times and cost
- The identification of optimal configurations of storage under various train scenarios
- Verification of the design and operational plans for the new terminal
- The impact of full tank(s) or stoppages in the pipeline flows, upon production

Speed and flexibility for the future

With the full list of questions in mind, Lanner conceived the initial model. Crucially, Lanner delivered a modular, configurable simulation tool designed specifically so that it could be re-used by Apache's planners in the future to support the evolving demands of the project. This enables the team to continue to analyze "what-if" scenarios and identify the very best answers to questions, highlight potential risks and secure buy-in from stakeholders.

The model created also provided data on optimising outputs from the proposed site design, establishing accurate resource thresholds and is a tool that can be continuously re-used to identify and validate change as the site develops.

This project has also highlighted certain factors critical to the success of simulation projects in LNG: knowledgeable consultants, a committed and forthcoming customer, the right level of simulation design, validation and verification in detail in partnership to ensure full understanding of how the model is constructed and what it shows, and a well-designed interface for experimentation.

ABOUT THE AUTHOR

Steve Hemsley is solutions sales director for Lanner. He has extensive experience in the application of simulation technology in demanding vertical markets ranging from defence and pharmaceuticals to oil and gas. Educated at the University of Wolverhampton in the UK, he has over 14 years experience in the simulation industry and now leads the development, marketing and sales of Lanner's Px-SIM product.

ABOUT THE COMPANY

Lanner provides businesses with superior technologies that enable value discovery, improve process understanding, support process change and result in superior decisions, both strategic and operational.

CONTACT INFO

Forward House, 17 High Street, Henley-in-Arden, Warwickshire, B95 5AA, UK
Tel : +44 (0)1564 333 300
Email: info@lanner.co.uk

Right ship, right berth, right time

Dr Humphrey S. Pasley, project delivery manager, and **Julia Race,** SEABERTH product manager at Cirrus Logistics Ltd. Basingstoke, UK

Berth space at terminals is a limited resource, and development of new berth space is expensive, time-consuming and may be limited by natural constraints. Effective berth scheduling allows terminals to maximize utilization of their berth space; therefore, berth scheduling is critical to the overall efficiency of the terminal and the associated supply chain.

What is operational berth scheduling?

Operational berth scheduling describes the process of producing a forward-looking plan for the vessel calls visiting a terminal. The term 'vessel call' covers the activities from point of arrival, passage through the port, berthing operations and outward passage to point of departure. The plan typically covers anything from three weeks, up to three or four months ahead, allocating vessel calls to berths for cargo operations.

The plan should meet business objectives such as: reducing waiting time, decreasing demurrage costs, ensuring vessels depart on time and meeting terminal throughput targets. The schedule must also obey terminal constraints, customer service priorities and vessel movement rules. Last but not least, the plan should be feasible in terms of port resources, cargo availability and tank ullage or yard capacity at the terminal. The number of berthing constraints often exceeds 100.

Mathematicians speak of the 'berth allocation problem' as an 'NP Hard' problem, because the computer time to find the absolute best solution is very long. To illustrate, if there are 10 vessel calls and two berths, each vessel call can use either berth, there is then over a million possible schedules.

Operational berth scheduling decisions arise at all types of terminals; oil, gas, bulk materials, and container terminals. This article will cover operational berth scheduling at oil and gas terminals.

Figure 1: Vessel call activities.

Oil and gas berthing trends

Oil and gas berthing is being influenced by the macroeconomic climate of western austerity, the so-called 'new economies' demand for energy resources, and also specific factors such as changes in refining practices.

The global economic slowdown has meant operations need to get more out of their existing assets throughout the supply chain – including berth infrastructure. There is a trend for oil refining to move away from Europe and closer to the source of production. The vessel traffic from the Middle East to Europe has changed, and terminals attached to European refineries are being converted into tank terminals. In addition, a rapid growth in Liquefied Natural Gas (LNG) movements, has meant that good berth and journey planning, including economic steaming is required. Growing gas spot cargo opportunities need agile and flexible planning.

Berthing challenges

Oil terminals deal with crude imports and refined products, via seagoing and coastal vessels. The shore-side infrastructure can be highly complex; the term 'spaghetti' has been used to describe some piping networks. The berthing schedule needs to consider pipeline transfers, rail heads, and/or truck loading points where these product movements share a common infrastructure. Often the product mix means vessel calls need to visit more than one berth. Inventory in the tank farm can be a constraint. As a result, scheduling vessel calls is a non-trivial task.

Gas production terminals load LNG onto cryogenic tanker vessels. The loading schedule is intrinsically linked with the delivery plan for transporting LNG to the receiving terminals, which have contractual delivery time windows. LNG inventory at the production terminal is a tight constraint, the berth schedule must ensure there are no tank-tops and production continues.

Oil and gas terminals share a common challenge. Their berthing schedules need to take into account operating constraints such as tides, service level and priority rules for stakeholders, availability of tugs, pilots and mooring launches and channel operating rules, as well as other safety rules that apply. The berth schedule is an important element in the wider supply chain. Coordination is improved through greater visibility of the plan, including the triumvirate of traders, production planners and jetty operators.

Tackling these challenges

Terminals must produce robust, effective schedules that consider all the relevant constraints. These schedules should be developed consistently, so that the same inputs lead to the same outputs without undue influence of the individual scheduler.

For a small terminal, with relatively constant traffic and little congestion, a purely manual method such as a whiteboard or spread sheets can give acceptable results. For larger or busier terminals, a decision support tool with scheduling algorithms can produce significantly better plans. Collaborative scheduling is relevant where several terminals share common port resources such as tugs, pilots and channels.

Optimization/scheduling algorithms need to facilitate manual intervention to handle unusual situations, so the planner

BUSINESS DIRECTORY

YOU'VE READ ABOUT THE PRODUCTS IN THE JOURNAL

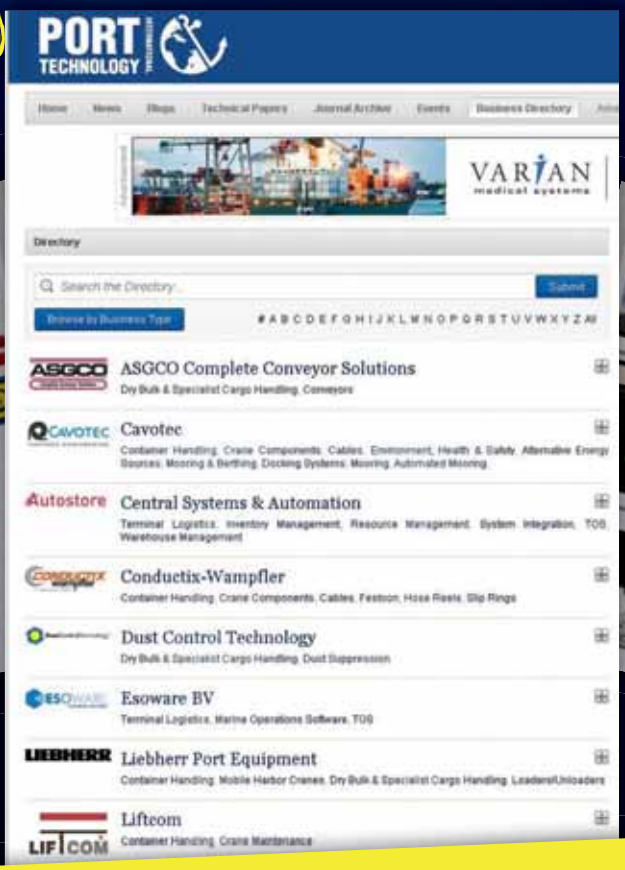
NOW SOURCE THEM IN OUR ONLINE EQUIPMENT & SERVICES DIRECTORY

Compare product profiles, technical specifications, company news and much more in the new PTI Directory.

With listings for equipment and services, the PTI Directory is a valuable resource for all specifying and purchasing needs

Download **technical papers** published by the company in the PTI journal

Watch **informational videos** of the products in action



WWW.PORTTECHNOLOGY.ORG/DIRECTORY

To add your listing to the Business Directory, contact Michael Stewart: mstewart@porttechnology.org

Figure 2: LNG vessel berthed in port.

stays in control. Full visibility of constraints and schedule Key Performance Indicators (KPIs) are also important to gain operator acceptance and consistency of use.

Ports are introducing multi-user berth scheduling decision support and optimization systems, integrated with Enterprise Resource Planning (ERP) solutions, vessel tracking systems and tank gauging to inject greater control and accuracy to the scheduling process. Such technology has led to vast improvements in the throughput and reduction of waiting times. An average of 10-12 percent reductions in demurrage has been experienced due to decision support tools.

Examples of berth scheduling innovation

Sabic Terminal Services Co (Sabtank), operators of a large Saudi Arabian tank terminal and product handling facility, has recently introduced a terminal management system; comprising automated berth scheduling and performance reporting. The system is used to schedule and plan operations at a total of 16 berths across four terminals. Sabtank has visibility of all berthing operations and KPIs across its businesses in one solution.

BP uses a scheduling system that incorporates algorithms to optimize berthing operations at its two sites in Rotterdam (Europoort and Pernis) encompassing 15 berths. Loading masters, planners and traders all access and update the system. Performance analysis identifies areas for improvement; these potential improvements are then tested using a strategic evaluation module.

Beyond operational scheduling

The visibility of actual historical performance information through the data captured by an operational scheduling system enables performance to be monitored over time, and opportunities for improvements to be identified.

The scheduling technology can be applied to tactical and strategic decisions, such as spot cargo opportunities, planning berth maintenance, capital investment in new berths, extending product lines or testing changes in traffic patterns. Such decisions are best made with the full scheduling technology used for operational decision making, so that future performance can be accurately modelled in the same terms that operational decisions are made.

Conclusions

Berth space is an expensive and limited resource. By employing effective berth scheduling, terminals can produce plans that make effective use of this resource, thereby saving money and improving efficiency. Operational berth scheduling can be a foundation for tactical and strategic decision making at ports and marine terminals.

Technology has a major role to play in the oil and gas industry, to manage product lifts in synchronization with the production plan, and ensure the uninterrupted flow of the supply chain. As the demand for energy increases, the operational activities of running terminals to capacity demands that whiteboards and spread sheets are relegated to history and berthing operators enjoy the same decision support as other transport and logistics sectors.

ABOUT THE AUTHOR

Dr Humphrey S. Pasley is project delivery manager at Cirrus Logistics Ltd. Dr Pasley has been instrumental in the development of the SEABERTH berth scheduling optimization software. He has led SEABERTH implementation projects in Europe and the Middle East.

Julia Race is SEABERTH product manager at Cirrus Logistics Ltd. Ms Race has over 20 years' experience applying optimization and scheduling methods to deliver business benefits. She is the main architect behind the SEABERTH berth scheduling software.

ABOUT THE COMPANY

Cirrus Logistics, a leading provider of supply chain software, delivers innovative solutions to empower better informed decisions and drive business profitability, through state-of-the-art scheduling, optimization and simulation techniques. Customers in the oil and gas, third party logistics and consumer sectors use solutions from Cirrus Logistics for operational and strategic decision making. Over the past 20 years, the company's involvement with maritime and oil and gas sectors has grown - which is now more than 50 percent of its business.

ENQUIRIES

Cirrus Logistics
9a Cedarwood, Chineham Business Park
Basingstoke RG24 8WD, UK
Tel: +44 (0) 1253 602937/602936
Fax: +44 (0) 1253 602949
Web: www.cirruslogistics.com

Impact of natural gas usage on port operations

W.S.Wayne, general manager and COO, Society of International Gas Tanker and Terminal Operators (SIGTTO) and **R.J.Roue,** principal technical adviser, SIGTTO

Figure 1: LNG as a marine fuel has many benefits to ports.

Introduction

The potential benefits of the use of Liquefied Natural Gas (LNG) as a marine fuel are widely recognized. In summary, the use of this fuel would allow the elimination of emissions of sulphur compounds (SOX), reduction of emissions of nitrogen compounds (NOX) and particulates, and the reduction of greenhouse gas emissions (CO2). From a port operational aspect, this is positive as it embraces the mitigation of local air quality issues and assists with the reduction of the carbon footprint of the port.

A normal component of the services which are provided to port users is the provision of fuels to the ships in port. Some particular challenges arise for ports when considering the use of LNG as marine fuel. Large ports have a complex infrastructure in place to supply conventional fuels to the port users. These fuels range from Heavy Fuel Oils (HFO) derived from refinery residuals (RMG/RMK), through blends of residual and distillates - diesel oils (DMB), to pure distillate often referred to as marine gasoil or 'DMA'. There may be additional low-sulphur grades. All in all, potentially quite a large number of grades, however all are common in one respect - the specified minimum flash point is 60°C. In most cases, delivery is in bulk ex-barge, the exceptions being on some oil tanker berths where fuels may be supplied over the jetty and, at the other extreme, small deliveries, say less than 25 tonnes, may be by road tanker. The significance of the flash point is that, under delivery conditions, even for heated HFO, the bulk liquid temperature is less than 60°C and hence the risk of ignition from a minor spill or mishap is very low. One cannot say that the fuels are 'non-flammable', but to ignite the fuel spillage under these conditions requires either a high energy source, such as may result from a collision with another ship, or the spillage coming into direct contact with an open flame.

About LNG

LNG is a mixture of liquefied gases, primarily methane. It is stored in bulk at near atmospheric pressure as a boiling liquid with a temperature of about -160°C. The flash point of LNG is less than -170°C. The significance of this is that any spillage of LNG will produce a vapour cloud, some part of which will be in the flammable range. The flammable range of LNG vapour in air is usually taken as five to 15 percent by volume. The ignition energy to ignite an LNG vapour cloud is much less than that for vaporized diesel fuel.

Should a vapour cloud ignite, the burning characteristics of LNG vapour, especially from spills onto water, produces little smoke, in contrast to burning pools of diesel fuels. This results in Surface Emissive Power (SEP – ie. radiation from the flame) being some four to five times higher than for diesel pool fires.

When LNG is spilled onto water it rapidly vaporizes, forming a visible white cloud. Initially, the cloud is heavier than air, but as the vaporized LNG is warmed by contact with the air, it becomes lighter than air and disperses naturally. The visible cloud is actually water vapour frozen out of the air by the extremely cold vapour. Based on many research spill trials to date, it is generally accepted that, for spills onto water, the portion of cloud within the flammable range does not extend beyond the visible cloud limits. The evaporation process may leave ice/hydrates on the water, but no permanent residue is left on the surface.

Explosive transition

Another phenomena may occur when LNG is spilled onto water, that of Rapid Phase Transition (RPT). This is a rapid boiling phenomenon and, by 'rapid', it may aid understanding to say 'explosive'. RPTs look and sound like an explosion, but there is no combustion process, just very rapid transition of phase from liquid to vapour. The physics of the process are very complicated and not fully understood, but opinion is that, despite being startling, there is not enough energy release to threaten the integrity of steel structures, ie. ships hulls.

LNG has another characteristic which needs careful consideration. If conventional shipbuilding mild steels are suddenly cooled to -160°C, as in an LNG spill on to the deck, the steel becomes very brittle and will spontaneously fracture. The vapour from LNG spills is not toxic to humans but is mildly narcotic. However LNG coming into contact with human skin will instantly cause severe frost burns/tissue damage.

Lessons from the LNG industry

The established LNG industry is based on large-scale bulk movements of LNG over long distances. This may be contrasted with the characterization of a fuel delivery infrastructure which is around many movements on a much smaller scale over short distances. The existing industry has an enviable safety record. So much so, that some commentators describe LNG as being 'safe', almost as if it was somehow intrinsically safe. The previous paragraphs should dispel that perception. The safety record has been achieved by diligent attention of all involved.

The main target is, simply, to prevent releases occurring. This is underpinned by three main factors: good design and construction quality; effective operating and maintenance practices, uniformly applied; efficient training practices. The industry safety record has been achieved in full cognizance of the intrinsic hazards of LNG, not somehow in spite of those hazards.

LNG fuel supply infrastructure

In conventional ports there is typically a zoning arrangement. One zone is where hazardous cargo operations, such as crude oil, oil products, chemicals and liquefied gases are conducted; the remainder, eg. containerships, ferry operations dry cargo etc. are regarded as 'safe' cargos. This is a bit simplistic since, even in 'safe' zones, hazardous cargo, eg. in containers or trucks, may be handled.

There are several model concepts for LNG fuel supply. One can, for instance envisage a dedicated berth for supply of LNG bunkers, within the 'hazardous cargo' zone, if you like a 'gas station'. Such a facility may be part of an existing large-scale LNG import terminal or a stand-alone plant. After the ship has completed normal port operations, it visits the LNG bunker supply berth prior to sailing. A second model is the concept of 'containerized LNG', ie. delivery of LNG fuel to ships in International Maritime Dangerous Goods (IMDG) type containers. In this concept, ISO tank containers are filled at an LNG plant and delivered to the ship fully charged, used containers being returned to the LNG plant for refilling.

A third model is to replicate the existing fuel supply infrastructure with LNG bunker barges visiting the vessels on their normal jetties. Whilst the former models can work, they are more likely to find favour in smaller ports with low intensity operations. The latter model is the one we consider most likely to be favored, particularly in large, busy ports, because the first model raises issues around extending overall port time, increase in port movements, scheduling and traffic management issues at the bunker berth etc. The container concept may work well for lower levels of demand but becomes impractical when large quantities are needed. However, using this third model does significantly alter the 'zoning' concept of a port – a hazardous product is now being handled throughout the port area on a routine basis.

Emergency responders

The emergency responders are typically trained to deal with the hazards in the zone they are assigned to, those working in areas with oil and products will be trained to deal with large scale spills and potentially very large fires, whilst those assigned to other areas will have their training tailored to the specific requirements, for instance this may be around managing large numbers of passengers in an incident. This is not to make any value judgement, but to recognize that the needs are different.

Whilst existing bunker spills do represent a hazard, the emergency responders' role tends to be more focussed on containment of the spill and cleaning up. Spills of LNG represent a different order of magnitude of hazard.

Additionally, emergency responders will need to be aware that many vessels may now have significant inventories of LNG on board whilst alongside throughout the port. Clearly, the training of the emergency responders will need to be adapted to reflect the new situation presented by LNG fuelling of ships.

Concluding remarks

The LNG industry has a strong safety culture which has delivered a 'safe' industry. Whilst not all aspects from the large-scale LNG industry practice translate directly to the small-scale LNG bunker operation, it should be the aim of all those who have a part in establishing the LNG bunker infrastructure to achieve equivalency in safety to that shown to work in the large-scale industry. This is essential if the benefits from the use of LNG as marine fuel in reducing harmful environmental emissions are to be realised.

ABOUT THE AUTHORS

W.S.Wayne is general manager and COO of the Society of International Gas Tanker and Terminal Operators (SIGTTO).

R.J.Roue, is principal technical adviser at SIGTTO.

ABOUT THE COMPANY

SIGTTO is a membership society whose mission is to promote safety by the sharing of knowledge and thus, the development of high standards and best practices throughout the international LNG and LPG shipping industry.

ENQUIRIES

Society of International Gas Tanker and Terminal Operators Ltd Incorporated in Bermuda
Registered Office: P.O. Box 1022,Clarendon House, 2 Church Street West, Hamilton HM DX
Bermuda Registered Number (England and Wales): FC 010561
Correspondence Address: 17 St Helen's Place, London, EC3A 6DG
Tel: +44 (0) 20 7628 1124
Fax:+44 (0) 20 7628 3163
E-mail: office@sigtto.org
Web: www.sigtto.org

EFR-Tracker floating roof monitoring system

John M. Lieb, P.E., chief engineer, Tank Industry Consultants, Inc. and Nick Tzonev, CEO Syscor Controls & Automation, Inc.

For more than 90 years, the floating roof has maintained its status as the preferred method for controlling product evaporation from petroleum Aboveground Storage Tanks (ASTs). Today, great numbers of External Floating Roof (EFR) ASTs and Internal Floating Roof (IFR) ASTs remain in operation at port terminals and other facilities throughout the world. Unfortunately, despite the remarkable track record of the safety of floating roof tanks, the risk of floating roof failures is steadily increasing as the global population of tanks ages. Petroleum storage tank accidents caused by overfill, sinking floating roof, or product spill, rank among the most devastating and costly industrial disasters. A March 2010 report from the International Association of Oil & Gas Producers (OGP) titled 'Risk Assessment Data Directory' quantifies the probabilities for various types of AST incidents to occur. The OGP report indicates that statistically each year, approximately:

- 1 in 350 ASTs will have product spilled outside the tank
- 1 in 650 ASTs will have product spilled on the floating roof
- 1 in 650 ASTs will be exposed to a rim seal fire
- 1 in 900 ASTs floating roofs will sink
- 1 in 8500 ASTs will develop a full-surface fire.

Counting the cost

Combining these probabilities, it can be expected that, annually, one in approximately 140 floating roof ASTs will suffer a significant accident that will cost the operator millions of dollars in repairs and product capacity losses. If not detected and addressed in a timely fashion, these incidents can develop into large fires engulfing adjacent ASTs and infrastructure, causing billions in damages. The haunting images of the Buncefield (see Figure 1), Puerto Rico, and Jaipur terminal fires are grim reminders that existing instrumentation and operational protocols are not immune to failure but they also beg the question: why did no one notice these incidents early enough and before they went out of control?

Experience shows that regardless of the root cause of an accident, floating roofs exhibit specific behavior patterns prior to failure. API research and many accident investigations have concluded that, through early recognition of such patterns, the majority of floating roof accidents can be prevented. As such, AST owners have been seeking sensor technologies that can detect signs of impending failure within sufficient time to allow prevention of disasters. To answer this need, Syscor Controls & Automation Inc. developed the EFR-Tracker external floating roof monitoring system in close cooperation with the petroleum industry. The EFR-Tracker is an effective and economical tool for accident prevention through continuous monitoring of key EFR AST parameters. The predictive nature of the solution will help reduce EFR accidents caused by: dangerous rain water accumulation and high wind loads; excessive snow and ice load; loss of buoyancy due to leaking pontoons or punctured deck; delayed roof collapse as a result of seismic events; overfilling; roof misalignment; sticking seals and sticking floating roof rolling ladders.

Safety

The EFR-Tracker sensor system evaluates the safety of an EFR through integration of proven sensor technologies that do not require maintenance or re-calibration. The system consists of wireless multi-sensors, repeaters, and a base station (see Figure 2). Wireless sensors are permanently installed on the deck and constantly monitor floating roof inclination, presence and depth of liquid on the deck, overfill conditions, vibrations, temperature, relative altitude and atmospheric pressure. The multi-sensors and repeaters are battery-operated devices in order to minimize installation cost by eliminating the need for power wiring in explosive environment. A powerful intrinsically-safe lithium-ion battery pack provides power to the system for over 10 years without the need for battery replacement.

Due to the large diameter of most floating roofs, the system simultaneously interprets data from multiple sensors across the EFR to ensure reliability, detection accuracy, and immunity to false alarms (see Figure 3). If a multi-sensor unit is damaged, the

Figure 1: Buncefield Explosion Source: 'The Buncefield Incident 11 December 2005 – The final report of the Major Incident Investigation Board, Volume 1.'

Figure 2: Components of the EFR-Tracker solution.

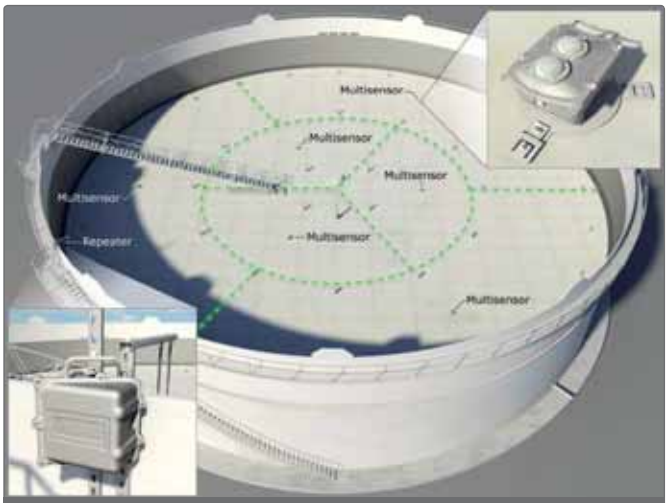


Figure 3: Deployment of EFR-Tracker sensors on EFR AST.

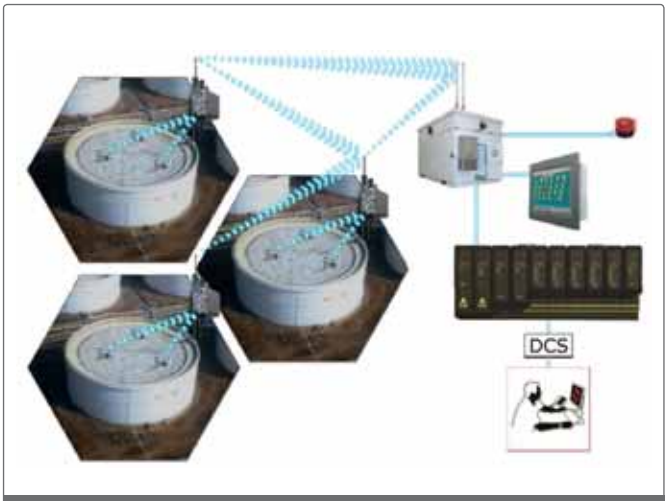


Figure 4: EFR-Tracker integration with the plant's DCS.

system intelligence will compensate for the fault and will ensure uninterrupted EFR protection through the redundancy provided by neighboring sensors.

Speed of delivery

Deployment is quick and there are no requirements for cold or hot metal work. The EFR-Tracker multi-sensors are attached magnetically to steel EFRs. The repeaters are fastened with a standard strut channel mounting system on any suitable structure close to the top rim of the tank. A variety of off-the-shelf accessories enable installation flexibility, whatever the AST specific construction details may be. The base station is installed in the instrumentation building and connected to the host Distributed Control System (DCS). Wireless network reliability is assured by a mesh topology where redundant network paths are available to ensure passage of information through the system. Finally, a high level of data security is guaranteed through the use of industry standard encryption algorithms.

The EFR-Tracker devices form a standards-based wireless cloud that allows over-the-air software updates and enables seamless installation expansion or the addition of other wireless equipment within the same network. As such, the facility owner will not be stuck in the past as technology evolves and new sensor types become available.

The EFR-Tracker can be integrated into the existing plant DCS through industry standard protocols or digital input and output (see Figure 4). The sensor information is relayed to an intelligent controller for analysis and keeping of long-term records. Alarms are generated and relayed to the plant's DCS when abnormal conditions are detected. Alternatively, the EFR-Tracker can be connected directly to an alarm control panel or third party alarm system for local and remote annunciation.

Accident prevention

The EFR-Tracker solution will dramatically improve the chances of predicting and preventing EFR AST accidents but ultimately it is up to the operator to take the correct actions when the system detects danger. Most floating roof conditions develop relatively slowly and the operator will have ample time to respond through scheduled or emergency maintenance. Good examples are sticking seals (months to develop), loss of buoyancy (weeks to develop), and delayed sinking due to earthquake damage (days to develop). Other conditions such as rain water accumulation (hours to develop) and overfill (minutes to develop) require sound emergency preparedness protocols and rapid response. Unfortunately, even if detected early, not all incidents are preventable. In such cases, a timely advanced warning of an inevitable floating roof failure will give the operator an opportunity to evacuate staff, deploy firefighting equipment, or foam the EFR. Such precautionary measures can make the

difference between a controllable incident and a large-scale industrial disaster.

The prevention of floating roof accidents has always been a high priority for the petroleum industry. Following a recent series of high-cost AST accidents around the world, the EFR-Tracker is a highly-anticipated solution that is viewed by many industry experts as a critical step for increasing the safety of the AST storage infrastructure. Looking into the future, Syscor is actively developing next-generation sensor additions that will expand the capabilities of the system. Detection of explosive hydrocarbons and detection of rim-seal fire are among the technologies that will soon be added to the EFR-Tracker. Due to the wireless nature of the system, these new sensors can be added seamlessly into an existing installation without the need for changing or upgrading any existing hardware.

Conclusion

The EFR-Tracker system is not intended to replace the human factor in the operation and management of EFR ASTs. Rather it is intended to provide around-the-clock, unbiased monitoring of many conditions that are known to lead to operational problems and, in the worst cases, failures of EFRs. The EFR-Tracker is an important tool for those charged with the responsibilities of safely operating and maintaining one or more EFR ASTs. It is an especially important tool for less experienced operations and maintenance personnel who have 'inherited' the responsibility for multiple ASTs that typically may have existed for many years. Today these personnel must rely on periodic inspections to assess the condition of their EFR ASTs. While these inspections can be valuable when properly performed and documented, they represent only a point-in-time 'snapshot' of the EFR condition. These inspections, no matter how diligently performed, are simply not sufficient to provide adequate warning of conditions such as overfilling, rainwater accumulation and other dynamic conditions that can develop. In the future, the EFR-Tracker will provide both real-time data and a continuous record for each and every AST in the owner's inventory. Based on this data, the operator can take the necessary actions to ensure the safety and reliability of the AST, as well as plan future maintenance, in the most cost-effective manner possible.

ABOUT THE AUTHOR

John Lieb is chief engineer for Tank Industry Consultants. He has specialized in the design and construction of above ground storage tanks and pressure vessels for more than 37 years and is an active member of an API subcommittee, a registered professional engineer and an API 653 certified tank inspector.

ABOUT THE COMPANY

Tank Industry Consultants (TIC) is a professional engineering firm offering a complete range of design, specification, and evaluation services to tank owners, prospective tank owners, consulting engineers, and contractors. TIC's technical staff consists of civil, mechanical, chemical, and structural engineers experienced in all areas of storage tank engineering.

ENQUIRIES

John M. Lieb, P.E.
Tank Industry Consultants
684 W. Boughton Road, Suite 101
Bolingbrook, Illinois 60440
Tel: 001-630-226-0745
Email: Lieb@tankindustry.com
Web: www.tankindustry.com

Responsible environmental management at the Port of Townsville

Tyco Thermal Controls, TraceTek Group, Reproduced by Aquilar Ltd, UK Master Distributor

High standards for environmental policy, management and monitoring led to TraceTek® engineers designing a complete and integrated leak detection solution to monitor the diesel transfer piping at the Port of Townsville, Queensland, Australia.

The Port of Townsville is unique by comparison to many of the world's ports in that it is located within the Great Barrier Reef World Heritage Area, adjacent to the Great Barrier Reef Marine Park. The port is situated in a growing city and in close proximity to a sensitive natural habitat including the seagrass beds, coral reef, mangrove forests and protected area of the dugong. Located in tropical north Queensland, the city is subject to an average rainfall of 955 millimeters in the wet season, from December to April, that also poses environmental challenges for containment of diesel leaks.

Port of Townsville Limited embraces a responsible and proactive approach to environmental protection by ensuring sustainable environmental management as a core component of its operation and port development.

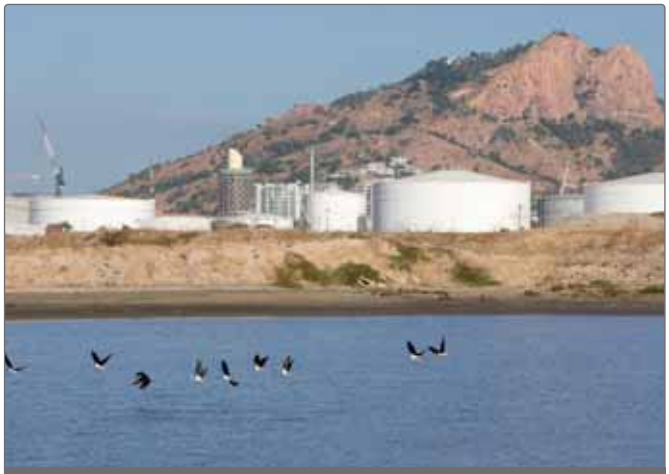


Figure 1: Port of Townsville.

The risk

At small oil ports around the world, tankers often unload their cargo of crude oil or refined fuels into small pipe systems that traverse or encroach on ecologically sensitive areas. Where operation is intermittent and pipeline lengths relatively short, traditional Supervisory Control And Data Acquisition (SCADA)-based leak detection systems which rely on predictable constant flow rates, are rendered ineffective. In fact even large leaks during off-loading may go completely undetected, compromising operators' environmental responsibility and devastating the local ecology.

Figure 2: Oil slick.

Leak detection challenges

The diesel transfer piping system at the Port of Townsville is a classic mix of different pipe installation modes. Portions of the one kilometer pipeline are above ground on trestle road crossings or low level pipe stands, buried underground, and under berth on the wharf.

The challenge for the TraceTek® leak detection team was to design a complete, integrated system solution that can effectively monitor the fuel piping regardless of the style of installation and transitions from above ground, to below ground, to wharf. A customized integrated system solution for all three modes of pipe installation had not been offered on the same project before in Australia. The diesel transfer piping system comprises approximately 556 meters of below ground pipe, 310 meters of above ground pipe and 275 meters of double contained pipe on the wharf.

The solution

For critical environmentally sensitive areas the key is quick detection and accurate location at the source of the leak. The TraceTek® sensor cable and monitoring system allows this, as it offers reliable and accurate fluid leak detection that directly pinpoints the source of the leak, to assist with the decisive action that is needed long before the spill can create damage.

The entire length of the TraceTek® TT5000 sensor cable,

Figure 3: Sensing cabling attached to pipe bottom.

with its conductive polymer technology, is sensitive to liquid hydrocarbons such as gasoline, jet fuel diesel and fuel oils. Once installed, with as many individual one kilometer circuits as necessary, the system can monitor the entire pipeline, detecting and pinpointing the location of a leak to +/- 1 meter.

Below ground piping

For the buried portion of the pipeline, a slotted PVC conduit is placed in the pipe trench on the same layer of sand that the single wall fuel pipeline rests upon. After the heavy pipeline work is completed the TT5000 sensor cable with an over braid of polyethylene rope is drawn into the conduit system while it is being assembled prior to burial.

Above ground piping

The TT5000 sensor cable with an external black polyester rope layer is strapped to the bottom side of the above ground single wall fuel pipeline. The densely braided polyester yarn exterior covering provides a very effective ultra violet shield protection for the sensor cable within. Installation provides allowances for supports, mechanical abrasion and thermal expansion of the fuel pipe.

Wharf under berth

The most common solution for long runs of double wall and containment pipeline under a large wharf, is to install the TT5000 sensor cable into and along the interstitial space between the inner and outer pipe. As the minimum clearance space was not available, due to specification, an alternative solution of low point detection was proposed. This could be facilitated by installing a fast fuel sensor probe at the low point as the pipeline on the wharf sloped back to the shoreline. Double wall pipe system is used as an effective means of leak containment for an over-the-water installation.

Monitoring

All of the sensor cables and fast fuel probes are monitored from a single alarm panel, with the installation providing an intrinsically safe monitoring circuit rated for the appropriate hazardous area classification. The alarm panel provides capacity for up to 127 circuits, far exceeding any plans for the future pipeline expansion. The TraceTek® system not only provides early detection but leads you to the leak, by providing a digital readout of the distance to the leak, so you can locate the source and solve the problem.

Never risk safety, the environment or your reputation

Liquid hydrocarbon leaks can jeopardize safety and damage the environment. Detect a spill, locate the source of the leak and take corrective action before the incident becomes a 'news story'. TraceTek® cable and monitoring systems make quick detection and accurate location at the source of the leak possible.

The TraceTek® leak detection and location system was developed in the mid-1980s by Raychem Corporation, which became part of Tyco Thermal Controls in 1999. Tens of thousands of TraceTek® systems have been installed over the years in a variety of leak detection applications ranging from water detection in commercial buildings to hazardous fluid monitoring to leak detection for fuel storage and transportations systems. The versatility of the TraceTek® technology lends itself to customized designs that detect and locate liquid leaks and spills before equipment or environmental damage is significant.

ABOUT THE COMPANY

Aquilar are a specialist distributor and manufacturer of leak detection equipment and solutions. Founded in 1999, they soon became the number one partner for the world leading Tyco TraceTek leak detection systems, providing the appropriate supply, design and support package to all its customers.

Aquilar has a highly trained and knowledgeable team, specialising in Tyco's TraceTek and Aquitron leak detection systems.

Priding themselves on the level of service provided to their clients. Offering step by step guidance in the design of the most effective solution for each project, backed up with full design drawings, schematics, technical submittals and quotations. Assisting through each step of the design, supply and commissioning of the leak detection system and providing whatever assistance required to complete the project to the highest standard.

Whilst Aquilar do not install leak detection directly, they do have a number of highly trained partner installers around the country that work alongside to ensure that all systems are completed and maintained to the clients specifications.

ENQUIRIES

Aquilar Ltd. (Julian Waumsley) Weights & Measures House, 20 Barttelot Road, Horsham, West Sussex. RH12 1DQ. UK.
Tel: +44 (0) 1403 216 100
Fax: +44 (0) 8707 940 320
Email: info@aquilar.co.uk
Web: www.tycothermal.com and www.aquilar.co.uk

Mooring and Berthing

"Mooring activities are a concern because of the number of accidents, the diminishing nautical skills on board ships and terminals, and the apparent lack of knowledge of all the components that affect safe mooring."

'Safe mooring starts at sea', page 117.

Engineered maintenance of port wharf structures

Scott Bacon, Newcastle Port Corporation with **Warren Green**, Vinsi Partners Consulting Engineers, Sydney and **Brad Dockrill**, Vinsi Partners Consulting Engineers, Newcastle, Australia

Introduction

Exporting over 103 million tonnes per annum, the Port of Newcastle, New South Wales, Australia is one of the world's largest single coal export ports. In addition to coal, the port handles over 40 different non-coal commodities. Forecasts indicate that Newcastle Port Corporation (NPC) can expect to exceed 180 million tonnes per annum by 2015 in coal trade alone.

Newcastle Port Corporation operates 365 days a year, 24 hours a day. It has 18 operational berths, seven dedicated to the handling of coal and 11 allocated to the handling of non-coal trade. NPC also owns, operates and maintains 195 navigation aids, 16 kilometers of roads, 4.5 kilometers of rail, 51 buildings, two breakwaters and over 7 kilometers of seawalls. Heritage structures near the entrance to the port also fall within the NPC asset register.

The port's assets are located in an aggressive marine environment so the corporation is acutely aware of corrosion-induced deterioration and the need for corrosion management and maintenance approaches to sustaining the service lives of structural and building assets.

Port of Newcastle wharf and berth structures

The wharf and berth structures of the Port of Newcastle are of reinforced concrete construction (decks, substructure beams and rear walls) supported on reinforced concrete or steel piles.

The berth, wharf and jetty structures that NPC are directly responsible for are summarized below (see Table 1). Other berth and wharf structures within the port are leased and are the responsibility of the tenants. The age of the NPC wharf and berth structures varies from 32 to 63 years, some are therefore at or beyond their designed lives. However, decades of future service lives are required of the structures so pro-active, engineered, maintenance and corrosion management is necessary.

Condition assessment of structures

Condition surveys have been necessary for all structures so as to determine the mechanisms and extent of deterioration and enable prognoses of future deterioration. Structural assessments and structural capacity checks have also typically been undertaken. Scenario analyses of remedial, maintenance and corrosion management options have been utilized. Informed decisions have therefore been possible by NPC.

Various consulting engineers have worked with the corporation to undertake the condition surveys, structural assessments and remedial options analysis. The independence of these consulting engineers has been paramount as conflicts of interest associated with the supply of materials, equipment or laboratory testing services would compromise recommendations.

Figure 1: Aerial view of the Port of Newcastle, New South Wales, Australia.

Figure 2: West basin, East basin, the Channel berth and Dyke berths within the Port of Newcastle.

Figure 3: Kooragang K2 and K3 berths.

TABLE 1: NEWCASTLE PORT BERTH AND WHARF STRUCTURES SUMMARY.

Wharf or berth structure	Elements description	Year constructed
Fitzroy Street wharf	Reinforced concrete pile caps, headstocks and deck Reinforced concrete piles	1949 (south end) 1956 (north end)
West basin no. 3 (see Figure 2)	Reinforced concrete crane beam, longitudinal beams and deck Reinforced concrete piles	1967
West basin no. 4 (see Figure 2)	Reinforced concrete crane beam, longitudinal beams and deck Reinforced concrete piles	1967
East basin no. 1 (see Figure 2)	Reinforced concrete longitudinal beams and deck Reinforced concrete piles	1964
East basin no. 2 (see Figure 2)	Reinforced concrete longitudinal beams and deck Reinforced concrete piles	1964
Channel berth (see Figure 2)	Reinforced concrete beams and deck HP2 steel piles	1978
Dyke 1 berth (see Figure 2)	Reinforced concrete dolphins. Reinforced concrete headstocks, prestressed planks and reinforced concrete slab for Road Bridges. HP2 and H section steel piles	1971
Dyke 2 berth (see Figure 2)	Reinforced concrete dolphins. Reinforced concrete headstocks, prestressed planks and reinforced concrete slab for road bridges. HP2 and H section steel piles	1971
Mayfield 4 berth	Steel beams, reinforced concrete beams and deck HP2, H section tubular and sheet steel piles	
Kooragang no 2 berth	Reinforced concrete longitudinal beams, end beams and deck Reinforced concrete piles and tubular steel fender piles	1965
Kooragang no. 3 berth	Reinforced concrete longitudinal beams, end beams and deck Tubular steel piles	1980

Maintenance and corrosion management approaches

The maintenance and corrosion management approaches being adopted by NPC for substructure elements of wharf and berth structures have been engineered and tailored to meet required future structure service lives, budgetary constraints, release of maintenance funding and lowest life cycle costs.

The maintenance and corrosion management approaches being adopted include:

doing nothing in some cases; penetrant treatment (and re-application) of select concrete elements to prevent reinforcement corrosion initiation; conventional concrete repair; impressed current Cathodic Protection (CP) of select concrete elements and petrolatum tape wrapping to mean low water level (MLW) of steel tubular or steel H-section (UC or UBP) piles. Also, CP (galvanic or impressed current) for in-water steel pile sections or various combinations of these methods.

These approaches have only been applied to those wharf and berth substructure elements that need them. For example, there is not a need to cathodically protect the whole reinforced concrete substructure sections of any berths, only those elements that need CP. Combinations of remedial options are routinely utilized.

Concrete CP systems overview

Impressed current anode systems include catalysed titanium ribbon mesh, mixed metal oxide coated ribbon and discrete anodes (proprietary and tailor-made). Transformer rectifier units (TR units) vary in number and type. Remote monitoring and control systems (RMCS) were installed to some TR units. The RMCS units had

Figure 4: Ribbon mesh anode installation into slots.

Figure 5: Ribbon mesh anode suspension from reinforcement at spalled areas.

Figure 6: Shotcrete reinstatement over ribbon mesh anode.

Figure 7: ALWC of tubular pile.

Figure 8: ALWC corrosion of sheet pile.

operational reliability issues from commissioning and no remote monitoring and control of the CP system has been performed (and the RMCS units have subsequently been discarded). Monitoring has been easily and cost effectively undertaken by manual means throughout the life of the CP systems.

For substructure beam or deck soffit elements, ribbon mesh and ribbon anodes grouted (cementitious) into slots (see Figure 4) or chases cut into the concrete surface have been utilized. At badly spalled areas the ribbon mesh anodes were suspended from the reinforcement using plastic fixings prior to application of shotcrete (see Figures 5 and 6). The grouts and shotcretes used were proprietary cementitious and CP compatible with known electrical resistivity characteristics and increased alkalinity (buffering capacity) to resist acidification (since the electrochemical reactions at the anode to grout interface are oxidising, producing acidity).

The above water sections of concrete pile substructure elements have discrete anodes installed. The discrete anode systems are proprietary conductive ceramic-titanium based or tailor-made catalysed titanium, installed into drill holes, which are then in turn grouted with proprietary cementitious grouts. As for the ribbon mesh and ribbon anodes, the proprietary cementitious grouts used were CP compatible.

Steel pile protection methods

Most of the NPC wharf, berth and jetty structures are steel piled including carbon steel tubular, H-section and sheet. In the past, the rate of corrosion of carbon steel piles in Newcastle harbour has been so low that corrosion protection methods have not always been necessary. Some four to five years ago NPC maintenance staff observed bright orange localized corrosion of some steel piles at around low water level, within the lower half of the tidal zone and within the in water sections. The bright orange localized corrosion at or near low tide is of the characteristic appearance of Accelerated Low Water Corrosion (ALWC) (see Figures 7 and 8). The bright orange localizsed corrosion evident to the below water pile sections has been assumed to be Microbiologically Influenced Corrosion (MIC).

NPC has an asset management plan for its various structures and buildings. When ALWC and MIC was identified to the steel piles of the wharf structures, a specific ALWC/MIC management and remediation strategy within the plan was considered necessary. A literature search was the first step so that an appreciation could be gained for how others have dealt with ALWC and MIC. Readily available literature and major databases were searched.

The literature search identified that the corrosion protection and maintenance strategies that are applicable to marine ALWC and MIC are those based on well established conventional methods, primarily cathodic protection (galvanic or impressed current), wrappings/tapes, coatings of various types and concrete encasement/jacketing.

Currently only steel tubular or steel H-section piles of wharf and berth structures in Newcastle Port are scheduled for protection. Sheet piles are to be repaired and protected at a later date. The protection methods considered appropriate from the literature search for Newcastle Port steel tubular and steel H-section piles were petrolatum tape wrapping to Mean Low Water level (MLW) and cathodic protection (galvanic or impressed current) for in water sections. Significant perforation of the tubular steel piles supporting dolphins of the channel berth occurred due to ALWC and MIC to the extent that the berth had to be closed. Structural repairs to the piles needed to be engineered to enable the berth to be re-opened and used.

Other maintenance and corrosion management approaches

Penetrant treatment of select concrete substructure elements and substructure sections has been by silane. Re-application of silane is scheduled at 10 year intervals. Concrete repair of select concrete substructure elements has been by conventional means. This involves the breakout of concrete to behind reinforcement and until uncorroded, concrete surface preparation, reinforcement coating system application and reinstatement with proprietary cementitious repair mortars (polymer modified and shrinkage compensated). Silane treatment of repair areas is then undertaken. Sprayed zinc operating as a galvanic (sacrificial) CP system has also been applied to soffit reinforced concrete elements of a number of dolphins of the dyke berths. Year 1 performance results are most encouraging.

Conclusion

Not surprisingly, corrosion induced deterioration occurs to structural and building assets within the aggressive marine environment of the Port of Newcastle. It is necessary to assess the condition of assets from which an asset maintenance plan can be developed. All maintenance and corrosion management approaches need to be considered and scenario analyses of the same are most useful.

Combinations of maintenance and corrosion management approaches have been adopted by NPC for its wharf and berth structures including doing nothing in some cases. The age of NPC wharf and berth structures varies from 32 to 63 years. Some are therefore at or beyond their designed lives. However, decades of future service lives are required of the structures. Maintenance and corrosion management approaches can be engineered to achieve required future service lives and to meet budgetary constraints, maintenance funding timings and at lowest life cycle costs.

ABOUT THE AUTHORS

Scott Bacon is the asset maintenance manager at the Newcastle Port Corporation (NPC). His responsibilities include the asset and maintenance management, project development and management associated with the corporation's berths, navigation aids, buildings, roads, rail, breakwaters and heritage structures.

Warren Green is a partner and corrosion engineer at Vinsi Partners Consulting Engineers, based in Sydney. He holds an MSc in Corrosion Science and Engineering from the University of Manchester Institute of Science and Technology (UMIST) and has over 25 years of experience in corrosion engineering and materials technology.

Brad Dockrill has over 25 years' experience as a professional engineer after gaining a Bachelor of Engineering, Civil Engineering (Hons) from the University of Newcastle. He is a partner and structural engineer at Vinsi Partners Consulting Engineers, based in Newcastle.

ABOUT THE ORGANIZATION

Vinsi Partners Pty Ltd are an independent consulting engineering firm delivering services in engineering (structural/civil), corrosion and asset control and durability assurance. Where we differentiate from other engineering consulting firms is our expertise and detailed technical knowledge in the related fields of corrosion and durability assurance.

ENQUIRIES

Warren Green
Tel: +61 2 9878 2292 or +61 400 288 809
Email: wgreen@vinsi.com.au

Safe mooring starts at sea

Captain Ben van Scherpenzeel, European Harbour Masters' Committee

Improving the mooring process

The safe mooring of a ship is of utmost importance. The mooring process however appears to be the forgotten link in the nautical chain. This became evident when the European harbour masters decided to make a video about strengthening the whole nautical chain through a greater awareness of all its links. Captain Ben van Scherpenzeel, of the European Harbour Masters' Committee (EHMC) explains: "A captain who has all information while still at sea, can well prepare the mooring of his ship when in port. Too often this information is missing, and one will end up with a mooring process that is less safe and less efficient then we would all like to see."

Mooring activities are a concern because of the number of accidents, the diminishing nautical skills on board ships and terminals, and the apparent lack of knowledge of all the components that affect safe mooring. The workshop 'extreme weather conditions/safe mooring policy' held at the International Harbour Masters' Association (IHMA) congress in April 2010, showed a large amount of uncertainty in day-to-day working practices in the mooring process and acknowledged the fact that safety in mooring is negatively influenced by a lack of knowledge from the whole mooring chain.

Though there are a number of publications on safe mooring (eg. by the Oil Companies International Marine Forum (OCIMF) and the Nautical Institute), there is a definitive lack of education about mooring in the port and shipping community. And there was no training video available that addresses all aspects of mooring, produced with the input of all parties concerned.

Developing information videos

The first EHMC video 'The chain' is a joint production by all those who are key to the business of bringing ships into port - the nautical chain; harbour masters, agents, pilots, tugboat captains, linemen, ship masters, hydrographic offices and terminal operators.

It was clear that the video was a perfect means of getting a message across therefore, a second video was produced. 'The missing link' shows the entire mooring process, from the production of a mooring line, up to the vessel coming alongside; from the basic rules for a mooring plan, to safe working loads and maximum holding capacities. With good preparations, starting while still at sea, mooring can become much safer and more efficient.

During the making of the film many experts discussed the topics raised and producing one common view was quite challenging. Many best practices are not yet common practice and there is no single set of internationally accepted guidelines for the entire shipping industry for the relation between the mooring components; mooring winch on vessel – mooring line on vessel – bollard/quick release hook on shore.

Common sense dictates that the bollard or quick release hook ashore should always be the strongest part. Another common sense finding is that lines should never break: snapping mooring lines cause many serious personal injuries and fatalities, and may

Figure 1: The bollard ashore is the strongest part of the chain.

Figure 2: Snapping lines can cause fatalities.

Figure 3: Lines must be maintained and handled correctly.

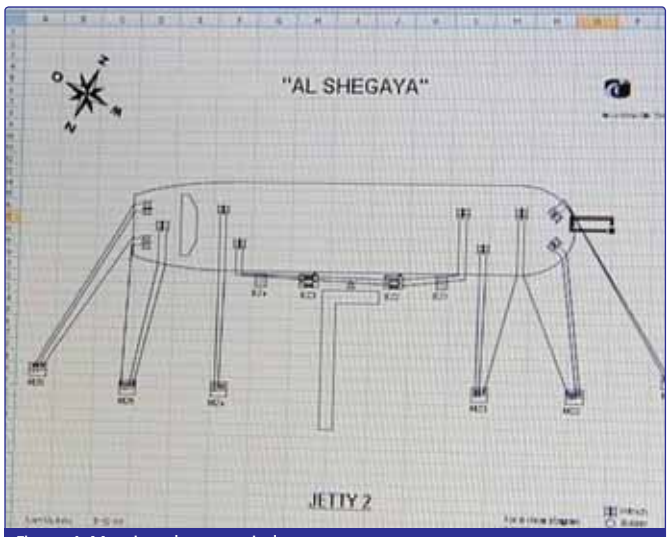


Figure 4: Mooring plans are vital.

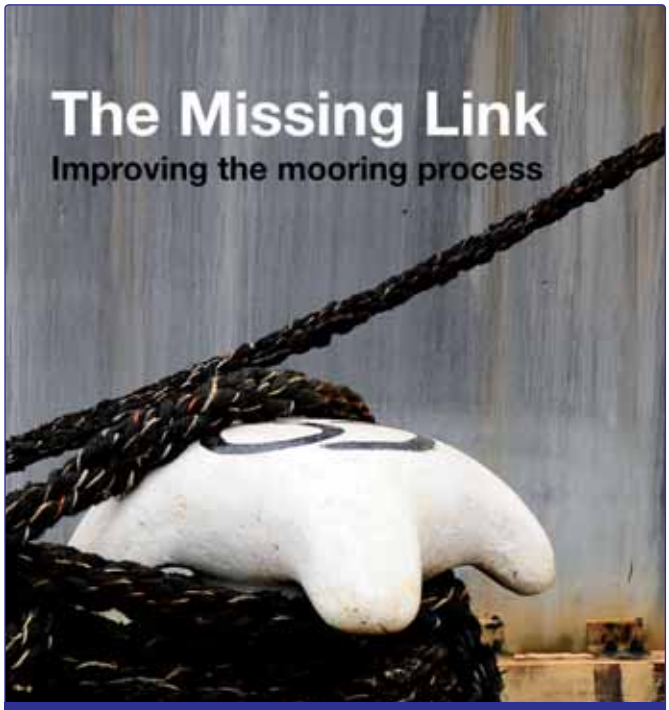


Figure 5: 'The Missing Link' video communicates best practise.

cause serious damage to infrastructure, or pollution. To stop mooring lines from breaking, lines should always be paid out from winches, and the break of the winch should render before the mooring line breaks. This may sound very logical and simple, however, this is not a design rule yet.

Also, clear guidelines for maintenance or replacing mooring lines and the settings of breaks or mooring winches are not implemented across the industry yet. The communication of mooring plans, providing safe working loads and positions of bollards or quick release hook is not a common practice at all terminals.

Findings of the working group

Some of the findings that the working group brought forward were; clear guidelines for paying out mooring lines: vertical angles should be less than 30 degrees, resulting in a horizontal distance being twice the vertical distance as a rule of thumb. Mooring lines that have the same function should have the same characteristics. Mooring lines are quite different from one another. If they have the same minimum breaking load, that doesn't mean they work together, as they might have a totally different elasticity. Also, inspection of lines is different per type of line. Per type of line the consequences of snapping lines are totally different. All lines in the same service should have the same tension.

It was also identified that the bollard or quick release hook should always be the strongest component. If not, it may result in a bollard being rocketed to the vessel. It takes little imagination to think that such an incident can result in a fatality. The break of the mooring winch should render before 60 percent of the minimum breaking load of the mooring line is reached. The break should always be the weakest link of all components. Sending mooring plans to the vessel, pilot and linemen prior to arrival is being regarded as a good practice: safe mooring starts at sea. Line handling is a matter of constant awareness. Stepping into a bight is the most common mistake. Line handling is also a matter of communication. Not only by radio; it is also a matter of having eye contact and hand signals. Correct line handling during docking can save a lot of time. If a line gets stuck under fenders when a ship comes alongside, it might force the crew to retrieve the line, and pay it out again. For a large tanker this takes about 20 minutes.

The objectives of 'the missing link'

It is by communicating and explaining these key guidelines that 'The missing link' intends to improve the awareness of how important safe and efficient mooring operations are and to show the relation between all the mooring components. It does so by considering the whole mooring process, and by showing how to avoid accidents and damage to terminal equipment and vessels while at the same time saving time, money and cut down on emissions. A safer and more efficient mooring process is important to crews, linesmen, pilots, ship owners, ship masters, ports, harbour masters and terminal operators.

The videos 'The chain and 'The missing link' are both initiatives of Ben van Scherpenzeel for the European Harbour Masters' Committee (EHMC), a regional committee of the International Harbour Masters' Association (IHMA).

ABOUT THE AUTHOR

Captain Ben van Scherpenzeel, director nautical developments, Policy and Plans, Harbour Master's Division Port of Rotterdam, has spent 15 years at sea; three years on tankers and reefer vessels as a deck officer and 12 years on cruise vessels as a deck officer, staff captain, and project manager of new build programs. He joined the Port of Rotterdam in 2004. His responsibilities are projects related to shipping. He is also Project Officer for the International Harbour Masters' Association and European Harbour Masters' Committee.

ABOUT THE COMPANY

The **EHMC** is the regional European branch within the International Harbour Masters' Association, IHMA, a professional body that unites Harbour Masters and Port Captains around the world. The principle aim and objective is the promotion of safe, secure, efficient and environmentally sustainable operations within ports.

The EHMC looks after the specific interests of members in Europe, offers additional advantages related to that region and is currently chaired by Captain Andreas Mai of the Ports of Bremen and Bremerhaven.

ENQUIRIES

Ben van Scherpenzeel
Email: scherpenzeel.ehmc@harbourmaster.org
European Harbour Masters' Committee
contact Ingrid Römers
Email: romers.ehmc@harbourmaster.org
Website IHMA: www.harbourmaster.org
Website EHMC: www.europeanharbourmasters.org

Tackling the rotor tug challenge

Jesper Nielsen, Sales Manager for the Maritime Division of FORCE Technology

Across the world, there is an increased demand for advanced simulator-based tools that can assist tug operators and ports in determining the best type, size, number of tugs and the strategies to be used for a given tug operation.

Simulations, including type-specific tug simulations, are a strategic focus area for FORCE Technology. It has been cooperating with a large number of tug operators and ports on training and port studies for the past 10 years. Considerable amounts of development funds have been used specifically to develop tug-related simulation systems based on towing tank tests and advanced mathematical models.

The studies in which we have seen a requirement for involving advanced tug simulation include: escort operations for large tankers when approaching terminals; towing out of large newly built ships from yards; assistance to Liquefied Natural Gas (LNG) carriers to and from terminals positioned offshore; and tug assistance in new or modified ports that will accommodate larger vessels in the future such as large LNG carriers, container vessels, cruise ships or tankers.

At FORCE Technology, we operate nine simulators, four of which are full mission systems and three are dedicated tug simulators. All simulators can be coupled, and all can easily be transformed and used as either tugs or other types of vessels.

Pictured is a new compact tug simulator where 27 52inch monitors with full HD resolution in a 360 degree array have been used to provide a very large field of view (see Figure 1). The simulator can be used to simulate a specific Azimuth Stern Drive (ASD), Voith Schneider propeller (VSP) or rotor tug and includes a vast selection of handles, winch and engine controls and instruments including overhead panels.

FORCE Technology has 50 years of experience in conducting comprehensive maneuvring and simulation studies. FORCE Technology conducts about 30 engineering studies every year in our simulator centre in Copenhagen, Denmark. The studies are conducted in order to ensure safe and efficient navigation of different types of vessels in existing or planned port facilities.

The simulation studies have different objectives which could include operations such as the placement of navigational aids; evaluation of breakwater layout and alignment, including width and alignment of approach channels; evaluation of arrival/departure conditions for existing or new port facilities. They can also include: ship motions in both frequency and time domains giving accurate assessment of risks; mooring studies; controllability of vessels at limited water depth; operational guidelines, as well as determination of tug type, size and number best suited for a specific operation.

Simulation studies involving rotor tugs

For the past years, we have performed an increasing number of simulator-based studies involving rotor tugs. The rotor tug

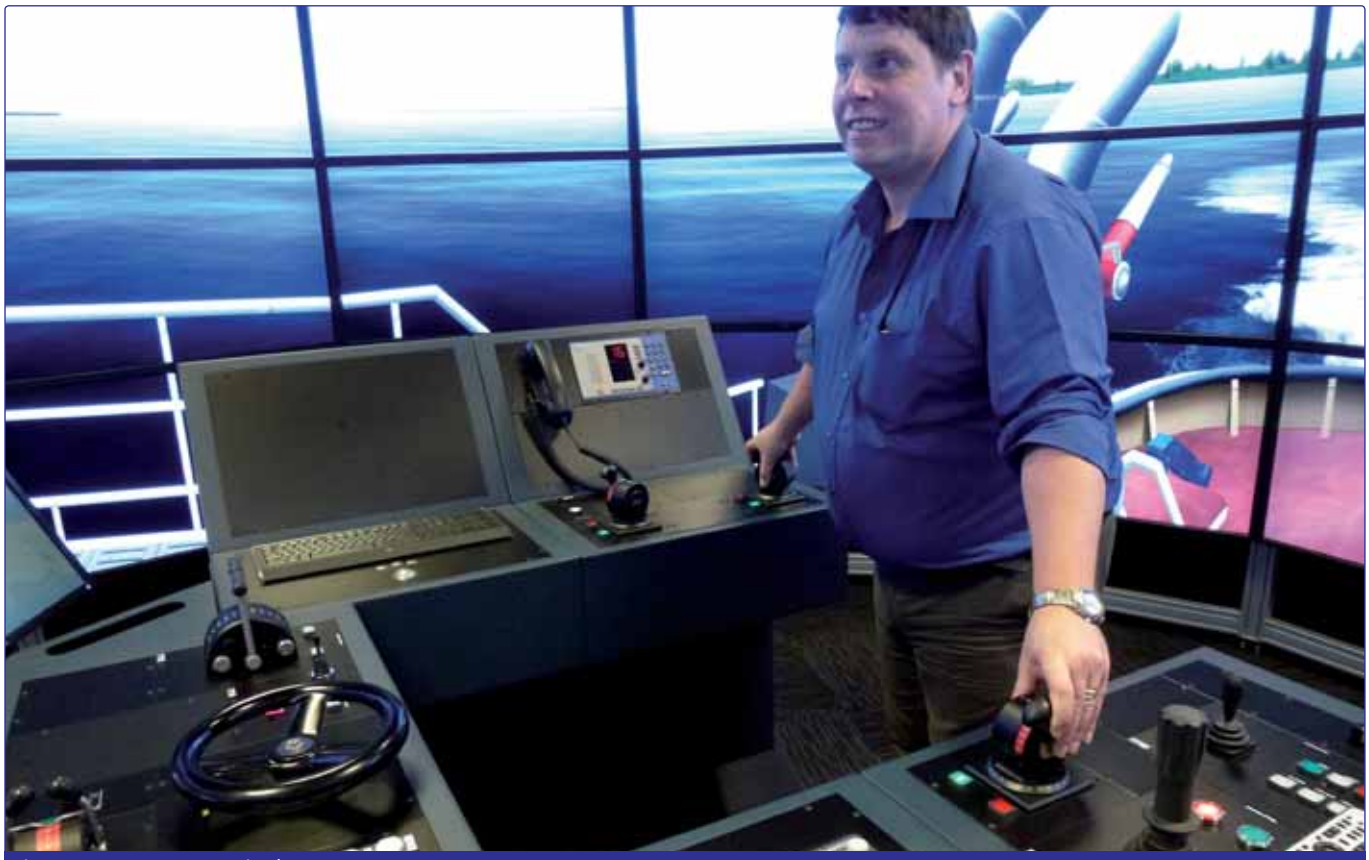


Figure 1: New compact tug simulator.

LNG vessel under tug assistance.

concept was developed by the Dutch company Kooren in the late 1990s and first used to handle the large-windage-area car carriers in the Bremerhaven locks. The rotor tug can be described as a 'conventional' tractor tug with two azimuth thrusters fore and the aft skeg replaced by a third azimuth thruster unit. This configuration of propulsion and steering units gives the high-powered rotor tug extreme maneuvrability and the ability to work efficiently in narrow spaces. For training and port studies, it is important that the mathematical models used are very precise and accurate. Based on data from physical tank tests, naval architects and engineers have produced different sizes of rotor tugs.

The mathematical models produced at FORCE Technology include complex features such as ship to ship interaction between the assisted ship and the tugs; tug performance in waves; fender interaction in three dimensions; modelling of the towing line; description of ship mass, inertia, time constants; deep/shallow-water hydrodynamics; aerodynamic forces (derived from our database of wind tunnel tests) and wave-induced motions.

The simulation studies performed involving rotor tugs have primarily been for the operation of very large bulkers and LNG carriers where the tugs have been instrumental to their safe approach and departure.

In order to compare the performance of rotor tugs to conventional tugs, the average use of tug power during arrival and departure for each run has been calculated in approximate figures in percentage of maximum power benchmarked against a similar operation using conventional tugs.

During the studies, the rotor tug type has shown its potential for specific vessel operations. One of the challenges has been that pilots have not been familiar with the capabilities of the rotor tug and therefore had to work closely together with experienced rotor tug captains in order to apply the correct tug strategies.

Advantages and disadvantages of rotor tugs

Based on the simulations, FORCE Technology has been able to draw some key conclusions regarding the use of rotor tugs for this specific form of operation. The main advantages of these tugs are their power and maneuvrability with short response times. In the hands of an experienced and well trained tug master, this type of tug is a very powerful tool. It is able to offer indirect towing on the stern (ahead speed) as well as on the bow (astern speed). In most cases during the simulations, three tugs were sufficient for both arrivals and departures of large vessels. Bringing a ship alongside whilE connected at the centre leads, the tug is able to line up parallel with the side of the assisted vessel and move her alongside with almost full power, thus reducing both time and space needed for maneuvring. If the tug is required to be classed as an escort tug, it must be equipped with a constant tension winch.

There are some disadvantages however, the tug has a deeper draft compared to ASD tugs. These tugs are not a common tug type therefore pilots and tug masters are not familiar with their use, and they will require training in order to use the tugs to their fullest potential. Using this type of tug as a normal ASD would not be using the tug to its full capacity.

With still larger vessels being operated, it is of vital importance to ensure that a specific vessel operation is carried out safely and efficiently. Using advanced simulators with the participation of pilots, captains, port authorities and tug masters, it is possible to ensure that a new port is fully operational from day one.

ABOUT THE AUTHOR

Jesper Nielsen is a Sales Manager for the Maritime Division of FORCE Technology. Jesper Nielsen is a former Captain and has been involved in shipping throughout his career. He has hands-on operational experience from working at different vessel types and ports across the world.

ABOUT THE COMPANY

FORCE Technology is a leading technology, consulting and service company offering services within a wide range of industries, such as construction, pharmaceutical, food manufacturers and the maritime industry. FORCE Technology has more than 25 years of experience in providing advanced maritime training to the shipping industry. The advanced simulator based training is based on our expertise within aerodynamic and hydrodynamic model testing.

ENQUIRIES

FORCE Technology
Jesper Hvolbøl Nielsen, Hjortekaersvej 99, 2800 Lyngby, Denmark
Tel: + 45 72 15 77 00
Fax: + 45 72 15 77 01
Web: www.forcetechnology.com

Customs and Security

"While thermal cameras can detect targets up to several kilometers away in both daylight and complete darkness, other technologies are available which provide other attributes or, in combination with thermal, can deliver an even more complete situational awareness solution."

'The role of thermal and focused beam NIR technologies', page 122.

The role of thermal and focused beam NIR technologies

George Swanson, sales engineer, Premier Electronics Ltd, London, UK

Overview

The most often quoted reasons for using thermal cameras rather than traditional CCTV CCD colour or IR cameras include long distance covert detection of humans and vehicles in total darkness and up to several kilometers range in daylight. This is combined with the ability, depending on the type and wavelength of the detector used, to detect targets through a variety of obscurants, including smoke, fog, water vapour, and glare from the sun. These attributes have long been applied to the military and defence markets but are now finding serious application in the commercial security sectors for perimeter security.

A major contributor to this increasing take up of thermal imagers and cameras into the security market has been the ongoing reduction in manufacturing costs and the improvement in resolution and sensitivity of uncooled thermal sensors in the 8-14 micrometers infra red range. Cameras with a pixel pitch of 17 micrometers and 25 micrometers pitch are readily available with sensor sizes of 640 by 480 and 320 by 240 Noise Equivalent Temperature Difference (NETD) and sensitivities of better than 40 milliKelvin are achievable. This value describes the ability of the imager to distinguish between two temperatures. A wide range of silicon germanium lenses are available including fixed focus, dual field of view, and continuous electronic zoom.

The (still) comparatively high cost of thermal cameras is offset by their superior range performance, resulting in a lower total camera count and associated infrastructure costs. Also the ability to see (covertly) in complete darkness without the added power consumption of IR illuminators offers an additional infrastructure advantage. The addition of video encoders to what were formerly analogue only cameras allows complete integration into IP systems with the added possibility of POE (power over ethernet) solutions. Also, the ready addition of various analytics further enhances the usefulness of the thermal technology.

Safety – a more complete solution

A unique advantage of thermal cameras in security situations is also the ability to combine both safety and security. An example of this is provided in the Fire Detection and Security range of at least two major manufacturers of thermal cameras. Available with a wide range of lens options these cameras combine the ability to detect human and vehicular intrusion into security sensitive sites with the further facility to protect areas at high risk of fire. These include premises with flammable materials, transportation tunnels, combustible storage areas, and plant machinery, as well as perimeter sites located near flammable forest and bush.

Typically these cameras use the long detection range inherent in thermal cameras to continuously monitor large areas looking for fires. The cameras' flame detection analytics identify the fire, establishing that a real fire threat exists, and then using multiple alarm mechanisms, communicate the level of risk and the fire's positional coordinates to the user who can also manually 'window in' on the area of interest. The algorithms in the analytics reduce false alarms to a minimum by scrutinising each hotspot in the observed area. The fire detection analytics can be used in combination with any other video analytics system.

A typical system tends to use a 640 by 480 resolution, 17 micrometer pitch thermal camera with either a fixed field of view optics or with a motorised dual FOV 45 to 135 millimeter lens, the latter enabling the user to 'zoom' in on the area of interest, and to subsequently autofocus on the scene.

In applications where the objective is to avoid an open flame situation, observing, say, a factory area with multiple machines, the EyeSec system can identify and alert the user when one of the machines reaches a pre-set temperature. The user can configure temperature thresholds and regions of interest (together with regions of non-interest using a masking algorithm if required). A similar scenario applies to any bulk storage area of hazardous materials with multiple possible sources of combustion. The analytics allow the operator to be alerted and intervene before materials held in these areas reach a critical temperature.

Long range flame detection and positioning is achieved within five seconds with multiple fires being detected up to an 11 kilometer distance, during the day, night, and in inclement weather.

Alerts are given when a preset temperature level is observed in the field of view. Temperature sampling with ambient temperature compensation improves detection accuracy. The image processing algorithms combined with a sensitive thermal imager provide high contrast thermal video enabling accurate analytics.

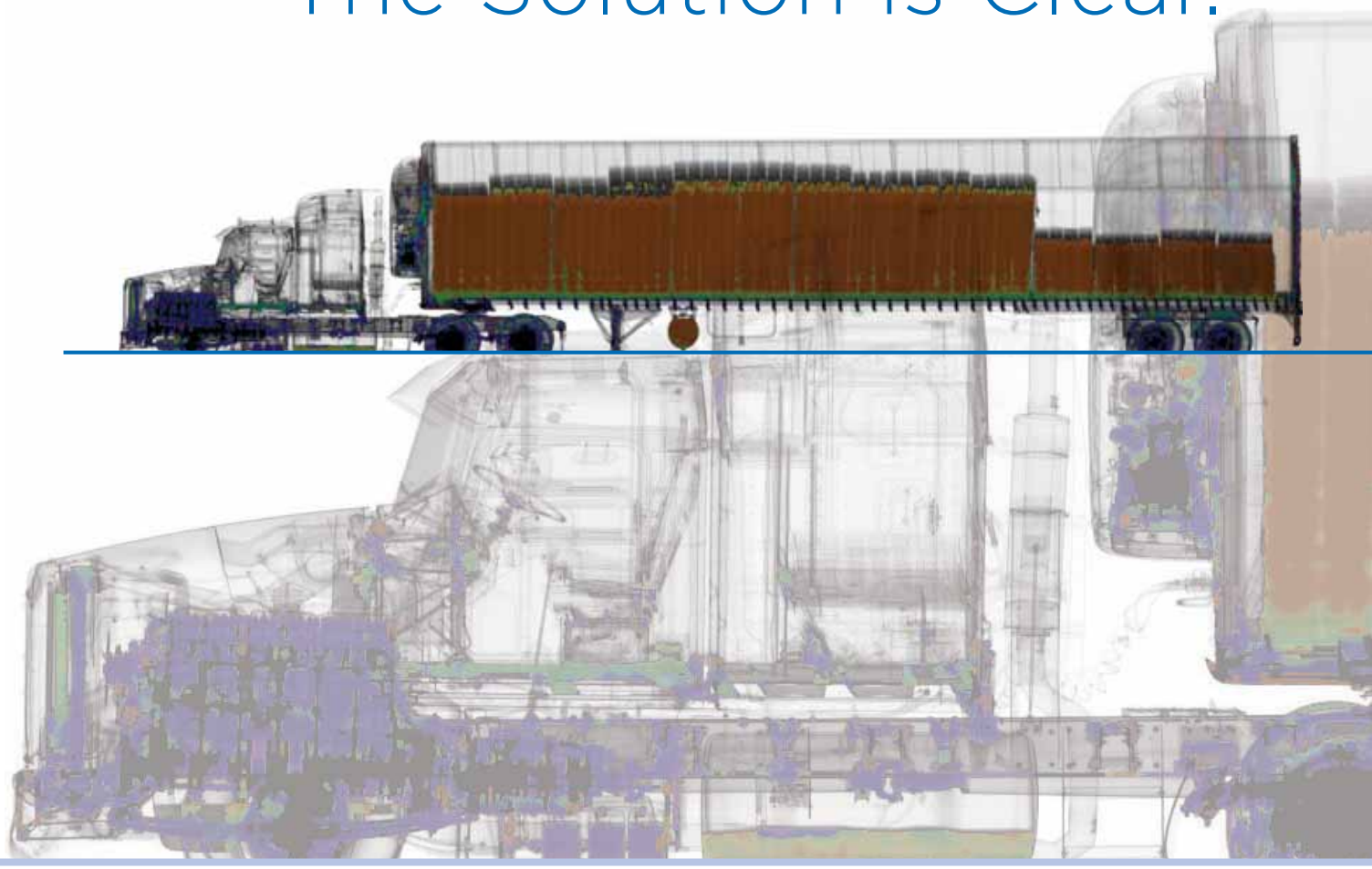
Focused beam NIR

While thermal cameras can detect targets up to several kilometers away in both daylight and complete darkness, other technologies are available which provide other attributes or, in combination with thermal, can deliver an even more complete situational awareness solution.

One such technology is based on illuminating the scene with a focused beam of NIR (Near Infra-Red) illumination integrated with a CCD imager and a continuous pan-tilt system. Depending on the type of the NIR illuminator, either a single panel 850nm LED, or a CW laser, human threat assessment ranges up to 8km can be achieved in daylight and up to 3km in total darkness.

These systems are able to resolve alphanumeric markings in both bright light and total darkness conditions within their operating ranges. They can also see through glass, which thermal imagers cannot. They are also capable of recognition of a specific individual in total darkness.

The Risk is Hidden.
The Solution is Clear.



Leading cargo security system providers have selected Varian Security and Inspection Products to offer unparalleled performance, reliability and safety in the most demanding environments.

VARIAN medical systems | A partner for life

SECURITY & INSPECTION PRODUCTS
tel: 702.938.4859
fax: 702.938.4833
e-mail: sip@varian.com

To learn more visit our website at www.varian.com/sip

Figure 1 EyeSec PTZ Camera.

Figure 2 Harbour Scene Thermal Wide Angle 320x240 pixel.

Available systems

The Vumii Claritii™ 500 system which utilises a single panel 850nm LED, can, with no natural light available, provide up to 500m of night time threat assessment level surveillance of a human target, and up to 80m of night time identification level surveillance from which a human target can be identified as a specific known individual. This night time threat assessment range is considerably superior to conventional NIR systems which typically are limited to around 100m. During daylight, a human can be detected from the background at up to 5500m, with a threat assessment level surveillance of up to 1900m. Identification level is the same as at night, 80m. In practice these figures will be dependent on atmospheric conditions.

The Vumii Discoverii™ systems with a CW laser as illuminator provide the longer range threat assessment figures alluded to above.

Conclusion

Thermal imaging provides for the ultimate long range detection and recognition of threats while Near-IR imaging allows critical assessment and identification capabilities which creates a powerful long range surveillance system in combination. In addition, as described, thermal cameras add an important and unique fire safety aspect to the surveillance feature set.

Figure 3 Claritii NIR Facial Identification 50 metres.

ABOUT THE AUTHOR

George Swanson graduated from Glasgow University with a BSc (Eng) in Electronics and Electrical Engineering in1974. He has a background in micro-electronics R&D in telecommunications and electro-optics, and has occupied positions at the design, project management, and management levels during his career. In 2006 he joined Premier Electronics Ltd as Sales Engineer where he is responsible for technical support and sales.

ABOUT THE COMPANY

Premier Electronics was founded in 1994 and is a supplier of a wide range of CCTV and security products including Thermal Imaging Cameras, Laser Ranging modules, CCTV and Board Cameras, Remote Building and Audio Control Systems and Biometric Access Control products. In addition to its security portfolio Premier also supplies cameras for machine vision applications as well as datacomms for factory automation. Premier Electronics provides technical support on all its sourced products backed up by its supply partners

ENQUIRIES

Premier Electronics Ltd
Room 11 The Old Building
Bishops College
Cheshunt
Herts
EN8 9XH
UK
Tel: 0044 (0) 1992 637211
Web: www.premierelect.co.uk

YOU'LL NEVER LOOK AT CARGO THE SAME WAY AGAIN.

The Next Generation of Mobile Cargo Scanning Has Arrived.

Engineered around your business, the all-new CX-Mobile™ G3 cargo scanner provides maximized efficiency, safety and cost-savings in a new sleek design. Easy to maintain and operate, the CX-Mobile G3 provides a fully customizable cabin built to your unique specifications with unparalleled performance, comfort and flexibility. And, the completely redesigned exterior is durable and corrosion-free for long-lasting cargo scanning in even the toughest of environments.

For more information, visit www.CXMobileScan.com, email us at inforequest.sds@L-3com.com or call +1-781-939-3800.

Security & Detection Systems

L-3com.com

Novel X-ray imaging technology

Szabolcs Osváth, assistant professor and **Krisztián Szigeti**, head of the preclinical imaging laboratory, at Semmelweis University, Budapest, Hungary

Introduction

X-ray inspection systems are a standard feature in many ports. These X-ray systems have the unique ability to non-destructively image the contents of entire cargo containers in just a few seconds. It is a difficult task, however, to identify what is in the container based on the obtained X-ray images. The superposition of two images with different contrasts - like in dual-energy X-ray imaging - can enhance the effectiveness of the detection. Here we present a new X-ray imaging technology which introduces an entirely new type of contrast based on movement. This technology can be combined with existing single-energy and dual-energy X-ray imaging methods, opening new possibilities in port security applications.

Dynamic X-ray imaging – a novel technology

We developed an innovative X-ray imaging technology to reveal previously inaccessible information about hidden movements. The method is sensitive to motions of living creatures or objects.

The novel X-ray imaging technology applies an altered data acquisition sequence and an altered data processing algorithm. The new technology provides two different images at once. One of the two images is the familiar conventional X-ray image. Together with this, a novel 'dynamic' image is also acquired that represents hidden local motions. The dynamic image brings a new type of contrast, which is based on motion. Static components disappear from the dynamic image, and moving objects appear brighter if they move faster.

The new technology has several advantages. The novel motion-based contrast opens new alternatives to detect and identify objects or living creatures. The imaging technology can be added to existing X-ray scanner models by a minor software and hardware upgrade, to enable them to detect motion. We obtain the dynamic image together with the conventional image without increasing the necessary measurement cost, time or radiation dose. The dynamic imaging technology provides extra information without sacrificing existing advantages of X-ray imaging.

Dynamic imaging reveals moving objects

We imaged the clockwork of an alarm clock to illustrate the capabilities of the new method. The electronic circuitry and the mechanics of the clock appear in the acquired conventional image. In the dynamic image, the still parts disappear, and we find a new contrast which is based on movement. (See Figure 1) The bright green indicates fast, dark red indicates slow movement. The wheels advancing the second, the minute and the hour fingers inside the clock are clearly visible. This demonstrates the large dynamic range of the movements that can be imaged at the same time: the wheels moving the second finger move 3,600 times faster than the wheels moving the hour finger.

Dynamic imaging reveals hidden pests

One important application of the dynamic imaging technology could be finding stowaway pests in the cargo. Stowaway pests travel hidden within transported goods and may damage the cargo while being shipped. In addition to this, potentially invasive species often travel as stowaway pests and arrive to new territories unnoticed. Although better part of these exotics are harmless, approximately 20 to 30 percent of the introduced species are pests and cause major environmental and economic problems. US legislation has been concerned about the problem for many years. The intention of the Invasive Fish and Wildlife Prevention Act 2012 is to prevent the import of potentially harmful exotic pests. The legislation would empower the US Fish and Wildlife Service to become proactive in stopping harmful invasive species from ever arriving on US shores.

To stop harmful exotics from arriving in the US, or to protect the cargo from stowaway pests, it will be necessary to find the pests in the large volume of transported goods. Finding stowaway pests however, can be extremely difficult. Below (see Figure 2 and Figure 3) we demonstrate how to use the dynamic X-ray imaging technology to find the unwanted stowaways.

We used the dynamic imaging method to visualize pests hidden inside wood or inside packaged food. The conventional X-ray image was unable to detect the hidden insects. The dynamic image clearly highlights the movement generated by the stowaway pest in the cargo: bright green indicates fast, dark red indicates slow movement.

Dynamic X-ray imaging in port security

Finding stowaway pests is important to protect the cargo as

Figure 1: Image of an electronic clock made with the new technology. The conventional image (left) and the dynamic image (right) were acquired at the same time.

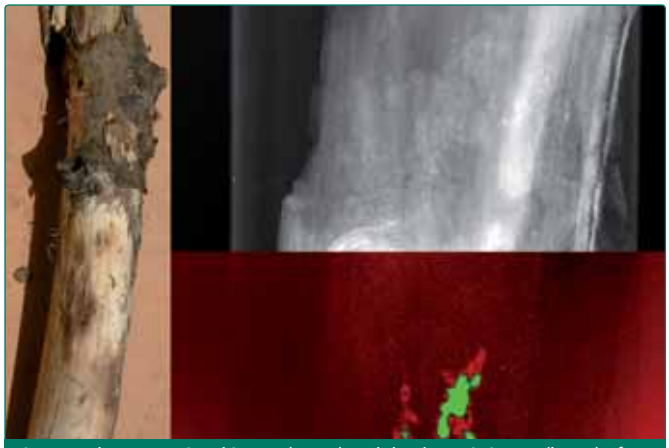


Figure 2: The conventional image (upper) and the dynamic image (lower) of part of the tree branch shown in the photograph (left).

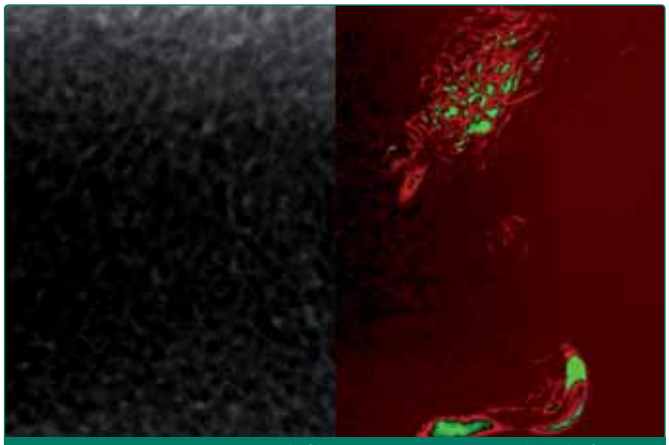


Figure 3: The conventional image (left) and the dynamic image (right) of a pack of rice containing mealworm larvae.

well as our ecological and economic environment, but it is an extremely difficult task. Dynamic X-ray imaging allows direct scanning of shipments for hidden movements, making the search for pests in the cargo much more effective. Besides the above application, dynamic imaging could reveal contraband of exotic animals or the presence of moving machines in the cargo.

The novel dynamic imaging technology can be added to existing X-ray scanners by a minor software and hardware upgrade, facilitating the introduction and spread of the technology.

ABOUT THE AUTHORS

Szabolcs Osváth has an MSc in physics, PhD in biophysics, and has done postdoctoral work in biochemistry. He is currently assistant professor at the Semmelweis University. His expertise lies in medical imaging and image processing.

Krisztián Szigeti has an MSc in physics, PhD in biophysics. He is currently head of the preclinical imaging laboratory of the Semmelweis University. His expertise is in medical imaging, preclinical imaging and image processing.

ENQUIRIES

Szabolcs Osváth, Ph.D.
Semmelweis University, Tüzoltó u. 37-47, Budapest, H-1094, Hungary
Tel: +36-1-459-1500/60224
Fax: +36-1-266-6656
Email: szabolcs.osvath@eok.sote.hu

New surveillance technology:

Q&A with Roland Meier, Team Leader Panomera®

Multifocal Sensor Systems Dallmeier

Video technology has become an indispensable element of the security arrangements at ports. German developer and manufacturer Dallmeier has unveiled a new approach to video surveillance of large areas: the Panomera® multifocal sensor system.

Mr. Meier, what is new about the Panomera® system?

With the Panomera® multifocal sensor system, a huge area can be monitored from a single location extremely efficiently. The most impressive aspect of the product is that it combines the overall view with simultaneous top detail resolution. Even distant objects are displayed with the same resolution as objects in the foreground of the picture. The entire area observed by the camera should be displayed in uniformly high quality. But anyone who has ever zoomed in on an image will notice a marked difference: the farther you zoom into the picture, the greater the loss of detail, causing the picture to become blurry. While objects in the foreground are certainly displayed with sufficient resolution, when the user attempts to enlarge objects from the background, they appear as so many ill-defined blocks. This is why when we developed the Panomera®; one of our objectives was to ensure that the resolution never fell below the specified parameters, not even in the most distant areas of the image.

How is this high resolution possible?

We are using a completely new lens and sensor concept. In conventional cameras, the pixels are used uniformly within the sensor, that is to say, the available megapixels are distributed evenly throughout the entire image. But the actual scene is not two dimensional like the sensor, it is three dimensional; the expanse of the lateral and depth perspectives becomes progressively larger the farther back you go. If the pixels are distributed evenly on the camera sensor, this means that the same number of pixels is available for capturing a much larger area than in the foreground of the image. And logically, as a result, more distant objects cannot be resolved any more when you zoom in. With Panomera®, we do not use just a single optical device, but a multifocal sensor system, meaning several lenses with different focal lengths. In this way, we "slice up" the scene so that each area has the optimum focal length assigned to it.

What advantages does this have for monitoring ports?

Panomera® works well both for very wide panoramas and for areas involving great distances. In effect, it is as if you were to combine the advantages of an overview camera and a high optical zoom PTZ camera. Panomera® records the entire area continuously, like an overview camera – unlike a PTZ camera for example, with which only the currently active zoom area is recorded. But at the same time you can move and zoom anywhere in the entire coverage area – and individuals are clearly recognisable even at distances of more than 160 meters.

The multifocal sensor system Panomera®, a unique new technology.

Panomera® unveils an entirely new approach to video surveillance of large areas.

Dallmeier offers complete solutions from a single supplier: cameras, recording servers, video management and analysis.

Until now continuous recording of the entire surveillance area was not standard practice. Of course, fixed dome or box cameras always record the whole of the area they are monitoring. But these cameras are not equipped with an optical zoom, so they are not suitable for monitoring expansive areas, or at least only as overview cameras. This is why a lot of PTZ cameras are being used at the moment. These can be used to zoom and move within the scenes. But at the same time, PTZ cameras have a definite disadvantage: they can only ever record the area that the operator is currently watching live. If the operator is currently zooming in on the front left portion of the image, only this area is being recorded. So if an incident were to take place at a different location at the same time, it would not be possible to review it afterwards. With Panomera®, on the other hand, the entire scene is recorded continuously and in maximum detail resolution – regardless of which area the operator is viewing live. This makes it possible to analyze incidents after they have occurred.

Couldn't you achieve this effect by using several HD cameras in conjunction with each other?

An operator can work much more efficiently with a single, synchronized system than he ever could with just multiple HD cameras strung together in line. The operator would have to concentrate on lots of individual images simultaneously. Moreover, the field viewing angles could never be synchronized with one another as much as with a single, integrated multifocal sensor system.

Another advantage of the Panomera® sensor concept is a substantially higher dynamic range. Panomera® works with several sensors, each of which selects its own exposure strategy in order to achieve ideal saturation. While with other cameras an average value is determined, Panomera® can make distinctions more effectively: Light areas are exposed for a shorter time and dark areas for a longer time. As a result, situations with a large dynamic range can also be recorded with good quality, without overexposure or "drowned" black areas.

If the entire scene is monitored by one camera, is it only possible for one security operator to work with the camera?

In contrast to PTZ cameras, with which only one operator can control the camera, with Panomera®, 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 of the individual users can select his view individually and zoom or pan as he desires. Or he can perform evaluations of the recordings at the same time. So analyses can be carried out by any number of employees at various workstations simultaneously. For example, one may be watching the overview image live, another may zoom in on a suspicious vehicle in the port area, while yet another is looking at the recording from an hour ago to see how some containers have been loaded onto a ship.

What bandwidth is required for this?

Owing to the so-called multicast capability several users can view the images from Panomera® without requiring repeated transmission of the data via network. This reduces the necessary bandwidth significantly.

How fluidly is movement represented in the images?

Panomera® provides image material in real time and at high frame rates of up to 30 frames per seconds, which translates to a completely fluid representation.

What is the situation regarding price?

Of course, a Panomera® is more expensive than a single conventional HD camera. But then you only need one Panomera® system to cover the same area that previously required several cameras. Even so, the greatest savings are realized in expenses for the infrastructure. The most expensive factor in installing a camera is not the camera itself, but the infrastructure it needs, that is to say: camera masts, wiring, electricity supply and so on. If you only need a single camera installation site, you save an enormous amount of money.

Would an existing video system have to be replaced completely?

No, existing cameras can be incorporated in the Panomera® concept. Even so, the entire video system can be monitored and controlled using a single management system. Also, a mobile solution can be created without difficulty via our iPhone server. The images from Panomera® can be displayed on an iPhone or iPad, for example. This results in faster response times and greater flexibility.

What plans do you have for developing this technology in the future?

We are in the process of completing project studies for a large number of customer enquiries, because Panomera® is not a mass-produced "off-the-rack" solution for all requirements. We perform the necessary project studies in advance to ensure that the multifocal sensor system is customized and the resolution required by the customer is achieved.

ABOUT THE COMPANY

Dallmeier has more than 25 years of experience in transmission, recording and picture processing technology and is a pioneer of CCTV/IP solutions worldwide. The company develops intelligent software and high quality recorder and camera technologies, enabling Dallmeier to not only offer stand-alone systems, but complete network solutions up to large-scale projects with perfectly integrated components.

ENQUIRES

Dallmeier electronic GmbH & Co.KG
Cranachweg 1, 93051 Regensburg, Germany
Tel: +49 (0) 941/ 8700-0
Fax: +49 (0) 941/ 8700-180
Email: info@dallmeier.com
Web: www.dallmeier.com, www.panomera.com

Port of West Sacramento upgrades video surveillance

Port of West Sacramento, Yolo County, California

It takes an intricate and well established security infrastructure to protect a port, even a small one such as the Port of West Sacramento. Following strict security regulations from the Department of Homeland Security and US Coast Guard, the port made the commitment to install a new video surveillance system featuring video management software from OnSSI.

At the Port of West Sacramento, cameras including Sony fixed cameras and PTZ models as well as FLIR thermal cameras, supply views throughout the port, and a video management software system from OnSSI provides a simplified, intuitive way to manage video feeds effectively.

Digital systems are still pretty expensive, and it takes foresight to understand that the investment is worth it. The city of West Sacramento is showing that a small city with a small port is willing to take on the challenge of installing a new system with an eye toward future growth. The system installer was World Telecom & Surveillance, Inc. (WT&S), a low-voltage contractor for 12 years, which has seen its business evolve into the surveillance field for the last eight years. Having witnessed the evolution of voice-over-IP in the telecom market, World Telecom was well equipped to oversee the Port of West Sacramento's transition to networked video. Bob Natoli of Intelligent Systems Marketing (ISM) was the local OnSSI manufacturer's representative firm involved in the Port of West Sacramento project.

Fiber optic and wireless transmission

The signals from cameras located throughout the port's premises are transmitted across fiber optic networks, including about 30,000 feet of new fiber installed by WT&S, and using wireless devices. There is fiber from each guard station to the server, a Dynamic Network Factory Security (DNF Security) server that is the video management engine. The server installed runs OnSSI's IP-based video surveillance management software.

Two DNF Security video monitoring workstations – one at each guard gate – run OnSSI's Ocularis Client Lite. The network is used solely for the video system; a separate network is used for the port's day-to-day business functions. Six-strand multimode fiber runs from the server to each network location. The use of fiber optic cables enables network signals to be transmitted for longer distances than Ethernet cabling. A significant upgrade in the fiber network was undertaken to accommodate the video network; the fiber upgrade will also likely find additional uses in the future as the port grows.

Flexible viewing options

During the original installation, OnSSI's legacy NetGuard EVS was being used as the client viewing software. Ocularis Client Lite was later installed after the project was complete.

The Ocularis platform from OnSSI runs on standard IT servers and adheres to and supports recognized industry standards, including integration with a range of physical security and camera devices. Ocularis Client Lite provides a simplified, intuitive way to effectively manage video feeds and complex physical security systems. Ocularis also provides the power to investigate events using instant review and digital pan-tilt-zoom during live monitoring. Targets can be detected automatically using video motion detection by a nearby camera. Security officers can follow any moving targets operating PTZ cameras through Ocularis. Across the Sacramento Deep Water Ship Channel from the port, on remote sites, two mobile wireless surveillance trailers are located. These are used to view the opposite shore and access to the waterway. Offering views back at the physical facilities of the port, the cameras help to make sure no one is gaining unauthorized access. In case of a natural disaster or other emergency, the trailers could be redeployed to provide surveillance of other locations.

The port also has new wireless links that have been expanded into the city approximately two miles from the port. The signal is sent back to the port though the Firetide wireless mesh, this link allows the port security to watch the train traffic into the port. The port also uses a Talk-A-Phone emergency broadcast system, which is not integrated with the OnSSI system although the two are used together. For example, if video identifies an intruder, the Talk-A-Phone system can be used to tell them to exit the water space.

Protecting the perimeter

The system secures the perimeter against any trespassers and ensures the integrity of the fence line. The port is located along a main roadway in West Sacramento, where vehicle, foot and bike traffic are common. If there are fishermen along the waterway, security looks to make sure they maintain a position away from the port docks. Video feeds also help security officers look for any activity in the port that is out of the ordinary or involves a restricted area. They can view traffic patterns at the port, and work crews, contractors or vendors working inside the ports. Cameras view along the roadways of the port, along the docks, and the waterway leading to the port.

The OnSSI system is convenient and scalable. In the future as the port expands, having an OnSSI system allows for ease of growth. Instead of dealing with analog systems needing multiple network or digital video recorders, it's just a matter of licenses, and scalability is unlimited. Software upgrades from OnSSI also ensure that the system will be state-of-the-art even several years from now.

OnSSI's ease of use simplifies the training curve for security personnel. Security officers can go back and research video using Ocularis tools. Having so much footage, it is very important to have the ability to do specific time-point searches so you don't have to scroll through hours of video. The Port of West Sacramento's investment in building an infrastructure to accommodate an IP-based video system is worth it and will provide additional benefits in the future.

The inland Port of West Sacramento is located 79 nautical miles northeast of San Francisco.

ABOUT THE PORT

The Port of West Sacramento was opened in 1963 to serve the Agricultural Industry in the Sacramento Region and is located 80 nautical miles from the Golden Gate Bridge. The main terminal is 140 acres and across the barge canal is an additional security responsibility of 250 acres. The Port exports agricultural and bulk products and also specializes in project cargo and cement imports. In 2013, the Port will begin a Marine Highway Barge Service servicing the Port of Oakland.

ENQUIRIES

Port of West Sacramento,
1110 West Capitol Ave,
West Sacramento,
CA 95691
Web: www.portofwestsac.com

Amy Cameron, 916-617-4733
Email: amyc@cityofwestsacramento.org

Q&A with Jim Devine, president, Global Terminals Inc

In May, US container terminal operator Global Terminals Inc announced a major expansion at its New Jersey facility, including the introduction of automated technology for the first time in the Port of New York and New Jersey. Global Terminal Inc president Jim Devine talks to Port Technology Internationl about the project.

What will be the future equipment profile of Global Terminals in New Jersey?

We have six STS cranes at the existing facility and we will be acquiring another two. Four of the current cranes can go 18 wide; we picked up another two quite recently that go 20 wide, and we will order two more that can go up to 22 wide. The technical review has been completed and the tenders have been sent out.

In the yard we have placed an order for 20 Konecranes automated RMGs, and for transferring the containers between the quay and stacks we will use manned one over one shuttle straddle carriers, which will help to increase productivity at our New York/New Jersey terminal. We are also committed to productivity and we are confident that the man-controlled machines will give us that. We are committed to bringing in the right employment levels and we are keen on employing ILA members.

The stacks in the yard will be double ended, and trucks will queue in one of five portals. Loading of the trucks will be assisted by humans in much the same way as you see at APM Terminals' Virginia operations.

How have the negotiations with the unions gone?

The negotiations are on two levels and are ongoing. We have advised the ILA that we are moving the direction of automation and we haven't yet finalized all the contracts. But our current contract with the ILA does provide for the certain implementation of technology.

The real impact of course is on manning levels, and we are optimistic that we will come up with the appropriate ratios. The automatic stacks supplement the existing terminal, so the actual reduction in manning in the yard will be minimal, and we expect there will be other, but different jobs generated: there's going to be much more maintenance engineers required, and adjacent to the terminal we are building a rail yard which will provide further employment.

We are hopeful that we will reach an agreement and we are fortunate that the East and Gulf coasts of the US are the domain of the ILA. 1977 was the last work disruption in New York-New Jersey and since then there has been a cooperative effort from both management and labor to reach agreements.

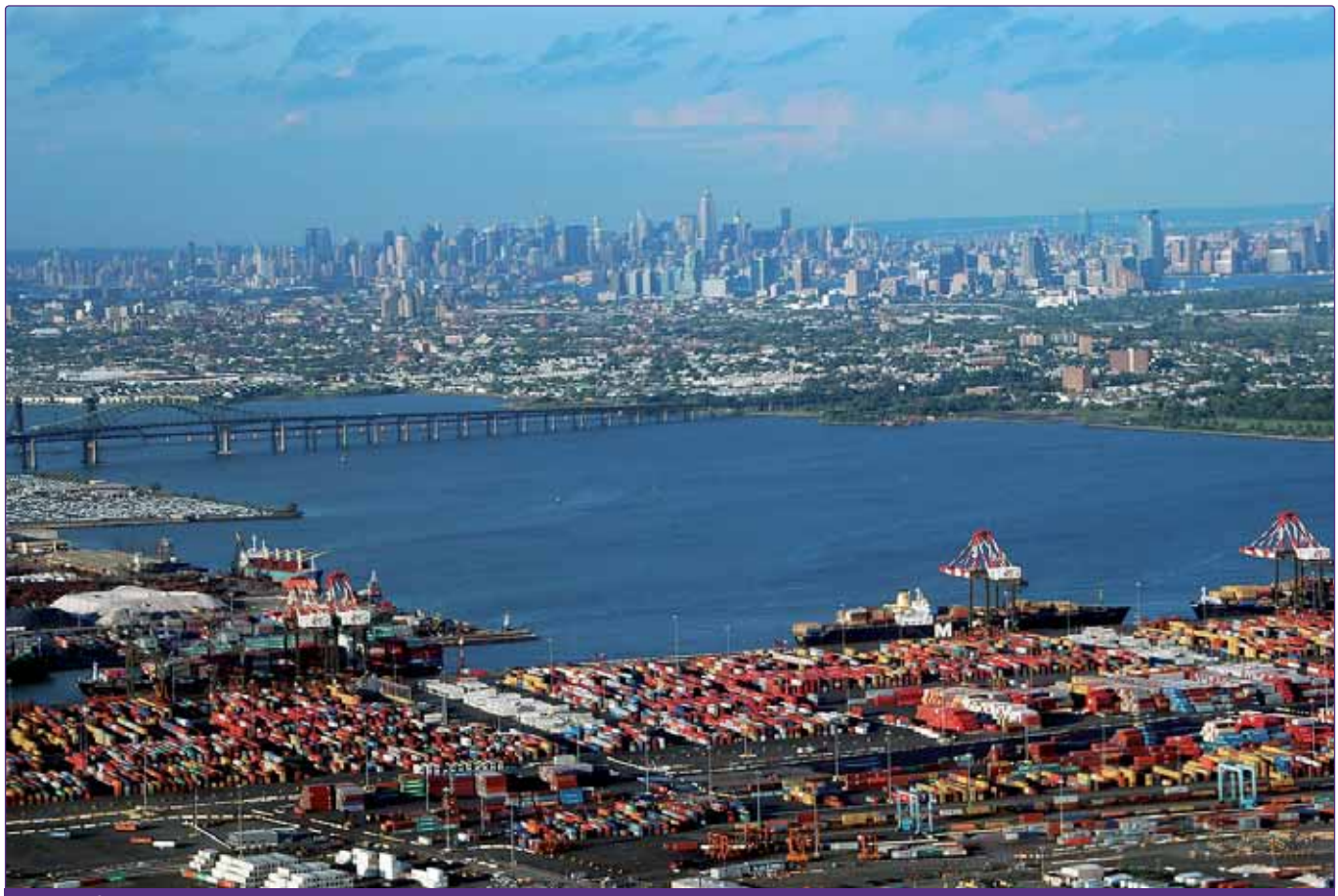
However, against that, the overarching issue is that the current master contract expires in September and the new one is due to begin on 1st October – so there are two negotiations going on at once. We have had three meetings so far and the temperament of them has been civil, constructive and professional.

Global Terminals is the only New York-New Jersey terminal outside the Bayonne Bridge. Will the project to raise the height of the bridge diminish Global Terminals' competitive edge?

We have a window of opportunity. The target date for our facility is 2014, while the bridge project is due to be completed by 2016, giving us a two year opportunity to capture the market of the largest ships.

In addition to having the ability to capture this traffic, the key thing is the productivity that we will offer. The larger ships require greater productivity because far greater numbers of container lifts per vessel call will be needed. At the moment the average lifts per ship in the New York/New Jersey harbor is 2,500, but where we see the lines going is consolidating services and using fewer but larger vessels. The development of the G6 alliance is very insightful – that represents the next evolution with the steamship lines, where there will be 6,000 7,000 or 8,000 moves on a particular vessel. So, what is needed is a real increase in productivity. We will be aiming for 35 moves per crane per hour, while the current average in the port is 27.

That is why the automated RMGs are such a key ingredient, because they will give the terminal a density that will allow it to achieve those crane moves. The stacks themselves will be placed at



The Port of New York and New Jersey, USA.

Source: Wikimedia Commons, Maureen, Buffalo, USA

an angle to the quayside; we are arranging them like that so they are longer and thus we can take advantage of the speed of the RMGs.

What effect do you think the new terminal will have on the competitive landscape of the port, given the extra capacity you are introducing?

Even though there will be an additional 600,000 lifts introduced to the port through this new terminal, in the context of the entire port of New York and New Jersey, it's actually a relatively minor part of the harbor. The terminal will reach its level and the other terminals in the port will also do well. We will be aggressive in securing cargo but we don't want to disrupt the nature of the port – we are working very hard to try not to disrupt the competitive nature of the harbor.

To be honest the competition that we do keep an eye on is to the south: Norfolk. I am very pleased with the Port Authority of New York and New Jersey spending all that money on the intermodal facilities, which have opened up new areas in the hinterland for our port.

We are competing aggressively with Virginia both in terms of service and price.

What effect do you think the enlarged Panama Canal will have?

Logic says that it's going to facilitate more cargo. However, the percentage increase in cargo will be determined by the pricing of the Panama Canal and how the US west coast railroads respond. I'm hopeful that the Panamanians will take an enlightened approach and we will see a migration of cargo from the Pacific rim to the east coast.

But also we are seeing increasing amounts of cargo coming from Asia to the east coast via the Suez Canal, especially over the last four or five years, and that market is definitely increasing.

How do you see the general economy developing?

My crystal ball is pretty cloudy – I can see a lot more in my rear view mirror. There is a slight uptick in this year compared to last year but the Piers data is showing flat-to-slight improvement in volumes.

But I would say, as an economy, we are an eight-cylinder machine running on five. We are hoping for more of a pick up but the housing market, which is so important to the overall economy, remains in the doldrums.

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

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

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

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

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

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 • www.aimglobal.org • 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

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

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

The International Association of Dredging Companies (IADC) is a trade organization with more than 50 main and associated members in the private dredging sector, all of which operate sizeable fleets and are active in the world market. IADC works to attract worldwide recognition for the dredging industry in general and to increase the public's awareness of the significant contributions of dredging towards economic growth and prosperity.
www.iadc-dredging.com

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

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.

Supporter companies

APM TERMINALS Lifting Global Trade.. DP WORLD

Port Technology International is supported by leading terminal operator networks, including APM Terminals and DP World.
APM Terminals is an independent business unit and operates a global port and terminal network of 50 facilities with 22,000 employees in 34 countries.
DP World is one of the largest marine terminal operators in the world, with 49 terminals across 31 countries.

Advertisers Index

Do you qualify for your FREE personal copy of Port Technology International?

To ensure your continued delivery please complete and return this form

Name: .....

Job Title: ..... Job Function: .....

Company: ..... Div/Dept: .....

Street Address: .....

City: ..... Zip/Post Code: .....

Country: .....

Telephone Number: ..... Fax Number: .....

E-mail: ..... Web URL: .....

For the purposes of our circulation audit, please write your city of birth: .....

Signature: ..... Day ..... Month ..... Year .....

In order to continually improve Port Technology International we require your feedback. We would be very grateful if you would answer the following questions

(Q) Which section(s) of the publication are of interest to you? (please tick)

Port Planning Design & Construction	❑	Environment, Health & Safety	❑
Dredging & Coastal Development	❑	VTS & Aids to Navigation	❑
Mooring & Berthing	❑	Container Handling	❑
Dry Bulk & Specialist Cargo Handling	❑	Customs & Security	❑
Liquid, Chemical & Gas Handling	❑		

(Q) Which subjects would you like to see in future editions? .....
.....

(Q) Do you keep the publication for future reference?
Yes ❑ (how long.....) No ❑

(Q) Besides yourself, how many other individuals read your copy of Port Technology International?
0 ❑ 1-2 ❑ 3-4 ❑ 5+ ❑

(Q) What do you like best about Port Technology International? .....
.....

I would be interested in submitting an article for Port Technology International ❑
I would be interested in advertising within Port Technology International ❑

Fax: +44 (0)20 7871 0101
Phone: +44 (0)20 7871 0123
Post: Port Technology International,
Trans-world House, 100 City Road, London. EC1Y 2BP, UK

TRANSPORT SECURITY

EXPO & CONFERENCE

- Focused Exhibition
- 30 Free to attend Technology Workshops
- Networking Functions & VIP Hosted Lunch
- Free to attend Evening Reception
- Four High Level Conferences:
  - Aviation Security & Air Cargo
  - Maritime & Counter Piracy
  - Public Transport Security
  - Supply Chain Security in Association with TAPA

Aviation | **Cargo** | **Maritime** | **Supply Chain**

Supporters

TAPA Transported Asset Protection Association

NATO Shipping Centre

SAMI Security Association for the Maritime Industry www.seasecurity.org

For more information please email info@transec.com

www.transec.com/advert12 14-15 November 2012 | Olympia, London

Van Oord

Marine ingenuity

Marine ingenuity

Van Oord is a leading international contractor specialising in dredging, marine engineering and offshore projects (oil, gas and wind). Our clients and business partners can rely on Van Oord to come up with smart and innovative solutions to the challenges they face in marine environments. We are driven by our passion for water and technology and applying our ingenuity to achieve the best and most sustainable results. www.vanoord.com

Dredging and Marine Contractors