



# LongRead

LongRead • Vol 1

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**APM TERMINALS**



Ships at anchor off California earlier this year

## Measuring port performance

**As congestion at container terminals around the world has become commonplace, port productivity has inevitably come into focus.**

A measure of just how serious the threat of port congestion is to global commerce was put into context by Moffat & Nichol's chief economist Walter Kemmsies, who recently described it as a "new form of trade barrier".

The recent travails of shipping lines and their customers on the US west coast has brought the matter to public attention - particularly when it involved a human interest story, such as McDonalds being forced to ration portion sizes to Japanese customers because exports of US potatoes were stuck on the docks.

It's a story that puts a smile on people's faces, whether born of schadenfreude or not, but the underlying impact of port congestion is far, far more serious. The economic damage caused to the US by the west coast congestion has been put at between \$1bn and \$2bn per day.

More insidious is the fact that it appears to be contagious. As cargo began to pile up along California's shores, either on land, or waiting on anchored vessels seeking a berth, congestion pinch points began to emerge at Asian export hubs. Manila was worst affected, with ships waiting up to two weeks to berth and

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export containers sometimes delayed for months before loading.

There are, of course, mitigating factors - local issues that accentuate the congestion and can often appear to be its cause. In Manila a ban on daytime trucking was blamed, but the reality, according to comments from MCC Transport chief executive Tim Wickmann, was that Asian ports - including top 10 global gateways such as Hong Kong, Shanghai and Qingdao - were all suffering their worst congestion levels for two decades. These backlogs were related, not isolated.

**“We have not seen any increase in berth productivity over the last six or seven years, and with productivity at current levels sooner or later we are going to run out of space.”**

In an increasingly globalised world, port congestion is an increasingly globalised problem. In the early part of this year it also returned to haunt the major north European import gateways, although not on the seismic scale that was experienced in the first half of 2014.

One of the root causes of the issue in North Europe was the terrible late



DP World's flagship Jebel Ali facilities in Dubai

winter weather, which literally blew ships off their schedules, and illustrated the glaring vulnerability of intercontinental container supply chains - the inability of ports to press a throughput accelerator if factors outside their control lead to a cargo backlog.

The requirement for ports to raise their productivity levels has been apparent ever since increasing container vessel sizes became the norm. Since the launch of Maersk's Triple-E series every major container line has become convinced of the economic merits of operating ultra large container vessels (ULCVs).

Currently these are restricted to deployment on the Asia-Europe trades,

but their entrance means existing vessels have been cascaded to other trade lanes, with the net effect that ports everywhere are suddenly dealing with larger boxships unloading ever larger numbers of containers in single calls.

But can ports step up to the challenge that Maersk Line chief executive Søren Skou issued at the recent TPM conference in Long Beach?

“Every time I meet with a port operator I stress productivity to get the bigger ships in and out - we have not seen any increase in berth productivity over the last six or seven years, and with productivity at current levels sooner or later we are going to run out of space.



Søren Skou, CEO, Maersk Line

“Crane and yard productivity can be faster, and in US ports in particular rail truck and chassis productivity all need to go up,” he told delegates. In mitigation, however, he added that the lack of progress lay partly with the drop in volumes seen after the onset of the global economic crisis.

“The subsequent decline in volumes and other associated problems masked the issues that were beginning to emerge in 2006 and 2007. The period of lower volumes meant there was no investment, so we have lost five years in terms of dealing with these issues,” he said.

But it is not as if the new requirements that larger vessels would place on ports

has not been talked about. Since the 18,270 teu *Maersk-McKinney Møller* was launched in mid-2013, observers have routinely talked about the need for terminals to be capable of handling 5,000-6,000 containers within a 24-hour period - equivalent to 208 - 250 container moves per hour.

However, it is apparent from data published in the *Journal of Commerce's* ground-breaking berth productivity reports that the industry as a whole remains way off this target. The latest data, covering the first half of 2014, shows that the best-performing terminal globally, the APM Terminal's facility in Yokohama, is hitting an average of 180 moves per hour - equivalent to handling 4,230 in a 24-hour period. The best of the best is still some 14-28% off the minimum productivity levels required by the ULCV class of container ships.

The result is that on the Asia-Europe trade, Maersk has found the time that vessels spend in port on a standard round trip has increased 50% from 12 to 18 days, while Drewry Maritime Advisors recently found that upsizing from a 13,000 teu vessel to 19,000 teu, a capacity increase of some 46%, had led to only

a 20% increase in berth productivity.

A further issue is the knock-on effect of ULCVs in ports unable to meet new productivity requirements - by taking so long at berth these vessels, which offer cheaper freight rates to shippers and lower operating costs to carriers, are, by dint of the ensuing congestion their presence causes, increasing costs in the supply chain.

However, because vessels have become wider rather than longer, terminal operators have been unable to do what they did previously when faced with bigger ships - deploy more cranes.

Here's the contrast: the 2009-built *Gerda Maersk* is 366 metres long, 43 metres wide and offers a capacity of 9,000 teu; by comparison the *Maersk-McKinney Møller* is just 10% longer at 399 metres, but 37% wider at 59 metres and carries twice as many containers. As ships carry more cargo *Gerda Maersk* vessel dimensions increase marginally - the *Emma Maersk* is just two metres shorter and two metres narrower than the *Maersk-McKinney Møller* but has a capacity of 15,500 teu - the latter is only fractionally bigger but carries 18% more cargo.

## How the numbers are crunched

Just what exactly is port productivity? Several years ago, this correspondent edited the now defunct magazine *Cargo Systems*, and the team took it upon itself to try to produce a metric which objectively measured port performance.

Why? Because everyone wanted it, but no one knew how to do it. In response, some argued that it was simply impossible to achieve. The Asian ports handle different cargo flows to European or US ports; ports from different parts of the world have different capital and operational cost structures; and anyway, ports in different regions do not compete with each other, so what was the point in comparing them?

Another obstacle was the reluctance of many operators to share data with a

third party. The variety of reasons aired boil down to the fact that no one likes to have the hugely complex business of running a container terminal reduced to a single number - unless they happen to be at the top.

Previously, the only way ports could be compared was by throughput, a method open to manipulation, especially in large transshipment ports, some of which were accused of inflated figures due to double counting - whether deliberate or not.

The methodology we eventually devised centred on four metrics - the capital cost of the berth, the number of cranes deployed per berth, the average crane moves per hour and finally, berth utilisation. Each of these factors, particularly the first, involved a number

of assumptions that we had to take.

It was an interesting exercise, but one that was largely academic. In hindsight, and in the light of the work done by the *Journal of Commerce*, it is clear where we went wrong - we were trying to produce something that allows terminal operators to measure themselves against their peers; the *JOC* work allows terminals to be judged by their customers. The buy-in that the *JOC* has had from the shipping lines has been crucial, and whatever shortcomings terminal operators may point to, participating carriers are now measuring terminals by the same relatively simple metric - from the time that the first mooring line has been tied to the quay when a vessel berths to the time that the last line is cast as it departs, then divide



The clock starts ticking from when the first mooring line is tied

the number of containers handled in the intervening period to give a gross berth productivity figure.

There might be flaws in this approach, it might ignore certain value-adds that some terminals can bring to supply chains - but it allows the industry to talk

about productivity within a common frame of reference.

Neither can the *JOC* be accused of rushing into this. Chief content officer Peter Tirschwell describes a six-year battle, mostly uphill, to convince carriers that it was in their interest to share their

proprietary data with the *JOC*. But by aggregating the data covering hundreds of thousands of port calls - over 150,000 individual port calls were included in the 2013 figures and many more in 2014 - the *JOC* has been able to provide container carriers, and by extension shippers and forwarders with a genuine industry benchmark.

Neil Davidson, director of ports at Drewry Maritime Advisors, says: “The only way you could pragmatically develop any sort of port productivity rankings is the way that the *JOC* has done it. The shipping lines collect this data, and by teaming up with the *JOC* it gives them a chance to put some pressure on the terminal operators.

“The downside is that all you get is the top line result - you don't know why there are the variations between different ports or

Continued on page 6

# Berth productivity rankings

2012 | 2013 | 2014



## Pump up the volumes

In **2014** the 30 largest container ports in the world handled a combined **370m** teu, up 5.3% from the teu handled in **2013**. 11 of the 30 are in **China**.



## Congestion indigestion

A 10-day shutdown of the US west coast ports is estimated to cost the country's economy **\$2.1bn** per day. It took ports in the region almost three months to clear this year's backlog.



## Smoke on the water

The most containers ever carried by a single vessel was the **18,168 teu** loaded on the Maersk McKinney Møller in Algeciras in January. The vessel has a capacity of 18,340 teu.



## Fleet of foot

As of 27 May 2015, there were 5,998 ships active on liner trades, representing a total capacity of **19,450,291 teu**, according to Alphaliner. The average container ship size is **3,743 teu** today, compared to **3,401 teu** in July 2013.



"Vessel size increases are not proportionate with the length of the vessels, so we cannot put more cranes into operation," says APM Terminals head of design and automation Alexandru Duca.

According to Drewry's director of ports, Neil Davidson, eight is the maximum number of cranes that can be set to work on the largest ship, while most terminals deploy six. The only other option, he says, is to increase crane moves per hour, but here too there are limitations - the critical space on the dockside under the cranes, coupled with the way containers are moved between yard stacks and quays, is too small to allow operators to achieve a step change in productivity.

"The problem is congestion under the crane - getting the boxes to and away from the crane is the fundamental issue. The more boxes you lift on and off a ship per crane per hour, the more trailers, tractors, straddle carriers and the like

are arriving in the lanes between the crane's legs, and you get a congestion problem on an individual crane.

"If you put more cranes on a ship to try and spread the traffic you create congestion all along the quay, so you either get congestion at one crane or along the whole quayside," he says.

There have been a number of press releases from terminals recently declaring huge numbers of containers handled in a single call, in some cases more than 10,000. These are often accompanied by a photo of the vessel at berth, and it is instructive to count the number of cranes at work on the ship - in one example there were six in a port that averages 25 moves per crane per hour - 150 total moves per hour - meaning that the vessel was likely in port for just over three days.

In another recent example, the 17,700 teu *CMA CGM Kerguelen* made a call at its south-east Asian hub of Port Klang on its maiden voyage and was served by no fewer than 12 cranes at one time.

"The high crane density on these occasions is, however, atypical of normal port operations for ULCVs," liner shipping analyst Alphaliner wrote recently, in a short piece entitled: *Photo opportunity beckons when large ships call.*



The CMA CGM Kerguelen at Port Klang

"At most loading and discharge ports, crane use is usually limited to about one third of the vessel's bays, which corresponds with a gantry fleet of seven to nine units on a modern-day ULCV. Westport's use of 12 cranes on *CMA CGM Kerguelen* was partly due to the high number of re-stows undertaken by CMA CGM at the port," it continued.

Anecdotally, another operator related a recent visit to a mainland Chinese port and was startled to see 11 cranes working on a single ship. "They're not all deployed," his guide admitted. "We put them there for the photo opportunity."

Back in the real world, "150 moves per hour is perfectly reasonable and acceptable in today's environment," says Mr Davidson. "It is well in the upper

echelons of productivity, and the lesson is that if you are a shipping line and are throwing 10,000 boxes at a single port, don't expect to be out of there in less than three days."

Others however, disagree, and argue that carriers should expect terminals to up their game. Andy Lane, partner at CTI consultancy in Singapore, says: "What needs to happen is that port calls need to be handled like F1 pit-stops, with far higher intensity."

Mr Lane argues that 36 moves per hour is "not even a stretch target", on the basis that a typical crane cycle takes around two minutes and averages 1.2 container moves - in fact he argues that a crane cycle could be completed in 90 seconds.

"But we see average performance in large Asian and European terminals struggling to exceed 30 moves per hour. So there is at least 17% waste, but probably a whole lot more in the terminal process," he says.

On the basis that terminals should strive to offer ULCVs the productivity they gave the first generation of post-Panamax vessels, the 6,600 teu *Regina Maersk* class introduced in the mid-1990s, Mr Lane says that to deploy 9.25 cranes per ULCV, which at 36 moving per hour would exchange 6,000 boxes in 18 hours.

"Søren Skou has left money on the table and not asked for enough!" Mr Lane says. "6,000 in 24 hours should be considered as an early milestone - essentially one of few ways in which a terminal can differentiate and avoid commoditisation and competition on price only."

According to CTI analysis from last year, which correlates with the *JOC* productivity figures, the average crane across the world's 12 largest ports handles 187,000 teu per year - ranging from 90,000 teu per year at Los Angeles-Long Beach to 239,000 teu a year at Qingdao. Mr Lane argues that if this is produced by a crane moving 26.7 containers an hour - the global average - then that represents a utilisation of just 50%.

"Getting an average 33 moves per hour out of cranes which are designed to produce upwards of 45 can surely not be difficult. Balancing peaks, a joint responsibility which also involves shippers, and getting utilisation of the bottleneck up to 60% also cannot be considered as a stretch target," he adds.

What has become clear as this debate moves into its next phase is that while cranes are able to make many more

moves per hour than they currently undertake, they are constrained by the interface between the quay and the yard, although APM Terminals' Mr Duca argues that this aspect cannot be looked at in isolation.

In an interview with *The Loadstar*, he repeatedly stresses the word "holistic" and the need to address "small pockets" where efficiency is lost.



APM Terminals' Alexandru Duca

"The first thing to be improved is the mind-set. We need to take a step back and engineer a complete solution for the crane interface - and at the same time if we split the terminal operation into smaller parcels we will find there are repetitive processes which can be streamlined."

This theme resonates with Mr Lane. "It has to start with recognition and acknowledgement that doing more of the same will not produce different or better results - that would be close to insanity. New strategies need to be hatched and implemented, and then to be consistently and relentlessly championed top-down, combined with organisational capabilities, enhanced to support the strategy."

"What gets measured gets done - do we measure enough of the right things? And this is not solved by "big-data" or "business intelligence" dashboards - it needs engineering from the execution processes and upwards. There is good data in the quay and yard cranes - about production - but it is used (and secretly kept) by maintenance or engineering departments," he says.

And terminals will need help from carriers if they are to raise productivity. "It is also not a singular effort - we also need much greater cooperation with shipping lines. A well-planned stowage, for example, is also very important to achieve these targets," Mr Duca says.

There is huge financial gain at stake for carriers, especially as most try to emulate the tremendous cost savings that Maersk has extracted from its business over the last few years - which

## TOP TERMINALS WORLDWIDE

TERMINAL NAME	PORT NAME	COUNTRY	BERTH PRODUCTIVITY
APM Terminals Yokohama	Yokohama	Japan	180
Tianjin Port Pacific International	Tianjin	China	144
DP World-Jebel Ali Terminal	Jebel Ali	United Arab Emirates	138
Qingdao Qianwan	Qingdao	China	136
Tianjin Port Alliance International	Tianjin	China	132
Ningbo Beilun (Second)	Ningbo	China	127
Guangzhou South China Oceangate	Nansha	China	122
Busan Newport Co Ltd	Busan	Republic of Korea	119
Yantian International	Yantian	China	117
Nansha Phase I	Nansha	China	117
Xiamen Songyu	Xiamen	China	116
South Asia Gateway	Colombo	Sri Lanka	111
Ningbo Gangji Yining	Ningbo	China	110
Dalian Port	Dalian	China	109
Khorfakkan	Khor al Fakkan	United Arab Emirates	108
Yangshan Deepwater Port Phases 3/4	Shanghai	China	107
Hyundai Busan Newport	Busan	Republic of Korea	104
Red Sea Gateway	Jeddah	Saudi Arabia	103
Yangshan Deepwater Port Phases 1/2	Shanghai	China	103
Tianjin Port	Tianjin	China	102
APM Terminals Rotterdam	Rotterdam	Netherlands	102
Meishan Island International	Ningbo	China	102
Salalah Container Terminal	Salalah	Oman	99
Busan New Port	Busan	Republic of Korea	99
Kao Ming	Kaohsiung	Taiwan	99

## TOP TERMINALS AMERICAS

TERMINAL NAME	PORT NAME	COUNTRY	BERTH PRODUCTIVITY
Panama Ports Company	Balboa	Panama	97
APM Terminals Port Elizabeth	New York	USA	82
Lázaro Cárdenas	Lázaro Cárdenas	Mexico	79
North Charleston	Charleston	USA	79
CONTECAR	Cartagena	Colombia	75
APM Terminals Houston	Houston	USA	68
Sociedad Portuaria Regional de Cartagena	Cartagena	Colombia	67
Libra Terminal 37	Santos	Brazil	67
DP World Callao	Caucedo	Dominican Republic	65
Tecon Santos	Santos	Brazil	64

## TOP TERMINALS ASIA/PACIFIC

TERMINAL NAME	PORT NAME	COUNTRY	BERTH PRODUCTIVITY
APM Terminals Yokohama	Yokohama	Japan	180
Tianjin Port Pacific International	Tianjin	China	144
Qingdao Qianwan	Qingdao	China	136
Tianjin Port Alliance International	Tianjin	China	132
Ningbo Beilun (Second)	Ningbo	China	127
Guangzhou South China Oceangate	Nansha	China	122
Busan Newport Co Ltd	Busan	Republic of Korea	119
Yantian International	Yantian	China	117
Nansha Terminal Phase I	Nansha	China	117
Xiamen Songyu	Xiamen	China	116

## TOP TERMINALS EUROPE/MIDDLE EAST/AFRICA

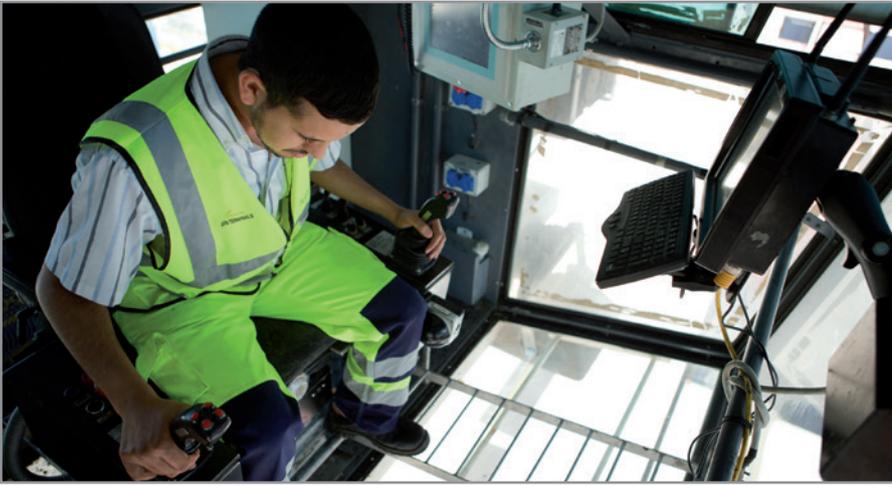
TERMINAL NAME	PORT NAME	COUNTRY	BERTH PRODUCTIVITY
DP World	Jebel Ali	United Arab Emirates	138
Khorfakkan	Khor al Fakkan	United Arab Emirates	108
Red Sea Gateway	Jeddah	Saudi Arabia	103
APM Terminals Rotterdam	Rotterdam	Netherlands	102
Salalah	Salalah	Oman	99
NTB North Sea Bremerhaven	Bremerhaven	Germany	97
ECT Delta Dedicated (West)	Rotterdam	Netherlands	89
EUROGATE	Hamburg	Germany	89
Antwerp International	Antwerpen	Belgium	84
APM Terminals Algeciras	Algeciras	Spain	81

## How the numbers are crunched cont...

different terminals, or why Asia so consistently outperforms Europe and North America.

Neither is it the last word in port productivity benchmarking - if anything, it should only be the beginning of the conversation. The Maritime Port Authority of Singapore has put out a request for proposals to launch a new study on port productivity, said by consultants who have seen the documents potentially to be a "massive contract", and which wanted to extend the scope of benchmarking to include terminal yards. How much benefit that would be to carriers remains to be seen, although for freight forwarders and shippers that are customers of gateway ports it could perhaps provide valuable insight.





berth productivity of the top 10 Asian terminals in 2013 was 111.3 gross cranes moves per hour, whilst in the first half of 2014 it had jumped to 131. In Europe the same comparison was 89.6 in 2013 and 99 in the first half of 2014, while in the Americas it had declined from 78.4 to 74.3.

What is confounding is that in 2012, average berth productivity in the same 10 terminals in Asia was 83.4, in Europe 64.5 and in the Americas 60.1, showing significant progress had been made by 2013.

However while improvements can be made under the current system, there is something of an upper limit, and for the next leap forward, a new way of organising terminal operations will have to be developed.

However, the very recognition of that requirement is a step forward in itself, Mr Duca says.

"We need that stress moment to change; these pressures will change the way that we look at our operations. When the first cars appeared on the streets the people called them horseless carriages, but the improvements that the car has brought to the world are much greater than simply getting rid of horses - we are now making the next step in the industrial revolution after mechanisation."

may well be found in how it chooses its terminals, and organises its rotations. Is this what Maersk means when it refers to "network efficiencies" in its financial reports?

According to CTI analysis, Maersk Line spends some 19% of its total costs on ship fuel - amounting to \$4.6bn per year - and makes around 31,000 port calls with its own operated ships, with 1,500-1,800 moves per call. Mr Lane calculates that a 7% reduction in port stay, say 1.3 hours out of a total of a 13-18 hour call, would "reduce fuel consumption to the tune of maybe \$120m per year", because it would allow the company to steam slower once it had left port.

But is the industry really capable of

achieving these productivity wins? At face value it would appear not. The JOC figures show quite a large jump in berth productivity at the world's leading ports and terminals between 2012 and 2013, but it would appear that things slid backwards last year.

A comparison of the numbers at the top 25 leading ports - where productivity figures have been aggregated over the different terminals - shows that more ports delivered worse productivity levels in the first half of 2014 than improved their performance: 15 saw productivity decline compared to just seven where it improved.

On the other hand, at a terminal level there is definite progress. The average

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