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Beating congestion by building capacity: An overview of new container terminal developments in Northern Europe

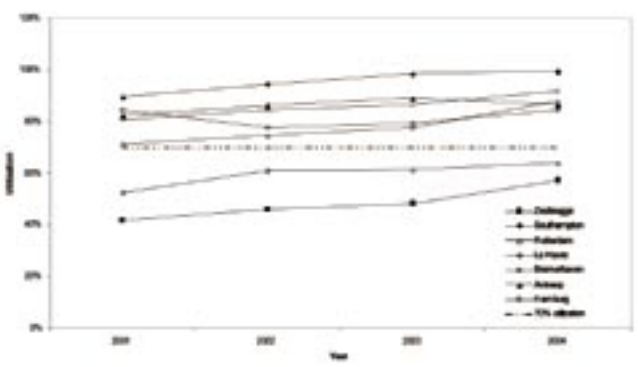
Martin Ilmer, Center of Maritime Economics and Logistics (MEL), Erasmus University Rotterdam, The Netherlands

Introduction

When the first super post-panamax vessels entered the world trade lanes in the late 90's, a lot of speculation started on how this would eventually shape the industry. A new round of economies of scale improvements began. This generated a lot of discussion on what the ceiling in vessel size would be. From an engineering point of view, the propulsion was the main restriction, while economists raised the point that economies of scale gained in one part of the system would be offset by diseconomies in another part. Since early 2004, the latter has become more evident. Present terminal capacity in some parts of the world proved not to be sufficient to deal with the large volumes of cargo originating from Asia. Large scale investments in so called "greenfield" terminal projects were delayed due to extensive consultation processes dealing with environmental and social economic issues. For a number of projects in Northern Europe, like Dibden Bay and Westerscheldt Container Terminal in Flushing, these consultation processes resulted in either project cancellations or renewed investigations on their ecological impact. Other projects, like the Antwerp Deurganck Dock could only start after very serious delays. This article addresses how container terminal investments in Northern Europe are developing and how the balance between the supply of and demand for terminal capacity in this geographical area will look like in 2010.

The drivers behind the usage of terminal capacity

Since early 2004, all ports in the North European range faced a more than average growth pattern triggered by high volumes of cargo arriving from Asia. Despite the attention given by terminal operators, it transpired that certain ports had more difficulties to deal with this growth than others had. Not only the availability of terminal capacity played a role, but also how it was utilised. In general, a container terminal starts getting congested when its utilisation exceeds 70%. Utilisation is the ratio between the actual throughput and the designed capacity of a terminal. One of the key drivers behind utilisation is, therefore, throughput and as such, rising container volumes carried on larger vessels lifted the utilisation in certain ports considerably. Apart from this, non-adherence to berthing windows due to delays or congestion encountered in previous ports and last minute coastal rotation changes to offset these delays caused further pressure on the available terminal capacity in certain ports.



Source: Drewry Shipping Consultants

Figure 1. Container terminal utilisation in North Europe.

It is clear that if the 70% utilisation level is taken as benchmark nearly all North Continental load centres entered the area of congestion. Terminal performance is not only affected by a disrupted arrival pattern of vessels, but also by how swiftly containers are removed from a terminal. Increasing dwell times put pressure on spatial yard capacity and landside delivery, and collection peaks create disruptions in the workload planning at terminals. Captured between these land and sea side activities, container terminals try to stretch existing resources to the maximum in order to deliver the required performance. From the demand side it is interesting to note that the delivery of very large container vessels in the next three years will have a further impact on available berthing windows and terminal capacity (see Table 1).

The deployment of these large vessels is fundamentally restricted to two trade lanes: Transpacific and Europe – Asia. In order to launch an additional service on the Transpacific, five vessels are required, while a Europe – Asia service needs eight. Under the assumption that no serious scrapping of older tonnage will take place in the next years and that the new tonnage will be equally distributed over respective trade lanes, the consequences will be rather large. The 7,000+ TEU new build range alone is sufficient for nearly 13 weekly additional loops on both the Transpacific and Europe – Asia trade lanes. When evenly spread over the week, the main North Continental load centres will receive two additional 7,000+ TEU vessels every day by 2009.

TABLE 1: DELIVERY CELLULAR CONTAINER CAPACITY

	2005		2006		2007		2008	
Capacity range	**Vessels**	**TEU**	**Vessels**	**TEU**	**Vessels**	**TEU**	**Vessels**	**TEU**
> 7,000 TEU	32	265,091	56	486,092	46	406,905	34	303,690
5,000 / 6,999 TEU	43	237,632	32	193,023	48	280,615	54	320,889
< 4,999 TEU	241	481,910	245	554,120	249	595,830	128	394,773
Total	**316**	**984,633**	**333**	**1,233,235**	**343**	**1,283,350**	**216**	**1,019,352**

Source: BRS Alphaliner

If the next capacity range (5,000 – 6,999 TEU) is included as well, this figure will double to four. A container terminal needs to have a degree of spare capacity to work effectively. Given the fact that terminal activities are derived from the developments in global container trade, this effectiveness can only be achieved when investments follow this growth pattern. A careful evaluation of upcoming terminal expansion programmes and its timing is required to assess whether the future supply of handling capacity can cope with the demand for it.

The start of the 21st century: A moment of accelerated growth

The major deep sea ports in the Hamburg – Le Havre range have seen their growth accelerating with double digit figures over the last several years. Increased imports of Asian products, mainly from China, led to an unpredicted increase of container traffic bound for European ports. This prompted a number of terminal operators to rethink their future handling capabilities both in terms of expected volume and the dimensions of the vessels being ordered by their customers. The initial reaction was to enhance existing productivity levels by adding more ship-to-shore cranes, or replacing them with bigger ones, updating yard equipment and by further optimising and fine tuning terminal processes to cope with the growth in volume. By the same token a number of new capacity initiatives were developed to deal with both anticipated volume growth and increased vessel dimensions. Apart from this, carriers started to show an interest in operating their own terminal facilities as well. Securing handling capacity, creating a competitive edge and cost reductions are often cited as the main reasons for this. When we zoom in on a country by country basis in the Hamburg – Le Havre range, the following plans exist to upgrade terminal handling capacity in the coming years.

Germany

The state-of-the-art robotised Altenwerder terminal in Hamburg opened in the summer of 2002 and already reached a 1.26 million TEU throughput by the end of 2004. From a strategic point of view the German carrier Hapag Lloyd has taken a 25% share in this terminal complex. Further expansions should lift Altenwerder's capacity to 3 million TEU in the near future. Given the very high growth figures for this port, mainly caused by high import volumes from particularly China, further investments may be required to absorb this growth. Spatial restrictions in the port of Hamburg are limiting expansion options to the Western and Central part of the port. The planning, however, is to double capacity of the four terminals active in Hamburg by 2008 as Table 2 shows.

Figure 2. Artist impression of the JadeWeserPort complex.

Source: Port of Bremen

In Bremerhaven, the Eurogate operated container terminal started the CT4 expansion in 2004. This followed the CT3a project that was completed in 2003. CT3a added another 340 meters of quay wall. The CT4 project will complement this with a further 1,700 metres of quay wall lifting the overall terminal capacity by 2.2 million TEU by the end of 2007. The total capacity of Eurogate's facilities in Bremerhaven will by then have reached a figure in excess of 6 million TEU per annum.

Since Hamburg and Bremerhaven are both tidal ports, fully loaded 8,000+ TEU vessels with a draught of at least 14 meters can only be received during high tide. In order to overcome this tidal restriction and to anticipate on further volume growth the State of Lower Saxony and the Hanseatic city of Bremen agreed to build a new container terminal in the Port of Wilhelmshaven. This project, called JadeWeserPort, creates terminal facilities to accommodate fully laden vessels with draughts up to 16 meters independent of tide. Subject to official approval, foreseen in mid 2005, these facilities can be in service in 2010 adding another 2.7 million TEU of deep water container capacity to the German port infrastructure.

Provided JadeWeserport is delivered on time, German deep sea capacity will grow up to 22 million TEU in 2010 (see Table 3).

TABLE 2: TERMINAL CAPACITY IN HAMBURG

Terminal operator	Current capacity (in TEU per annum)	Planned total capacity in 2010 (in TEU per annum)
Eurogate Container Terminal Hamburg	1,600,000	3,300,000
HHLA – Container Terminal Burchardkai	2,600,000	5,200,000
HHLA Container Terminal Altenwerder	1,900,000	3,000,000
Tollerort Container Terminal GmbH	720,000	2,000,000
Total	**6,820,000**	**13,500,000**

Source: Port of Hamburg

TABLE 3: GERMAN CONTAINER TERMINAL CAPACITY 2010

German container terminal capacity in 2010	Current capacity (in TEU per annum)	Planned total capacity in 2010 (in TEU per annum)
Hamburg	6,820,000	13,500,000
Bremerhaven	3,800,000	6,000,000
JadeWeserPort development		2,700,000
Total	**10,620,000**	**22,200,000**

Source: Ports of Bremen and Hamburg

TABLE 4: ROTTERDAM CONTAINER TERMINAL CAPACITY IN 2010

Rotterdam container terminal capacity in 2010	Current capacity (in TEU per annum)	Planned total capacity in 2010 (in TEU per annum)
ECT Terminals (estimated)	6,800,000	8,000,000
APM Terminals	1,200,000	1,500,000
Euromax Terminal		2,000,000
Total	**8,000,000**	**11,500,000**

Note: The capacity of Rotterdam Short Sea terminals is not included

Source: APM, Euromax

Source: JWD Consultants

Figure 3. Artist impression of the Euromax terminal in Rotterdam.

Source: Port of Rotterdam

Figure 4. Artist impression of the Maasvlakte II development.

Source: Port of Antwerp

Figure 5. Artist impression of the Deurganck Dock complex.

Netherlands

Terminal capacity in the Netherlands is concentrated in two locations: Amsterdam and Rotterdam. The Ceres Paragon Terminal in Amsterdam, which was opened in 2001, contributed around 1 million TEU of handling capacity to the Dutch market. Despite the take over by NYK Lines of Japan, the terminal has not attracted any customers yet. Its revolutionary design around an indented harbour allows handling activities from both sides of the vessel, which could give very high productivity levels. In Rotterdam, terminal development has been a mixture of longer term "greenfield" projects (Euromax and Maasvlakte II) and medium term productivity enhancements. Deep sea terminal capacity is located at ECT's Home, Hanno and Delta facilities, while short sea services are concentrated at the Rotterdam Short Sea Terminal. APM Terminals occupies the Northern part of Delta terminal peninsula. From a capacity point of view the Rotterdam deep sea terminal capacity is estimated to be around 8.0 million TEU, split between 6.8 million for ECT and 1.2 million for APM Terminals. During the last years, ECT has grouped nearly all its large deep sea customers at its Delta facilities. Accelerated investments have been made to develop the remaining part of the Delta Dedicated West terminal by adding extra ship-to-shore cranes and yard capacity. By the beginning of 2008 a further 0.88 million TEU of capacity will be generated as a result of separating the handling of feeder and barge traffic from deep sea traffic at ECT's Delta terminal. Almost simultaneously, the joint venture between Royal P&O Nedlloyd and ECT, the Euromax terminal will be opened.

This pure "greenfield" complex comprises the latest degree of terminal automation and the first phase of this project will add 1.5 million TEU handling capacity by early 2008. It will be complemented by phase two, coming on stream shortly afterwards, lifting the capacity of the terminal to 2.0 million TEU.

The Maasvlakte II development will further increase the Rotterdam based terminal capacity. However, the delivery of this project, around 2011, falls outside the scope of this article. It goes without saying that Maasvlakte II will provide Rotterdam with substantial opportunities to open additional (dedicated) deep water container handling facilities.

Belgium

The most controversial terminal project in the port of Antwerp has been the Deurganck Dock development. The first phase of this project, severely delayed by environmental and ecological issues, will be opened mid 2005. Concessions have been given to P&O Ports to operate the left bank and PSA to operate the right bank. The first part of the P&O Ports operated terminal will be completed in June 2005, followed by the PSA operated terminal in November 2005. The combined capacity will be approximately 2 million TEU, growing to 7.5 million TEU by 2008.

Despite the delays in the project, the timing of the delivery of Deurganck Dock could fit well to absorb the growth in volume, especially when the cargo is destined for the hinterland served by other ports as well. Situated outside the locks, the Deurganck facilities can receive the latest generation of container vessels.

TABLE 5: ANTWERP CONTAINER TERMINAL CAPACITY IN 2010

Antwerp container terminal capacity in 2010	Current capacity (in TEU per annum)	Planned total capacity in 2010 (in TEU per annum)
PSA operated terminals	6,265,000	10,015,000
P&O Ports operated terminals	2,000,000	5,500,000
Total	**8,265,000**	**15,515,000**

Source: P&O Ports and PSA

Notwithstanding the above project, existing Antwerp based facilities of both P&O Ports and PSA will be upgraded in the next several years, influencing the overall container capacity as follows (including the Deurganck Dock – see Table 5).

The two facilities at the port of Zeebrugge, Flanders Container Terminal and Ocean Container Terminal Hessenatie Zeebrugge, jointly offer around 2 million TEU handling capacity. The concession given to APM Terminals to operate and upgrade the Flanders Container Terminal will result in an additional 1 million TEU extra capacity as from 2006 onwards.

North-France

The Port 2000 project is the main driver behind expansion of the port of Le Havre. Ultimately, it will complement the port with 12 additional berths alongside a quay wall of four kilometres long. By the end of 2004, Le Havre's handling capacity equalled 3 million TEU. The first four berths will become available in the second half of 2005 and gradual expansion is planned in the next years to meet the growing demand for container handling. When the project is completed an estimated 4 million TEU of extra capacity will have become available.

The United Kingdom

Note: Only UK ports with a throughput exceeding 1 million TEU have been analysed. Thamesport, Tilbury and Liverpool have container facilities serving deep sea trades, however due to their size they have been left outside this analysis.

TABLE 6: UK MAIN PORT CONTAINER TERMINAL CAPACITY 2010

UK main port container terminal capacity in 2010	Current capacity (in TEU per annum)	Planned total capacity in 2010 (in TEU per annum)
Southampton (estimated)	1,400,000	1,600,000
Felixstowe (estimated)	3,500,000	5,000,000
London Gateway		3,500,000
Bathside Bay		1,700,000
Total	**4,900,000**	**11,800,000**

TABLE 7: CONTAINER TERMINAL CAPACITY DEVELOPMENT UNTIL 2010

Terminal operator	Location	Current capacity (in TEU per annum)	Planned total capacity in 2010 (in TEU per annum)
Eurogate Container Terminal	Germany	1,600,000	3,300,000
HHLA – Container Terminal Burchardkai	Germany	2,600,000	5,200,000
HHLA Container Terminal Altenwerder	Germany	1,900,000	3,000,000
Tollerort Container Terminal GmbH	Germany	720,000	2,000,000
Bremerhaven	Germany	3,800,000	6,000,000
JadeWeserPort	Germany		2,700,000
ECT Delta Terminal	Netherlands	6,800,000	8,000,000
APM Terminals	Netherlands	1,200,000	1,500,000
Euromax Terminal	Netherlands		2,000,000
Ceres Paragon Amsterdam	Netherlands	1,000,000	1,000,000
PSA operated terminals Antwerp	Belgium	6,265,000	10,015,000
P&O Ports operated terminals Antwerp	Belgium	2,000,000	5,500,000
OCTHZ Zeebrugge	Belgium	1,000,000	1,000,000
Flanders Container Terminal	Belgium	1,000,000	2,000,000
Le Havre	France	3,000,000	7,000,000
Southampton	United Kingdom	1,400,000	1,600,000
Felixstowe	United Kingdom	3,500,000	5,000,000
London Gateway	United Kingdom		3,500,000
Bathside Bay	United Kingdom		1,700,000
Total		**37,785,000**	**72,015,000**

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Source: Statistics of various port authorities

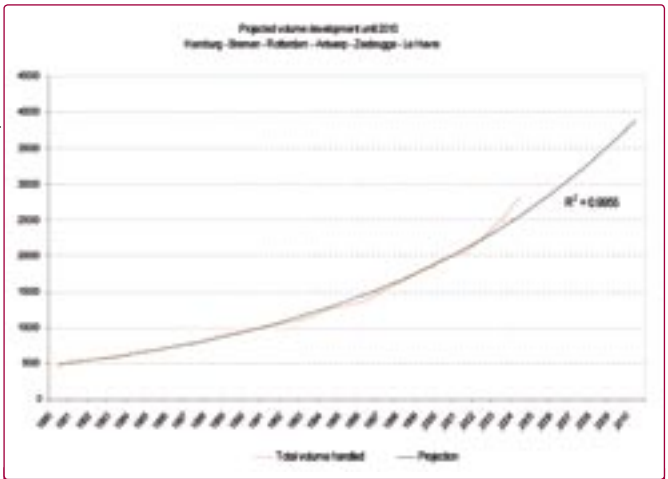

Figure 6. Volume development in a selected number of ports until 2010.

In order to cope with the growing container traffic to and from the United Kingdom, out of the original four major "greenfield" plans three have reached the stage of consultation or implementation. The Dibden Bay proposal, aimed to relieve Southampton Container terminal, was declined due to its environmental impact. Expansion of the Port of Felixstowe by re-developing the South part of the port with a one kilometre quay extension will contribute another 1.5 million TEU handling capacity. Another Hutchison Port development is the Bathside Bay complex in Harwich. This terminal should become the second biggest in the UK covering nearly 2,000 metres of quay wall creating 1.7 million TEU of handling capacity. The public inquiry for this project closed in October last year and the report of this inquiry is presently reviewed by the Secretary of State.

By far the largest project is Shell Haven, better known as London Gateway. The site, a former Shell refinery located on the North bank of the river Thames, will be converted into a 3.5 million TEU container complex managed by P&O Ports. The public inquiry report was submitted to the Secretaries of State in 2004. On the basis of favourable conclusions of the on all above projects, the UK based main port capacity may develop (see Table 6).

Conclusion: Will supply meet demand?

According to various statistics of the ports mentioned previously, the total volume handled in 2004 was 32.3 million TEU. The available handling capacity was 37.8 million TEU, which gives an overall utilisation of 84%.

Eventually, if all the "greenfield" projects materialise within the timescales set, the total handling capacity will increase to 72 million TEU by 2010. The current available capacity will nearly have doubled. The graph in Figure 6 displays the total volume handled in a number of ports from 1980 until 2004. Extrapolation of this data shows an expected throughput of nearly 38.9 million TEU in 2010. The projected available handling capacity for respective ports in the Hamburg – Le Havre range shows a figure of 59.6 million TEU of which 4.7 million TEU is completely new developed "greenfield" capacity (JadeWeserPort and Euromax). Under the assumption that demand and supply develop in this way, the overall terminal capacity utilisation in this port range will be around 65%.

It is rather difficult to draw one single conclusion on whether the supply of terminal capacity will meet the demand for it.

1. Additional capacity will become available before 2010. However, the majority of the projects will be delivered in full as of 2008 or even later. The interim period between 2005 and 2008 will see a continuation of utilisation levels above 70% for a number of ports.

2. A number of large projects are still in the consultation stage, especially in the United Kingdom, causing uncertainty whether extra capacity can be delivered in time.

3. The demand for terminal capacity relies heavily on the developments in world container transportation. The latter depends on how and in which direction the global economy will evolve. Despite the huge order book for cellular tonnage, there is no guarantee that the economic growth figures, as seen in the past, will continue. A softening growth in world trade and in particular the position China has in this, may leave large 8,000 TEU+ vessels underutilised and may give container terminals operators time to breath.

ABOUT THE AUTHOR

Martin Ilmer joined the Center of Maritime Economics and Logistics (MEL) at the Erasmus University in Rotterdam in 2003, following a career at P&O Containers and P&O Nedlloyd. He holds a master's degree in Maritime Economics and Logistics and lectures maritime logistics.

ABOUT THE ORGANISATION

The **Erasmus Center for Maritime Economics and Logistics** (MEL) is an inter-faculty scheme of Erasmus University Rotterdam (EUR). The Center's objectives are to offer postgraduate and executive, in-company, educational programmes in Maritime Economics and Logistics and to constitute a focal research point in that field at Erasmus University Rotterdam (EUR).

The Center is part of both the Rotterdam School of Economics and the Rotterdam School of Management. On the one hand, the Center builds upon the tradition on maritime research that was initiated at Erasmus in the 1930s by Jan Tinbergen and his student Tjalling Koopmans, both Nobel laureates in 1969 and 1975 respectively, and on the other hand, the Center builds upon the prestige and the academic excellence guaranteed by the constant recognition of the Rotterdam School of Management as a top Business School in the world.

ENQUIRIES

Martin Ilmer MSc
Center for Maritime Economics and Logistics (MEL)
Erasmus University Rotterdam
PO Box 1738
3000 DR Rotterdam
The Netherlands

Tel: +31-10-4081480
Fax: +31-10-4089093
E-mail: ilmer@few.eur.nl
Website: www.maritimeeconomics.com