

TRENDS IN THE CONTAINER SHIPPING AND NEED OF A NEW GENERATION CONTAINER TERMINALS AND CONTAINER VESSELS

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Abstract: The development of container transport in recent years marks a constant intention for increased cargo flows. Projections indicate continued upward trend of container traffic. For 2020 is expected traffic of containers in the world to reach 371 million TEU, an increase of more than twice than that in 2008. Another characteristic of the modern container traffic is the globalization of the market. The dynamic development of container transport requires a change in the structuring and reorganizing workflow container terminals. It also requires change in the type and capacity of the container vessels involved in the reorganized transport schemes. In these changes imposed by the hierarchy of container terminals stands etc. "Hub-and-spoke" container terminal and thus transport scheme which includes a new generation of ships carrying containers (mother vessels).

Keywords: CONTAINER TERMINAL DEVELOPMENT, TRANSPORT TERMINALS, MOTHER VESSELS

1. Introduction

The container shipping became very important factor to the world economy. The historical development of the container shipping can be divided into following periods:

- **Introduction (1958-1970)** – From the first containerized commercial services in the late 1950s until the design of the first cellular containerships in the 1960s, the container was an unknown variable in global shipping;
- **Adoption (1970-1990)** - the container became acknowledged as a transport product and investments in intermodal facilities accelerated.
- **Growth (1990-2008)** - Containerization began to seriously impact global trade patterns and manufacturing strategies, particularly with the entry of China in the global economy;
- **2008 is defined as year of maturity** of the container traffic. It will be linked with the maturation of the global economy. This can be linked to a number of factors and different kind of technical, economical limits and to the world recession started in 2008 with impact on the container traffic [1].

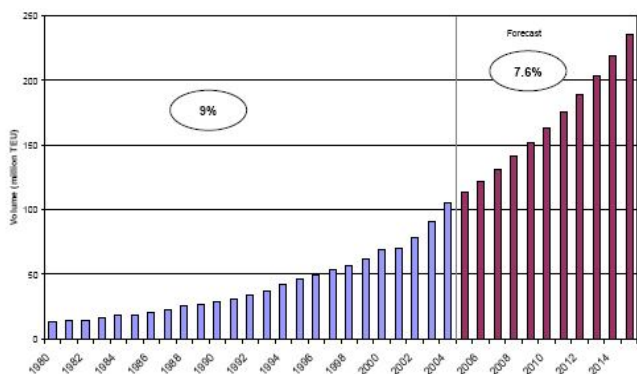


Figure 1 Historical development of the container ships [2]

Between 1990 and 2008, container traffic has grown from 28.7 million TEU to 152.0 million TEU, an increase by about 430%. This corresponds to an average annual compound growth of 9%. The forecasts suggest continued trend of increasing of the traffic of containers between 2008 and 2020 with average rate from 7%. It is expected a traffic from 371 million TEU in 2020 [3].

As shown in Figure 1 Historical development of the container ships [2], the forecasts predict stable growth of the container traffic in the next years. This requires changes in the organization of the container transport and reflects on the capacity of the container ships.

According other newer statistics the Global Economic Crisis from 2008 has a negative impact over the container traffic, there are given different possible scenarios for the container traffic flow beyond (see Figure 2 Historical periods in the container shipping development, scenarios after the World Economic Crisis 2008 /2009 [4]:

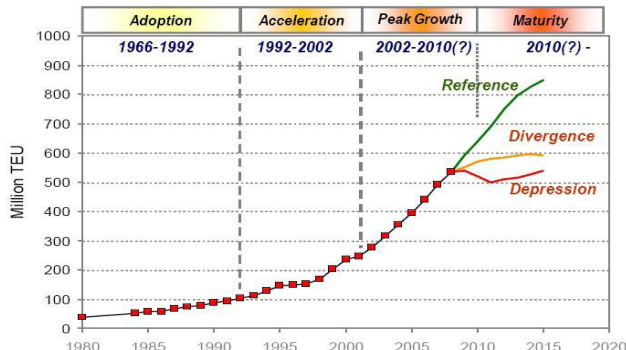


Figure 2 Historical periods in the container shipping development, scenarios after the World Economic Crisis 2008 /2009 [4]

- **Depression** – the worst scenarios – the container traffic will continue to decrease;
- **Divergence** – the container traffic levels before the crisis will not be achieved;
- **Reference** – sustainable growth as in the past decade – the best scenarios;

Studies show that at the beginning of 2010 traffic has gradually recovered and in Europe has reached the levels before the global recession, which is encouraging for the realization of the third and most beneficial of these scenarios [5].

Purpose of these paper is to summarize the last tendencies in modes of transportation of containers, the trends in the development of the container ports and the in the container ships.

2. Containerships

The growth in the container traffic leads to growth in the capacity of the container ships. The ship owners prefer to use larger container ships in order to lower the costs for carriage of tone cargo.

In the last years (after 2006) occur the sixth generation container ships from class Panamax – the biggest one Emma Maersk is with capacity 12500 to 13000 TEU according the configuration.

The limitations for the sizes of the containerships are mainly geographical and then technical. But also the optimal size of the containerships have to be compromise between the scale factor (leading to water transport) and to what extend is cost-effective processing of such vessels in ports.

In the Figure 3 Past and forecasts global container volumes [6] are shown the containerships generations in historical plan and with their main dimensions.









		Length	Draft	TEU
First (1956-1970)	 Converted Cargo Vessel	135 m	< 9 m	500
	 Converted Tanker	200 m	< 30 ft	800
Second (1970-1980)	 Cellular Containership	215 m	10 m 33 ft	1,000 – 2,500
Third (1980-1988)	 Panamax Class	250 m	11-12 m 36-40 ft	3,000
	 Post Panamax	290 m		4,000
Fourth (1988-2000)	 Post Panamax Plus	275 – 305 m	11-13 m 36-43 ft	4,000 – 5,000
Fifth (2000-2005)	 New Panamax	335 m	13-14 m 43-46 ft	5,000 – 8,000
Sixth (2006-)	 New Panamax	397 m	15.5 m 50 ft	11,000 – 14,500

Figure 3 Past and forecasts global container volumes [6]

In the diagram given in Figure 4 Maximum ship’s size by year of build [6] is shown the tendency of increasing of the capacity if the new build ships.

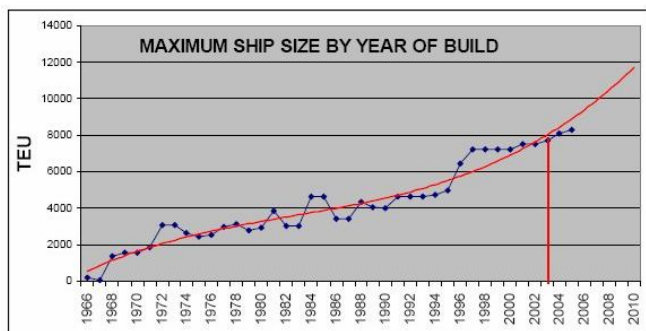


Figure 4 Maximum ship’s size by year of build [6]

The container vessels from last generations have a special specific role in the container traffic, because of the listed geographical limitations and economical reasons they do not visit every port in the shipping line. They are serving only between so called transshipment ports and are known as “mother vessels” – the new vessel in the ship hierarchy.

The capacity and main dimensions of the containerships in their hierarchy is shown in Table 1 Container ships hierarchy [6]

The shipping between the ports of call is realized by ordinary feeder container ships.

Vessel type	Dimensions	Number of containers
Small Feeder Ship breadth up to	approx. 23.0 m	Up to 1,000 teu
Feeder Ship breadth	approx. 23-30 m	1,000 – 2,500 teu
Panamax Ship breadth equal to Ship draught for passing canal, up to Overall ship length	max.: 32.2 / 32.3 m (106ft) 12.0 m (39,5 ft) 294.1 m (965 ft)	2,500 – 4,500/5,000 teu
Post-Panamax Ship breadth larger than	max.: 32.3 m	4,500/5,000 – 10,000 teu
Suezmax Ship breadth up to Ship draught up to Draught x breadth up to Overall ship length up to	max.: 70 m 21.3 m (70 ft) Approx. 820 m ² 500 m	10,000 – 12,000 teu
Post-Suezmax One or more Suezmax dimensions are not met		More than 12,000 teu

Table 1 Container ships hierarchy [6]

3. Container ports (terminals)

As mentioned above there is a hierarchy in the container terminals too [3]. There are two main groups:

- Gateway ports (small ports – destination of feeder ships);
 - Direct call ports;
 - Feeder ports;
 - Niche ports – small ports as local monopolies;
- Hub ports (transshipment ports)
 - Global hubs
 - Regional hubs

The first are well known ordinary container terminals, existing from the first period of the containerization to now.

Interesting are the “hub” container terminals as new generation ports (terminals), where is conducted “transshipment of containers”:

- Containers are unloaded from mother vessels, stored and loaded on board of different number smaller feeder container ships to be transported to the final recipient.
- And back -the feeder container ships are carrying other containers, which are unloaded in the transshipment ports, grouped according their destination and loaded on the board of mother vessels.

The development of transshipment terminals is close related with following facts [7]:

- The increase of the ship’s size in recent years - the container ships from last generation can’t operate in the national port calls;
- The operating costs in the direct call ports increase versus these in the transshipment ports;

- The transshipment ports offer more attractive opportunities to the carriers and the line operators: greater storage capacities, rapid processing, modern equipment etc.

The global hubs are the greater existing container terminals. They usually are located close to the main maritime routes.

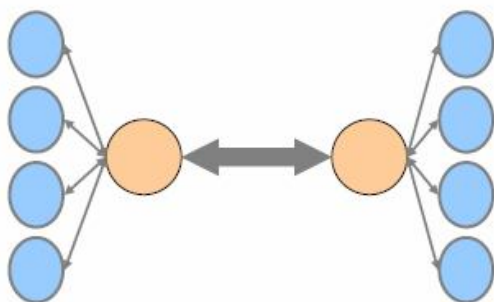
According a ranking of "top 20" container terminals in the World for 2009 – the most busily of them is port of Singapore with throughput 29 973 200 TEU in 2008 (the peak year in the world container shipping), followed by 3 Chinese ports: Shanghai, Hong Kong and Shenzhen.

The nearest to Bulgaria hub port according this list are Istanbul (52nd place) and Constanta (80th place) [8].

The tendency in the development of "hub" container terminals is to build them "offshore". So are eliminated some of the negatives related to the increasing draft of the ships from last generation and the limited water dept onshore, where usually are placed the ports. The building of the ports offshore decreases the additional costs for dredging works.

4. Transportation modes

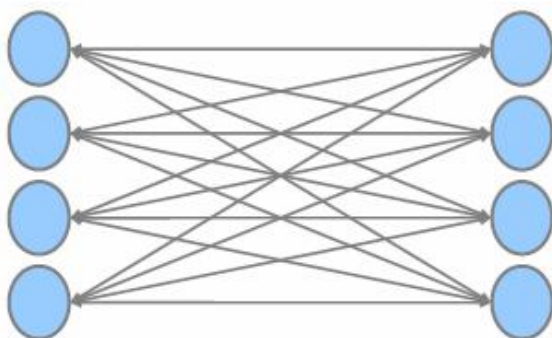
The introduction of the transshipment terminals in the recent years lead to the development of a new transportation model – hub and spoke model. The principle of working of this model is shown on Figure 5 Hub and spoke network principle [3]:



Hub-and-spoke network:

Figure 5 Hub and spoke network principle [3]

In this example model are given total 9 connections – one of them is operated with mega container ships (mother vessel) and the rest with short sea services (feeder container ship). The figure represents the nature of the described network. The number of the ships included will be different for each specific region. The main factors defining the network are: the cargo flows (mainly) and the number of the linear operators working in the port.



Point-to-point network:

Figure 6 Point to point network principle [3]

In comparison to this model the well known traditional model "point to point" given as example is characterized with 16 independent connections, as illustrated on Figure 6 Point to point network principle [3].

As demonstrated in the figures, the point to point network is more complex then the hub and spoke network. This results in:

- The number of the ships included;
- The size of the ships able to be included in the network;
- The duration of the loading and unloading operations;
- The equipment of the ports;
- The complexity of the logistics of both networks;
- Last but not least is the competitiveness of both ports, especially in terms of the World economic crisis and the period after that.

The introduction of the hub and spoke container terminals and models doesn't mean the end of the port of call terminals, because they are the real connection with the onshore transportation facilities – railways, cars, channel and river transport. The ports of call leave important stage in the total transportation chain the difference is that they are not single and have to work with cooperation with the bigger hub ports.

The introduction of the new transportation chain has advantages and disadvantages as follow [3]:

First will be listed the disadvantages:

- The bigger ships are always accompanied with higher risk;
- The bigger ships need deeper water, greater berths, more powerful cranes and port facilities – this network need great investments in infrastructure;
- Because of the longer time for operation the economy of the scale in the ship's dimensions can be lost;
- When more then one hub ports are placed close to each other is a risk, that the cargo flows can easy move between them and this is a serious risk for the investor;

The advantages are as follow:

- Can be achieved higher frequency of service using the same fleet activities;
- In the hubs can be realized economy of scale – when using efficient distribution system and handling with great cargo capacities;
- Can be realized economy and of scope when use shared facilities;
- The ship owners can optimize the number and capacity of their ships;
- The presence of hub container terminal in a region ensure work for the ports of call in the same;
- The presence of hub terminal in a country increases its competition in the region and has positive impact on the economic.

5. Conclusion

The World economy crisis affected negative the maritime business and specifically the container shipping, although it was a leader in the cargo shipping in the recent years. After a peak in year 2008 followed a decline in the cargo flows and reorganization of the shipping lines. The statistic from 2010 indicates promising to revive the container market and achieving of the pre-crisis levels.

Before the Economic crisis started a processing of development and introduction of a new: ships, ports and working networks and models. In the hierarchy appeared:

- Mega ships (mothervessels) with mega capacity, while serious restrictions because of their dimensions;
- Hub ports – powerful, modern and expensive facilities with high potential and competition;
- Hub and spoke network – as possibility to increase frequency of the service;

The investments in the recent years are particularly risky, and that is understandable to the situation.

But the globalization of the World economic, the leader role of the Asia market and particular of the factor China required assessing the risk, the feasibility, the necessity and economic benefit of introduction of new transport schemes in a region.

In the present paper are discussed the features, the positives and negatives of the implementation of the new transportation schemes.

References:

- [1] Jean-Paul Rodrigue, Claude Comtois and Brian Slack (2009) "The geography of the transport systems"
- [2] Regional shipping development, Container traffic forecast 2007 Update
- [3] Ghislain Lorthiois "Container shipping : impact of mega container ships on ports in Europe and the Med" – MAREFORUM 2008
- [4] Elsayeh M. Mohi-Eldin Elkolla M. Mohamed "The impact of the financial crisis on container terminals (A global perspectives on market behavior)";
- [5] European Liner Affairs Association, April 2010
- [6] <http://www.eurans.com.ua/eng/faq/containerships/>
- [7] Container Transshipment and Demand for Container Terminal Capacity in Scotland
- [8] Container management 2009, World top container ports