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ANALYSIS OF THE STRUCTURE OF TRANSPORTED CONTAINERS IN THE ADRIATIC FEEDER SERVICE WITH A RETROSPECT ON THE PROPORTION AND EFFECT OF EMPTY CONTAINERS ON THE SERVICE

In performing the feeder service, shipowners are faced with the problem of transporting empty containers. Trends on the market often cause import and export disparity, due to which it is necessary to transport empty containers by joining them to the cargo, i.e. their emplacement is necessary. An empty container is a kind of ballast in a shipowner's feeder business because it takes up the same space as a full one, and brings only half the freight.

An analysis of the Adriatic feeder market in 2004 which included the ports of Rijeka and Ploče, and Lošinjska Plovidba as a shipowner, showed a highly unacceptable ratio of full containers to empty ones amounting to 70:30, which was almost double the proportion of empty containers on well-established feeder markets such as the North European feeder market.

Key word: feeder service, ratio of full to empty containers

1. INTRODUCTION

In the 1990s the traffic in Croatian ports was minimal, especially the container traffic, which almost ceased to exist, mostly due to the war on that territory which was the cause of general insecurity.

At the same time there were trends toward the globalisation of the market that had an impact on cargo transport. Furthermore, traffic tended to concentrate in a small number of ports while the size of the ships engaged in the transport increased. Due to the reduced quantity of cargo on the Adriatic container market the direct container lines from Croatian ports could not survive, which lead to establishing of shipping lines between Croatian ports and large transhipment terminals in the Mediterranean which mega-shipowners call at.

As far as the structure of transported containers is concerned, three basic categories can be distinguished, and they are as follows:

- container type,
- container size,
- content.

According to type, containers can be divided into standard containers, containers for special purposes (refrigerating containers, containers for transport of liquids, containers for transport of oversize cargo etc.).

The difference in size chiefly refers to the length as there are 20 ft containers and 40 ft containers.

As for the content, the main difference is whether a container is full, i.e. whether it contains cargo or is empty.

Container service or feeder service also includes transport of empty containers at a mega-shipowner's booking request. It is particularly important to a shipowner to transport full units. However, the shippers can rarely comply with such a request and consequently empty containers are often transported together with the full ones. The question is what is the proportion of empty containers in short sea shipping transport, how it effects the operation of the shipowner and what is the proportion of empty containers on well-established markets such as the North European feeder market.

This analysis should show the proportion of empty containers in the Adriatic feeder service.

2. THE ADRIATIC FEEDER SERVICE

The Adriatic feeder service[1] is the system of connecting the Croatian ports of Rijeka and Ploče with the Mediterranean transhipment terminals (HUB ports) of Gioa Tauro, Malta and Taranto. The analysis focuses on the container traffic carried by the feeder service of Lošinjska plovidba – Brodarstvo d.d. (Lošinjska Plovidba), i.e. containers transported by ships the Lipa, the Lošinj and the Susak, in 2004.

In 2004 the feeder service of Lošinjska Plovidba had a turnover of 56,510 TEU[2], i.e. 36,289 transported containers. The proportion of full containers was 69.73%, while 30.27% were empty ones. In 2004 the ships "Lipa", "Lošinj" and "Susak" transported 56,024 TEU, i.e. 35,940 containers[3]. The proportion of full and empty containers that were transported is the same. One TEU equals one standard 20 ft container. One 40 ft container equals two 20 ft containers. Therefore, the equation is as follows:

- 1 TEU = 20' container
- 2 TEU = 40' container.

A feeder service voyage consists of a ship rotation from an Adriatic port to transhipment terminals and their return to the Adriatic ports. The voyage itself can be divided into:

- the outgoing voyage, and
- the incoming voyage.

The outgoing voyage includes loading containers in the Adriatic ports which are to be transported to the Mediterranean transhipment terminals. For the purpose of this analysis the Adriatic ports will be considered the ports of Rijeka and Ploče.

The incoming voyage includes loading containers in the transhipment terminals to be transported to the Adriatic ports. From the data obtained it is easy to see whether a particular port is mostly oriented towards import (unloading) or export (loading).

3. THE PORTS OF RIJEKA AND PLOČE

As a rule the port of Rijeka is the starting port of the feeder service. Most of the traffic in the port of Rijeka involves import and export of cargo of the Republic of Croatia, or transit of cargo to be transported to or from Hungary, Austria, Czech Republic, Slovakia and Serbia and Montenegro. The traffic in the port of Ploče usually consists of transit goods to or from Bosnia and Herzegovina, and Serbia and Montenegro, and partly the southern counties of the Republic of Croatia.

During 2004 the ports of Rijeka and Ploče were involved in the feeder service performed by three ships of Lošinjska Plovidba, and they are the RO-RO ships "Lipa" and "Lošinj", and a LO-LO ship the "Susak". In the course of 2004 these ships made 98 voyages for the purposes of feeder service.

During 2004 the Croatian ports of Rijeka and Ploče involved in the feeder service of Lošinjska Plovidba had a total turnover of 31,061 TEU, i.e. 20,130 transported containers, as follows:

- the port of Rijeka 16,869 TEU,
- the port of Ploče 14,372 TEU.

Taking transported containers as a unit, the turnover is the following:

- the port of Rijeka 11,202 containers,
- the port of Ploče 8,938 containers.

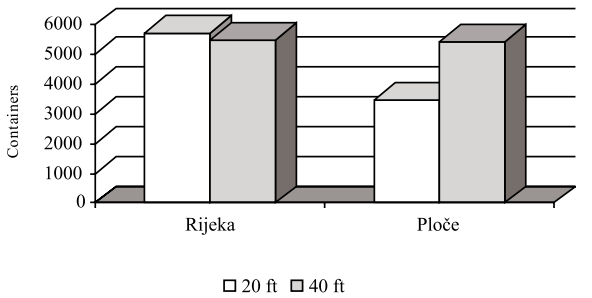
Further analysis of the container turnover in the above mentioned ports, taking in consideration the container size, shows that there were 45.70 %, i.e. 9,100 20ft containers, and 54.30%, i.e. 10,931 40ft containers[4].

[1] Feeder service is a system of container transport from transhipment terminals (HUB ports) to the ports of destination, and vice versa. It is more thoroughly elaborated in *Komparativna analiza RO-RO/kontejnerski brod feeder servisa Lošinjske plovidbe (Comparative Analysis of RO-Ro/Container Ship Feeder Service of Lošinjska Plovidba);* Sergio Kos, Juraj Bukša: Pomorstvo 2004, pg. 175-188

[2] All the data has been provided by Lošinjska Plovidba as the shpowner performing the feeder service and by the Port Authority of Rijeka as the service coordinator.

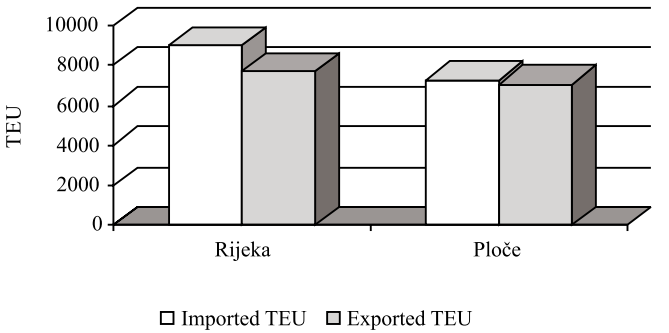
[3] The rest of the containers were transported by the ships "Rijeka" and "Rapoča", owned by Lošinjska Plovidba, which are from time to time used in the feeder service to help out, thus rendering the service more flexible.

[4] In practice 20ft containers are used in transport of cargo which is smaller in size and of heavier weight, while 40ft containers are used in transport of cargo bigger in size and of smaller weight.



Graph 1. The proportion of 20ft and 40ft containers transported to and from the ports of Rijeka and Ploče in the container turnover of the feeder service of Lošinjska Plovidba in 2004.

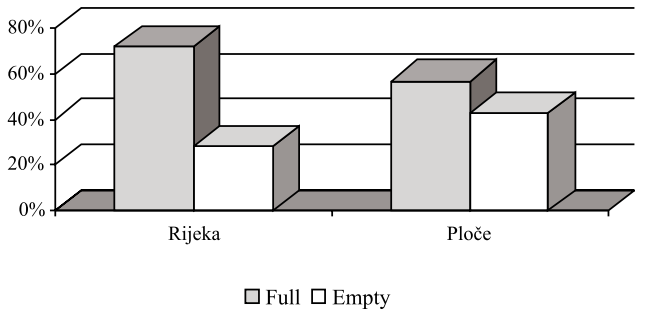
The analysis of the transported TEU in the abovementioned ports with regard to import or export shows that the ratio of the loaded to the unloaded TEU is the same in both ports.



Graph 2. The proportion of the imported and the exported containers transported to or from the ports of Rijeka and Ploče in the turnover of the feeder service of Lošinjska Plovidba in 2004

However, the analysis of the proportion of full and empty TEU shows that there were 65.26 % full TEU and 34.64 % empty TEU[5]. Although since the feeder service was established in March 1999 until today the number of transported TEU has increased 14 times, the ratio of full to empty containers has not changed significantly. One of the reasons is the lack of containers to be exported from the ports of Rijeka and Ploče. Furthermore, mega-shipowners have no other choice but to use the Adriatic feeder service also for emplacement of their containers to transhipment terminals.

[5] In seaborne transport there are empty containers due to the lack of cargo to fill them up in a particular port. In that case their emplacement is necessary to the ports where there is cargo to be exported, i.e. to be loaded. A high proportion of empty TEU in the export of a port is a good indicator that that port is mostly oriented towards import. Furthermore, a high proportion of empty containers in transport is an additional burden



Graph 3. The proportions of full and empty containers in the ports of Rijeka and Ploče transported by the feeder service of Lošinjska Plovidba in the course of 2004

The proportion of empty TEU in the total TEU transported to and from the port of Rijeka within the feeder service of Lošinjska Plovidba is almost 30% [6], while that of the port of Ploče is almost 45%.

3.1. THE PORT OF RIJEKA

During 2004 in the feeder service system of Lošinjska Plovidba the port of Rijeka had a turnover of 16,869 TEU, i.e. 11,202 containers. Since the feeder service incoming voyage and outgoing voyage can be distinguished, the structure of the turnover will be analysed accordingly.

The outgoing voyage includes loading the cargo in the Adriatic ports, in this case the Croatian ports of Rijeka and Ploče, to be transported to the transhipment terminals of Gioa Tauro, Malta and Taranto.

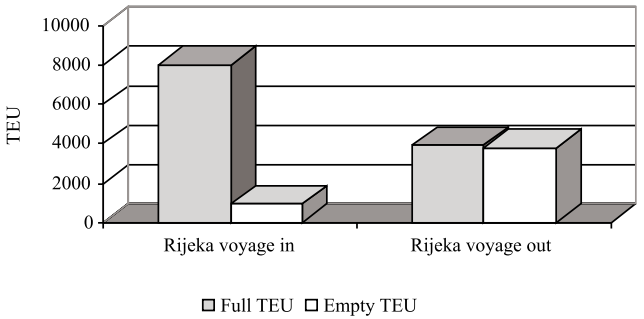
In the outgoing voyage the port of Rijeka had a turnover of 7,707 TEU, i.e. 5,000 containers. The proportions of the empty and of the full TEU were the following:

- 3,916, i.e. 50.81% full TEU,
- 3,791, i.e. 49.19% empty TEU.

On the other hand, in the incoming voyage, the port of Rijeka had a turnover of 6,202 TEU, i.e. 8,982 containers. The proportions of the empty and of the full TEU were the following:

- 8,022, i.e. 89.31 % full TEU,
- 960, i.e. 10.68 % empty TEU.

[6] According to *Bommen, L.: The North European Maritime Container Feeder Market, Sjöfartens Analys Institute Research, Göteborg*, 2002, pg .61, the average proportion of empty containers in the North European feeder service is 17%.

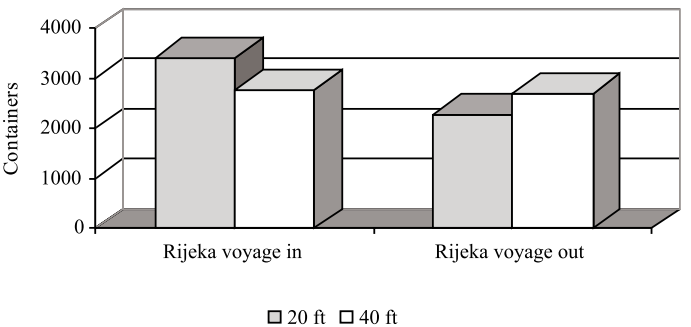


Graph 4. The proportions of full and empty containers transported to and from the port of Rijeka within the feeder service of Lošinjska Plovidba in the course of 2004.

Out of 5,000 containers, which was the turnover of Lošinjska Plovidba in the port of Rijeka, there were:

- 5,715 20 ft containers
- 5,487 40 ft containers.

The following image shows that 20 ft containers prevailed in the incoming voyage, while 40 ft containers prevailed in the outgoing voyage.



Graph 5. The proportions of 20 ft and 40 ft containers in the incoming voyage and in the outgoing voyage in the turnover that the feeder service of Lošinjska Plovidba had in the port of Rijeka in the course of 2004

The abovementioned data indicate that import prevails in the port of Rijeka as far as the Adriatic feeder service is concerned. The proportion of empty TEU in the outgoing voyage is almost 50%.

3.2. THE PORT OF PLOČE

During 2004 in the Adriatic feeder service system of Lošinjska Plovidba the port of Ploče had a turnover of 14,372 TEU, i.e. 8,928 containers.

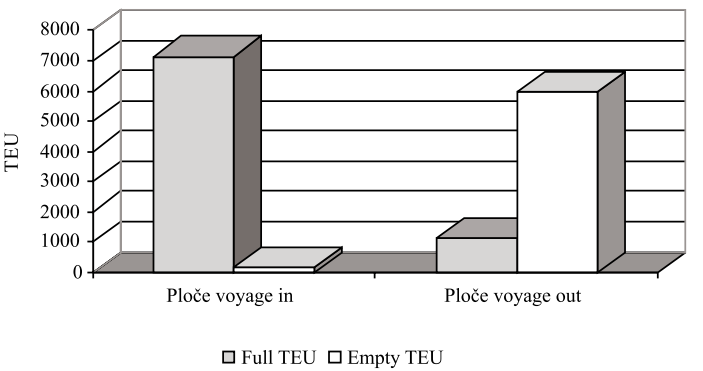
In the outgoing voyage the port of Ploče had a turnover of 7,089 TEU, i.e. 4,414 containers. The proportions of the full and the empty TEU were the following:

- 1,121, i.e. 15.81 % full TEU,
- 5,968, i.e. 84.19 % empty TEU.

The ratio of full to empty containers in the port of Ploče clearly indicates that import prevails in the port of Ploče.

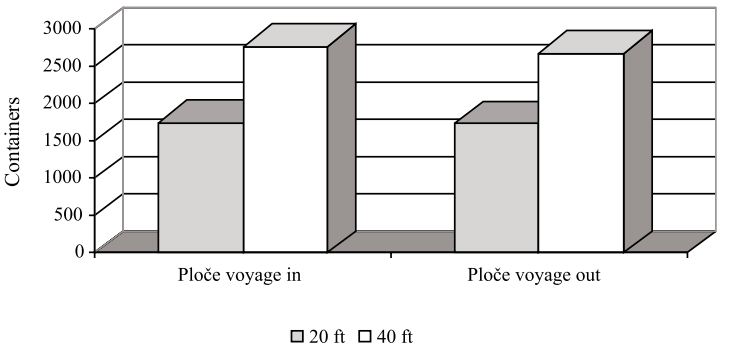
In the incoming voyage the port of Ploče had a turnover of 7,283 TEU, i.e. 4,514 containers. The proportions of the full and the empty TEU were the following:

- 7,130, i.e. 97.9% full TEU,
- 153, i.e. 2.1% empty TEU.



Graph 6. The proportions of full and empty containers transported to and from the port of Ploče within the feeder service of Lošinjska Plovidba in the course of 2004.

The analysis shows that the containers transported to and from the port of Ploče are mostly 40 ft ones. However, taken the fact that the port of Ploče is mostly oriented towards import, we know that almost 85% of the containers transported from the port of Ploče did not contain any cargo.



Graph 7. The proportions of 20 ft and 40 ft containers in the incoming voyage and in the outgoing voyage in the turnover that the feeder service of Lošinjska Plovidba had in the port of Ploče in the course of 2004

The analysis of the structure of containers according to their length shows that in both voyages, incoming and outgoing 40 ft containers prevail.

4. THE INFLUENCE OF EMPTY CONTAINERS

The question is what is an acceptable proportion of empty containers transported in container liner shipping, i.e. how does the transport of empty containers influence the shipowner's business and what is the effect of the ratio of 20 ft containers to 40 ft ones on container transport.

Transport of empty containers is unavoidable in a feeder service mainly due to the following:

- The general situation on the feeder market sometimes brings about a disproportion in the demand for containers among the areas where transport is done, due to which there are empty containers to be transported, which are then directed to other destinations.
- The demand for specific types of containers (for example refrigerating containers) can bring about a disproportion if the freighters insist on certain particularities, and the forwarders do not provide them in due time.
- Fragmentation of the market also leads to a hold-up due to a lack of equipment or insufficient reloading capacity causing imbalance, which affects the whole market.

The influence of empty containers in transport on the liner business of the shipowner is shown in the analysis which has been carried out.

The freight is the main shipowner's source of profit and it is in his best interest to use as much capacity as possible and to transport as expensive cargo as possible.

The following expression represents the Adriatic container market:

$$f\,FC = 2fEC \quad (1)$$

where:
f = freight [US $]
EC = empty container
FC = full container

The freight for the transport of a full container per TEU on the route between a HUB port and Croatian ports and vice versa is double the freight for the transport of an empty container.

If the proportion of empty containers is 30% per voyage, the expected freight is reduced by 15% while the costs remain the same, which means that the expected profit is reduced.

A ship that transports empty containers makes considerable losses which are proportional to the TEU transported per voyage.

If a certain route brings about the constant ratio of full to empty containers per voyage, the size of the ship, i.e. its capacity, will also affect the amount of the losses.

It can be represented by the following expression:

$$L = fCC - f\,(FC + 0.5EC) \quad (2)$$

where:
L = losses [US $]
CC = container capacity that the ship can transport
f = freight
FC = full container
EC = empty container

The fact that the proportion of empty containers on the Adriatic container market is double as compared to that in the North Europe, and this illustrates how bleak the prospects of the Adriatic feeder shipowners are in comparison to the shipowners in North Europe.

5. CONCLUSION

The Adriatic feeder market, which has been booming ever since it was opened up in 1999, last year, in 2004, reached values that called for a thorough analysis.

The constituent parts of a feeder market are containers, feeder shipowners and ports. It is in their common interest to make as large profit as possible per unit of transported or transhipped cargo.

Containers, which are usually owned by a mega-shipowner and therefore can be considered their constituent parts that they are only temporarily separated from, define the basic conditions on the market. It is in the mega-shipowner's interest that all the transported containers are always full. However, due to trends on the market there is often a disparity

of import and export, due to which it is necessary to transport empty containers by joining them to the cargo, in other words their emplacement is necessary. That part of transport is performed by feeder shipowners. An empty container is a kind of ballast in a feeder shipowner's business because it takes up the same space as a full one, and brings only half the freight.

Port operators, who charge their services by the weight of the transhipped cargo, also suffer losses with each transhipment. The above analysis shows the ratio of full to empty containers in both import and export, which on an average amounts to 70:30, and only by comparison with the North European feeder market, where that ratio is 83:17, does it reveal its importance.

The analysis of the container structure according to the container size, i.e. the proportion of 20 ft and 40 ft containers, shows the ratio of 45:55, which depends on the type and the condition of the cargo to be transported. The influence of the ratio of 20 ft to 40 ft containers is significant only for RO-RO ships and port operators, as their performance is increased when 40 ft containers are being transported or transhipped.

The analysis demonstrates the actual situation on the market and is a basis for further research of such situations, their consequences for the feeder shipowner and port operators as well as for the quest in finding ways of how to reduce the proportion of empty containers on the Adriatic feeder market.

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Sažetak

ANALIZA STRUKTURE PREVEZENIH KONTEJNERA U JADRANSKOM FEEDER SERVISU S OSVRTOM NA UDIO I UTJECAJ PRAZNIH KONTEJNERA U SERVISU

U obavljanju servisa feeder brodari suočeni su s problemom prijevoza praznih kontejnera. Kretanja na tržištu često dovode do nerazmjera uvoza i izvoza, zbog čega je potrebno prazne kontejnere prevesti do tereta, odnosno potrebno je njihovo pozicioniranje. Prazan kontejner u prijevozu predstavlja svojevrstan balast u poslovanju feeder brodara jer na brodu zauzima isti prostor kao i puni kontejner, a donosi upola manju vozarinu.

Analizom stanja na jadranskom feeder tržištu koja je uključila luke Rijeka i Ploče te brodara Lošinjsku plovidbu, za 2004. godinu uočen je izrazito nepovoljan omjer punih i praznih kontejnera koji iznosi 70:30, što je gotovo dvostruko više nego na formiranim feeder tržištima poput sjevernoeuropskog.

Ključne riječi: feeder servis, odnos punih i praznih kontejnera

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