

# Intermodal transport as an integral part of logistics system

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**Abstract** The experience of companies that are successful in the carriage of goods prove that intermodal transport is now a major factor in determining the success of logistics system. A modern approach to the transport is based on intermodal transport. The article is based on the method of external observation. It presents the essence of intermodal transport and its benefits. It specifies transportation as an integral part of logistics system.

**Key words** – transport, intermodal transport, logistics system

## 1. Introduction

Transport is the movement of people and goods from one location to another, using different modes of transportation. Therefore, the objective is to provide cargo delivery in a timely manner, in good condition and at an acceptable cost. Because of many different modes of transport, it plays an important role in the Polish economy and intensifies the development of cities, regions and countries. Especially, Poland's central location has a great strategic importance.

Unfortunately, it is not fully utilized. The obstacle is a low level of transport infrastructure. Among a variety of modes of transport, intermodal transportation becomes significant. E. Mendyk defines intermodal transport as the transportation of freight without any handling of the freight itself when changing modes (MENDYK E. 2002).

Intermodal transport is usually defined as the multimodal carriage of goods by rail, sea or inland waterways over the primary route, with the use of road carriage in the initial and final segments of the route. The article presents intermodal transport as an integral part of the logistics system and shows its role in the economy.

## 2. Transport as a part of logistics system

Transport is an integral part of the logistic system because is the physical link that connects raw materials, finished products, customers and suppliers. As pointed out by E. Horvath and A. Torok (HORVATH E., TOROK A. 2015) increasing transport activity is a basic human necessity and a key factor of economic growth which, in turn, has a large effect on environmental pollution. Transport appears in every phase of the sup-

ply chain, from raw material procurement, to production and distribution of finished products, to end users. For this reason, it is based on a process approach.

It should be noted that the process approach gears towards both internal and external customers. Hence, allowing transport enterprises to receive signals from the environment and to respond to them rapidly, which affects the development of competitiveness. This approach focuses on teamwork, information flow and communication based on trust. As pointed out by R. Ulewicz and M. Mazur manufacturers are interested in optimizing operational costs and the increase of production (ULEWICZ R., MAZUR M. 2013).

A company manages only those actions that are able to quickly and efficiently identify, meet and even create customer needs and expectations. All the actions leading to this goal are the essence of the process approach (GRAJEWSKI P. 2007).

Recently, the key role in transport has been played by logistics that suggests systemic organizational and technical processes - from suppliers, through production, on to customers. In transport companies, common problems such as empty loads, rising fuel prices and demands for internationalization are growing and thus companies are searching for solutions to adequately overcome these issues (CVAHTE T., TOPOLŠEK D., STERNAD M. 2015). When reduction of production costs can no longer provide growth and economic efficiency of enterprises, then the efficiency of chains and networks, and logistics processes determine competitiveness (KARKULA M. 2009).

The key to the resource-based strategy is to have a set of skills, tangible and intangible resources and processes. In this case, the first task will be to develop and implement appropriate business processes by optimizing the three main criteria: cost, time, and customer satisfaction (FILIPOWICZ P. 2004). The implementation of the strategy through the processes' rendition will guarantee the optimal process.

Logistics processes can accomplish many tasks and targets. Mostly, those goals are identified with the implementation of the task, which is delivery of certain goods to the right place and at the right time. The procedure for task execution requires the fulfilment of certain conditions, which include the implementation of specific tasks (sub-processes) that constitute the

main process--the process of logistics (JEZIERSKI A. 2009).

Logistics is hidden in these activities and gives the product or service the value of time and place (TOPOLŠEK D., JEREB B., CVAHTE T. 2016). Enterprises whose managers understand the principles of the process and logistics approach and systematically manage them, are able to respond more effectively to changing customer expectations and objectives defined at the organizational level.

### 3. The essence of intermodal transport

The concept of multimodal transport (NEIDER J., MARCINIAK-NEIDER D. 1997), also known as intermodal or combined transport, is defined in the United Nations Convention on International Multimodal Transport of Goods (Geneva, 24 May 1980). According to the Convention, international multimodal transport means the carriage of goods by at least two different modes of transport on the basis of a multimodal transport contract from a place in one country, at which the goods are held liable by the multimodal transport operator, to a place designated for delivery, situated in a different country.

In the field of multimodal transport there are three terms that are slightly different, although in practice they are used interchangeably. Developed by CEMT (European Conference of Ministers of Transport), definitions of new types of transport processes carried out by different modes of transport include (ROMAN Z. 2006):

- intermodal transport as a freight transport in one and the same loading unit, or road vehicle, which uses successively two or more modes of transport without handling the goods themselves, in changing modes and which is performed by a single operator
- multimodal transport as a freight transport performed by a single operator which includes at least two modes of transport
- combined transport as a freight transport by at least two modes of transport, which is independent on each section of transport process.

An essential condition defining the type of multimodal transport is the carriage in unit loads, such as

containers, swap bodies and semi-trailers (ROMAN Z. 2006a) "Integration with respect to combined transport means an assembly of various projects aimed to connect the individual cells of a complex combined transport in a one functionally and institutionally coherent transport process" (SZWANKOWSKI S. 1998). Integrated transport chains are the vision of the development of the transport sector in accordance with the concept of sustainable development of transport, and, simultaneously, they promote intermodal transport.

The United Nations Economic Commission for Europe created European Agreement on Important International Combined Transport Lines and Related Installations (AGTC). This international agreement, also signed by Poland, was ratified on April 1, 1991 in Geneva. It sets out the organizational and development objectives of intermodal transport. In order to succeed in developing the concept of integrated transport chains, one should adhere to the following factors:

- status and opportunities for infrastructure development,
- market liberalization,
- organization and management methods,
- degree of implementation of innovative technologies and systems,
- methodologies of logistics solutions,
- level of unification and standardization,
- economic aspects (service prices, taxes, insurance),
- security standards and environmental protection.

Figure 1 presents the combined transport chain.

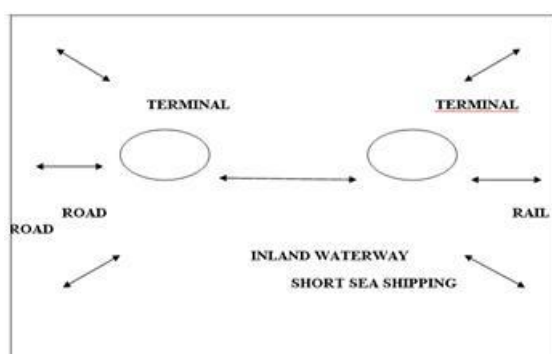


Fig. 1. Combined transport chain

Source: WRONKA J.2002

There are two main chains of combined transport. Land and water:

- railroad, road and inland waterway or rail and inland waterway – the main carriage is by rail and

inland waterways, while the carriage by road is only to/from land or water terminals.

Land and sea:

- rail-sea or road-sea – the main carriage is via water and rail transport, while road transport is used only to/from ports.

Combined transport is the integration of transport processes in the transport chain at all levels: technical, technological, organizational, documentary, pricing and legal. The level of integration is very important from the point of view of the user, as well as for the service provider (ZALOGA E., STĘPIEŃ G. 2005) (Table 1).

Table 1. The potential benefits for the combined transport participants

Participants	Expected benefits
Railway	One of the few areas of potential growth and the transport market segment which can compete with road transport.
Shipping companies and ports	The development of new products and entering new markets. The integration of short sea shipping reach into the sea-land intermodal transport chains with the key role of seaports.
Shippers	Lower transportation costs, additional alternative transportation, increased safety.
Road transport operators	Better resource management, increased safety on the roads, neutrality of combined transport towards clients, better use of means of transport, reduced personnel expenses (reduced driving hours).
Combined transport operators	Better resource management, more alternatives for freight transport.
Authorities, politicians, society	Implementation of sustainable transport by increasing market share of environmentally friendly transport industry and technology. The inhibition of environmental degradation by road transport and, consequently, a significant reduction in the external and social costs of transport and energy con-

	sumption. Increased competition leads to more rapid introduction of market principles in transport.
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Source: WRONKA J. 2002a

#### 4. Intermodal transport processes in economy

Intermodal transport is a complex process that connects different modes of transport. Transportation of unit loads in the railroad system in Europe has its own separate rules. In many countries there are associations (joint-stock companies) whose principal activity is the organization of intermodal transport. They associate entities serving all types of cargo units; railway companies, car transporters and freight forwarders. Services provided by railroad transport companies are based on (JEZIERSKI A. 2009a):

- handling freight trains running between shipping and receiving terminals,
- handling organized groups of wagons, which can be transformed into regular trains on selected transport sections,
- handling individual wagons with unit loads attached to scheduled trains.

In Europe, there are three major operator systems that create combined transports (ČERVINKA M. TYKVA T. 2010):

- system of national combined transport associations affiliated to the International Union for Railroad Combined Transport (French.: Union Internationale de Societes de Transport Combine Rail-Route - UIRR),
- Internationale Gesellschaft für die Entwicklung des Kombinierten Verkehrs (ICF),
- System of International Company for the Development of Combined Transport – (German: Intercontainer-Interfrigo. Internationale Gesellschaft für die Entwicklung des Kombinierten Verkehrs (ICF).

One of the most significant international intermodal transport operators is Intercontainer-Interfrigo Society (ICF) SA (NEIDER J. MARCINIAK-NEIDER D. 1997), established and registered in 1967 in Brussels, which brings together 23 European railways shareholders. ICF operates under Belgian law with the general direction, commercial and operational offices in Basel, Switzerland. ICF organizes international com-

bined transport, mainly by containers in Europe and in the Far East. Inclusive within the ICF system is maritime freight transport. Moreover, the company conducts membership marketing and canvassing, thereby selling services of its member.

#### 5. Conclusions

To conclude, intermodal freight transport is defined as the use of two or more modes to move a shipment from origin to destination. As pointed out by J. Kubicki and A. Kuriata, each of those modes performs, more or less, autonomous tasks in the transport chain. It should be noted that the transport of goods enables a steady production increase and connects regions and countries. Thus, building one integrated economic complex. It contributes to reduction in the global transportation cost, increases the number of modes of transport, improves the quality of services and makes the shipment more prompt, efficient and safe.

#### Literature

1. CVAHTE T. TOPOLŠEK D. STERNAD M. 2015. *The impact of clustering on transport companies*, „Production Engineering Archives”, Vol. 7, No 2, pp 25-28.
2. ČERVINKA, M. - TYKVA, T. 2010. *Vliv regionální politiky a jejích nástrojů na rozvoj podnikatelského klimatu a znalostní ekonomiky*, „Ekonomika Management Inovace”, 2010, vol. 2, no. 1, p. 63–70.
3. FILIPOWICZ P. 2004. *Strategia organizacji a zarządzanie procesami [w:] Podejście procesowe w zarządzaniu*, red. M. Romanowskiej, M. Trockiego, Oficyna Wydawnicza Szkoły Głównej Handlowej w Warszawie, T.I. Warszawa, s. 137 (Organizational strategy and process management [in] The process approach to management).
4. GRAJEWSKI P. 2007. *Organizacja procesowa. Projektowanie i konfiguracja*, PWE, Warszawa s. 106 (The organization proces. Design and configuration.).
5. HORVATH E. TOROK A. 2015. *Development of road transport emission standards*, „Production Engineering Archives”, Vol. 7, No 2, pp 6-10.

6. JEZIERSKI A. 2009. *Model referencyjny procesu logistyki* [w:] *Podejście procesowe w organizacjach*, red. S. Nowosielski, Wrocław, s.281( Reference model Logistics process [in] Process approach in organizations.).
7. KARKULA M. 2009. *Modelowanie symulacyjne jako narzędzie doskonalenia procesów logistycznych na przykładzie centrum logistycznego* [w:] *Podejście procesowe w organizacjach*, red. S. Nowosielski, s.231(Simulation modeling as a tool to improve logistics processes on the example of a logistics center [in:] Process approach in organizations.) .
8. MENDYK E. 2002. *Ekonomika i organizacja transportu*, WSL, Poznań (Economics and organization of transport).
9. NEIDER J. D. MARCINIAK-NEIDER D. 1997. *Transport intermodalny*, PWE, Warszawa, s. 16.
10. ROMAN Z. 2006. *Międzynarodowe przewozy towarów*, Wyższa Szkoła Cła i Logistyki w Warszawie, s. 47-48 (International transportations of goods).
11. SZWANKOWSKI S. 1998. *Lądowo-morskie łańcuchy transportowe*, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk, s.10 (Land and sea transport chains).
12. TOPOLŠEK D. JEREB B. CVAHTE T. 2016. *Increasing competitiveness with intercompany integration of logistics and marketing functions*, „Production Engineering Archives”, Vol. 10, No 1, pp 29-32.
13. ULEWICZ R. MAZUR M. 2013. *Fatigue testing structural steel as a factor of safety of technical facilities maintenance*, „Production Engineering Archives”, Vol. 1, No 1, pp 32-34.
14. WRONKA J. 2002. *Transport kombinowany w aspekcie zrównoważonego rozwoju*, Wyd. Naukowe Ośrodka Badawczego Ekonomiki Transportu, Warszawa-Szczecin, s. 27( Transport combined in the context of sustainable development).
15. ZAŁOGA E., STĘPIEŃ G. 2005. *Uwarunkowania rozwoju zintegrowanych łańcuchów transportowych*, Translog, s. 63 (Conditions for development of integrated transport chains).