*logistics hubs, inland port,*
*berth, transfer,*
*storage, transport*

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## INLAND PORTS IN THE ROLE OF LOGISTICS HUBS

*Logistics hubs are considered for an important element in the logistics chain. They reduce downtimes during transport of cargo between suppliers and consumers. They offer a wide range of logistics services such as handling, storage or distribution of cargo. Logistics hubs which arise randomly or according to a set mode have various forms. Inland ports can also be considered for logistics hubs. Inland ports together with vessels and waterways create the pillars of the inland navigation system. They participate in transport of cargo between consignors and consignees.*

## VNÚTROZEMSKÉ PRÍSTAVY V ÚLOHE LOGISTICKÝCH CENTIER

*Logistické centrá sú považované za dôležitú zložku v logistickom reťazci. Znižujú prestoje počas prepravy nákladu medzi dodávateľmi a spotrebiteľmi. Ponúkajú širokú škálu logistických služieb ako manipulovanie, skladovanie alebo distribúcia nákladu. Logistické centrá, ktoré vznikajú náhodne alebo podľa stanoveného modelu majú rôznu formu. Vnútrozemské prístavy sa tiež môžu považovať za logistické centrá. Spolu s plavidlami a vodnými cestami vytvárajú piliere vnútrozemskej plavebnej siete. Podieľajú sa na preprave nákladu medzi odosielateľmi a spotrebiteľmi.*

### 1. INTRODUCTION

Inland ports are the places on the waterway (a navigable river, a canal or a lake) where inland water transport meets with other mode of transport (rail and water transport). They consist of land and water area. Each inland port has got at least one berth in which cargo is transferred by cranes, is stored on the open areas or in the warehouses and is transported by other means transport (wagons, trucks). Due to significant changes in the world since the second half of the twentieth century inland ports have transformed into multimodal logistics hubs. They offer various logistics services such as transfer, storage or transport of cargo, passenger or vessel services.

### 2. LOGISTICS HUBS

Logistics hubs are the places in the logistics chain where two and more mode of transport (mainly road and railway transport) meet there. They consist of the complex of the

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buildings, facilities and devices which provide a wide range of logistics services such as transfer of cargo, its storage, handling, packaging and transport. These hubs perform the complex services according to the labour division including information and communication technologies.

**2.1. The role and division of logistics hubs**

The main role of these hubs is to increase the quality and efficiency of transport, the management of transport flows. These hubs arise in the places where transport flows are concentrated; important transport routes intersect each other and where the directions of transport flows alter. Natural localities for their location are economic and industrial agglomerations, transport junctions, container terminals, state borders, sea or inland ports and so on.

According to the establishment logistics hubs can be divided into two groups. The first group consists of the hubs which arise randomly according to the actual requirements and the development of market (most hubs arise this way). The second group consists of the hubs which arise according to a set model.

The main determinants for the location of these hubs are:

- transport routes and their capacity,
- transport infrastructure (a direct connection of the logistics hub with other mode of transport),
- the distance between the urban city and the logistics hub,
- the distance between customers and the logistics hub,
- the distance between an airport / inland port and the logistics hub,
- the total area of the logistics hub and its possibilities for a next development.

The disposition of the logistics hub depends on the volume of transport flows, the structure of handling products and its infrastructure. The most important parts of logistics hubs are transhipment areas and their infrastructure (handling facilities and devices, road and railway infrastructure), storage facilities (warehouses and open storage areas) and so on.

In multimodal logistics hubs there are concentrated:

- container terminals,
- entities which carry out transport operations (forwarders, carriers, navigation companies),
- entities which offer various services associated with cargo (custom or quality inspection, tallyman or stevedore services, special treatment of cargo)
- technical, operational and administrative facilities associated with transport (warehouses, facilities which offer various services for instance supplying, repair, guard, rescue and emergency services).

## 3. INLAND PORTS

### 3.1. Division of inland ports

Inland ports are divided into:

1. Business (public) ports. These ports transfer bulk, general and liquid cargo between vessels and other means of transport by different handling devices. They also store cargo in the warehouses or on the open storage areas, transport, pack it to the customers. They usually consist of water and land area. The land of port is equipped by handling devices (gantry or container cranes, fork lift trucks, reach stackers) and infrastructure (roads and railway). It enables transport of cargo between port and hinterland. Business ports are situated in the surrounding of big commercial and industrial areas. They are usually divided into various transhipment sectors according to cargo which is transferred there, for instance transhipment areas for bulk, general and liquid cargo, container terminals, Ro-Ro Ramp for cars, berths for transhipment of oversize or overload cargo.
2. Industrial ports are used by private companies for transhipment of raw materials, semi-finished or finished products between vessels and the land of port. They are usually equipped by specialized handling devices.
3. Passenger ports are used for embarking or disembarking of passengers between vessels and the area of port. They are usually situated in the city centres because their area does not take up too much space.
4. Shipyard ports are used for mending or reconstruction of vessels. They are equipped by gantry cranes, ship lifts, dry or floating docks, warehouses and workshops.
5. Specialized ports are designed for special purpose and special vessels such as military, army, sport, fishing or recreation ports.

Business (public) or industrial ports are the most import ports from the point of transport view.

### 3.2. Handling and storage devices of inland ports

One of the most important roles of inland ports is transfer of cargo. Cargo is transferred between vessels and other means of transport like wagons or trucks without storage. This kind of transhipment is called a direct transhipment.

Because it is very hard to harmonize arrival and departure between vessels and other means of transport the part of cargo is stored on the open areas or in the warehouses. The kind of storage depends on physical and chemical properties of cargo. This kind of transhipment is called an indirect transhipment.

#### 3.2.1. Handling devices

Handling facilities and devices of inland ports are divided into two groups according to type of working cycle.

*Cyclically operating de*vices (different cranes, trucks) work in cycles. The transhipment time and the output of the devices depend on:

- kind of cargo which is loaded / unloaded (physical and chemical properties of cargo),
- the transhipment variant (a direct and an indirect transhipment),
- the trajectory of movement of a jib,
- practical experience of a crane operator.

Gantry cranes (see Fig.1.) which are the most widespread cranes in inland ports are used for transhipment of bulk and general cargo. They consist of three basic parts: a jib, a tower and a gantry which moves on a truck. The jib is equipped by a hook or grab, according to the kind of cargo which is transferred by a crane.

*Fig.1. A gantry crane which transfers bulk cargo*

In container terminals of inland ports there are used container gantry cranes (Fig.2.) for handling of containers. They load and unload containers between vessels and other means of transport. They are larger than gantry cranes and their output depends on the speed of hoisting system of a crane and the transhipment variant.

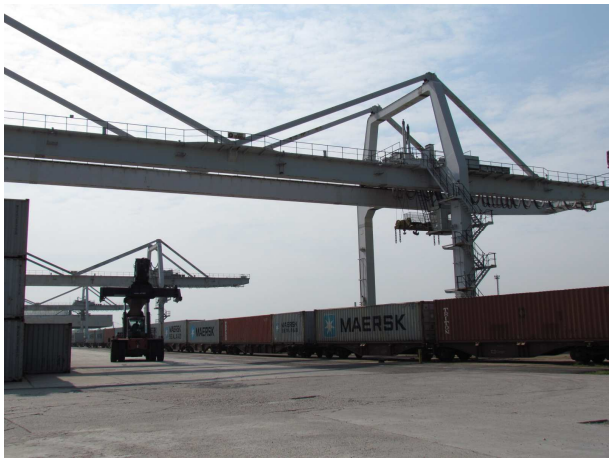


*Fig.2. A container gantry crane in the container terminal*

Reach stackers (Fig.3.) are used for handling of containers between container storage areas and other means of transport. They are better for manipulation of containers than container gantry cranes due to their operating speed. They are used for stacking, loading or unloading of containers and they can manipulate with containers in two and more rows.


*Fig.3. A reach stacker in the container terminal*

Forklift trucks are used for transport of empty containers in the container terminals of inland ports or palettes with cargo between warehouses and open storage areas. On the open areas there are used. In the warehouses there are used forklift trucks with the electromotor. Forklift trucks with a combustion engine are faster and have bigger lifting capacity than forklift trucks with an electromotor.

*Continually operating devices* such as conveyor belts work continually and are used for manipulation of bulk cargo. They have a bigger output than cyclically operating devices. They connect the places of loading with the places of unloading.

**3.2.2. Storage devices**

The part of cargo which is transferred between vessels and other means of transport is stored on the open areas or in the warehouses.

On the open areas there is stored non-sensitive cargo like coal or gravel. Its physical and chemical properties allow it to be stored outside. Weather condition does not influence on its properties.

Cargo which is sensitive for weather conditions like general cargo on pallets (Fig.4.), paper rolls or cartons has to be stored in the warehouses. Not only is it protected against rain, solar radiation, pests it is also protected against damage, loss or theft.

Agricultural products like grains are stored in the special warehouses called silos. They can protect these products against weather conditions and pests for a longer period. In tanks there is stored liquid cargo like petroleum products.


*Fig.4. Bags stored in the warehouse*

**3.3. Infrastructure of inland ports**

Road and railway transport link inland port with the hinterland. These modes of transport carry cargo within the land of the port and between the port and the hinterland. The particular transhipment sectors of the port are interconnected by railway lines and roads (Fig.5.). Railway wagons carry out mainly bulk cargo for longer distances. Trucks carry out mainly general cargo and containers for shorter distance.

*Fig.5. Infrastructure of an inland port*

## 4. CONCLUSIONS

Transport is considered for the most important element in the logistics chain because it connects its individual parts. The downtimes which arise during transport of cargo can be eliminated by the incorporation of logistics hubs in the logistics chain. These hubs perform a lot of logistics services such as transshipment of cargo, its storage or transport by at least two mode of transport. They can arise randomly or according to a set model. Inland ports can also be considered for logistics hubs. They offer a wide range of logistics services such as transfer, storage or transport of cargo. Inland ports are located on the waterways (a navigable river, a lake or a canal) near industrial and commercial areas.

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