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FUNCTION OF TRAIN TRACTION DEPARTMENT AND RAILWAY VEHICLES IN LOGISTIC CENTRES

ABSTRACT

The increasing globalization has spread the production locations to every part of the world thus increasing even more the role of transport in determining the price and quality of a product. Therefore, the producers and carriers join together more and more frequently through the supply chains. Railway carriers have a very significant role in supply chains, both through organization of transport and forming the trains as final products, and through forming the logistic centres. Logistic centres are the starting and the final railway stations but also the meeting points of the national carrier with other carriers (sea, road, river as well as other railway carriers) and they also represent information centres. For the quality of service at logistic centres, it is important to have well organized operation of train traction. In order to keep up the regularity of trains and the quality of transport at logistic centres, among other things, it is necessary to provide an optimal number of locomotives and to provide the technical inspection place. Special attention should be paid to the organization of work performed by the engine staff. At logistic centres it is possible to organize high-quality technical inspection of wagons thus increasing the traffic safety.

KEY WORDS

logistic centres, train traction, rail locomotives, technical inspection place, engine staff, management of railway vehicles

1. INTRODUCTION

Railway traffic in the European countries in the last quarter of the last century experienced a number of changes, ranging from the crisis situations to the new development. The decline of the railway traffic was mostly affected by the fast development of competitive road transport that has had an increasing share in the land transport. A large number of European countries and the fragmentation of the European network of railway lines have additionally aggravated the overcoming of the weaknesses and stimulating of the railway traffic advantages. The foundations of creating the European Union have clearly indicated the orientation towards the development and restructuring of the railways of all the countries. In this segment the basic characteristic is the division of the unique railway system onto the railway infrastructure and railway carriers. The next important aspect that affected the future development of railway traffic is the globalization and development of the global market, which brought to the allocation of the preparation of raw materials and semi-products, and thus also to the formation of new transport flows.

The most important advantages of road transport are the flexibility, acceptable lower safety standards, possibility of transporting smaller volumes of goods and the possibility of complete "door-to-door" service. Therefore, the railway traffic has been naturally oriented to mass transportation and the development of cooperation with maritime carriers. Fast development of road transport has increasingly led to congestion of roads, and to greater environmental pollution. The development of ecological awareness and the need to save energy increasingly lead to considerations about land transport as an integral unit which includes road and railway transport as well as combined transport. Logistic centres become thus the meeting places of different land carriers.

The development of railway traffic in Europe is based on the White Paper and EU guidelines which direct the activities towards functional consolidation of the railway companies and accounting and organizational separation of the railway infrastructure and railway carriers. Thus, the railway infrastructure remains under the control of the state which takes care of the traffic safety and regulation through the infrastructure manager, as well as for the maintenance and development of the railway network. In this way the creation of high-quality and modern European network of railway lines is provided, that will be interoperable and stan-

dardized in the future. On the other hand, railway carriers are classified into the passenger carriers and the cargo carriers. This is also where the issue of the formation of train traction and technical inspection of wagons remains, as important elements for each railway carrier. Until now, several models of organizing railway carriers have been developed, and they have proven more or less good due to the geographic, economic, political as well as culturological differences between EU member countries, so that work continues on finding an optimal and separate solution for each railway company. By defining the function of train traction and technical inspection of wagons in logistic centres, the preconditions are created for greater cooperation within the railway transport area.

According to the present organization of the Croatian Railways, the railway traffic area consists of:

- passenger transport,
- cargo transport,
- train traction,
- railway vehicles and Technical inspection of vehicles.

The development of market with expressed competition in the conditions of globalization have forced the production companies to a series of business changes and adjustments to business policies, which has led to using up of all the possibilities for future major rationalization within the restructuring processes. The very fact that the raw materials and semi-products are increasingly purchased from all the world markets, leads to the conclusion that the companies can realize major rationalization in the future through less expensive and higher quality delivery, i. e. affecting the transport flows leading to the development of cooperation between the production companies and carriers. Logistic centres are places of their future cooperation. In this way the market battle between competitive companies turns into a market battle between supply chains. The operation of supply chains depends, among other things, also on how well they are organized and therefore also on a maximally well defined function of train traction and technical inspection of wagons at logistic centres.

2. SUPPLY CHAINS AND LOGISTIC CENTRES

Before defining the role of logistic centres it is necessary to analyze the definition of supply chains:

«Supply chain includes, thus, all the participants from the raw materials producers to finished product consumers. For all of them it is of greatest importance to ensure profit from their activities and competitive advantage important for the market position in the future, with the reduction of logistic costs. »

For the efficiency and profitability of the supply chain it is important to note the concepts of integration, differentiation, rationalization and flexibility.

According to the definition, the supply chains can be divided into the following segments:

- producers of raw materials and semi-products,
- transportation companies in transport chains,
- companies in logistic chains,
- logistic centres, and
- production companies.

2.1 Transport companies in supply chains

Transport companies in supply chains appear in all the transport modes, from sea, railway, road, river to air transport. Railway transport companies realize their service through train operation and through operation at large cargo railway stations. Large cargo railway stations are favourably positioned for the creation of logistic centres with all their tasks and roles.

2.2 Logistic centres

Logistics understands all business activities that are necessary for the preparation of production and its realization, as well as the sales of finished products regardless of the operation conditions, whereas transport logistics understands all those activities that allow the transport service process provided by the transport companies. The basic task and role of logistic centres consist in adequate integration of all the participants in the process of transport service including: carriers, suppliers, forwarders, distributors, customs, intermediaries, retailers and others.

Apart from these basic tasks, high-quality information technology system has to be organized, that can provide the following information:

- Information about the transport organization:
  - prices of services of all the transport companies in the supply chain;
  - prices of services of all the participants in the logistic chain;
  - information on the movement and condition of goods;
  - information about the arrival and delivery of goods.
- Information on products:
  - data on products;
  - prices in supply of products in the supply chain;
  - prices in product demand in the supply chain;
  - delivery deadlines.

Regarding railway transport services, apart from the train schedule, it is necessary to optimally harmonize also the organization of train traction and the technical inspection of wagons, and therefore, for

high-quality operation at the logistic centre it is necessary to define the following:
- organization of engine staff work,
- provision of the necessary number of railway locomotives,
- provision of the necessary number of railway vehicles,
- technical and inspection place for railway vehicles.

3. TRAFFIC ASPECTS OF LOGISTIC CENTRES

3.1 Organization of train operation

Logistic centres are in practice the start and end points of cargo trains where greater volumes of goods accumulation and where a greater number of railway workers is concentrated. They are established:
- at intersections of traffic corridors,
- at port centres, and
- next to big cities and production plants.

The forming of logistic centres at intersections of traffic corridors from the traffic aspect is primarily in the function of organizing trains in the international traffic and raising the quality of transport services in international traffic.

The function of logistic centres in port centres is based on the development of cooperation between the railway carriers, ports and overseas carriers with the aim of reducing the time schedule of transport and reduction of cargo handling costs.

Logistic centres next to big cities feature a number of functions in the very logistic centres, as well as outside them. The basic advantage is the accumulation of wagons and their distribution by cruise cargo trains to the final traffic places of work. In this way it is possible to remove heavy trucks from the city centres. The distribution of wagons to the final traffic places of work can be organized by means of a special transport company which includes also the engine and train accompaniment and the manoeuvring locomotives for cruise cargo trains.

3.2 Organization of train traction in logistic centres

The organization of work of the engine staff primarily understands provision of high-quality and price-affordable shift of the engine staff (licensed according to EU guidelines because of the possibility of work in international traffic as well).

Since the European network of railway lines has not been made interoperable and standardized yet, it is necessary to ensure high-quality locomotive rolling stock (single-system and multi-system electro-locomotives, diesel locomotives, manoeuvring locomotives), thus overcoming the lack of uniformity in infrastructure.

Logistic centres are places where also different railway carriers can meet, and it is therefore necessary to use the information technology to provide a good solution for the monitoring of the rolling stock so that the carriers could optimally use their transport means.

For a high-quality flow of railway transport, one of the most important issues is the transport safety, so that within the logistic centre it is necessary to organize also the technical and inspection place both for railway locomotives, and for the railway wagons. Such technical and inspection centres should satisfy the strictest European criteria so that their quality of operation and service would attract also foreign railway carriers to the area of technical and inspection activities.

4. FUNCTION OF TRAIN TRACTION DEPARTMENT IN THE LOGISTIC CENTRE

4.1 Railway locomotives

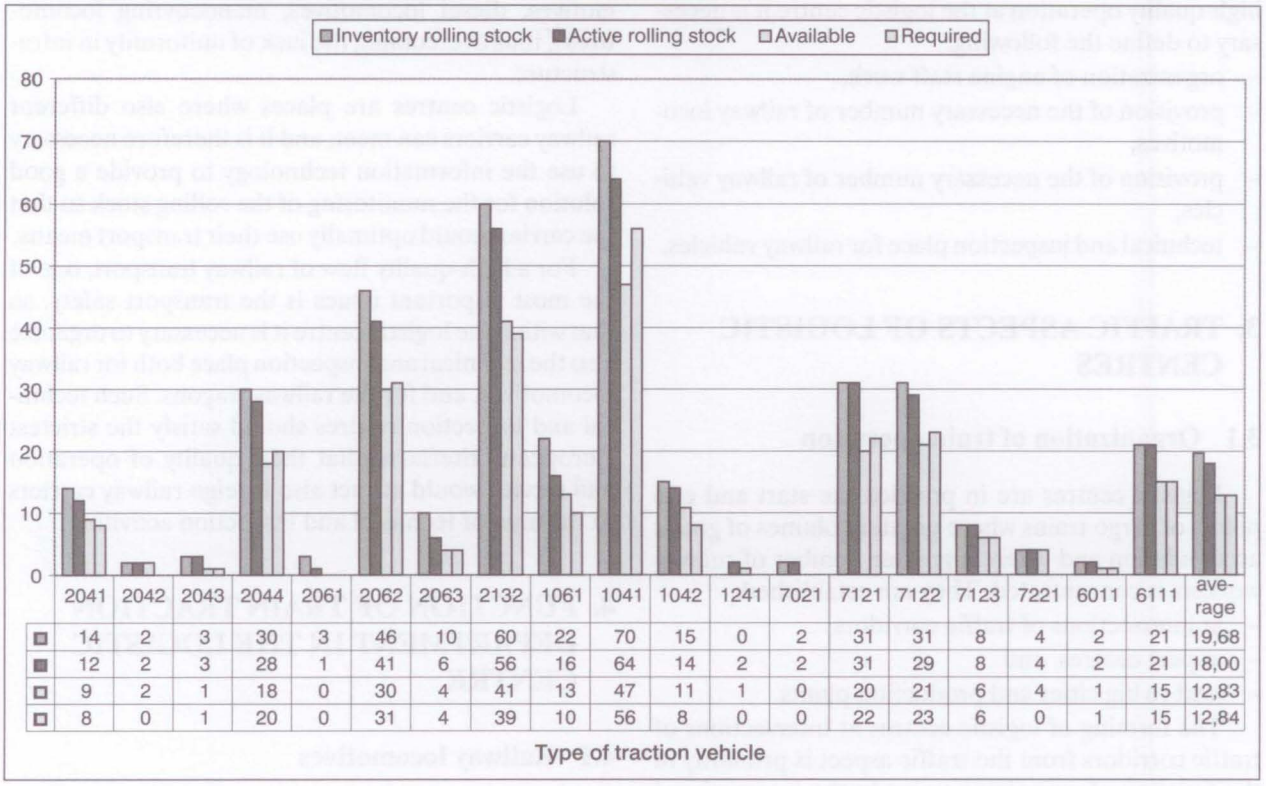
The operation of locomotives in the logistic centre can be divided into two main groups:
- locomotives that operate within the logistic centre, and
- locomotives that enter or exit the centre as part of the train composition or independently.

The basic function of Train traction department is to ensure optimal service of manoeuvring in the logistic centre, and timely train dispatch. In order to fulfil these conditions it is necessary to follow by means of information technology the intervals of regular maintenance of traction vehicles and foresee stops where they need to be supplied by fuel, oil or sand. Each unplanned stop due to poor organization of locomotive operation creates unnecessary additional costs. Inside or in the vicinity of the centre it is necessary to ensure a stable plant or mobile device to provide diesel fuel, oil and sand.

If the logistic centre is in the vicinity of a major city special emphasis in the work of locomotives has to be placed on the reduction of noise and harmful emissions. The conditions for the work of electrical manoeuvring locomotives need to be ensured, which produce significantly less noise in work and do not generate harmful gases. If work is performed by diesel traction vehicles, it is necessary to additionally work on the projects to reduce noise and pollution on the existing series of traction vehicles.

In case of entry or exit of interoperable traction vehicles to and from the logistic centre, it is necessary to ensure the engine staff qualified to manage it. At rail-

Table 1 – Average daily condition of traction vehicles availability



	2041	2042	2043	2044	2061	2062	2063	2132	1061	1041	1042	1241	7021	7121	7122	7123	7221	6011	6111	average
□	14	2	3	30	3	46	10	60	22	70	15	0	2	31	31	8	4	2	21	19,68
■	12	2	3	28	1	41	6	56	16	64	14	2	2	31	29	8	4	2	21	18,00
□	9	2	1	18	0	30	4	41	13	47	11	1	0	20	21	6	4	1	15	12,83
□	8	0	1	20	0	31	4	39	10	56	8	0	0	22	23	6	0	1	15	12,84

ways in the European Union the work is done by means of traction vehicles that are interoperable, and at crossing the border only the engine staff changes. In order to make the locomotive interoperable, it is necessary to ensure software with manuals for particular locomotives in the languages of countries where the work is done. Every country has to issue a special permit for every series of the traction vehicle. Since in some European corridors three systems of electrical traction interchange, the railways that have no multi--system locomotives will not be able to perform the services of traction. In its rolling stock HŽ has locomotives that are on the average some thirty years old, and the purchase of new traction vehicles has to be planned, especially if one wants to operate in the European environment.

4.2 Technical-inspection place

For some time already, the Croatian Railways have been involved in solving the problem of the lack of high-quality technical inspection place which would provide unifying of several technological processes in the work with the wagons and trains. The technical inspection place, as a component of the logistic centre would enable optimization of time necessary for train assembling. In order to optimize the time that the trains and wagons spend at the logistic centre, it is necessary to design software solutions that will allow computerized control of all the activities regarding wagons. Software solutions are also necessary to control regular maintenance of wagons, and especially for the contact points between HŽ and the wagon maintenance.

Provision of garages, stable electricity supply plants and plants for single point brake trials, as well as unifying of inspection places would significantly optimize the need for carriage and wagon examiners.

Within the technical inspection place it is necessary to ensure certain spare parts for wagons and stipulate activities that have to be performed, so that wagons do not have to be labelled because of them nor sent to the workshop.

4.3 Engine staff

The schedule of activities of the engine staff on traction vehicles in the logistic centre additionally restricts the operation of the traction vehicle. Software solutions for the introduction of information technology into the operation of engine staff, significantly facilitate the scheduling of the engine staff activities. Since the work of the engine staff is a cost, it is obvious that work optimization can bring certain savings in everyday work.

The HŽ rolling stock contains 19 series of traction vehicles and 21 units of Train traction department where the engine staff work. The training of the engine staff does not comprise all the series of traction vehicles and the additional training for particular series is done subsequently. Every deviation from the engine

staff working schedule can therefore cause problems and delays in work. In purchasing multi-system locomotives it is necessary to direct attention to locomotives in the environment. These traction vehicles substantially reduce the costs of the work due to simpler education and training of the engine staff, as well as due to easier repairs and supply of spare parts because of the possible locomotive defects in other countries.

For working on interoperable traction vehicles in international traffic the engine staff have to have a licence in compliance with EU guidelines. The European licence for engine operators includes competences, education, validity and ownership of the licence, taking away of the licence and control and assistance in emergency events.

If the engine staff drove in other countries, it is necessary to ensure the essence of the difference in regulations for each railway administration or country separately.

5. RAIL WAGON MANAGEMENT AND TECHNICAL INSPECTION OF VEHICLES

The necessity of accountancy separation first of all of the railway transport and the railway infrastructure, and subsequently of passenger and cargo transport, has imposed the need to redefine the basic means per single business areas of the Croatian Railways, including the ownership of railway wagons, and the solving of the issue of managing and maintaining as well as the technical wagon inspection.

5.1 Management and maintenance of railway wagons

Railway wagons can be divided into the following three groups:

- passenger coaches,
- cargo wagons, and
- wagons for the railway infrastructure maintenance requirements.

Based on this classification it is clear that the majority of railway wagons will be the basic means of railway transport, whereas the minority will be the basic means of railway infrastructure. Further separation within the railway transport and the development of independent companies that operate passenger and cargo transport will impose the need to separate the passenger and cargo wagons as the basic means. This form of distribution of basic means has been accepted in the majority of the European railways.

Apart from such distribution of classifying the basic means, it is possible to keep all the railway companies combined in a single unit and to develop the so-called wagon *pool*. This form of reorganization within the railway transport requires also solving of wagon operative involved in wagon management.

At the Croatian Railways the management of passenger and cargo wagons is carried out in such a way that the properly functioning wagons are managed by CARGO and Passenger transport, and the malfunctioning wagons are managed by Technical inspection of vehicles and wagon maintenance businesses. CARGO and Passenger transport do not own the cargo and passenger wagons, which is not the case in the EU member countries. In the new HŽ organization the wagons will be owned by the mentioned businesses.

Optimization of the times necessary to handle wagons at the logistic centre is possible only by designing software solutions of technological processes at the centre that would enable complete informatization in wagon handling and management. For full computer control in rail wagon management it is necessary to design five applications:

- inventory wagon rolling stock,
- wagon maintenance,
  - regular maintenance,
  - special repairs.
- economic obligations according to UIC regulations, and
- control of proper operation of wagons in traffic, labelling and sending to the workshop.

The mentioned applications allow monitoring of all the costs per each wagon:

- separately for the spent material,
- separately for workforce, and
- guarantees for the installed spare parts.

5.2 Technical inspection of wagons

The activities related to technical inspection are primarily related to technical proper functioning of passenger and cargo wagons, and the regularity of cargo loading into wagons, thus representing the service group of activities for companies that provide services in passenger and cargo transport. Similarly to the case of train traction activities, for the activities of wagon technical inspection there are several forms of organizations within, as well as outside the railway carrier system.

The experiences of single European railway companies have shown that by neglecting the selection of optimal organization forms for the technical inspection activities of wagon the traffic safety is jeopardized to a certain extent. One of the significant advantages of railway transport is the safety, so that the selection of a high-quality solution for the wagon technical inspection activities is also one of the important steps in the development of high-quality transport services in the supply chain.

6. CONCLUSION

The development of European railways based on the White Paper and EU guidelines clearly divides the railway system into railway infrastructure and railway carriers. Railway infrastructure of the European countries is to a great extent fragmented according to its technical characteristics, but also according to technological solutions within railways which greatly reduces the competition of railway traffic compared to road transport. The solution for the existing condition can be seen through the establishment of a European network of railway lines which would consist of:

- interoperable high-speed lines, and
- interoperable conventional lines.

In order to achieve this goal it is necessary to ensure large financial means and a longer period for the implementation of the set projects. With their activities, the Croatian Railways tend to integrate into the development processes of the European railways and to modernize and standardize the international corridors according to high requirements of the European Union. Since the Croatian Railways are still passing through a process of the financial consolidation it would be unrealistic to expect greater financial investments into railway infrastructure over a shorter period of time, so that the expected development of the Croatian Railways within a shorter period of time can be expected through the development of railway carriers.

Business areas of railway transport through the process of modernization and restructuring are planned to be enabled for the market performance. In the first step this is the founding of the railway carriers providing services in passenger transport and establishment of railway carrier to provide services in cargo transport. Apart from these two parts, it is necessary to restructure also the operation of train traction and the activities of the technical inspection of wagons. Depending on the quality, the restructuring of these four areas within the railway transport will affect the entire development of the Croatian Railways, that is, the railway transport in the Republic of Croatia.

On the other hand, market globalization has brought to a situation in which production companies are less and less competitive on the markets, and the competition increases for the supply chains which include production companies, transport companies, companies for the logistic services and trade companies. The entire development of the economy of the Republic of Croatia will depend on the quality of the created supply chain since such chains already exist in the neighbouring and developed countries. The Croatian Railways are the largest land carrier, but also one of the biggest enterprises, and are therefore in the best position to connect all the other participants in the supply chain.

For the Croatian Railways to participate in the creation of the supply chains in the Republic of Croatia, the prospects should be directed towards:

- establishment of a strong railway carrier in cargo traffic (which includes modern and functional logistic centres);
- good solution of the issue regarding train traction operations, and
- good solution of the issues regarding technical inspection of wagons.

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SAŽETAK

FUNKCIJA VUČE VLAKOVA I ŽELJEZNIČKIH VOZILA U LOGISTIČKIM CENTRIMA

Sve veća globalizacija dovela je alokacije proizvodnje u sve dijelove svijeta pa je prijevoz dobio još značajniju ulogu u određivanju cijene i kvalitete proizvoda. Iz tih razloga sve se češće proizvođači i prijevoznici udružuju kroz lance snabdijevanja. U lancima snabdijevanja veliku ulogu imaju i željeznički prijevoznici, kako kroz organizaciju prometa i formiranja vlakova kao finalnih proizvoda, tako i kroz formiranje logističkih centara. Logistički centri su početni i završni kolodvori vlakova, ali i mjesto susreta nacionalnog prijevoznika s ostalim prijevoznicima (pomorskim, cestovnim, riječnim pa i drugim željezničkim prijevoznicima), te informacijski centri. Za kvalitetu usluge u logističkim centrima važno je imati dobro organizirane poslove vuče vlakova. Da bi se održala redovitost vlakova i kvaliteta prijevoza u logističkim centrima, između ostaloga, potrebno je osigurati optimalan broj željezničkih lokomotiva te osigurati tehničko-pregledno mjesto. Posebnu pažnju potrebno je posvetiti i organizaciji rada strojnog osoblja. U logističkim centrima, moguće je kvalitetno organizirati tehnički pregled vagona čime se povećava sigurnost prometa.

KLJUČNE RIJEČI

logistički centri, vuča vlakova, željezničke lokomotive, tehničko-pregledno mjesto, strojno osoblje, gospodarenje željezničkim vozilima

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