SABINA KAMNIK ZEBEC, M.Sc.
E-mail: sabina.zebec@uni-mb.si
University of Maribor, Faculty of Civil Engineering
Smetanova ulica 17, SI - 2000 Maribor, Republic of Slovenia
BOJAN PIRŠ, M.Sc.
E-mail: bojan.pirs@slo-zeleznice.si
Holding Slovenske železnice d.o.o.
Kolodvorska 11, SI - 1506 Ljubljana, Republic of Slovenia
HUGO MAUČEC, M.Sc.
E-mail: hugo.maucec@gmail.com
Mestna občina Murska Sobota
Kardoševa 2, SI-9000 Murska Sobota, Republic of Slovenia

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INTRODUCTION AND AFFIRMATION OF CAR TRAINS IN THE EUROPEAN UNION

ABSTRACT

We live in a time of continuous technical and technological development. It is the time of globalization which is the main driver of the technological procedures in the process of executing transport services. Railway transport in Europe requires special attention, since it has a number of attributes which are not being effectively used. Measures to reduce the use of road network have been prepared, which would consequently increase railway transport. Individuals in personal vehicles could reduce transport costs with the increasing use of railway transport. The introduction of car trains in Europe is also supported by the European Union, but there has been very little done in the European car train system. The first goal of the European union seems to be understandable : using piggyback transport to redirect as much road freight transport as possible to the European railway system. Car trains in the integrated European rail system are one of numerous possibilities of how to offer a user of personal vehicle and his fellow passengers a safe, comfortable, economical and ecologically acceptable way of travel on a specific distance in the local or global sense of combined transport of vehicles and passengers.

KEY WORDS

road transport, railway transport, car trains, European Union

1. INTRODUCTION

After the Second World War a mass production of freight and later personal vehicles began – ever since a revolution in road traffic has begun. Consequently, due to a mass production of road vehicles, large investments were made in road infrastructure. With time, the rail system became nonflexible, many non-profitable railway lines were terminated and the users of transport services began to use the expression »door to door«. After that, railway traffic began to stagnate, and later on even to decrease, whereas road traffic is still on the rise on account of rail traffic, mostly due to its flexibility. Consequently, with the road traffic the number of traffic-jams, road accidents, noise and the increasing pollution of the environment also increased which nevertheless have caused soaring costs to the country. For the abovementioned reasons, the long distance road traffic has become less efficient and above all, more expensive than before. Another environment-friendly form of combined transport , in international as well as in inland transport is also a car train. Introducing car trains to Europe is also supported by the European Union. The first goal in the piggyback transport is understandable – to redirect as much road freight transport as possible to the European rail system.

2. THEORETICAL CHARACTERISTICS OF CAR TRAINS

Car train (English also *motorail,* Slovene *avtovlak,* German *Autozug,* AmE. *auto train,* Italian *autotreni*) is a trainset which consists of passenger coaches and freight cars for transporting personal vehicles, and is being moved over the tracks with the help of a tractor unit, in this case a locomotive. Therefore, a car train requires at least one coach intended for drivers of personal vehicles and their companions, and at least one car for personal vehicles. Car train falls into the category of passenger trains and into the suprastructure of the rail transport.

The term of Huckepack transport technology [2,5] can be translated to several European languages. There is the original from German *Huckepack tragen* – to carry on one's back, in English it is called *piggy-back*

and in French *kangourou.* This kind of transport technology originates from Germany, from the time of the Second World War when mostly military cargo vehicles, weapons and tanks were transported by the rail. At the beginning of the 1070's this technology began to be widely used for civilian transport of goods in combination truck – railway cars. The term »combined transport« comes from this combination. The main driving force of the success of the Huckepack technology in the last twenty years is the development of Huckepack – infrastructure, suprastructure and traffic in the Federal Republic of Germany. This technology is also being developed in other countries (Hungary, Czech Republic, Slovenia, Croatia, etc.). In Europe, the Huckpack railway freight transport is organised and carried out by specialised national establishments or companies such as Kombiverkher in Germany, Ökombi in Austria, as well as the Adria Kombi company in Slovenia.

In Europe, piggyback transport of A technology has several names, the most important two come from the English language (Rolling motorway – abbreviation Ro-Mo) and from German (Rollende landstrasse – abbreviation Ro-La) , the meaning of the term being a travelling highway in Slovene. The characteristic of this combined piggyback transport technology is that freight cars carry road vehicles and the passengers are transported in passenger coaches. It is about transporting personal vehicles, motorbikes, bicycles and other luggage. Freight cars can be one or double-deckers. A front or side loading ramp is used for loading and unloading. Special cars connected with a hinge are used for the transport of road vehicles to enable the vehicles to drive over these swivels, positioned between individual cars. A horizontal way of loading is applied to A technology.

The piggyback system of B technology stands for the railway transport of trailers and semi-trailers without a towing vehicle and the drivers of trucks. Loading and unloading is performed at terminals – manipulative stations with the help of a specific towing vehicle which drives trailers and semi-trailers backwards across a special ramp onto idler cars. A vertical manipulation is also possible, with the help of a transporter container loading bridge with a special grip of specific piggyback cars. Road semi-trailers or trailers are being reloaded horizontally and vertically in the B system of the piggyback transport technology.

The piggyback system of C technology stands for the transport of upper trailer and semi-trailer structure, without chassis. It is about the usage of interchangeable truck load compartments, which can be transhipped the same way as containers. Loading and uploading by the system of vertical technology to container or so called piggyback car is characteristic for this technology.

3. CAR TRAINS CONDITION ANALYSIS IN THE EUROPEAN UNION

Car train is in the international transport designated with uniformed vertical labels. These labels are found in the vicinity of terminals for loading personal vehicles or they can be found in advertising material, issued by railways and tourist offices. A car train consisting also of sleeping coaches is designated in a slightly different way.

Each train or each route of a specific train running in the European network is numbered. This number has its purpose; it is sorting the trains by their ranks and by their importance and purpose respectively. The number conveys various data: whether a train is a part of the internal or international transport, whether it is a passenger carriage (international, internal, express, bathing, regional, etc.). The number also tells us whether a train is a goods train (international, internal, perishable goods, etc.) or if a train is intended for combined transport, etc. Car train belongs to the group of passenger trains whereas the combined transport trains (trucks) belong to the group of goods trains.

Table 1 - The review of passenger trains' numbering

Train numbers	Fond	Purpose
000		EC, EN, IC and other trains in the international transport and ICS trains in the internal transport
500		IC trains in the internal transport
600		RG trains in the internal transport
800		Car trains in the internal transport
1000		Seasonal EC, EN, IC and other trains in the international transport
1300		Car trains in the international transport
1500		Seasonal IC trains in the internal transport
1600		Seasonal RG trains in the internal transport
1800		Seasonal car trains in the internal transport
2000		Local passenger trains in the internal transport
31300		Shared car trains in the international transport
31800		Shared seasonal car trains in the internal transport

Source: General directives of PTN and timetable booklets, Slovene railway, 2004, p. 184

Basic car train is every regular or irregular car train whose schedule is defined in advance and announced in the timetable. *Shared car train* is a car train which runs according to the timetable of some regular or already established irregular train. For passenger trains there is a special train numbering (Table 1).

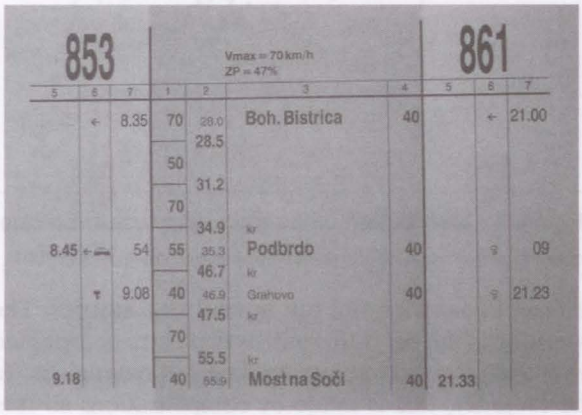

Figure 1 - An example of car train numbering in the internal transport in a timetable booklet

Source: *Timetable booklet 5*, Slovene railway, Ljubljana, November 2005, p. 28

Figure 1 demonstrates equal car train railways under numbers 853 and 861 in the internal transport in Slovenia, which start their runs at the railway station in Bohinjska Bistrica and end them at the station called Most na Soči. The maximum velocity of the car train on the open railway is 70 km/h. Single train velocity on sections out of the train stations are listed in the first column and indicated in the second column by the kilometre stones. In the third column, names of the stations are listed, where the car train stops with the exception of the station Grahovo, where it does not. The train speed at the very area of the station is listed in the fourth column and the column number 5 signifies the arrival time of the car train at certain station. The column 6 presents various notes and the seventh column represents the car train departure time.

At transporting goods, two important factors must be considered: to bring the load in time and not to damage the load during transport. By transporting passengers, the comfort of the drive must also be an important factor. One of many attributes of a car train is that it can carry passengers who do not have a personal vehicle, classic passengers, who wish to travel on a specific destination without a personal vehicle. Passengers are therefore able to travel on all destinations where there are car trains.

In internal transport there are passenger laws and rules of every individual country or a railway company performing services to be followed. In international transport, the train passenger must follow the same rules and laws as other people who individually cross the state border at the border crossing point. By crossing the border, a passenger must show one's identity documents to border-crossing authorities of an individual country. The procedure is somewhat easier if the passenger is travelling on the territory of the European Union and one's country is the member of the union. Other countries still require a visa and some other documents. In the international transport, all personal vehicles, motorcycles and bicycles which correspond to the permitted profile on railways can be transported. Some transport operators require a technically impeccable vehicle. The vehicle must have a proper certificate about roadworthiness. Mostly it is about a passed technical inspection, insurance policies, ownership of the vehicle, etc. The driver of such a vehicle must therefore be an adult with a driving licence.

A very successful combination in combined transport is the connection of railroad and sea transport with ferries. The technology is called *Roll on – Roll off* (abbreviation Ro – Ro). In Slovene, this would be translated as *zapelji na – zapelji z* (Figure 3). There are a few points in Europe where road, railway and sea traffic intertwine (Figure 2). The north of Europe has the highest number of these junctures, the connection of Germany with Scandinavia and France with Great Britain. Beside the abovementioned, there are also the links in the Mediterranean Sea between Spain and Africa, France and Corsica, and between Italy and Sicily. There are certain links between the Continental Greece and its islands, and also between the European and Asian part of Turkey.

Terminals for unloading of automobiles from cars are usually situated in the proximity of ports or docks where a personal vehicle is taken on board the ferry with the help of its driver. Such examples are German ports Rostock and Sassnitz, where transport operators

Figure 2 - Waterways in the North

Source: http://www.scandlines.de/de/ (3.11.2006)

Figure 3 - Ro – Ro technology

Source: http://www.railfaneurope.net/ph/dk/ (3.11.2006)

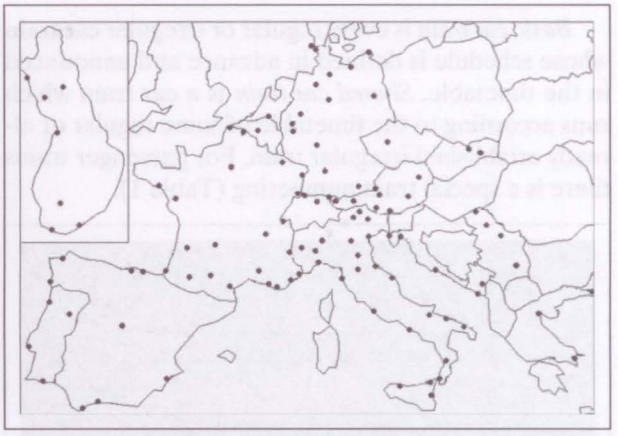

Figure 4 - Distribution of car train terminals in Europe

Source: http://www.autoreisezuege-in-europa.de/fpl/karte.htm (3.11.2006)

DB AutoZug and Scandilines – a ferry transport company, successfully cooperate. The companies have coordinated arrivals of car trains and departures of ferries which are naturally most favourable for the users of these services. There are also ports with a special infrastructure where a trainset drives directly onto a ferry. In this case, the personal vehicle is situated on the car and the car on the ferry. This kind of technology is often used at transporting car trains between the Continental Italy and Sicily.

There are 109 larger terminals for loading and unloading of automobiles, motorcycles and other goods in the European internal and international car train system. It is clear that this system does not include all terminals but only the biggest and the most important ones, which gives us a realistic picture of the present situation of terminals in Europe. The biggest terminal congestion is in the Central Europe and the south of France whereas the technology, with some exceptions (Slovakia), is not so developed in the east, and has no connection with the rest of the Europe. One of the main reasons for the absence of links is a bad integration of the eastern European rail system in the west European. The main discrepancies are in different signalling-security systems and different widths of rail tracks. In the first place among the countries with the highest number of terminals are the countries of Central Europe: Italy (24 terminals), France (21) and Germany (16). Figure 4 shows distribution of car trains terminals in Europe.

Until recently, Great Britain which has a rich history of car trains, has had the last two terminals in the south part of the country (Penzance and London), but these ceased to operate at the end of 2005 because car train internal transport stopped. Therefore car trains in England do not operate till further notice. The only terminal for international traffic in the Republic of Slovenia is situated in Koper. Terminals in our proximity are in Croatia (Rijeka) and in Austria (Graz and Villach). International car train operators come from different countries and run in various countries. The operator of the car train route is therefore determined with contracts between individual rail companies. In the majority, this is made by compensations so that one transport undertaking drives to a city of another country, and another undertaking drives to this country but to a different city. Terminals operate during the car train running. In case that a car train operates only one season the terminal can be used for other activities during the rest of the year, for example for transport of trucks. The trend in economically developed countries is that terminals are not unused when car trains are not running but they operate throughout the year since the prize for building such a terminal is not at all small.

3.1 Car trains in Germany

German rail is a driving force of the progress in the European car train system. DB AutoZug company, which deals with the transport of automobiles and passengers, was established anew in 1997 and covers a great part of the Central Europe. From 30 European terminals total, used by the company, 16 are situated in Germany. In 2005, the company transported 200,000 personal vehicles and 500,000 passengers. Consequently, 160 million road kilometres are spared to European roads in a year. Besides internal transport in Germany, the company is in business with international car train transport to France, Italy, Austria and Croatia. DB AutoZug possesses 308 cars, 163 of which are double-deck coaches of open type for transporting automobiles, 36 sleeping coaches, 84 bolster cars (combined), 13 classic coupe coaches and 12 restaurant coaches. German car train system and its network respectively are the most developed and expanded in Europe. [8,1]

Figure 5 is an example of a distinguished timetable for the German railway. Figure 6 shows car train terminal in Bremen.

Figure 5 - German car train terminals

Source: http://www.autozug.de/ (4.4.2006)

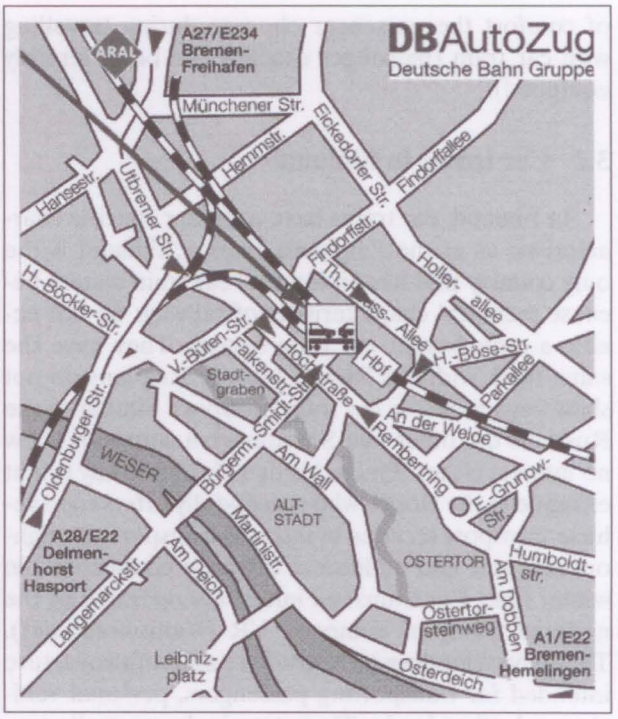

Figure 6 - Car train terminal in Bremen

Source: http://www.dbautozug.de (4.4.2006)

The car train number 1478 denotes destination Lörrach – Hildesheim. The return car train is denoted by number 1479 and drives in the opposite direction. The night car train timetable is valid for the period between April and October 2006 and the length of the destination is 640 km (Figure 7). During the tourist season, the train drives six days a week. The timetable gives information on maximum dimensions of a vehicle, the price of transport, the type of passenger cars, the time of vehicle loading and other important things for passengers. In different time periods, the transport of car trains has different prices. The highest prices are at the peak of a tourist season in July and August, while the prices are much lower in an afterseason period. The height of the price depends also on the type

Lörrach ⟷ Hildesheim

PKW + 2 Personen im Liegewagen
Einfache Fahrt schon ab € 103,90

Verbindung (nachts)	640 km	Tag	April 06	Mai 06	Juni 06	Juli 06	August 06	September 06	Oktober 06
Hildesheim Hbf → Lörrach Gbf		Montag		23 30	12 19 26	3 10 17 24 31	7 14 21 28	4 11 18 25	2
		Dienstag			6 13 20 27	4 11 18 25	1 8 15 22 29	5 12	
		Mittwoch	5 12 19 26	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	6 13 20 27	4 11
		Donnerstag		18 25	1 8 15 22 29	6 13 20 27	3 10 17 24 31	7 14 21 28	5 12
		Freitag	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28	4 11 18 25	1 8 15 22 29	6 13 20 27
		Sonntag	2 9 16 23 30	7 14 21 28	4 11 18 25	2 9 16 23 30	6 13 20 27	3 10 17 24	1 8 15 22
Lörrach Gbf → Hildesheim Hbf		Montag	3 10 17 24	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28	4 11 18 25	2 9
		Dienstag			13 20 27	4 11 18 25	1 8 15 22 29	5 12 19 26	3
		Mittwoch		24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	6 13	
		Donnerstag	6 13 20 27	4 11 18 25	1 8 15 22 29	6 13 20 27	3 10 17 24 31	7 14 21 28	5 12
		Freitag		19 26	2 9 16 23 30	7 14 21 28	4 11 18 25	1 8 15 22 29	6 13 20 27
		Samstag	1 8 15 22 29	6 13 20 27	3 10 17 24	1 8 15 22 29	5 12 19 26	2 9 16 23 30	7 14 21 28

		Preis pro Richtung in Euro				
2,05 m max. PKW-Höhe / bis 2,65 m ⟷ Länge	PKW	87	9,90	109	9,90	131
	smart fortwo, Motorräder und Anhänger bis 2,50 m	61		77		92
Liegewagen (Kinder bis 11 Jahre 50% ermäßigt)	Einzelplatz (Belegung mit bis zu 5 Liegen/Abteil)	47		60		72
	Einzelplatz (Belegung mit bis zu 4 Liegen/Abteil)	53		66		80
	Eigenes Abteil (mit bis zu 5 Personen belegbar)	176		222		254
Schlafwagen	Eigenes Abteil (mit bis zu 3 Personen belegbar)	191		242		277
Schlafwagen mit Dusche/WC*	Eigenes Abteil (mit bis zu 3 Personen belegbar)	251		302		327
Gastronomie	Snacks und Getränke an Bord erhältlich	Frühstück inklusive				

*Schlafwagen mit Dusche/WC nur freitags von Hildesheim nach Lörrach vom 02.06. – 13.10. und samstags von Lörrach nach Hildesheim vom 03.06 – 14.10.

	Abfahrt am	Verladezeit Auto	Verladezeit Motorrad	Abfahrt	Ankunft	Zug-Nr.
Hildesheim Hbf → Lörrach Gbf	Mo-Fr, So	21:30 - 22:20	21:20 - 21:40	23:05	06:49	1479
Lörrach Gbf → Hildesheim Hbf	Mo-Sa	20:10 - 20:25	20:10 - 20:20	20:30	05:13	1478

Figure 7 - Internal car train on destination Lörrach – Hildesheim

Source: Die Bahn, Mit Auto und Zug durch Europa, 2006, p. 23

of comfort the passenger chooses during travelling with car train (passenger coaches can be differently equipped).

3.2 Car trains in Finland

In Finland, car trains have a similar specific characteristic as at the Peninsula Ibérica. Finland is the only country that has an internal car train system because technical characteristics of railways do not enable a cross-border car train system. They have the same track width as Russia, but the Russians do not show any interest in car train transport. Similar to the Russians the other two Scandinavian countries show no interest either. Finland is therefore the only bright example in the North, who successfully offers road vehicle transport services in internal transport throughout the year and additional car train connections in winter time. Car trains in Finland are operated by the national transport company VR (Valtionrautatiet). They have a modern infrastructure and suprastructure intended for transporting passengers, personal vehicles and other loads. Their terminals meet all standards, like passenger coaches, they are one of the most comfortable in Europe. VR operator can offer almost everything a passenger desires. VR, as one of the few car train operators in Europe, uses a whole palette of freight cars for personal vehicles, from double-deck coaches, covered, open, to one-deck coaches, and flat cars. [11,2]

On Figure 8 there is a railway system of Finland car trains.

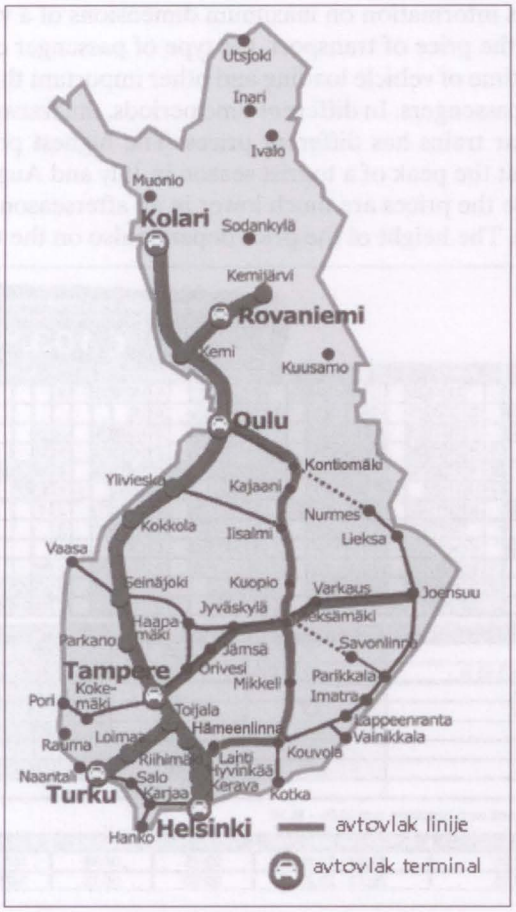

Figure 8 - Railway system of Finland car trains

Source: http://www.vr.fi/heo/eng/aikataulut/ (10.4.2006)

3.3 Car trains in other European countries

The widest known international car train on the Balkan is Optima Express which operates between Turkey and Austria. It is meant for the Turks living in Germany and Austria who are returning to Turkey and then back to Germany in the summer tourist season. In **Greece,** there are two car train terminals: Athina (Athens) and Thessaloniki. They are connected by an internal car train on a daily basis.

In **Serbia and Montenegro** there are 6 terminals for unloading of internal car trains. The only international car train in the country is Optima Express with its terminal in Niš. Other terminals are in Subotica, Novi Sad and Niš (Serbia), and in Podgorica and Bar (Montenegro). The car train from Beograd to Podgorica and to Bar leaves every day, and the car train between other terminals operates during the tourist season. In Serbia and Montenegro, car trains are operated by Železnice Srbije - ŽS.

In **Croatia,** there are two car train terminals, in Rijeka and Split. The Austrian ÖBB connects Vienna with Split and Rijeka. Until recently, Split has also had a link with the Czech cities Prague and Brno, but this car train does not operate until further notice. German DB Autozug connects Rijeka with Dortmund, Frankfurt and Hamburg. All car trains in Croatia operate during summer tourist season.

Slovakia is connected with the city of **Prague** by a car train running through the cities of Košice (700 km) and Poprad Tatry (600 km). In the Czech Republic, the first car train was introduced in 1997. The Czech Railways, joint stock company (Česke Drahy ČD), operate the car train running on a daily basis. In eight years, they have transported 12,000 personal vehicles on the distance Prague – Poprad Tatry, it is also possible to transport motorbikes and bycicles. Manipulation cars are open double-deck cars of L series. The international car train Jadran Express, connecting Prague, Brno and Split was running from 2003 to 2005. During the summer season of 2005 this train transported 5600 passengers and 800 vehicles and motorbikes. Its capacity is 508 passenger seats and 30 personal vehicles. In 2006, the train was not running to the Adriatic coast, mainly due to economic reasons. [5,1]

Spain (8 terminals) and **Portugal** (4) have similar car train system to Finland. The national transport

operator in Spain is the Spanish National Railway Network - RENFE (Red Nacional de los Ferrocarriles Españoles), and in Portugal the Portuguese National Railways - CP (Caminhos de Ferro Portugueses). There are nine pairs of car trains running in Spain. The main reason that there is no connection between Spain and Portugal are different widths of tracks.

3.4 Car trains in North America

The United States of America have only one car train in the internal transport running on the east coast between the cities of Lorton (20 minutes to Washington) and Stanford (30 minutes to Orlando) on the total length of 1350 km. The car train is operated by the railway company Amtrak which performs all transport services on the railway (Figure 10). The

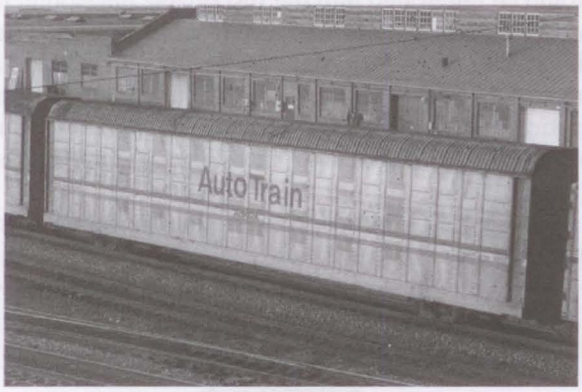

Figure 9 - Freight wagon for road vehicles' transport

Source: http://www.northeast.railfan.net/amtk9092. jpg (11.4.2006)

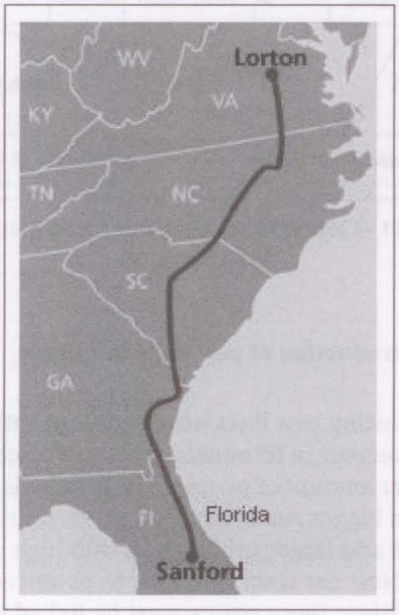

Figure 10 - The line of car train Amtrak

Source: http://www.amtrak.com/ (11.4.2006)

foundations of the car train were set in December 1971. After an unsuccessful start and a great loss, the preceding company went bankrupt. Therefore the car train had not been running for a few years and was brought back in 1981 by the Amtrak company. At the average velocity of 82 km/h, the drive lasts approximately 16 hours and 30 minutes. The car train does not stop at the stations between Lorton and Stanford and therefore loading is not possible. The passenger is entitled to a breakfast and lunch. [6,1] Today, the car train operates very successfully, mainly because of the following factors: the passenger enjoys a lot of comfort, the passengers accept the length difference between the place of the car train arrival and the point of their destination, the passengers are prepared to pay the price to avoid car drive and traffic on the road. Often, there are traffic jams on the parallel road link. The advantages of a car train are low travel costs and more frequent departures (Figure 9).

4. PROPOSAL OF ARRANGEMENTS FOR EFFECTIVE CAR TRAIN RUNNING

Economic, technical and ecological proposals and arrangements for an optimal car train system running are given bellow.

4.1 Reasons for introducing car trains in Europe

4.1.1 Price, quality and other benefits

The prices of car train tickets in Europe are not uniformed and vary considerably. In more developed Central European countries the prices are proportionately higher and correspond to the gross domestic product of the country. The prices also vary inside some countries since there is more than one transport operator, from national companies to individuals with a concession. All car train tickets in Europe should be reduced for a third of the current price for these to be equal to the prizes in road transport. This way, we could gain more users, but there is still a lot to be done. It must be taken into consideration that in France, Switzerland, Austria, Germany and similar not only locals use car trains and the road, but also people from other, less developed countries (Poland, Czech Republic, etc.) for which the prices are astronomically high given their social status and position. It is impossible in Europe to introduce a uniform car train price, but some other measures need to be made, and the European ticket system needs to be reduced and simplified. The car train user needs to be offered all the time as much comfort as possible, for a reason-

able price. This way, a qualitative offer can begin already in the terminal for loading personal vehicles. There should be a store, post office, bank, restaurant, rooms for relaxation, play rooms, library with newspapers in different languages (depending on the place of the terminal), suitable sanitary works, general cleanliness in the terminal, etc. in the proximity of the terminal. Similar goes for passenger coaches where there are certain limitations, but a user can also feel very comfortable and homely on a car.

When an individual service user is done with the car train ride, one does not get any benefits. After travelling with a car train, the user should be accordingly awarded with ecopoints (similar to the rewards one gets for shopping big), because he is able to travel in a safe and ecologically acceptable way. When the user would collect a certain number of points, one would have preferences in public passenger transport, for example additional free car train fares, special discounts at travelling with passenger trains, discounts for bus transport, etc. With this, new ways of travelling by public means of transport would be offered to the user, and thus avert the user from travelling with a personal vehicle. The system of ecopoints should be integral, universal and just for the whole European Union, so that a user of a car train in Spain would be able to, for example profit in services of the local passenger transport in Paris or Berlin, or travel by a classic passenger train, for example Ljubljana – Budapest. Thus, ecopoints could benefit the passenger anywhere in the European Union.

4.1.2 The integration of road and train transport

The system of the European car trains is about integration – a connection between road and railway transport. In Europe there is also a third branch of this integration – sea transport. Cities and places where all three transport branches are brought together are located along shores in main ports of the European Union. The integration between road and railway transport is in some cases pretty bad, and there is none between some bigger cities which puts many a car train user in inferior position.

The terminals, being main links between road and railway, need to be in the proximity of main currents on a road link whether this is a motorway, a high-speed road or a regional road. A terminal is the main point of integration between road and railway transport. In most cases, the car train user's closest loading terminal is up to a 100 kilometres away or even more. Therefore it is the user's choice whether to decide for the car train or decide if the ride to the car train terminal is even worth the drive or it would be wiser to take the road to the final destination. Integration therefore largely depends on the user of the car train services. In case the integration is bad or there is none, the train operator loses many potential users who would otherwise benefit from their services. Ideally the distances between the terminals for loading and unloading of car trains and individual destinations, where a car train passenger wishes to go, are in the same place or as closely together as possible. The reality however is different, since after the vehicle is unloaded the driver has yet to travel a good portion of the way in order to get to the desired destination. For some users the integration is also unfair. In order to solve this issue we should re-establish a homogenous car train system throughout Europe. A system of this kind would need to be brought in over a longer period of time since on a short term the system becomes inefficient and too costly. The systems are shaped through centuries and require a lot of work, energy and compromises between individual parties and countries respectively. The overloaded road system would thus be integrated into the railway car train system, and all together would be integrated into the sustainable development of the greater part of Europe. It must be also mentioned that there are certain track capacities in the rail transport which will overload with time and the integration of both systems (road and railway). It will thus be necessary to build new railway links and update the existing tracks.

On Figure 11 there is a connection between participants of car train services.

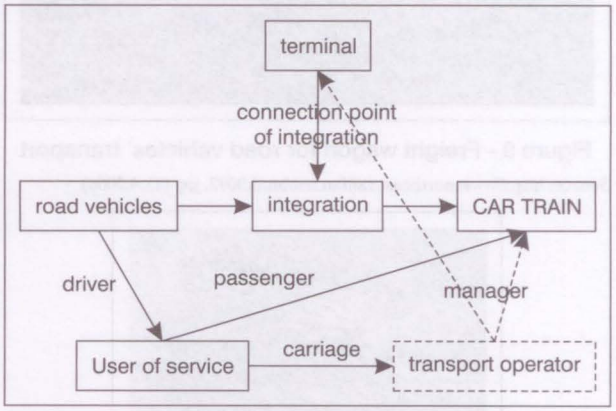

Figure 11 - Connections between participants of car train services

4.1.3 Introduction of new links in Europe

Introducing new links would consequently require a larger number of terminals, mainly in places desired by a bigger amount of people. The terminals would be needed in bigger road junctions, ports, airports, tourist resorts and larger urban areas with high density of settling. New car train links are to be introduced on one condition; these points must be linked to the rail infrastructure (railway tracks). By establishing a new car train link, cooperation with general public in the

proximity of a possible placing of a terminal is necessary. Studies of traffic flows should be made that would justify the introduction of a new line. General public should be asked whether there is a need for new connections. An inquiry should be made and extract the number and percentage of eventual car train users on the new relation. It should be calculated theoretically whether the integration between road and railway transport is worth from the economic aspect or what would be the costs, incomes and depreciation of a newly introduced car train. There are noticeable differences among the links between individual European cities, since car train links throughout Europe are not homogeneous. The lines are very dense in Central Europe whereas other parts of Europe are less linked or not linked at all.

4.1.4 Ecological effects of introducing car trains

Global civilisation development and constant population growth causes growth of transport and consequently higher energy consumption. This can be visible in negative effects on the environment, people, climate and nature. In individual transport forms the rail plays, as a massive carrier in passenger and freight transport, an important role and has a big responsibility. Taking into account that rail is energetically and ecologically very acceptable means of transport, a greater contribution should be made in the future to the passenger and freight transport in a way that is environment friendly, unlike the majority of other means of transport. In 1998, the energy consumption in transport sector was responsible for 28 % of all CO_2 emissions, which is the number one cause for the warming of the atmosphere. 6 milliard tons of CO_2 are released into the atmosphere yearly. Road transport produces, in addition to CO_2, other harmful gasses which have a negative impact on the environment and speed up the warming of the atmosphere like NOx (nitrogen oxides – 46 %), CO (carbon monoxide – 57%), SO_2 (sulphur dioxide – 3 %) and other gasses. The entire transport is one of the main factors in the pollution of the environment. [8,1] In comparison to the year 1988, the road transport in 2005 has risen by 25 % and road freight transport by more than 90 %. In this period of time the CO_2 emissions have gone up more than 40 %. From the aspect of future strategy railway is the most suitable for the sustainable development of the transport system.

4.1.5 External transport costs

The user of the car train transport service does not meet the entire costs for the transportation and the effects it has on the environment and society. These costs are defined as external costs since they are not accounted for in the price paid by the users, and are not an important factor in the world transport market at the moment. Nevertheless, big changes are also expected in price policy of external costs since we are confronted with increasingly high sums counted in milliards of €. The transport service users are not yet aware of the costs they are producing in transport. The most important external costs in transport sector are: [9,1] accidents, noise, air pollution, change in climatic conditions, space consumption, congestions, additional costs of transport. External costs (without congestions) in the whole Europe in 1995 were 570 milliards of €, which is about 7.8 % of gross domestic product in these countries. Counting congestions, the number reaches 10 % of GDP. The vast majority of external costs in road transport present personal vehicles. External costs vary from one country to another and depend on the branch of transport. In the countries of the European Union these costs reach 0.088 €/tkm in road transport while these are considerably lower in railway, 0.019 €/tkm.

4.2 Guidelines of car train development

Guidelines of car train development in the European Union are not strictly defined for car trains but refer to a general freight transport on the railway. The principal guidelines given by the European commission concern the transport of freight, passengers and piggyback transport from the point of view of transport companies carrying freight. Various European commissions refer to car trains only indirectly through other reports intended for freight railway transport. The European Union thus supports car trains merely morally, through various agendas for a cleaner environment and encouraging the use of public passenger transport. For a better future development and car trains recognition, concrete directives should be given in this area by the union. These would undoubtedly contribute to a better effectiveness of the car train system in Europe.

4.3 Transport politics

Transport policy is a part of the general national policy, as well as economic and development policy. **Transport policy** is applicative interdisciplinary and multidisciplinary science which comprises the technique and technology of transport, its organization, economics, law, etc. Transport policy ensures transport companies equal conditions for entering the transport market, equality and transport competitiveness. Transport policy is striving towards the regulation of trade relations and it enables transport companies to reach decisions that would not be in public interest. By creating, designing and operationalizing of transport policy we must pay attention to the goals,

principles, measures and instruments, etc. which would enable modernization, growth and development of all transport branches within micro- and macro-transport systems. [1,5]

Business policy is defined as general terms or agreements which determine a general direction and restrictions in decision-making and in control managing function. It is the principle for the decisions of a company which is kept inside the planned directions. Business policy is therefore all about common decisions with which a company confirms its goals and decisions confirming basic solutions necessary for achieving goals. Business orientation of a company, before mentioned goals, basic guidelines, tempo of the development and business movement are also confirmed by the business policy. The decisions made in business policy are most important for a company. It is therefore understandable from this point of view that the business policy of a company is led by those who manage the company. One can not imagine a successful and efficient transport company without a transparently defined and completed business policy since it is business policy that sets concrete goals for a defined time-frame or the selection and determining of the method and means for achieving business goals with which a permanent progress is ensured, and consequently an increase in productivity, economy and economic viability. Under the business policy, the following sub-policies must be paid special attention: staff policy, market policy, production policy, ecological policy, financial policy and development policy.

National railway management should follow three basic principles for a successful and creative consideration: that simple methods work very well – to make use of simple methods as much as possible because they are better than complicated ones, they are more recommendable and easier to understand; that lengthy discussions have a bad influence on solving problems of innovations – it is important to recognize the problem, introduce it properly and try to solve it in a proper manner. Management is too discriminated in the car train organization therefore managers are not able to do their work successfully, since a good management of a company which deals with personal vehicle transport services is the first condition for a company to be able to successfully offer its services to an increasingly demanding market of transport services.

4.4 Approach by the railway

The competitiveness of car trains is, among other, limited because of the European railway networks in individual countries. This level of non-integration is reducing the capabilities of the fast and reliable international railway transports. Due to some border formalities, like exchanging train drivers and locomotives, rechecking the breaks, etc., the travelling time becomes longer than necessary. In Europe, there are different signalling systems, electric circuits, track widths. Axle loads differ, too, as do travel directions and different profiles of railway tracks. All these factors contribute to slower car train drives because there are too many unnecessary stops, exchanging of locomotives and similar. The biggest problem in Europe is different signalling-safety systems on railways that vary from one country to another, because train drivers are not acquainted with safety regulations of another country. The problem is easily solved in countries with the same electrical supply. There are four different supply systems: two AC voltages 25,000V (France, Croatia, Portugal, Germany, Hungary, Great Britain) and 15,000V (Austria, Germany), and two DC voltages: 3,000V (Slovenia, Slovakia, Italy, Poland, Croatia) and 1,500V (Spain, France). In places where individual countries meet, the change of voltage requires the change of a locomotive and staff. To complicate things further, the supply system can even vary within a country (Germany has three systems as does France, Croatia has two systems, etc.). The supply problem can be solved by procuring multi-system locomotives which can operate in all European grids.

Technical problems, like different track width or railway profile can be solved with capital investments in the infrastructure. The changing of railway profile is thus conditioned by immense financial means since this would mean the reconstruction of tunnels, galleries, electrical installations, which is not possible in the railway transport at the moment. On some parts of tracks in Europe the maximum axle pressure should be increased to 22.5 tons/axle, and so should the speed of travelling by eliminating or increasing the railway curves radius. The problem of the track width would need to be solved between Spain and France, and Finland and Eastern Europe (Ukraine, Belarus). The most simple solution would be that a third track be attached on the already existing track (for example in Spain and Finland), which would correspond with the standard width of the European railway network (1435 mm). It would thus be possible to operate two different types of cars and locomotives on the same alignment.

There is one other solution to this problem; a special rail chassis with an automatic wheelbase regulation (and thus the track width) could be attached to the cars. The Spanish company Talgo has a highly developed wagon chassis regulation technology for track widths of 1668 mm and 1435 mm. This technology is mainly used on passenger trains between Spain and France. Eastern Europe has the technology of physical replacement of the chassis. This technology is older and very time-consuming since it is necessary to lift every car individually and replace both bogies. The

passengers remain on their seats in both cases and do not need to transfer.

The access to the railway area and the movement in this area are allowed only on defined places and during the time set by the administrator of the public railway infrastructure who runs the area. Everyone is bound to honour the internal order on the railway terminal area and on trains.

Persons, occupying the railway area or train are responsible for their own safety. It is forbidden for these persons to: walk on tracks or stand on a track or even near it, to walk or restrain between the yellow line and the track on the platform, to walk or restrain near a moving train or cars, to restrain in the space between the warehouse, the loading – unloading ramp and the vehicles that are moving or are about to be moved, to cross the railway bridge, go through a tunnel or walk on any other construction works on the rail tracks, to sit or stand by the open door or on the stairs of the car or on transitional gangways and other places that are not meant for the transport of passengers. In addition to before mentioned measures all persons must comply with the following restrictions: not to cross the tracks in places that are not intended for crossing, not to walk over buffers or crawl under them, not to jump on the vehicles or off them while in motion, not to drive in a train that is not intended for transporting passengers, not to lean through the window and open the outer doors of the coach or lean on them without the permission of the carrier or the administrator, not to act or behave in a way that would endanger the passengers' safety, the safety of other persons or the railway transport.

Passengers are allowed to restrain in waiting rooms, on platforms and other places intended for them. The users of railway services for goods transport are allowed to restrain in rooms and places for the reception and delivery of the goods, and in places intended for working with users. In rooms intended for passengers and in trains for the transport of passengers it is not allowed to introduce: substances and objects which are by the regulations not allowed to be transported as luggage, objects which may disturb other passengers or cause damage, and animals with the exceptions which are specified in the passenger tariff.

Unforeseen time delays are a fairly frequent occurrence in individual car train transports, which principally causes negative reactions. Delays are mostly a result of various maintenance works on tracks and occasional extraordinary events (for example the derailment of some other train, accidents on the crossings of the road and the railway, etc.). There are also various crossings of freight and passenger trains on monorail which are already covered by the car train time table, but there are usually some small deviations due to the above mentioned reasons. In other words, even if the car train is of a higher rank among passenger trains it does not mean it will arrive without delays.

The most important thing in the coincidence in time is the coordination in car train transport. This means that the transport operator should stick to the agreed schedules which are known in advance and are written in time tables. That way the future user of the car train service knows when a certain train is to leave according to the time table. A delay may occur by the loading of personal vehicles onto freight cars since some users are not skilled in loading automobiles. A fixation of motorcycles takes a lot of time, especially with a larger group of motor cyclists without prior notification. The general goal is obvious; the car train should depart on time and arrive at the final terminal according to its time table. In case of a delayed car train arrival the operator is obligated to pay the compensation, which arises in case of delay, to the passengers and the users of transport services if the operator is found guilty, of course.

A coincidence in time exists also in other cases. One of possible correspondences is also the previously mentioned link between sea and railway transport, particularly between ferries and car trains. A lot of valuable time may be saved, which would otherwise be spent with a less qualitative organization, if both transport branches are properly coordinated.

5. CONCLUSION

Road traffic, specifically personal vehicles represent the world's biggest polluter of greenhouse gasses due to their enormous number, and the biggest source of traffic accidents and traffic jams. The car train appears as a new and better solution to road traffic since it reduces the number of vehicles on roads, reduces accidents, gas emissions, external costs are lower and thus we save large quantities of energy. The biggest problem in car train development is the non-integration of the European railway network.

The momentary car train use is slowly increasing since there are being more personal vehicles and motorcycles transported every year, the number of standard passengers who benefit from car train services is increasing also. The future looks brighter for car trains since the prices of petroleum products grow constantly, there is no end to traffic jams, external costs are rising which suits the railway transport, but the railway is still very inflexible and unprepared for positive changes and thus the increase in its competitiveness. The railway market is still not liberalized enough.

Guidelines should concern the following areas: the integration of the railway system and a higher standard implementation; a faster liberalization of railway

transport; establishing unified standards for railway profile dimensions; carriers of transport must be subjected to comparable ecological and safety measurements; financial aid of the European Union for investments in combined transport; to increase, via car train terminals, the integration of road and train transport; adopt the measures that will increase and improve the quality of railway transport; adopt more restrictive measures in the field of road transport, personal vehicles and trucks; introduce a system of granting certain benefits for all users that apply public passenger transport services (road and railway); carry out more researches which would come up with suggestions for faster car train development; external costs should be added to the prices of transport services.

Mag. **SABINA KAMNIK ZEBEC**
E-mail: sabina.zebec@uni-mb.si
Univerza v Mariboru, Fakulteta za gradbeništvo
Smetanova ulica 17, 2000 Maribor, Republika Slovenija
Mag. **BOJAN PIRŠ**
E-mail: bojan.pirs@slo-zeleznice.si
Holding Slovenske železnice d. o. o.
Kolodvorska 11, 1506 Ljubljana, Republika Slovenija
Mag. HUGO MAUČEC
E-mail: hugo.maucec@gmail.com
Mestna občina Murska Sobota
Kardoševa 2, 9000 Murska Sobota, Republika Slovenija

POVZETEK

UVAJANJE IN AFIRMACIJA AVTOVLAKOV V EVROPSKI UNIJI

Živimo v času nenehnega tehničnega in tehnološkega razvoja. Živimo v času globalizacije, ki je glavno gonilo tehnoloških postopkov v procesu izvajanja prometnih storitev. Posebno pozornost je potrebno posveti železniškemu transportu, saj ima veliko pozitivnih lastnosti, ki jih v Evropi še ne izkoriščamo dovolj. Pripravljeni so ukrepi, ki bi zmanjšali uporabo cestnega omrežja, s čimer bi se povečal železniški transport. Posamezniki v osebnih avtomobilih bi tako z večjo rabo železniškega transporta zmanjšali prevozne stroške. Uvajanje avtovlakov v Evropi podpira tudi Evropska unija, vendar je bilo v evropskem sistemu avtovlakov zelo malo narejenega. Prvi cilj unije v oprtnem transportu je razumljiv, da se čim več cestnega tovornega prometa, preusmeri na evropski železniški sistem. Avtovlaki v integriranem evropskem železniškem sistemu so ena od številnih možnosti, kako uporabniku osebnega vozila in njegovim sopotnikom ponuditi varno, udobno, varčno in ekološko sprejemljiv način potovanja na določeni relaciji v lokalnem ali globalnem smislu kombiniranega prevoza vozil in potnikov.

KLJUČNE BESEDE

cestni promet, železniški promet, avtovlaki, Evropska unija

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