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THE EFFICIENCY OF THE BIMODAL SYSTEM TRANSPORTATION

SUMMARY

The development of fast railway results in an increased application of Trailer Train bimodal system transportation. The traffic costs are multiply reduced, particularly the variable costs. On the other hand the environmental pollution from exhaust gases is also reduced. Therefore, by the year 2010 cargo transport should be preponderantly used which would be characterised by fast electric trains producing less noise, at lower costs and with clean environment.

1. INTRODUCTION

In the European countries the new technology of combined road-railway transportation has been in use for several years now. The increased road freight transport has endangered the environment by exhaust gases of the motor vehicles. Therefore, new solutions are being sought, and one of them is the combined road-railway transportation. Along with these two types of transportation, also water transport may be included, if this is geographically suitable.

The idea is to design such a vehicle which would operate both on the road and on the tracks at a minimum cost and expense. Such vehicles, which could operate in these conditions, have been called Road-Railer and can be easily included as single shipments within a composition of a freight train and a passenger train, but they can also form a separate train, the so-called Trailer-Train. This kind of transportation is called bimodal system, and bimodal transport means transportation of goods on pallets or containers loaded onto road-railway transport vehicles and using interchangeable bogies or proper handling equipment.

2. BIMODAL SYSTEM

Unlike the conventional road-railway systems, the bimodal transport technology has certain advantages due to the simplicity of transition from road to railway and vice versa, without needing any special handling manipulations and constructed terminals. In the ma-

jority of minor railway stations there are paved parts of tracks as well as auxiliary tracks which provide the necessary space for handling manipulations from road to railway and vice versa.

The first technology developed in the USA, as well as the subsequent two, started from the application of the bimodal roadrailer i.e. road-railway cargo semi-trailers presented as MARK IV. The second technology was developed at the TIGER RAIL'S TRAILER TRAIN (Great Britain) and meant the application of road trailers, fitted with certain reinforcements for supporting the railway bogies - assemblies. They are joined by special spiral fixing devices. They can be integrated into the train individually or in a group. The transportation speed is up to 120 km/h. The transition from one form of transportation to the other takes approximately five minutes, and no special handling equipment is necessary. Figure 1 shows the bimodal system Trailer-Train - procedure. The handling is done by guiding along the special runners of the bogie.

The technical characteristics of the trailer train are: length 12000 mm, width 2430 mm and height 2219 mm. It had a volume of 65.78 m³, tare 9 tons. Triple-axle mechanism of the trailer is lifted during the transportation by rail by means of hydraulics, and lowered during transportation by road. The integration of manufacturers as well as carriers into the bi-modal transportation technologies project resulted in various models and types of semi-trailers. Thus the bimodal procedure in USA called Mark V was developed and in Great Britain the Trailer Train.

In the maritime transport the bimodal technology has been applied in the full container ships. This type of ships replaces completely the harbour plants and handling machinery. The bimodal system, as a part of the integral and multimodal transport, has a significant role in the transportation system by connecting the less developed regions.

Multimodal transport implies the transportation of a unique transport unit formed by several means of transport, road vehicle, railway vehicle, ship or plane with the possibility of one vehicle together with freight

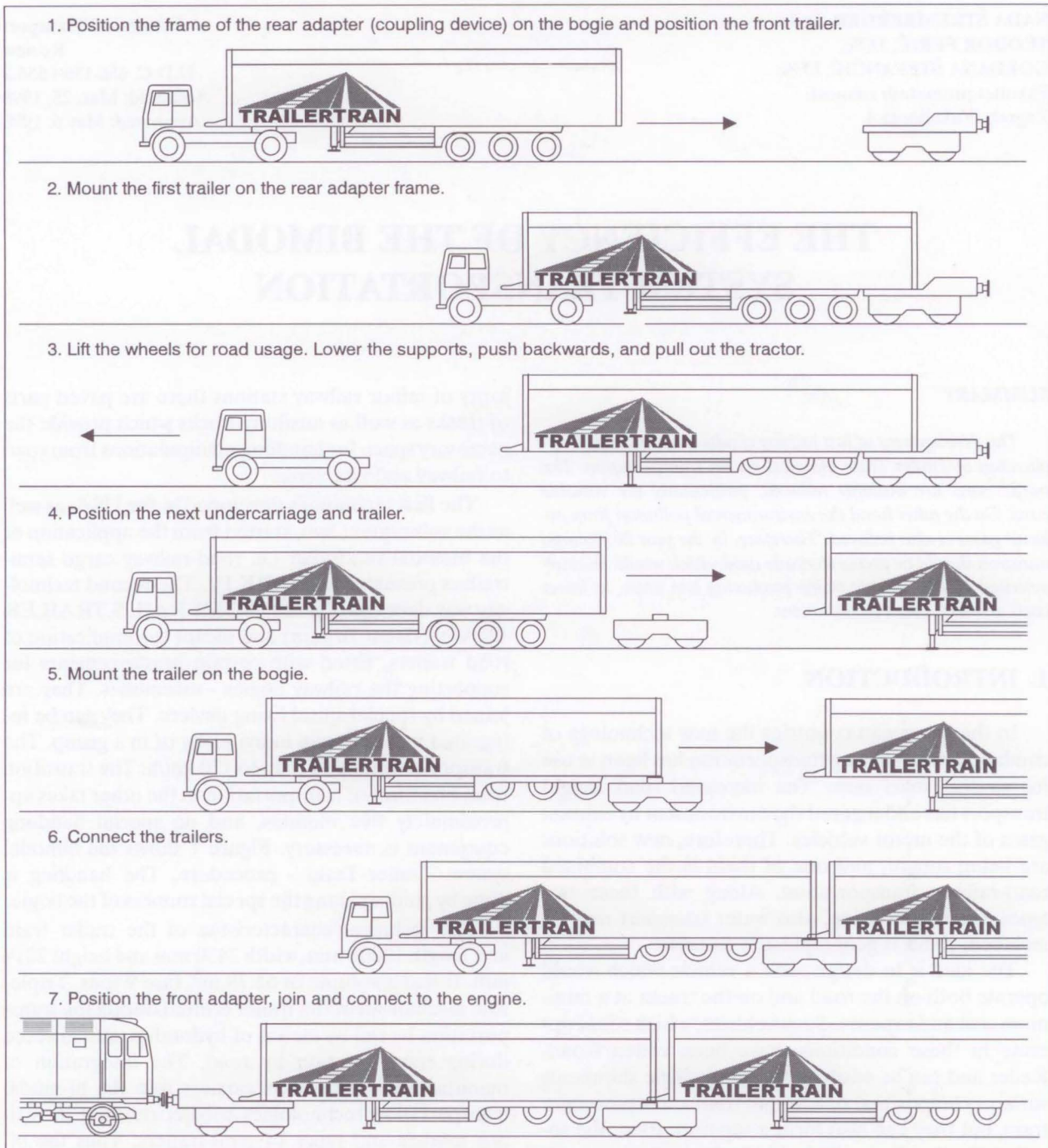


Figure 1 - Bimodal system Trailer-Train - procedure

becoming the object of transportation on a bigger means of transport (Piggyback).

Bimodal transport means transport of freight on pallets or containers loaded on the road - railway vehicle or ship, which do not depend on the cargo handling objects.

In the new transportation road-railway, the costs need to be considered, but at the same time the current and new transportation modes need to be compared. The comparison indicates efficient improve-

ment in the field of industrial productivity, since it allows:

- a) reduction of investment costs since the costs of a bimodal unit are by ca. 25% lower than the costs of the "pocket wagon", considered isolated, even by 40% lower than the costs of conventional combination "pocket wagon" + semi-trailer;
- b) reduction by at least 40% of the total proper mass of the railway and road vehicle when transported along tracks;

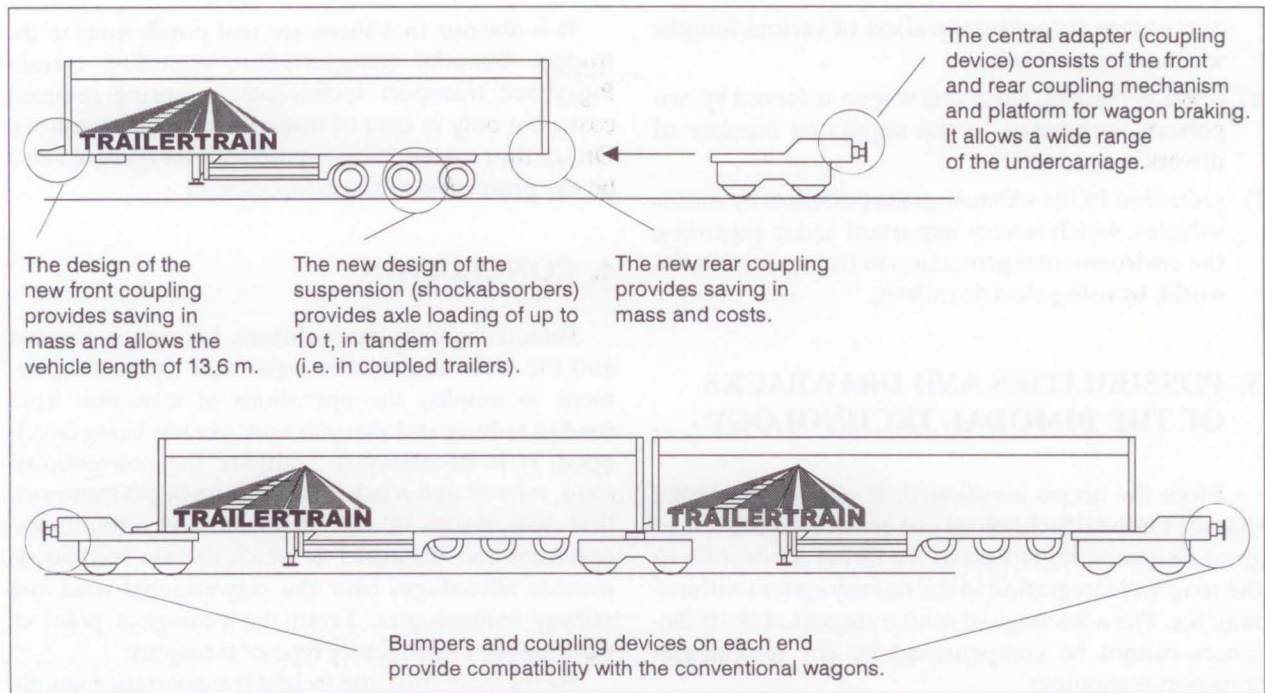


Figure 2 - Bimodal procedure - Mark V

- c) reduction by about 30% of the terminal handling costs, without any substantial investments in the equipment;
- d) avoiding the risk of investments in the railway part of the transportation combination becoming obsolete because of the development regarding road vehicle dimensions, since the axle assemblies of the

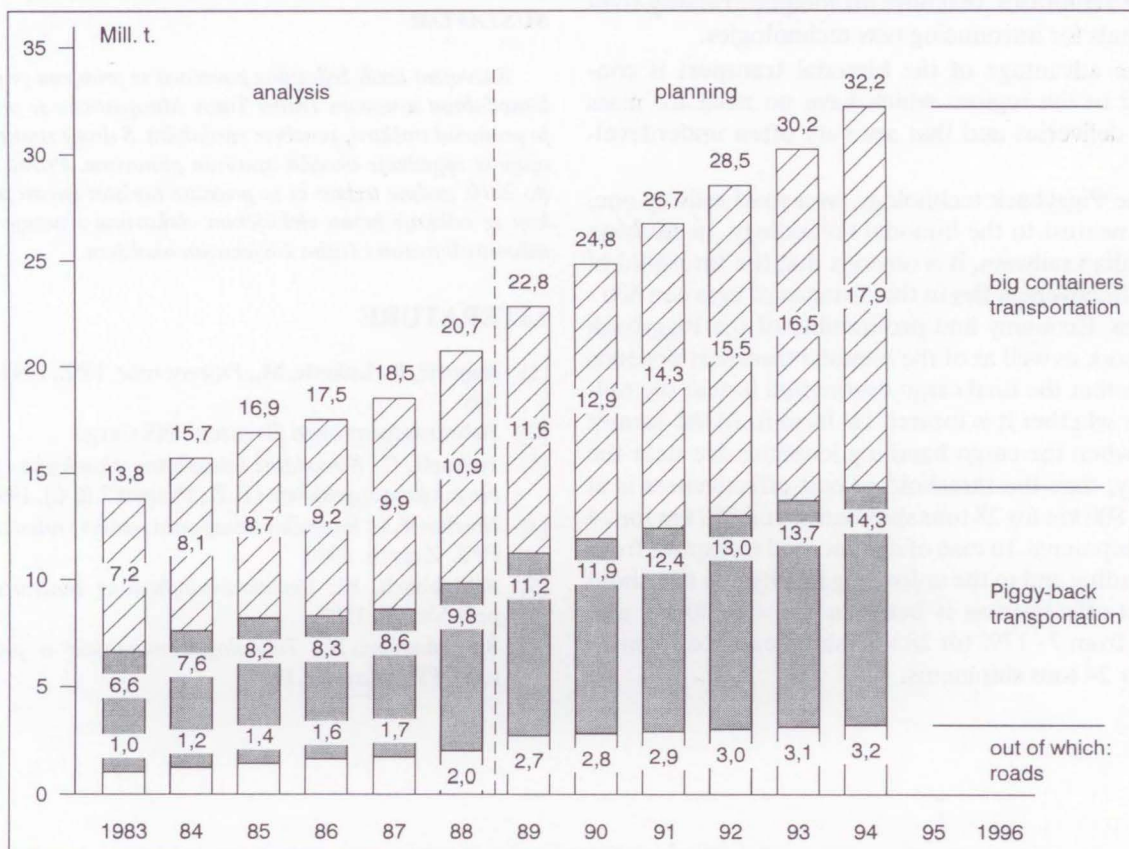


Figure 3 - Combined freight transportation with transport profit in Mill.t.

new system accept semi-trailers of various lengths without any problems;

- e) fewer personnel, since one wagon is served by two persons, compared to the stipulated number of drivers in road traffic;
- f) reduction in the exhaust gases pollution by motor vehicles, which is very important today regarding the environmental protection in Europe and in the world, by using electric railway.

3. POSSIBILITIES AND DRAWBACKS OF THE BIMODAL TECHNOLOGY

From the above mentioned, it can be concluded that the bimodal technology can be used exclusively at great distances, regardless of the direct connection to the road and integration in the railway system within 5 minutes. The advantage of road transport at short distances cannot be compensated by any multimodal transport technology.

Bimodal transportation is used at great distances by being included, according to possibilities, in the direct relations of trains as a part of a single composition. The use of the bimodal transport means presents in fact an expansion of services of the developed railways in the world, and a new possibility for the less developed countries, that have no adequate railway-road terminals for introducing new technologies.

The advantage of the bimodal transport is connected to the regions which have no need for mass cargo deliveries and that are very often underdeveloped.

The Piggyback technology, as a road-railway one, is the nearest to the bimodal technology. In studying the Italian railways, it is obvious that the threshold of cost-effectiveness lies in the distance of between 800 - 915 km. Economy and profitability of the Piggyback transport, as well as of the bimodal transport depends on whether the final cargo destination is near the railway or whether it is located far from it. In the former case, when the cargo handling locations are near the railway, then the threshold of cost-effectiveness is at about 800 km for 28 tons shipments, and 850 km for 24 tons shipments. In case of distant road transport, from the loading and to the unloading facility, the threshold of cost-effectiveness is between 915 - 1,000 km and varies from 7 - 17% for 28 tons shipments, i.e. from 1 - 9% for 24 tons shipments.

It is obvious that there are real possibilities to introduce bimodal transportation, regarding certain Piggyback transport techniques, requiring reduced costs, but only in case of transport at great distances. One of the reasons for using this technology could also be the protection of the environment.

4. CONCLUSION

Bimodal system has its future, because in Europe and the USA new technologies and types of equipment to simplify the operations of transition from road to railway and vice versa are already being developed. It is necessary to compare the conventional road, railway and road-railway (Piggyback) transport, that will result in the financial and exploitation optimum and distances at which certain techniques provide advantages over the conventional road and railway technologies. From the ecological point of view, this is a satisfactory type of transport.

By the year 2010, the freight transportation should be carried out almost in full by high-speed trains at longer relations. There must be a mutual relationship between the flow of goods and information.

SAŽETAK

UČINKOVITOST PRIJEVOZA BIMODALNIM SUSTAVOM

Razvojem brzih željeznica povećava se primjena prijevoza bimodalnim sustavom Trailer Train. Mnogostruko se smanjuju prometni troškovi, posebice varijabilni. S druge strane smanjuje se zagađenje okoliša ispušnim plinovima. Prema tome, do 2010. godine trebao bi se pretežito koristiti teretni promet koji se odlikuje brzim električnim vlakovima s manje buke, nižim troškovima i čistim čovjekovim okolišem.

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