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Benefits of Bimodal Transport Technologies

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Combined transport systems using technology that does not require railroad containers (or wagons) are sometimes also referred to in the literature as bimodal systems or roadrailers.

The idea behind the mentioned above technology is to use specialised rolling stock (semi-trailers) for combined transport that can travel both by road and by rail.

Bimodal transport technology was developed in the 1950s in the USA as an alternative technology to piggyback rail transport. Early designs used semi-trailers equipped with both road and rail wheeling. These solutions reduced payloads and created higher risks of derailment when travelling by rail. This system was operated by C&O, Union Pacific and Contrail [1]. Modern bimodal transport technology is based on the formation of a train of semitrailers that are supported by rail bogies.

There are three basic technical solutions which ensure the formation of a train using bimodal transport technology:

- the use of adapters whereby the front and rear ends of neighbouring semitrailers are supported by one standard rail bogie;
- the rear end of the semitrailer is supported on the bogie, the front end is coupled directly to the neighbouring semitrailer in the train;
- use of non-standard bogies on which the front and rear ends of neighbouring semitrailers are supported directly.

Today, the bimodal transport technology is used by Triple Crown on the US rail freight market. Several companies are involved in roadrailer production: Deluxe, Bowser, Santa Fe, Amtrak [2]. Sometimes roadrailer groups are attached to passenger and goods trains.

Compared to other types of multimodal equipment, bimodal transport technology has a significant advantage.

Firstly, with these technologies it is inexpensive to maintain rolling stock at terminals. They do not require expensive overhead cranes or platforms for handling trailers. The simplest terminal can consist of a gravel area between the rail tracks to allow for the installation of roadrailer equipment on the rail track.

Secondly, because the cost of such terminals is low, a significant number of transshipment points can be placed directly next to customers. Hence, the costs for local delivery and removal of trailers by road can be expected to be reduced, which is essential especially for short-haul transport as these costs for local road transport account for up to 30 % of the total costs.

Thirdly, bimodal and similar technologies reduce losses and damage, as the transport between certain terminals ccirculate without intermediate reloading.

Bimodal transport technology can use higher speeds than, for example, in double-decker wagons because the centre of gravity is at a lower height. Since this is a new and unusual technology, railway unions are inclined to allow smaller crews to work on such trains [3]. Also, roadrailers hold 12 % more freight than conventional piggyback trains.

On the other hand, bimodal transport technologies have a number of disadvantages. Compared to trucks, these technologies have a higher tare weight of the rolling stock and a lower payload. Although the capital investment is relatively lower, the cost of special trailers for such transportation is 2-

2.5 times higher than conventional road trailers, or trailers transported on rail platforms.

This means that the use of roadrailers requires an increase in their load throughout the year.

The disadvantages of bimodal systems are:

- the use of expensive specialised rolling stock. Semitrailers must be adapted to be coupled to bogies and/or hitched to each other, as well as have a reinforced design to meet the train loads, which reduces their load capacity. For this reason, such rolling stock is ineffective when used for road transport outside the bimodal system, since some of the carrying capacity is lost due to excessive weight;
- inability to transport other intermodal transport units;
- impossibility of selective loading/unloading;
- practical impossibility of sorting operations (one of the semi-trailers loses its support when a trailer is created)
- the problem of storing and moving free trolleys;
- impossibility of accompanied transport.

Because of these features, bimodal systems are cost-effective for handling constant flows in "isolated" logistics systems with constant flows of homogeneous cargo.

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