



16th Conference on Reliability and Statistics in Transportation and Communication,
RelStat'2016, 19-22 October, 2016, Riga, Latvia

Routing Methodology for Heavy-Weight and Oversized Loads Carried by Rail Transport

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Abstract

A problem of optimisation of transportation processes of heavyweight and oversized loads (hereinafter – HOL) by rail transport is analysed in this article. Universal multi-criteria evaluation system of route formulated by the authors ensures rational choice of heavyweight loads routes of rail transport. The article reveals a set of problem related to heavyweight and oversized loads transportation. Also it presents analysis of scientific literature sources, which are used to tackle the issues of HOL transportation. The principles of heavyweight and oversized loads transportation route selection are formulated in the article. On the basis of principles criteria methodology has been created which includes criteria set and enables an objective evaluation of HOL transportation processes route segments, cargo transportation and cargo handling technology and it can be practically applied to territory.

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Peer-review under responsibility of the scientific committee of the International Conference on Reliability and Statistics in Transportation and Communication

Keywords: heavy-weight load, oversized loads, railway, methodology

1. Introduction

The suitable route selection of loads' transportation is a complex, multidimensional task. It is important to consider not only the need to transport goods from point A to point B in shorter route. Also it is appropriate to plane

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in such a way that necessary costs to develop infrastructure would not only be as low as possible, but also create the infrastructure to be used for the greatest number of loads' transportation (Cheng and Lester, 2001; Jongwon, Sanghyeok, 2006 Exhibition; Wang *et al.*, 2011). The emergence of transportation route creates or at least improves conditions for human economic activity. Therefore it is appropriate to consider negative and positive impacts of heavy-weight and oversized loads transportation routes on economic social development in the territory.

The main aim of the article –to provide routing methodology principles for heavy-weight and oversized loads transportation by rail to optimizing loads transportation.

2. Routing for transportation of loads by rail transport

Rail mode of transport compared to road transport, is not flexible routing, because a new section of the track or the development of the current is much more expensive and technically complicated task than to develop or improve the same length of the car road section (Sakalauskas, 1997). During transportation of heavy-weight and oversized loads by rail often arises the problem. Cargo weight is not the main problem. The main problem is load size. Assessment of suitability of rail transport mode for transportation of heavy-weight and oversized loads is most often associated with the limit values of the load size. By analyzing rail network must be acknowledged that in different areas of their density is very different (Jarašūnienė, 2009). It is forecasted that the proposed investment for improve of infrastructure will not ensure the necessary quality and will appeared narrow, weak points, which will limit movement possibilities of necessary loads (DIOMIS 2007). ERIM – European Rail Infrastructure Master plan–recognizes that all participants of transportation by rail must take the necessary actions to ensure the implementation of above mentioned modal shift changes.

In rail transport oversize and heavy load is load, which weight exceed of 60 tons, a length of 14 m (exceed length of the standard platform 13.3 m), width 3.25 m and height – 4 m. The maximum permissible load capacity, which can be transported by rail is up to 500 tons. This parameter is influenced of existing railway bridge load force in the route. These limits are applied in most of the European continent railway, but in some countries where are old infrastructure is not sufficiently improved, these restrictions may be more stringent. If parameters of heavy-weight and oversized loads do not exceed those limits, that rail transport is the best option to carry HOL for medium and long distances. Standard weight of the load being transported by truck – 20–24 tons, but the railways could carry any loads up to 500 tons (Simplextrans, 2011; Oversize ..., 2011).

Volkov in book “The basics of railway design and economic research” provides assessment methodology of technical and economic options in selecting the right design decisions to build new lines and reconstruct existing. The author particularly emphasizes the importance of economic the transport processes evaluation (Volkov, 1990).

When loads are transporting by rail is important to evaluate the potential negative impact on line side infrastructure and its durability (Podagėlis and Povilaitienė, 2006 Exhibition; Vasilis Vasiliauskas and Kabashkin, 2006). It may be assumed that the selection and application of special measures for transportation of heavy-weight and oversized loads by rail, when is maintained the standard conditions of road load, the negative impact for road infrastructure will be analogous to the standard cases of loads transportation.

3. Routing selection principles for carriage of heavy-weight and oversized loads by rail

For the successful transportation of heavy-weight and oversized loads, are necessary to define a set of conditions that necessary to meet. The conditions that determine the appearance of that need may be twofold: it is a specific need or transporting specific loads from point A to point B or projections that will appear multiple needs to transport such loads within a certain territory.

The examination of the HOL transportation process from starting (the route, mode of transport, transportation vehicles selection) till ending with transport action planning and implementation it can be seen that the individual transportation procedures and operations in different modes of transport has obvious qualitative similarities. It also may be different depending on the implementation of the price or time (eg., the road do not meet the requirements of HOL transportation, the need to improve the road surface or deepen inland waterway bed, increase road turning radius of, rail or water side, etc.) (Déjus, 2011; Kaklauskas *et al.*, 2007; Podvezko, 2005; Tupėnaitė *et al.*, 2010; Turskis *et al.*, 2009; Palšaitis and Sparrow, 2010). After formalizing the evaluation process of all HOL route it is

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