МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ УКРАИНЫ
ДНЕПРОПЕТРОВСКИЙ НАЦИОНАЛЬНЫЙ УНИВЕРСИТЕТ
ЖЕЛЕЗНОДОРОЖНОГО ТРАНСПОРТА ИМЕНИ
АКАДЕМИКА В. ЛАЗАРЯНА
ООО “НПП “УКРТРАНСАКАД”
ГП "КИЕВГИПРОТРАНС"

ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ РАЗВИТИЯ ЖЕЛЕЗНОДОРОЖНОГО ТРАНСПОРТА (15.05 – 16.05.2014)

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СЕКЦИЯ 2
«СОВЕРШЕНСТВОВАНИЕ КОНСТРУКЦИЙ И ТЕХНОЛОГИЙ РЕМОНТА ВАГОНОВ»

DEVELOPMENT PERSPECTIVES OF THE POLISH SUW 2000 AUTOMATIC VARIABLE GAUGE AXLES CHANGE SYSTEM

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Rail transport is not very popular in comparison to the volume of traffic carried by road, although in comparison with the goods delivery, it offers definitely shorter transport routes and a much more favorable delivery terms of goods to customers. One of the main but not the only obstacle that deters a large extent the delivery companies while making the choice of railway transport in transcontinental and international directions is the world's diversification of rail gauge. These differences cause serious operational difficulties because at the junction of tracks of different widths, the goods must be handled, pumped or wagon bogies must be replaced. These operations are very expensive and usually require the construction of expensive back-storage and handling or maneuvering yards, as well as modernization of border crossings, where different track gauges are being used between countries. Besides these operations, significantly increase goods transporting and passengers traveling times.

Differentiation of gauges in the world causes difficulty in movement of both passengers and cargo. To cope with these differences two types of transport technologies are being used:

– handling/transshipment technology,
– Variable Gauge Axle (VGA) systems.

Technology of transshipment varies with operations performed depending on the transported cargo. It is based primarily on transshipment of transported cargo handling at terminals located at the border crossings with standard gauge of 1435 mm wagons into wagons of 1520 mm gauge. Depending on the type of load, this technology can be divided into the following methods:

– pouring,
– pumping,
– overloading.

Reloading is done using adapted for this device mainly using gantry cranes and loaders. Transshipment of bulk materials such as coal, crushed stone and other aggregates is done using wheel loaders, also wood is handled by such machines, but equipped with the so-called grapple. Steel products include: steel coils, sheets and plates packages, rolling wire and rods of iron are handled by cranes or gantry same containers. Transshipment of liquid fuels and LPG is done using special pumps (pumping liquid fuels) to allow pumping from standard gauge tanks to broad-gauge tanks, or vice versa. Reloading technology is characterized primarily with long duration of cargo handling operations, but there are also significant costs, especially in winter, when the bulk goods in bulk and freeze before transshipment must be thawed in the halls, where there is a sufficiently high temperature allows defrosting of load.

Reloading stations, which are transitional gateways beyond the problems of security, especially during the transport of dangerous goods, accompanied by a huge expenditure of time, labour and energy, as well as damage to the transported cargo. Besides, most often in the handling of bulk materials are a significant number of damaged wagons [1].

The changing technology transport is done by the same mean of transport, which is put at the border from one gauge to another. Override wagons can be done by:

– replacement of the running gear wagons,

– automatic VGA systems.

Changing wagon with one gauge to the other is done using the vehicle body and raising the railroad car and exchange of wheelsets using composite screw jacks. Wheelsets exchange process takes place at any changing point otherwise, it depends primarily on the number of lifts installed at a given point, which affects the size of the group and the number of simultaneous changing indexable wagons.

Wheelsets replacement procedure in changing section from 1435 mm to 1520 mm usually includes the following operations:

1) setting the wagon on the lift station,
2) loosening in wagon air brake,
3) disconnect couplings brake and hanging them on brackets,
4) substitution of lift bars under brackets marked on the wagon,
5) unlock bolts of bogie pivots connecting the truck to the body,
6) disconnecting the grounding connection body with cars,
7) raising the body until it reaches the output bolts of the socket bogie pivots in wheelsets,
8) bring his truck out of the wagon (manually or using hoists),
9) substitution using the crane trucks with different width,
10) bringing wheelsets of different width under body of the wagon (manually or mechanically),
11) leaving the body,
12) hanging from the bars the jack body,
13) connection of rod braking system,
14) securing bogie pivots,
15) connection to the grounding connector body with cars,
16) discontinuation the wagon from the lifting position [1].

The wagon bogies exchange technology does not correspond to the demands consignments of international travel. The potential danger to passengers during lifting wagons is noise and vibration during the exchange of bogies, lack of appropriate sanitary - hygienic conditions while doing this operation and its long duration - all this is not conducive to the popularization of foreign travel by rail. In freight transport, this method is mainly used to transport hazardous materials, chemical products and petroleum products carried in tank wagons, for which other methods of overcoming differences in track gauges are too risky [1].

Changeover system requires a complex structure of the vehicles, which must be adapted to the requirements and operational conditions both on the standard and broad railways gauge. Systems used in Variable Gauge Axle (VGA) technology allowing wheelsets to automatically change the width of the track are following:

– TALGO system (Spain),
– DB AG/ Rafil system (Germany),
– BRAVA system (Spain),
– SUW 2000 system (Poland).

As the author of a patent SUW 2000 railway engineer Ryszard Suwalski [5] says, overflow of one ton of fuel from the tanker standing on the track of 1435 mm into tanks places on the track of 1520 mm, costs about $ 10. Tank has a capacity of 50 tons of fuel, so the fuel overflow from one tanker to another costs about $ 500. If you count all the trains moving during the day the savings are already enormous.

Unfortunately, there is no decision to proceed with production, freight and passenger cars, implemented by individual wagons equipped with automatic gauge change system does not allow the wheels to prove unquestioned economy solutions. Producing more cars binds to financial outlay, and it is a barrier almost insurmountable. The system is particularly useful in the transport of dangerous goods, easily breakable in the handling and polluting the environment [4].

Poland has SUW 2000 gauge changers installed on international lines to Lithuania and Ukraine used for daily night-trains and some freight transport [3].

Since 14 December 2003, VGA trains were introduced between Krakow (Poland) and Kiev (Ukraine) instead of bogie exchange. VGA saves about 3 hours compared to truck exchange. Unfortunately this is no longer in use. Author of SUW 2000 considers the unutilized possibility of using the system at the time of commissioning the most important Euro 2012 football championships, which took place in Poland and Ukraine. The fact should be underlined that when it comes to technology, it overcomes stringent operating conditions at low and very low temperatures (-60°C) very easily, without the need for additional equipment, special protection and safeguards. Furthermore, it does not require adapting body systems and cross-country railway wagons and special changing track position of 26 m length can be performed off-site and can be transported to the place fitted in with the existing track layout [4].

SUW was produced by Zakłady Naprawcze Taboru Kolejowego in Poznan, which was closed and it affected the expansion of the system. In addition, the price of wheelset offered by the company worked in a similar way. At the moment there are is a producer in Poznań who could, with the help of selected employees from ZNTK Poznan, take up production of wheelsets. This producer, who knows the system SUW-2000 has featuring modern machinery, appropriate production area and qualified personnel and can easily handle this project. The only obstacle to the implementation, in addition to the general, nationwide lack of financial resources for implementation are formal-legal (property rights).

There are two types of transport technologies so you can "combine" tracks of different widths: transshipment technology and Variable Gauge Axle (VGA) systems with Polish SUW2000 system. In the first transshipment are done using adapted for this device mainly using gantry cranes and loaders and specialized pumps. In the second carriage is done through the same means of transport, which is put at the border from one gauge to another. Override wagons take place through the exchange of the running gear wagons or automatically change the track width.

After several analysis, it was found that the execution of the common changing track position for all four VGA systems is very complex technically and economically unviable. Therefore, these systems are operated separately [2]. In further work is underway to have the opportunity to use a common changing track position for each system. VGA system technology is primarily more expensive to implement, but it allows you to operate more trains in less time than the handling technology.

The only obstacle to the implementation, in addition to the general, nationwide lack of financial resources for implementation of SUW 2000 which is now not is use are formal-legal (property rights) problems.

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ОГЛАВЛЕНИЕ