ҚАЗАҚСТАН РЕСПУБЛИКАСЫНЫҢ БІЛІМ ЖӘНЕ ҒЫЛЫМ МИНИСТРЛІГІ
Л.Н. ГУМИЛЕВ АТЫНДАҒЫ ЕУРАЗИЯ ҰЛТТЫҚ УНИВЕРСИТЕТІ

КӨЛІК – ЭНЕРГЕТИКА ФАКУЛЬТЕТІ

«КӨЛІК ЖӘНЕ ЭНЕРГЕТИКАНЫҢ ӨЗЕКТІ МӘСЕЛЕЛЕРІ: ИННОВАЦИЯЛЫҚ ШЕШУ ТӘСІЛДЕРІ» IX ХАЛЫҚАРАЛЫҚ ҒЫЛЫМИ-ТӘЖІРИБЕЛІК КОНФЕРЕНЦИЯСЫНЫҢ БАЯНДАМАЛАР ЖИНАҒЫ

СБОРНИК МАТЕРИАЛОВ IX МЕЖДУНАРОДНОЙ НАУЧНО – ПРАКТИЧЕСКОЙ КОНФЕРЕНЦИИ: «АКТУАЛЬНЫЕ ПРОБЛЕМЫ ТРАНСПОРТА И ЭНЕРГЕТИКИ: ПУТИ ИХ ИННОВАЦИОННОГО РЕШЕНИЯ»

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В сборник включены материалы IX Международной научно – практической конференции на тему: «Актуальные проблемы транспорта и энергетики: пути их инновационного решения», проходившей в г. Нур-Султан 19 марта 2021 года.

Тематика статей и докладов участников конференции посвящена актуальным вопросам организации перевозок, движения и эксплуатации транспорта, стандартизации, метрологии и сертификации, транспорту, транспортной техники и технологии, теплоэнергетики и электроэнергетики.

Материалы конференции дают отражение научной деятельности ведущих ученых дальнего, ближнего зарубежья, Республики Казахстан и могут быть полезными для докторантов, магистрантов и студентов.

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traction performance, the traction power increases by 18%, the maximum traction force (at δ≈20 %) reaches 17 kN.

Towing characteristics on the wet and dry concrete coating on the first transmission (i_M = 53.48) : without reload truck develops maximum thrust force of 37.5 kN adhesion on wet , and 50.8 kN for dry concrete, and in normal cases (without ballast or additional loading) it stops due to the complete slipping of the propellers. The engine of the truck on wet concrete without additional loading operates only on the regulatory branch of the characteristic. Then, as a dry concrete, it works as regulatory and at deregulatory the molecular branches characteristics.

Wet concrete without additional load at maximum traction power N_T = 6 6kW traction force on bridges distributed equal to K_{1-2} = 1.21. The same index for dry concrete with N_T = 98.2 kW composition - to set up K_{1-2} = 1 05 i.e. to behold bridges towing loaded almost evenly.

An increase in the towing weight of the towing vehicle due to the operation of the towing device by 2500 kg, when towing on wet concrete, increases the maximum traction force to 52.5 kN, while the engine goes to the unregulated branch. The maximum traction power N_t increases to 88.5 kW, which means 34% of all fuel consumption at one and so on the same traction force 25 kN reduced to 2.8%. The total traction force is distributed unevenly across the bridges (K_{1-2} = 0.21%), i.e. bear the brunt bridges balancis truck, and forward bridge develops small traction due to insufficient adhesion weight .

As a result, the positive effect of additional loading of the truck with additional adhesion weight due to the operation of the towing device on increasing the traction force and the unit, increasing its tractive power, reducing the slipping of the propellers, as well as reducing the hourly and specific fuel consumption on all characteristic supporting surfaces was confirmed using the traction characteristics.

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DIFFERENT RAILWAY GAUGE PROBLEM BETWEEN KAZAKHSTAN AND CHINA

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For the connection of trans-continental railway network, it is critical to conquer the break-of-gauge problem at the borders in different countries. Up to now, the best solution seems to be the employ of the auto-changeable gauge equipment. Countries, such as Kazakhstan and China are developing and commercializing auto-changeable gauge equipment to maximize transport efficiency for the trans-continental network. The efforts to search a suitable logistical service are also underway. In this paper, technology and development trend of this equipment in several countries is indicated through inspecting and analyzing the historical and current situation of development, operating mechanism and technical problems. As the basic technology of auto-changeable gauge is not well developed in our country, the purpose of this study is to search an approach to fix the research direction, and find practical ways to international cooperation.

Rail transport is one of the most important regulators of the socio-political and economic life of each state. At the present stage of development of the economy of Kazakhstan, the strengthening of international trade relations (including with non-CIS countries) is one of the main tasks economic policy, on the successful solution of which the result largely depends ongoing reforms in the republic. Increase the productivity of existing railway lines can be achieved by increasing throughput and reducing time of delivery of goods. For the timely formation on the territory of the country of a competitive international transport corridor, it is necessary to provide various options solutions to existing problems, including those associated with the movement of trains on sections with different track gauges. At present, if it is necessary to change the gauge of the railway composition, a method of replacing bogies is used, which is characterized by significant losses for unproductive operations.

So, at present, the territory of Kazakhstan is associated with railways of China through two stations in Dostyk and Khorgos. There the transition from one track to another is also carried out by changing the wheeled carts from wheelsets of different standards. A train on the wide gauge 1520 goes to the wheelset rearrangement workshop where it is rolled from one side (Fig. 1).

Figure 1 – Wagon axle interchanger

Jacks are installed in the workshop and the track of the Kazakhstan standard runs through 1520.On the other side of the workshop, the track narrows to 1435. Along the same (wide) track can move at low speed bogies and standard 1520 and 1435, while wheeled pairs 1520 lie on the rail with the entire width of the wheel, and 1435 only touch the outer edge wheel widths - the flanged inner part hangs in the air. To prevent the wheelset of standard 1435 from slipping off the rail, inside gauge 1520, counter rails are laid. Counter rails and wheelsets support from the inside 1435 from the side of the flange preventing the wheels from slipping off (fig. 2). Jacks are installed in the workshop and the track of the wide standard runs through 1520.On the other side of the workshop, the track narrows to 1435. Along the same (wide) track can move at low speed bogies and standard 1520 and 1435, while wheeled pairs 1520 lie on the rail with the entire width of the wheel, and 1435 only touch the outer edge wheel widths - the flanged inner part hangs in the air. To prevent the wheelset of standard 1435 from slipping off the rail, inside gauge 1520, counter rails are laid. Counter rails and wheelsets support from the inside 1435 from the side of the flange preventing the wheels from slipping off (fig. 2).

Figure 2 – Changing bogies in a passenger coach

The whole process only in the workshop takes about an hour. They can simultaneously rearrange up to 12 cars in the train. As a result of multiple couplings and uncoupling and replacement of wheel bogies international trains at the station Brest can be up to 3 hours, wasting travel time.

At the beginning of the twentieth century, attempts began to develop technologies for the transition of cars from one gauge to another, and vice versa. More rearrangement of bogies of passenger and freight cars became a progressive method for different track gauges at specially organized bogie exchange points on border joints (PPV). In Kazakhstan, a carriage rearrangement point is organized at Dostyk and Khorgos stations on the border with China (Fig. 3 and 4). Thus, at Dostyk station, the wagon rearrangement point (PPV) is intended for rearrangement of passenger and freight carriages of 1520 mm track gauge to 1435 mm track gauge and vice versa. In addition, at the PPV, cars are being repaired, a single technical revision bogies, their current repair and preparation for rolling under wagons, loading bogies and wheelsets for sending the latter for planned types of repair, unloading after repair scheduled preventive repair and maintenance of equipment and devices.

Figure 3 – Changing bogies in a passenger coach

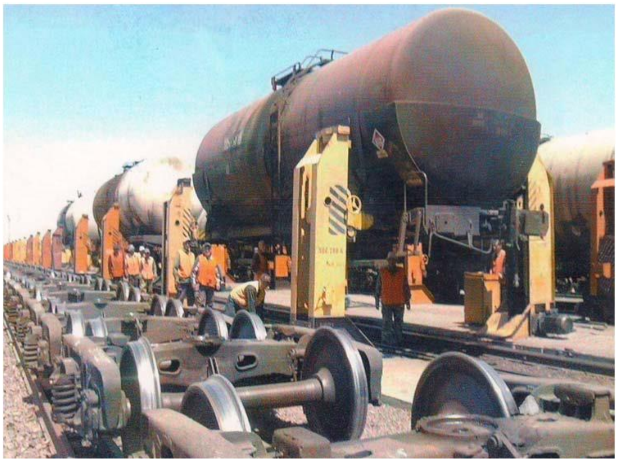


Figure 4 – Changing bogies of freight coach

The work of the point of rearrangement of freight cars is organized on a rotational basis around the clock, in two shifts of 12 hours.

After arranging the wagons by positions, preparatory work for lifting wagons. These works include:

Wedging of bogies, disconnection of brake linkage rods, recess pivots, removal of the propeller shaft with a generator drive from the middle of the axle connecting the generator power cable, extending the jack trunks. The car body is lifted simultaneously by four electric jacks with a lifting capacity of 40-50 tons. The lifting of the cars begins immediately after the completion of the preparatory work. After lifting wagons in all positions and ensuring clearance, using a winch the bogies are removed from under the wagons. also done with a winch. After lowering the body, all work is performed preceding lifting in the reverse order. In addition to changing carts at the head and of tail cars, the automatic coupler is changed with a change in height above the level of the rail heads. Relocated cars, according to their technical condition, must meet the requirements and standards established by the "Rules of Technical Operation" and "Rules for the use of wagons in the international passenger and railway freight traffic (PPV) ". Currently, the method of replacing bogies is characterized by significant loss of time for unproductive operations. Rearrangement of wagon bogies from 1520mm to 1435mm gauge and to turnover to change points near border stations, has significant disadvantages - increase in the turnaround time of wagons; significant costs of technological and production resources. A particularly effective method of passing the system rail track joints are considered to be the use of sliding wheelsets. Therefore, the problem of developing sliding wheelsets, capable of changing the track width on special transfer switches without stopping the movement travel devices. In this case, almost absolute reliability should be ensured, since the failure of the sliding wheelset leads to emergency with heavy consequences. In 1969, the first practical application of sliding wheelsets began.

Then the first Spanish TalgoRD passenger train arrived from Barcelona to Geneva production with sliding wheelsets. Back in 1965, the Spanish company Talgo began to develop systems automatic rearrangement of wheels. Reliable operation is shown by the design of the Spanish company "Talgo". Sliding wheelsets are operated on passenger express trains developed by the same firm. They run between Spain (where the gauge is 1676mm) and European countries (1435 mm) and have been operating trouble-free for decades. TALGO trains are on single axle bogies (i.e. spring suspension, brakes and other equipment mounted on one sliding wheelset). So that at the same time the load on each axle did not exceed the permissible standards, the length of each carriage was less than a standard passenger 4-axle carriage. The operation to change to another track gauge is performed automatically without assistance of staff in the process of passing the train at a speed of 10 - 15 km / h a special translating device made in the form of a rail track assembly (fig. 5).

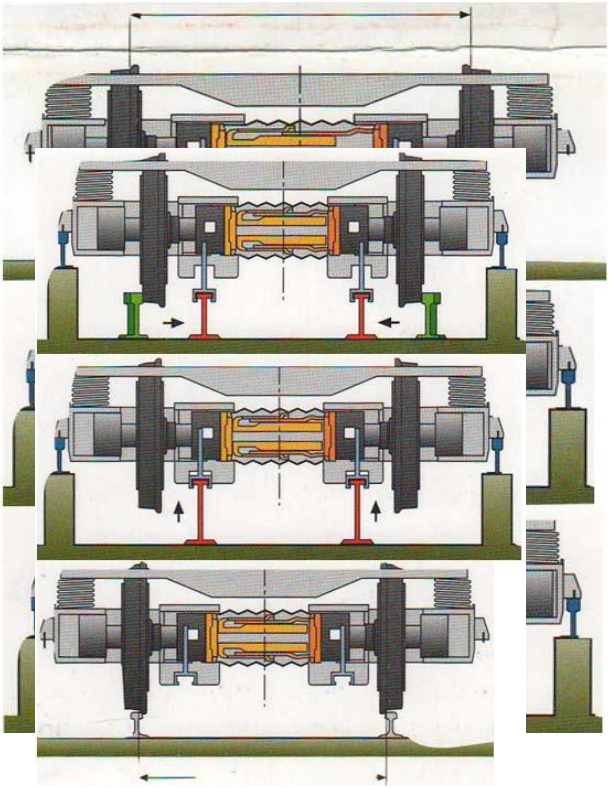
3. Moving the wheels to a new position. (from width A to width B and vice versa)

4. Side locking of wheels in the new positions

5. Wheel loading. The severity goes from external rails on wheels

Figure 5 – Pattern of TalgoRD rail track changing system

The schematic of the Talgo sliding wheelset is shown in (Fig. 6). Due to symmetry the diagram shows the details of the left half - the left semiaxis rotates in a bookbox bearing and inner bearing. Both bearings are connected horizontally housed steel rigid frame. Each wheelset carries two of these auxiliary frames. But the wheel is connected to the semi-axle with the usual interference fit. When you change the track width, the parts move together. Passenger carriages are under forced lateral displacement of wheel blocks, which occurs when the car moves along the transfer installation. Movement wheels are loaded (fig. 6). Removal of the load occurs due to the fact that the sliding bearings located on the outside of the bearings, slide onto the support rails of the transfer installation and move along them. The process can be broken down into five distinct steps:



1. Release the wheels. The load is transferred to external slide guides

2. Unlocking the wheels from the side limiter.

Figure 6 – Gauge changing process

Thus, the use of wheelsets automatically changing track gauge is very promising, subject to the advanced conditions. The technology will significantly reduce the time spent by passengers trains on the way. However, before using this or that system, you need to take into account many important nuances. Firstly, all employees, except for constructive complexity, properties but one drawback - standards for the profiles of the rolling surface of wheels, working rail head surfaces, for the slope of the 1520 mm track and 1435 mm track correspond to each other, that is, they differ. Secondly, you should take into account the dimensions railway rolling stock and the approach of the buildings of those countries where it is planned to operate wagons with sliding wheelsets. Besides, before starting to widely implement a particular system, it is required to implement a set of measures to guarantee the safe operation of new undercarriages. It will be necessary to organize a specialized base of a higher level for maintenance and repair of sliding wheelset systems than conventional ones. The cost of building and maintaining such systems will certainly exceed similar costs for traditional systems. But calculations show that from an economic point of view, the use of such systems can be quite justified.

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ӘЛЕМДІК КӨШЕ-ЖОЛ ТОРАБЫНДА АВТОБУС ЖОЛАҚТАРЫН ПАЙДАЛАНУЫНА ТАЛДАУ ЖАСАУ

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Автобустарға арналған жолақтар – жоғары жылдамдықты автобус желісінің негізгі құрамдас бөлігі болып табылады, бұл жолақтар арқылы автобус қозғалысының жылдамдығы мен сыйымдылығын, сапасы мен сенімділігін арттырады. Жалпы автомобиль қозғалысына қызмет ететін жолақтар бар, оның ішінде автобустарға бөлінген жолақ жолдың бір бөлігін ғана алады.

Автобустарға арналған әлемдегі алғашқы жолақтар 1940 жылы Чикагода құрылды. Еуропадағы алғашқы автобус жолақтары 1963 жылы Германияның Гамбург қаласында трамвай жүйесі жабылып, бұрынғы сегменттелген трамвай жолдары автобус қозғалысы үшін қайта құрылды. Көп ұзамай Германияның басқа да ірі қалаларында пайда болды және 1970 жылы Германияның автомобиль жолдары кодексінде автобус жолақтарын енгізуге ресми