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IMPROVING THE METHODS OF STRENGTHENING THE ROLLING STOCK AND MEASURES TO PREVENT ACCIDENTS IN THE EVENT OF THEIR SPONTANEOUS DEPARTURE

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ABSTRACT:

Currently, one of the main issues in ensuring the safety of train traffic at Uzbekistan Railways is the reliable fastening of trains to prevent them from leaving the station as a result of spontaneous movement of trains. The scientific article outlines the principles of ensuring the safety of rolling stock currently available on station tracks and the use of methods to prevent other trains from exiting the tracks in the event of a spontaneous departure of rolling stock.

In addition, the methods of strengthening the rolling stock of the railways of the CIS and foreign countries, as well as the prevention of spontaneous departure of trains, were analyzed, and suggestions were made that could improve the performance of the railway station.

Keywords: locomotive, wagon, rolling stock, spontaneous departure of the wagon, brake shoes, accident.

INTRODUCTION:

In order to meet the needs of Uzbekistan Railways in the transportation of household goods and passengers, locomotives, passenger and freight cars are purchased annually at great expense, as well as passenger cars of JSC "Construction and repair of Tashkent passenger cars" and Andijan Mechanical Plant produce freight cars [1].

In particular, 65 mln. The purchase of two high-speed Talgo-250 passenger electric trains and 4 economy-class wagons in 2019-2021, as well as the renewal of the locomotive fleet through the purchase of locomotives will cost 362.14 million US dollars. In addition, 60.2 million US dollars were allocated for the reconstruction of locomotives, 51.00 million for the renewal of passenger cars, 34 million for the modernization and extension of freight cars, and 375.50 million for the construction of freight cars. This is evidenced by the fact that it is planned to allocate funds in US dollars in 2020-2024 [2]. In view of the above, ensuring the safety of trains and the efficient use of rolling stock is the main task of every railway company.

Spontaneous departure of rolling stock is a strictly accountable condition that occurs in a very dangerous emergency, which can lead to train crashes [3]. Even today, there are still cases of spontaneous movement of trains, due to the ignorance of some employees of the railway transport and indifference to their duties, in particular, the failure to comply with the rules of fastening the tracks with brake shoes on the station tracks.

One of the most striking examples of such incidents was the escape of a PU2-010 electric locomotive with 23 loaded semi-

trailers from the Djigaristan station of the Uzbekkomir JSC on December 19, 2021 to the Shtolnaya station. As a result, the PU2-010 electric locomotive at Shtolnaya station collided with 10 empty half-wagons and caused 15 half-wagons and PU2-010 electric locomotives to deviate from the railway track and overturn. As a result, the overturned electric locomotives and wagons became unusable. This has caused significant economic damage to Uzbekkomir [4, 5].

In order to prevent the above, it is necessary to develop a system of traffic safety on the railways of Uzbekistan, in particular, measures to further improve the prevention of derailment of trains due to spontaneous movement of trains and a new approach to solving the problem of accidents on railway transport.

Criteria for determining the shoes required to secure rolling stock on station tracks:

One of the main issues in ensuring the safety of train traffic on railway transport is the reliable fastening of trains to prevent them from leaving the station as a result of spontaneous movement of trains on station tracks. Today, there are enough types of advanced technical means to strengthen the rolling stock on the station roads, and methods have been developed to justify their application.

The most common of these techniques are brake shoes. Brake shoes (rail-mounted device for stopping wagons) temporary storage of locomotive-free trains on station tracks to prevent their spontaneous movement.

In accordance with the requirements of Chapter 11 of the Instruction on train traffic and shunting operations on the railways of the Republic of Uzbekistan, the minimum standards of the required footwear shall be determined in accordance with Appendix 2 to this Instruction [6-7].

A graph of the scales for fixing the rolling stock with brake shoes is developed and shown in Figure 1.

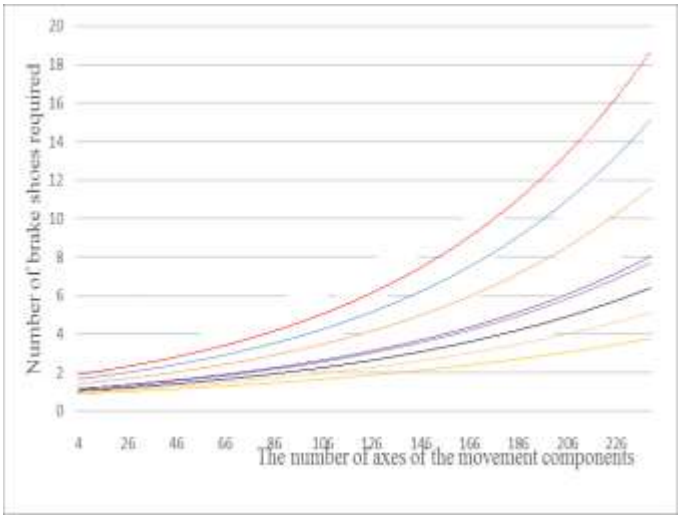

Figure 1. Fastening of rolling stock with brake shoes diagram of the norms

As can be seen from the diagram of the norms of fastening of rolling stock with brake shoes, the number of necessary braking shoes increases as the number of axles of trains and the slope of the road increases. This in turn requires more manpower as well as extra time. As a result of increased operations on installation and removal of brake shoes on the railway tracks, there will be an increase in the number of overdue trains in the receiving and sending parks of stations. The following analysis of the methods of strengthening the railway rolling stock used in the CIS and abroad in order to positively address such problems is given below.

Analysis of methods of strengthening the composition of the movement in the CIS and abroad:

Mechanized and automated devices that fasten rolling stock on the roads are much more efficient than hand-held devices. Their use allows to achieve the greatest economic and social productivity.

The main requirements for such devices are reliable operation, the ability to organize

local or remote control, relative cheapness and ease of installation on the road.

The main device used to fasten rolling stock on station tracks on Russian railways is stationary brake pads type UTS-380. The UTS-380 tower is designed for mechanized fastening of rolling stock on the roads of different stations of the station (except for the main roads) [8].

Local or centralized management, as well as the help of a hoist, is provided for the transfer of the support pads to the working and non-working conditions.

There are no close analogues of UTS-380 and UZR-68 on foreign railways.

However, Windhoff (Germany) developed the VP 600 Lower Pillar. It is successfully used at the Nuremberg qualifying station. The operating position of the stand corresponds to the raised position of the stop buffers, and when the buffers are lowered, the stand does not interfere with the passage of rolling stock. The tower is driven by an electric motor with a worm drive, designed for a load of 600 kN in each direction, and when the total mass is 100 t, it is allowed to hit it at a maximum speed of 1.3 m / s. Using a system of levers, the forces acting on the pillar are evenly distributed throughout the entire upper device of the road [9].

Another of the foreign mechanized devices for fastening wagons US-made Iron Python hydraulic dampers are used.

The construction of the Iron Python tower is completely similar to the UTS-380 tower, except that the hydraulic shock absorbers prevent the wheels from slipping or breaking on the tower during shunting operations. The disadvantages are the high price [10].

There are many types of devices that reduce the speed and tighten wagons at foreign railway stations. In particular, New Joule J-4015S point wagon fasteners are used on U.S. railroads. The J-4015S wagon clamp shown in Figure 2 is used on station tracks and on the tracks of industrial plants [11,12].

Figure 2. J-4015S wagon fastener

When the wheel flange rises above the point wagon stop head, the head compresses the oil in the first cylinder. The compressed oil passes from the service cap between the first and second cylinders to the second cylinder. The air under the second cylinder is compressed and the working valve is closed from the control device.

The service valve has an adjusting screw that allows you to adjust the oil flow rate and the braking force acting on the wheel accordingly. The resistance acting on the wheel head is controlled by a screw.

Wheel pairs use energy to push the cylinder, which resists vertical movement as each wagon passes through the decelerator. Accordingly, the speed of the wagon wheel decreases and stops when it travels on the roads where the decelerators are located.

Advantages of Joule piston retarder J-4015S type wagon decelerator:

- The ability to sort all types of wagons with any cargo at sorting stations;
- Used for fastening cars on station tracks;
- When used on station tracks, it is possible to create an integrated track by inactivating the cylinders [12].

The following achievements can be achieved when using the above innovative devices on the railways of Uzbekistan:

•To reduce the delay of trains in the receiving and sending parks of stations by reducing the

number of operations on installation and removal of brake shoes on the railway track;

• Reducing operational staff by increasing labor productivity;

•Increase the level of security through automation and control of the fastening process;

• Reduce the impact of the human factor in strengthening the composition of the movement;

• Reduce additional costs for shunting operations in order to strengthen the fastening of rolling stock with brake shoes;

•Reduction of monthly salary costs for train builders and signalmen performing brake shoe tightening operations.

However, all of the above devices can only be used to prevent wagons and movement units from moving spontaneously. However, these devices do not eliminate this situation when, for some reason, wagons and units move spontaneously.

Analysis of ways to prevent the spontaneous departure of rolling stock on the railways of the CIS and foreign countries:

The following technical means and safety devices are available to prevent accidents in the event of a spontaneous departure of rolling stock on the railways of the CIS and foreign countries, as well as the prevention of accidents: lowering arrows, lowering boots, as well as devices that extinguish shock energy [9].

The decision to install this or other safety devices is made on the basis of an analysis of the profile and plan of the tracks, including the tracks of wagons separated from the locomotive [9] .

During the construction of railway stations, closed tracks are designed in order to keep the rolling stock moving spontaneously on the station or station tracks. The closed roads to be built for this purpose will be designed on the lower side of the station, where the traffic components are likely to leave. The ends of the closed roads are designed in such a way that they rise in the opposite direction to the longitudinal slope of the earth's crust and are blocked by a prism-shaped pillar [12]. In any case, guard arrows are used to direct the self-propelled vehicles to the guardrail. In cases where it is not possible to use protective arrows in conjunction with these accessories, wheel tracking devices shall be installed. [9].

"KSB" - "Wheel Tracker" Devices:

In order to prevent the station from moving from the station tracks and depot tracks to the receiving and departing tracks of the station in case of spontaneous movement of trains, on the tracks loaded with dangerous and discharged KSB - "wheel tracks" devices are used on russian railways. these devices are available in "manual (ksb-r)" and "electric (KSB-e)" models. [9].

Devices for unloading trains:

In case of loss of control from the main cabin of trains or in case of spontaneous departure of wagons, in order to prevent an accident due to the departure of other trains, the device. For example: "Train derailment (derailment)" is used. [14].

One of the main disadvantages of the use of "KSB" - "wheel tracks" and "train derailment devices" is the fact that the self-propelled vehicles cause great damage to themselves and the railway infrastructure.

At passenger and freight terminals located at the end of closed railway lines, there is a risk of collisions at the end of the platform or railway line due to the inability of trains to stop in time or insufficiently and to reduce speed. When these situations occur, they can cause enormous damage to the lives of passengers, cargo, rolling stock itself and

railway infrastructure. In order to prevent this loss, the station's shock absorbers are widely used in the United States and Europe [15].

The disadvantage of shock-absorbing devices is that they are expensive, and the device can not withstand speeds exceeding 25 km / h.

CONCLUSION:

In order to prevent the spontaneous departure of trains on the Uzbek railways, it is advisable to use the devices analyzed above. In particular, the use of mechanized and automated devices in the fastening of rolling stock provides greater safety and economic savings than manual tightening.

Drawing on foreign experience in the field of accident prevention in case of spontaneous departure of rolling stock, it was determined that in the context of Uzbek railways it is necessary to develop guidelines on "Procedure for interaction of personnel in case of spontaneous movement of rolling stock.".

In the event of loss of control from the main cab of a train or the use of the above-mentioned devices to prevent accidents when wagons leave on their own and other trains go on the track, the self-propelled rolling stock will cause great damage to itself and railway infrastructure. considered to increase.

Therefore, in case of spontaneous movement of rolling stock on station roads, it is possible to prevent possible losses by timely stopping of rolling stock using special devices that operate automatically without human intervention.

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