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СОВЕРШЕНСТВОВАНИЕ РАБОТЫ СОРТИРОВОЧНЫХ СТАНЦИЙ ПУТЁМ ВНЕДРЕНИЯ МОДЕРНИЗИРОВАННЫХ ТОЧЕЧНЫХ ВАГОННЫХ ЗАМЕДЛИТЕЛЕЙ

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Аннотация: В статье представлены сравнительные исследования работы лучевых и точечных замедлителей. Предлагается внедрить новую систему автоматического регулирования скорости движения вагонов для улучшения работы сортировочных станций в Узбекистане.

Ключевые слова: замедлитель вагона, бегун, положение торможения, системы торможения балками, грибки замедлителя, визуализация движения.

IMPROVING THE OPERATION OF MARKING STATIONS THROUGH THE INTRODUCTION OF MODERNIZED POINT CAR MODULES

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Annotation: The article presents comparative studies on the operation of beam and point moderators. It is proposed to introduce a new system of automatic regulation of the speed of wagons to improve the work of marshalling yards in Uzbekistan.

Key words: car retarder, runner, braking position, beam braking systems, retarder fungi, motion visualization.

INTRODUCTION

Today, scientific work is being carried out to reduce the waiting times of wagons in the supply chain of railway transport, to optimize shunting half-flights, and to digitize the transportation process [1-12]. However, research aimed at ensuring the safety of movement of modern devices and easing manual labor has not been carried out sufficiently.

On the railway, the main economic indicator is the turnover of wagons. Sorting stations are created in the places of appearance and repayment of cargo flows. For the process of processing, formation and disbanding of trains, marshalling stations are equipped with automation and mechanization means to control the movement of the cutter from the moment of uncoupling at the top of the marshalling yard to the moment of its braking and entering certain marshalling tracks. From the moment the cut moves from the top of the hill, its speed is controlled, the transition along the arrows to the desired paths, and interval braking is carried out to ensure the necessary intervals between the runners, and targeted braking is carried out before the runner enters the marshalling yard.

For interval and targeted braking, various types of car retarders are used.

Wagon retarder - a stationary braking device installed on a railway track to reduce the speed of wagons (cuts) during shunting work. Provides mechanized braking of moving cuts, eliminates unproductive and dangerous manual labor. The car retarder is installed on the tracks of hump yards, as well as on inclined sidings of industrial enterprises. According to the shape of the brake body interacting with the wheel, rail car retarders are distinguished as beam and non-beam; according to the principle of action - weight, pressure and specialized; by type of drive - pneumatic, hydraulic, electric; at the place of work - hill and park; according to the number of working rails - one- and two-rail. The most widely used are double-rail beam moderators with pneumatic and hydraulic drives [1].

METHODS

Beam braking systems for wagons have been widely used since Soviet times. The braking positions of the descent part of the sorting humps (1 and 2 BP) are equipped with beam car retarders of the following types: pressure (VZPG and KNP) and weight (KV-3). On some slides, these retarders are also installed as an exception at 3 BPs. The most widely used moderators are

Volume 1 | Issue 5 |
August 2022
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KV, KNP-5. For pressure retarders, the braking force depends on the pressure level of compressed air in the cylinders of the installed control equipment; for weigh trucks, the pressure force of the tires on the wheels is set automatically by the power system of the retarder itself, depending on the weight of the braked car [2].

Pincer-shaped wagon retarders (independent of the weight of the wagon) also have movable brake beams, the braking force of which is not affected by the weight of the wagon. Since the maximum allowable braking force of the retarders independent of the weight of the wagons is set for the lightest wagons, so that when entering the retarder there is no squeezing out of the wheels, then, consequently, a heavier wagon with the same braking force cannot slow down as strongly. However, according to operational conditions, a heavy car must be slowed down in the same way as a light car. This requires longer braking distances and car retarders (or two links located one behind the other), which, however, unreasonably lengthens the distribution zone. This can be avoided to a certain extent

However, beam moderators have a number of disadvantages. The use of pincer-type braking systems does not exclude the post of shoemakers and is not always able to meet the increasing safety requirements in railway transport. If the tires of the wheel pairs are of different thickness, then, in addition to excessive wear, cracks in the brake beams also occur.

Pincer-shaped beam retarders, which are used in Uzbekistan and the CIS, have been replaced by point ones that meet modern requirements for marshalling and shunting stations.

Today, despite the objective difficulties, the railways do not stand aside from technical progress: introducing new equipment, systems, etc.

Fig. 1. Placement of retarder fungi at the rail head

The new automatic railcar speed control system (SARPO) is a joint development of Axtone and Tens (Poland) with the participation of specialists from the Warsaw University of Technology and the national railway operator of the Republic of Poland [3].

RESULTS

The main difference between the SARPO system and beam retarders (Fig. 1) is the guarantee of stopping the wagon (cut) where necessary. In addition to regulating the speed of the cuts, the system also provides visualization of movement, event registration and continuous monitoring of the technical condition of the equipment, detects and signals malfunctions in the

Volume 1 | Issue 5 |
August 2022
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operation of various units. Its main working elements are small-sized point retarders (fungi), which are mounted in the base of the rail and connected in series into groups (sections) of 5-20 pieces. Each section is controlled by one signal, with each mushroom absorbing a certain amount of energy from the cutter wheel. In addition to point retarders, the system includes motion, mass, distance sensors, drive infrastructure (electric or air drive) and a control computer that diagnoses the system and indicates errors. Moreover, it records all the actions taking place at the station, and if necessary (for example, in the event of an accident), it will be easy to restore a detailed picture of the incident.

SARPO is a system that adjusts itself according to certain climatic conditions. Its implementation begins with determining the type of station where it will be installed, the gradient of the hump (it is possible to install it on the hump without a slope), the type of brakes used on the rolling stock, the weight, speed and number of wagons in the coupler. Based on these data, specialists calculate the required number of point retarders and complete them in groups for installation on certain sections of the track in such a way that braking is most effective. The speed control of the moving cut is based on the principle of kinetic energy control, which is determined on the basis of measurements of the mass and instantaneous speed of the cut. Mass measurement is carried out using wheel pressure sensors [4].

When braking, each retarder takes a position at an angle to the rail. All fungi have the same size and are divided into active and passive. Their number depends on the relief of the station: where it is necessary to additionally slow down the cars, passive fungi are placed, which are constantly in a position at an angle to the rail. There are two positions for active retarders: "BRAKE" and "DO NOT BRAKE". In the "BRAKE" position, the cylindrical head of the fungus is tilted towards the head of the rail so that the wheels of the passing cut, pressing on it, give off their energy and reduce the speed. "DO NOT BRAKE" is the position in which the cylindrical head of the retarder is retracted from the head of the rail so that the retarder does not affect the moving cut [5].

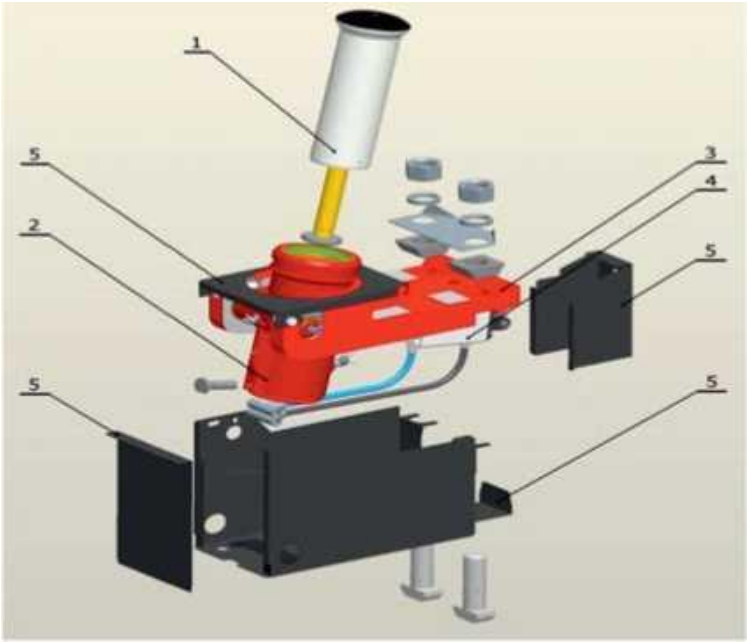

Figure 2. Retarder device:
1 - brake group; 2 - housing; 3 - mounting; 4 - control unit mechanism; 5 - protection

Volume 1 | Issue 5 |
August 2022
ISSN: 2791-3651

5. DISCUSSION

The wheel rolls onto the retarder fungi (Fig. 2), presses on them and rolls over their surface with a comb. In this case, the shape of the wheel does not affect the effectiveness of braking. In other words, in this case, the amount of absorbed energy does not depend on either the profile or the wheel manufacturing technology. In addition, the introduction of the SARPO system at the station increases the safety of work, since it allows you to completely eliminate the post of shoemakers.

The main advantages of the SARPO system include the following:

- increasing the capacity of the station and accelerating the process of train formation;
- increased security, the elimination of the post of shoemakers;
- accurate bringing of the cuts to the target without damaging the goods and wagons, eliminating dangerous situations associated with "catch-up" of cuts;
- no risks associated with lubricated wheelset rims or with non-standard wheel sizes;
- no need for maintenance specialists, since the system itself identifies its problems and displays them on the screen. For the current control of the system, 1-2 people per shift are enough;
- registration of the history of events for the station;
- the ability to integrate with other systems already existing at the station.

Another advantage is the possibility of phased installation of the system without a complete stop of train traffic through the station, as well as the possibility of partial implementation of the project and its further modernization and expansion in the future.

CONCLUSION

To date, a new system for automatic control of the speed of cars (SARPO) has been introduced at the Poznan-Franowo station in Poland, which made it possible to completely eliminate the post of shoemakers, leaving one person to monitor its work. The place and cause of malfunctions, in case of their occurrence, will be indicated to the employee by the computer.

According to the results of the operational evaluation of the Polish railway workers, the system has significantly increased the efficiency of the station. As for Uzbekistan, this system will be widely used in marshalling yards, which will be a significant step towards technological progress.

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Volume 1 | Issue 5 |
August 2022
ISSN: 2791-3651

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