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USE OF A SYSTEM FOR DETERMINING THE STATE OF A NON-JOINTED TRACK TO ENSURE THE SAFETY OF TRAIN TRAFFIC

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ABSTRACT:

The article presents a system for monitoring the temperature stresses of jointless rail lashes laid in the track, which allows monitoring the longitudinal displacement of the track throughout the entire life cycle: from the moment the rails are welded into long lashes, including their laying, and throughout further operation.

Keywords: longitudinal forces, track hijacking, beacon sleepers, jointless track, control, monitoring, temperature stresses.

INTRODUCTION:

In railway transport, both in Uzbekistan and abroad, there is a tendency to intensively increase the speed of passenger and freight trains. The basis for the transition to higher traffic speeds is the modernization of the railway track and its infrastructure, including the widespread replacement of the link railway track with a non-jointed one.

The main danger of the operation of a rail linkless track is associated with the fact that significant longitudinal forces arise in the rail lashes caused by changes in temperature [1]. When the temperature of the rail-jointed lashes increases in relation to the temperature of fixing in them when they are laid in the path, the rail-jointed lashes elongate, and in the pinched state, longitudinal forces arise, which can create a danger of ejection of the track [2]. When the temperature decreases, forces appear that can cause stretching and breaking of the rail linkless whip or breaking of the rail joint due to the cutting of the butt bolts; this creates a large gap that is dangerous for train traffic. From the moment of fixing the rail lashes during laying, constant control and monitoring should be organized over the force of pressing the sole of the rail to the sleeper and over the longitudinal movements (hijacking) of the rail-free lashes. Stealing lashes due to the violation of the technology of fastening, wear rubber cushioning strips that directly affect the clamping force applied to the foot rail to the sleeper, by weakening the torque applied bonding, which causes the violation of the established temperature-busy mode of operation and can lead to dangerous concentrations whips tensile or compressive stresses.

METHODS:

At present, in order to detect the longitudinal displacement of the rail lashes in a timely manner, in accordance with industry regulations, a walking tour of the sections of the track and their visual control is carried out [3].

The inspection is carried out with an orientation to the displacement of the control sections of the rail lash relative to the "lighthouse" sleepers located at a distance of 100 m from each other opposite the picket post [4]. Longitudinal displacement of rail lashes (hijack) show traces of terminals on the sole of

the rails (Fig. 1), the displacement of the pads on the tracks (Fig. 2), wzbogacania or loose fit of ballast to the side faces of the sleepers and their bias.

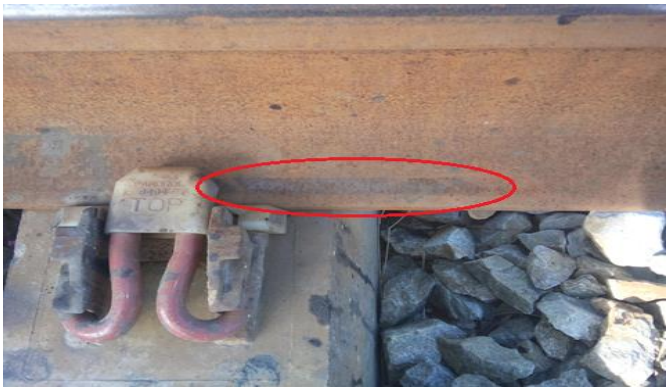

Figure 1. Traces of the terminal on the sole of the rail at the longitudinal displacement of the lashes.

When operating a trackless track, it is often necessary to eliminate deviations in order to bring the content of the bond that ensures the rail is pressed against the sleeper, and the position of the track in the plan and profile, in accordance with the technical requirements. As a rule, due to the lack of time in between trains eliminating deviations are performed using high-performance cars; while pre-deployment training path is not. During operation, the control sections of the rail lash are shifted relative to the "beacon" sleepers, and, accordingly, it becomes impossible to accurately determine the possible theft of the rail linkless track [2].

Figure 2. Displacement of the under-rail linings along the sleepers.

Until recently, there were no other ways to control the longitudinal displacement of a trackless track. The main disadvantages of the described method are related to the fact that it requires:

- Perform mathematical calculations to determine the lengthening of the rail lash when it is forced into the optimal fixing temperature;
- Apply chalk or oil paint marks on the sole of the rail and the lining for visual observation of the movement of the railless whip when it is forced to stretch during the laying period;
- Paint the "lighthouse" sleepers with oil paint (fig. 3);
- Constantly conduct visual surveillance (it is carried out by specially trained people assigned to a specific site).

Figure 3. Marking of the control section on the lash and the" beacon " sleeper to control the hijacking of the track for the rail fasteners.

In Addition, with this Method,:

- Possible mechanical displacement of track equipment "lighthouse" sleepers relative to the cross-sections applied to the sole of the rail;
- It is not possible to restore the original data obtained during the laying of the jointless rail lash;
- It is not possible to accurately measure the theft of a jointless rail lash, since the sections are applied with a large error, and

the "beacon" sleepers are displaced due to strong vibration when passing trains.

When laying the rail-jointed lashes up to 800 m long with the device of equalizing spans, it was possible to dissolve the lash and fix it again at the optimal temperature when the initial fixing temperature was lost. Today, when the length of the rail-jointed lash reaches 74 km or more, it is almost impossible to do this: you need to cut the lash into dimensional sections, loosen them, fix them and weld them again into the lash. This is a very labor-intensive work, which entails long breaks in the movement of trains and significant economic costs.

There are a number of organizational measures [5] aimed at preventing changes in the position of the joint-free path in the plan or profile, but none of them guarantees the elimination and absence of places of stress concentration in the joint-free lash. The increase in train speed requires good technical condition of the path, as well as the replacement of manual labor by high-performance vehicles, a reduction in the numbers of workers employed on the way and upon visual inspection of the condition of the elements of the top structure of a way, roadbed and structures.

To ensure that the busy train schedule is clearly observed, it is necessary to monitor the condition of the track, predict the disorder of the track and eliminate it in a timely manner. Until now, information about changes in the longitudinal movements in the trackless lashes could only be recorded during the absence of traffic on the track. A system for monitoring the temperature stresses of jointless rail lashes laid in the track is proposed, which allows you to control the process from the moment the rails are welded into long lashes throughout the entire life cycle, including their laying and further operation.

RESULTS:

The basis of the system is a wireless measuring sensor (SKBP-2009) with an electronic unit mounted on a rail. It allows you to measure the degree of tension, compression and the magnitude of the resulting stresses of the rail when the ambient temperature changes. Such wireless measuring devices are designed to measure and control the internal stresses in the rail lashes that occur under the influence of temperature changes and other external influences on the rail-sleeper grid.

The schematic diagram of the device for monitoring the state of the jointless rail lashes laid in the way, during their operation, is shown in Fig. 4.

Measuring temperature and reference temperature sensors equipped with an electronic unit monitor the stresses that occur during the operation of a non-jointed rail track.

According to the readings of the electrical signal of the sensor, data on the temperature and the conditional fixing temperature corresponding to the internal stresses occurring in the rail are taken. This information is determined by the results of calculations performed on the basis of the data of the electronic unit.

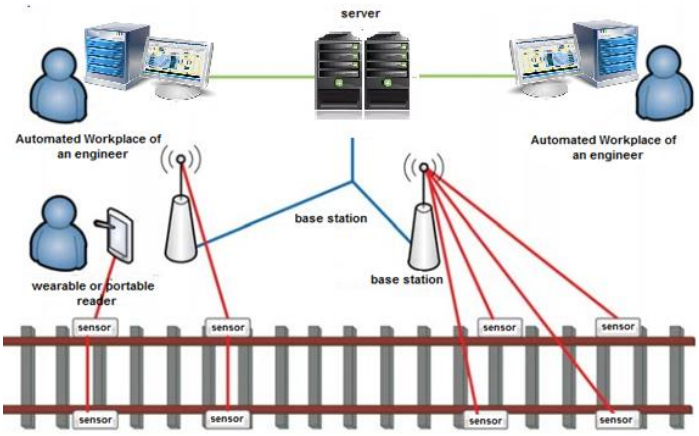

Figure 4. Schematic diagram of the device for monitoring the temperature stresses of jointless rail lashes laid in the path during their operation.

The sensor is attached to the rail neck by a specially developed method - by spot welding it to a pre-sanded section of the rail neck surface. A protective housing is installed on the sensor, which is attached to the clamp. The sensors with the electronic unit are self-contained, sealed, vandal-proof and have a built-in power supply. The information from the sensors is transmitted wirelessly to the base station, and from it goes to the server.

The server performs long-term storage, processing of the received information and its display on the web interface. Based on data on the value of the resistance of compacted ballast shear sleepers, friction between the rail and under rail cushioning gasket (depending on the bond), the data on the plan and profile, the way a native of the rolling stock system allows you to analyze and compare the growth of opposing forces that arise due to stress concentration, and to anticipate a possible change in the position best image path in plan and profile.

CONCLUSIONS:

Thus, the monitoring system of temperature stress state rail seamless way allows monitoring of the area of railway track when its distance from the workplace, to analyze the work of the scourge at any time, including previous requested intervals. This makes it possible to predict the development of malfunctions, and in critical situations, turn on the red signal of the traffic light to stop the train, preventing the departure of the rolling stock. With the help of stationary and manual reading devices, the system keeps electronic records and controls the performance of work at the initial stage of laying a non-jointed track and in the future at any time.

REFERENCES:

1) Albrecht V. G., Kogan A. Ya. Besstykovoi put. - M.: Transport, 2000.
2) Mirakhmedov M. M., Khalfin G. R. Longitudinal forces associated with the movement of trains. ACTUAL PROBLEMS OF MODERN SCIENCE AND INNOVATION IN THE CENTRAL ASIAN REGION proceedings of the international conference 26 September, 2020 y, Jizzakh, Uzbekistan.
3) Instructions for the device, installation, maintenance and repair of a non-jointed track.- Tashkent, 2018.
4) Khalfin G. Condition of fence sleepers causes of uneven distribution of longitudinal stresses in the rail lash. Universum: technical science. №12, 2019.
5) Technical instructions for the device, laying, maintenance and repair of a non-jointed track. - Moscow: Transport, 2000.