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EFFICIENCY OF EXTENSION OF RAIL LASHES AT JSC " UZBEKISTAN RAILWAYS"

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ABSTRACT
The article examines the work of the lashes of the jointless track in foreign countries and in our country, examines the most important conditions for its trouble-free operation, and also calculates the economic efficiency of the extension of the rail lashes.

Keywords: joint-free path, linear drag, displacements, bonds, efficiency, equalization span

INTRODUCTION
Theoretically, the temperature-stress mode of operation of the lashes of a non-jointed path does not depend on their length. With sufficient linear resistance to movement, each lash has so-called "breathing" ends [1], during which the forces of linear resistance "accumulate" to the value of the longitudinal force corresponding to the difference between the actual temperature of the rail and the temperature of its attachment. Next, the whip remains stationary, no matter how long it is.
In the developed countries of the West, such a joinless path is used, in which the switches are also welded into endless whips. "Breaks" are made, as a rule, only on bridges with equalization devices. The required linear resistance is provided by elastic intermediate fasteners with a linear dependence of the clamping force on the deformation of 10 mm or more (NABLA, PANDROL, VOSSLOH, etc.). They do not require additional maintenance and securely press the sole of the rail to the base.
On high-speed sections of the TGV, INTERCITY, and others, signaling and auto-locking systems operate without traditional rail circuits with insulating joints. Nevertheless, on the tracks laid earlier, there are such joints, but without equalizing

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spans, since the shear resistance in them is sufficient for the perception of temperature and braking forces. The most common glue-bolt joints are made with short (from 3 m) pieces of rails, and then welded into lashes. There are high-strength isostyki, which are collected directly in the path or next to it, followed by welding in the lash. The resistance of such joints to shear on the railways of Western Europe is 1.6-1.8 MN, which is sufficient for a non-jointed track with reliable elastic fasteners in a milder climate than in Russia. The lashes are introduced into the calculated temperature range mainly by means of hydraulic devices [2].

At JSC “Uzbekistan Railways”, the average length of the lashes is about 500-700 m, the equalization spans are about 40 m and the "breathing" ends of the lashes are 50 m on each side. Therefore, the ratio of the length of the middle parts of the lashes, where the level of dynamic interaction of the track and rolling stock is the smallest, to the length of the zones of equalizing spans and "breathing" ends is 3:1. In these zones, the failure of the elements of the upper structure is much greater: rails-10-12 times, linings-2 times, overhead and under-rail gaskets-1.8 -, 2 times, spring washers-1.8 times. And the cost of current maintenance reaches 80% of the total cost of maintaining a non-jointed path.

Until recently, the widespread use of "ultra-long" lashes was held back by the following reasons:

- imperfection of intermediate fasteners of the KB type;
- the need to ensure the operation of automatic signaling and auto-locking;
- the complexity of the introduction of lashes in the calculated temperature range, the technology of repairs of the path.

METHODOLOGY

One of the most important conditions for the trouble-free operation of a non-jointed track is the creation of the necessary linear resistance to the movement of rails relative to sleepers or rails together with sleepers relative to ballast [3]. The shift of the rail-sleeper grid relative to the ballast layer is rare and can occur with significant deviations from the standards in the outline of the ballast prism and the degree of its compaction. The movement of the rails relative to the sleepers is hindered by the terminals, and when fastening the KB 65, there are also embedded bolts. The fastening of the CB reliably "resists" the widening of the track and the alignment of the rails, but requires significant labor costs for periodic tightening of the nuts of the terminal and embedded

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bolts 25-30% of the total cost of the current maintenance of the jointless track. With a load capacity of approximately 40 million t-km gross per 1 km per year, they need to be tightened at least 2 times in the middle of the lashes and 3 times — at the ends and equalizing rails. In case of violation of this periodicity or low-quality work in areas with "extra-long" lashes, irreversible deformations will occur.

First, we will determine the benefits of welding lashes as long as the block section. For the calculation, we will take the following initial data: the inter-repair period is about 13 years, the average length of the block section is 1.5 km, one zone of equalization spans is arranged on it; the length of the equalization spans to be eliminated and the "breathing" ends of the lashes is $3 \times 12,5 + 2 \times 50 \approx 140$ m.

RESULTS OF THE RESEARCH

1. Savings from reducing the consumption of butt fasteners.

With three equalizing spans, four pairs of joints are eliminated. The cost of welding one joint in the RSP -19.82 $, the PRSM machine on the stage in the "window" — 78.9 $. Of the eight joints in the path, two are welded and six are welded in the RSP. The total cost of welding is equal to:

$$6 \times 19,82 + 2 \times 78,9 = 277 \text{ \$}.$$

The price of two six-pin pads and six bolts with nuts is 42.5 $. This means that 8 x 42.5 - 277 = 63 dollars will be saved.

2 Savings by increasing the service life of the rails.

In the zones of equalizing spans and "breathing" ends of the lashes, 21 rails per 1 km fail during the repair period, and in the middle of the lashes - 1.5 pieces/km. When eliminating one zone of equalization spans, less $(21 - 1.5) \times 0.14 = 2.73$ rails will be removed. Their replacement costs $2.73 \times 25.42 = 69.39$ $, and the price of the rails themselves with a length of 12.5 m and a weight of 64.64 kg / m is equal to: $2,73 \times 12,5 \times 64,64 \times 0,88 = 1941$ $, where 0.88 $ is the cost of 1 kg of rails. A total of $ 1,941 is saved.

3 Savings by reducing the frequency of fixing the nuts of the terminal and embedded bolts.

In the area of equalizing spans and "breathing" ends of the lashes, the accepted initial data requires 2.13 puffs per year or 27.69 puffs for the inter-repair period, and in the middle of the lashes, respectively, 1.18 and 15.34.

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There are 262 sleepers on the 140 m track. Tightening the nuts on 1000 SGP sleepers costs -407.4 US dollars, and the earnings of the maintenance staff — 7.6 US dollars. The number of puffs decreases by 27.69 - 15.34 =12.35. Consequently, expenses are reduced by 12.35 × (407.4 + 7.6) x 0.262 = 1343 $.

4 Savings by reducing the number of alignments.

In the zones of equalizing spans and "breathing" ends of the lashes, an average of 2.14 straightening per year or 27.82 straightening per repair period is required, and in the middle of the lashes — 0.89 and 11.57, respectively. The cost of operating the Dyomatik-0832 machine is 134 $ per 100 sleepers, and the staff earnings are 1.5 $ per 100 sleepers. So, it is saved 2,62 × (27,82 - 11,57) × (134 + 1.5) = 5769 $ Finally, the service life of the fasteners is increased, which saves 954 $.

The total savings for all positions on the 1.5 km section will be 63 + 1941 + 1343 +5769+ 954 = 10070 $ for the inter-repair period.

The efficiency of welding lashes with a length of a stretch is 2 times higher. When using high-strength isostyks, and without equalizing spans, you can save, respectively, 963 $ per 1 km per year, because the remaining zones of equalizing spans and "breathing" ends of lashes of the same length as in the first case, i.e. 140 m on a block section with a length of 1.5 km, are eliminated.

CONCLUSION

Taking into account the exchange rate of the sum as of May 28, 2021 in relation to the US dollar in the amount of 10589 sums for 1 US$, the total value of the economic efficiency from the introduction of extra-long lashes will be 106631230 sums for the inter-repair period, based on the elimination of one span between adjacent lashes.

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