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On the issue of introducing an experimental industrial batch of under-rail pads on the railways of the Republic of Uzbekistan

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ABSTRACT: The article deals with the implementation of a pilot-industrial batch of under-rail rubber gaskets with improved physical and mechanical properties, which have a positive effect on the reduction of vibrodynamic vibrations in the area of the rail joint of the railway track.

KEY WORDS: stiffness, rail joint, rail spacers, vibration, rubber, ballast, damping.

I.INTRODUCTION

Previous studies have shown the possibility of obtaining rubber pads with a predetermined stiffness using the additional ingredients used and varying their amounts in order to obtain predetermined physical and mechanical properties of rail pads [1,2,3].

[4,5] To test the effective elastic processing of vertical and horizontal transverse shock and dynamic effects of wheels on the rails, damping high-frequency vibrations, create optimal spatial elasticity of the track, constant along its length in all directions, we set up an experiment to determine vibration acceleration with standard and experienced industrial gaskets. The composition of the rail pads is presented in table.1.

Table 1 Composition of under-rail pads of a pilot industrial batch

№	Name	Unit rev.	Structure production.	Structure № 1	Structure № 2	Structure № 3	Structure № 4
1	Rubber brand ARKM	kg	15	13,3	11,1	13,3	11,1
2	Carbon black (soot) 803	kg	15	13	13	13	13
3	Technical oil	l	-	4	6	4	6
4	a piece of chalk	kg	10	-	-	-	
5	Sulfur	kg	0,5	0,65	0,65	0,65	
6	Thiuram	kg	0,20	0,20	0,25	0,20	0,25
7	Regenerate	%	-	2,7	3,9	2,7	3,9
8	2mm synthetic fiber	kg	-	1,0	1,5	1,0	1,5
9	Stearic acid	kg	0,2	0,25	0,4	0,25	0,4
10	Zinc oxide	kg	0,2	0,20	0,25	0,20	0,25
11	Fly ash + surfactant	kg	-	4,5	9	-	-
12	OMS + surfactant	kg	-	-	-	4,5	9

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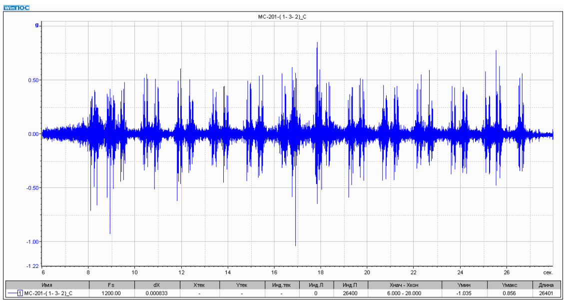
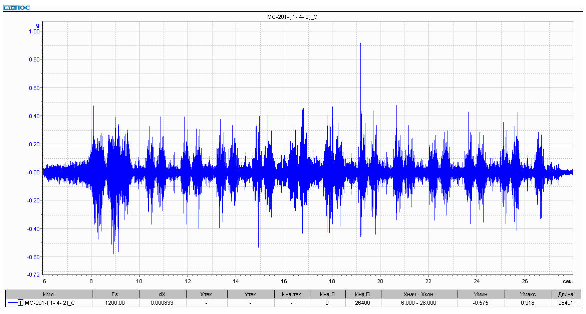
The research results are shown in Fig. 1.

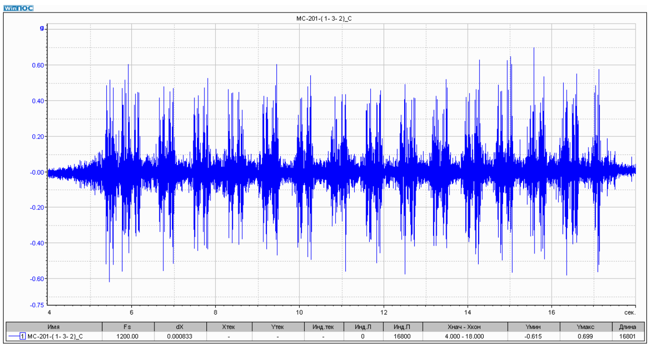
About regular gaskets

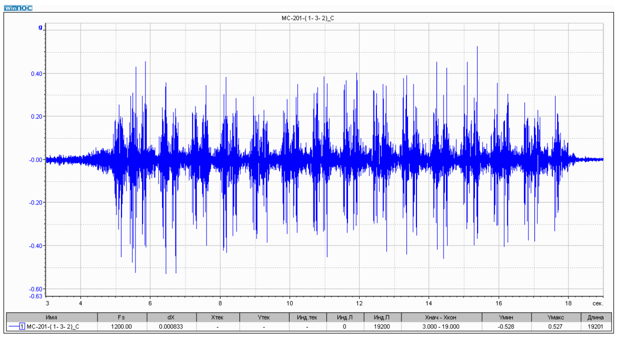
With pilot industrial gaskets



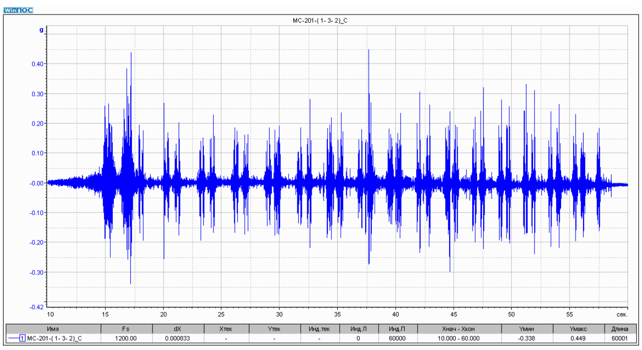


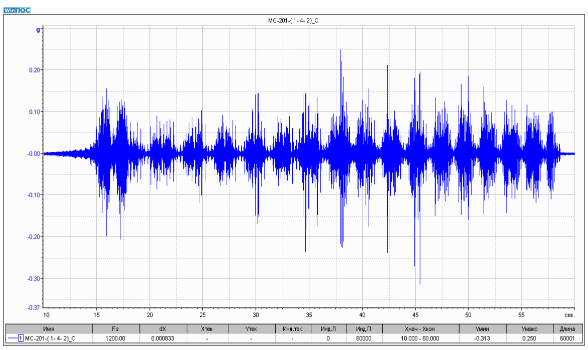
Ballast vibration acceleration graph in the rail joint area





The graph of vibration acceleration of ballast in the area of the rail joint with 3 test pads-shock absorbers during the movement of a passenger train





The graph of vibration acceleration of ballast at a distance of 5 test pads-shock absorbers (2.35 meters from the joint) during the movement of a passenger train

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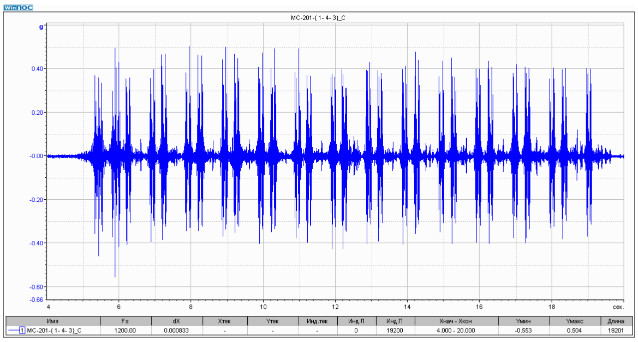
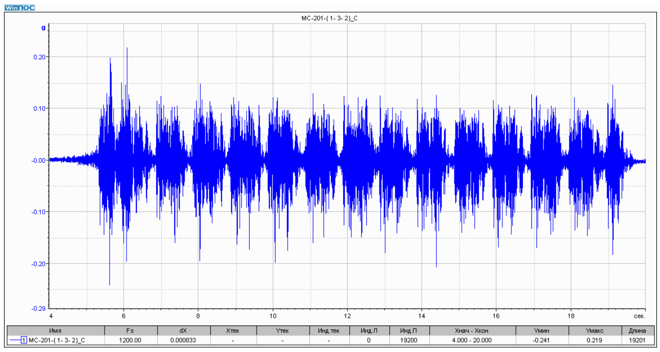




The graph of vibration acceleration of ballast at a distance of 5 test pads-shock absorbers (2.35 meters from the joint) during the movement of a passenger train

Fig. 1. Schedule of vibration acceleration of ballast of standard and test pads-shock absorbers during the movement of a passenger train

Fig. 1 shows the graph of vibration acceleration of ballast in the area of the rail joint. Ballast vibration acceleration values with standard gaskets are 1.15g. A sensor located at a distance of 1.4 m from the rail joint recorded readings of 0.93g, a sensor located at a height of 2.35 m recorded 0.6g and a sensor located at a distance of 3.3 m recorded 0.4g. Thus, the ballast layer with standard gaskets for melting from the rail joint along the receiving rail at a length of 3.3 m perceive vibration accelerations from 1 to 0.4 g.

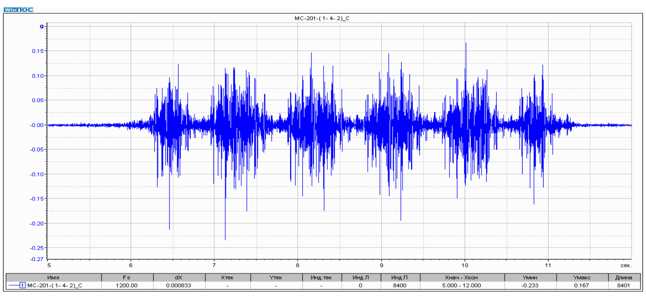
The sensor located in the area of the rail joint shows the vibration acceleration of the main platform of 0.45g, the sensor at a distance of 3.3 m shows the vibration acceleration of 0.24g.

The second stage of the experiment was the effective location of the obtained sub-rail pads with different stiffness at a distance of 3.3 m from the rail joint. The analysis of the experimental data showed that the most effective location of the developed under-rail pads is the laying of train No. 1 at distances of 1.4 m, train No. 2 at distances from 1.4 m to 2.35 m and train No. 3 at distances from 2.35 m to 3.3 m.

Experiments have shown that such an arrangement of gaskets most effectively dampens vibrodynamic acceleration in the studied areas of the ballast layer.

Figure 2. the graph of vibration acceleration of ballast in the area of the rail joint is presented. The ballast vibration acceleration values for test pads are 0.5g, a sensor located at a distance of 1.4 m from the rail joint recorded readings of 0.32g, a sensor located at a distance of 2.35 m recorded 0.22g and a sensor located at a distance of 3.3 m recorded 0.16g. Thus, the ballast layer with standard spacers at a distance from the rail joint along the receiving rail at a length of 3.3 m perceive vibration accelerations from 1 to 0.4 g.

About regular gaskets



With pilot industrial gaskets

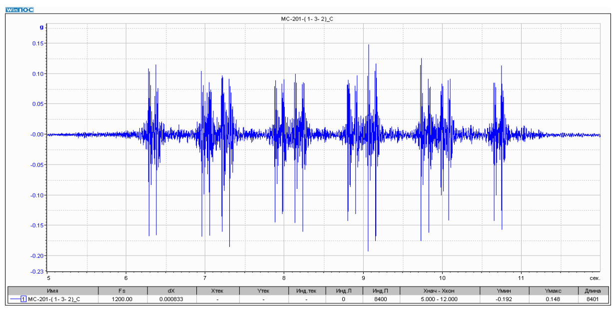


Fig. 2. Schedule of vibration accelerations of the main platform with standard and experimental shock-absorber pads during the movement of a passenger train

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Figure 2 shows the graphs of the acceleration of the main platform by the experimental sub-rail spacers located above the above scheme in terms of rigidity.

The sensor located in the area of the rail joint shows the vibration acceleration of the main ground of the roadbed 0.15g, the sensor at a distance of 3.3 m shows vibration acceleration 0.12g.

Earlier studies of the vibration accelerations of ballast and on the main site of the roadbed, carried out by the applicant, show that the installed pads of reduced rigidity can significantly improve the work under the rail bases due to a significant decrease in force and vibration effects by 30%.

The calculation of economic efficiency was made on the basis of the total annual amount of the reduced costs for the maintenance of the path of the PCh-4 unit, which amounted to 4391100.00 thousand soums

CONCLUSIONS

The developed compositions of experimental industrial gaskets made it possible to use local dispersed fillers of fly ash and OMC, as well as to study their physical and mechanical properties. In the course of the study, we took it as a filler surfactant + OMS. The use of OMS with surfactants in fillers will increase the adhesion properties of the “rubber-filler”.

Experimental data showed the best results with pilot industrial shock absorbers. Experienced shock absorber pads, which have a lower rigidity than standard ones, most effectively reduce the level of vibration acceleration in the ballast, which significantly reduces performance, reduces the labor intensity of work on the current track maintenance, and has a positive effect on the stress-strain state of the track.

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