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CAUSES ANALYSIS OF THE LOCOMOTIVES BRAKING EQUIPMENT FAILURES IN THE "UZBEKISTAN RAILWAYS" SC CONDITIONS

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Abstract
The article is devoted to the current topic of improving reliability and analysis of the causes of failure of locomotive braking equipment in the conditions of JSC «Uzbekistan Temir Yollari». The article presents an analysis of the causes of failures of brake equipment of the rolling stock of the railway of Uzbekistan. It is shown that the main reasons for the removal of brake pads from service is their wear, including the seizure of friction surfaces. Brakes are one of the main means of ensuring the safety of train traffic. The classification of brakes and their main properties are presented.

Keywords: safety, brake systems, reliability, malfunction, pads, rolling stock.

Introduction

Uzbekistan Temir Yollari JSC is putting new railway sections into operation today. In particular, the Angren-Pap, Tashguzar-Kumkurgan-Baisun railway sections are mountainous, and one of the main tasks in the operation of these sections is the safe

use of rolling stock. Therefore, it is advisable to identify factors that affect the occurrence of slippage between the brake pad and the bandage, which reduces the service life of the brake system of mainline locomotives, and eliminate defects in the brake components of rolling stock. Reliable operation of the braking system and its parts of railway rolling stock is the basis for ensuring the capacity and carrying capacity of railways, as well as the safety of train traffic [1-6]. The reliability of rolling stock braking equipment plays a special role in ensuring traffic safety. To improve the reliability of braking equipment, it is necessary to identify the main causes that lead to failures of braking equipment [7].

Results and Discussions

In 2018-2020, 18,780 operational failures were registered on the railway sections of UTY JSC due to malfunctions of rolling stock braking equipment, which is 12.6% of the total number of failures.

The largest number of failures due to failures of braking equipment was recorded in Karshi-Termez RZHU-2895 cases, 14.75% of the total number of failures of braking equipment recorded in Uzbekistan Temir Yollari JSC, in Bukhara RZHU-2456 cases (12.51%), in Tashkent RZHU - 1968 cases (10.02%).

In 2020, there was a general trend of reducing the number of rolling stock brake failures compared to previous years. However, it was noted that the number of failures of the brake lever transmission and brake valves in 2020 was higher than in 2018-2019. (Table 1.1).

Due to the purposeful work carried out to improve the quality of service of braking devices in the locomotive depots of Uzbekistan Temir Yollari JSC, there is a general shift in reducing the number of failures of braking equipment [8-9].

Table 1.1 Average number of failures of brake equipment components

№	Names of braking equipment	Node Failure		
		2018	2019	2020
1	Hand brake	60	55	45
2	Tanks	132	128	123
3	Brake cylinder	212	214	219
4	Automatic mode	209	219	223
5	Brake suspension	674	628	675
6	Lever transmission	898	872	908
7	Brake fittings	1098	1201	1315
8	MainlineBrake line	2805	2880	2815
9	Air	Distributor 528	5318	5765

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Table 1.2 shows the distribution of brake equipment failures by brake units in 2018-2020.

Table 1.2 Distribution of failures of rolling stock braking equipment components

№	Names of braking equipment	Node failure distributions, %
1	Hand brake	0.40
2	Tanks	0.53
3	Brake cylinder	2.11
4	Automatic mode	2.43
5	Brake suspension	4.04
6	Lever gear	4.68
7	Brake fittings	12.06
8	Brake line	17.7
9	Air	**distributor 56.05**
	Total	of 100

The largest number of failures of brake equipment in 2018-2020 is associated with malfunctions of air distributors.

The main part of failures is related to the complexity of the air distributor design and the presence of a large number of structural elements, which reduces their reliability. Next in terms of the number of failures is a violation of the integrity of the brake line. The distribution of failures of braking equipment due to failure of the brake line is shown in Table 1.3.

Over the past three years, failures of the brake line on the roads of Uzbekistan Temir Yollari JSC caused 1,429 failures of braking equipment. The largest number of violations was registered in the Tashkent MTU (250 cases (17.68% of the total number of failures due to brake failure)) and Karshi MTU - 130 cases (9.87%).

Table 1.3 Reasons for deterioration of the rolling stock brake line integrity in 2018-2020

№	Names of brake line equipment	failures, %
1	Brake failure in the last car	0.38
2	Interference by unauthorized persons	0.72
3	Reason not found	1.31
4	Brake line malfunction	2.53
5	Disconnecting the connecting tap	2.63
6	Air leakage through connecting hoses	2.78
7	Air leakage through the connecting sleeve	4.32
8	Other faults	4.73
9	Brake line breakage	6.68
10	Disconnecting the pipe leading to the spare tank	6.69
11	Air leakage from the air duct due to low thread density	8.89
12	Break of connecting hoses	16.06
13	Open pipe leading to the air distributor	41.87
	Total	of 100

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Failure of the lever transmission often leads to failure of the braking equipment. As a result of this malfunction, 468 failures of braking equipment occurred in Uzbekistan Temir Yollari JSC. The distribution of brake equipment failures due to lever transmission failure is shown in Table 1.4.

Table 1.4 Reasons for the failure of the lever transmission in 2018-2020

№	Names of gearshift equipment	Node failure distribution, %
1	Lack of continuous traction (thrusts)	0.88
2	Skidding of wheelsets, sparking	2.20
3	Applying trailing arms at dead center	2.20
4	Failure to observe the dimensions A and B of the lever transmission	5.29
5	Malfunction in the autoregulator	5.29
6	Incorrect adjustment of the brake lever transmission	5.29
7	Lowering the bracket for uniform wear of the brake pads	5.73
8	Trangel break	9.25
9	Other reasons	12.33
10	Brake traction transmission failure	14.98
	Total	of 100

The locomotive crew is required to monitor the air pressure in the brake line using pressure gauges that lead to a malfunction [10-11].

In addition to minor malfunctions that cause the brakes to work poorly, there are also cases of complete failure of the braking equipment.

The traffic safety concept of Uzbekistan Temir Yollari JSC has been developed. The measures provided for in the Concept are aimed at ensuring security (management, people and technologies) in Uzbekistan Temir Yollari JSC.

The human factor also affects the existing methodology for measuring the density of the train's brake line, which is associated with a low level of accuracy of measuring instruments and imperfect methods for determining the validity of brake equipment. Currently, the train's brake line density is measured using pressure gauges and untested drivers ' wristwatches. The density of the train braking network is measured repeatedly, since this parameter is used to assess the performance of train braking equipment.

In accordance with paragraph IV of the Regulations (kaisi Koidalarni), the level of brake line density is measured during full brake testing, reduced brake testing, technological testing of freight train brakes, acceptance of the driver's crane, as well as after stopping and parking the train for 300 s (5 min) or more [12-16].

Conclusion

During 2018-2020, one of the main reasons for rolling stock brake failures in Uzbekistan Temir Yollari JSC was malfunctions of air distributors and the brake line.

Therefore, it is necessary to pay special attention to the quality of repair and testing of air distributors of brake equipment in workshops for repairing brake components of wagons and locomotives.

Also, before sending trains from car maintenance points, you should pay special attention to the density of the air ducts connected to the air distributors of the cars in the composition and the threaded parts of the brake line.

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