

## RATING OF THE OPERATIONAL MASSAGE OF THE TIRES OF LARGE-LOADED MINING DUMP TRUCKS OPERATING AT THE OBJECTS OF THE ALMALYK MINING AND METALLURGICAL COMBINE

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### ANNOTATION

The article presents the results of experimental and theoretical calculations of the norms of operational mileage of tires made on the basis of the methodology of the Scientific Research Institute of Oversized Tires (NII KGSH). It was found that the results when determining the norms of tire mileage by 2 methods practically coincided. It is noted that all observations of tires and calculations of their mileage were carried out on tires that have only natural wear and tear, excluding tires that were prematurely removed from service due to mechanical damage or tread peeling.

**Keywords:** tire wear, heavy-duty dump trucks, wear resistance, rationing, quarry roads, tire mileage.

### INTRODUCTION

Mining dump trucks are used in various road, climatic, geological, mining conditions. On the basis of the results of numerous scientific research works, statistical data of motor transport enterprises and an expert assessment of the operability and the main reasons for the occurrence of tire failures, the SRI KGSH identified the main factors affecting the tire life and characterizing the following categories of operating conditions [1]:

- Type of road surface;
- Longitudinal profile of roads (average value and proportion of longitudinal slopes in the traffic arm);
- The strength of the transported rocks.

Typical reasons for the failure of pneumatic tires of mining dump trucks in operation are [2]:

- Manufacturing defects that were not detected during the final inspection of tires at the manufacturer's plant;
- Mechanical damage (cuts, punctures, chipped lugs and others);
- Fatigue and thermal damage (peeling of the tread, sidewalls, delamination of the cord and others);
- Natural wear of the tread.

In the interstate standard of the CSS GOST 26585-2003 "Pneumatic tires of large and extra large sizes for off-road career vehicles. Technical conditions", which is also valid on the territory of the Republic of Uzbekistan, similar 3 categories of operating conditions for these tires are also defined, according to which manufacturers must establish their warranty runs.

As you know, tire wear in winter decreases from 25 to 30% in regions where the average temperature in summer is + 20 ° C, and in winter -20 ° C. In the Republic of Uzbekistan, the average winter temperature does not exceed -5 ° C at the facilities of the Almalyk Mining and Metallurgical Combine (AGMK), and in summer it reaches + 35 ° C. As our long-term observations have shown, tire mileage in winter compared to the summer period increases from 15 to 25% [3-7].

All calculations were carried out on tires that had natural wear and tear, excluding tires that were prematurely removed from service due to mechanical damage or peeling of the tread.

### METHODS

The first method for establishing KGSH mileage norms is the method of setting individual operational mileage norms for automobile KGSH, developed by the Research Institute of KGSH, based on the study of the influence of the above factors on the tires of heavy dump trucks in the Kalmakyr, Sary-Cheku quarries and on the OXX site [7].

The second method of standardizing the operating mileage of the KGSH was carried out by road studies of the dynamics of tire wear in specific quarry conditions. The recommendations of GOST 28169-89 "Pneumatic tires. Methods for determining tire wear resistance during road tests", since there are no similar standardized methods for KGSH.

The data of calculations of the predicted mileage of the controlled tires until complete wear of the tread, carried out on the basis of road studies of their wear resistance, are given in the table. Along with this, the results of theoretical calculations of the norms of the operational mileage of these tires, carried out on the basis of the NII KGSH methodology, are presented.

### Calculating Predicted Tire Mileage

Projected mileage rates	Tire type, place of use and dump truck number		
	27.00-49	33.00-51	33.00R51
Predicted tire mileage based on road tire wear studies	Kalmakir №3 29622 km	Kalmakir №08 30502 km	Kalmakir №021 56712 km
	Kalmakir №6 27616 km		
Theoretical calculation of the norms of the operational mileage of tires according to the method of NII KGSH	Kalmakir 23690 km	Kalmakir 28428 km	Kalmakir 56875 km
		Sari-Cheku 31500	Sari-Cheku 60000

In the course of the road survey, all technological transport routes in the Kalmakyr and Sary-Cheku quarries were analyzed in detail. The shoulders of the routes, the length of round trips, the number, length and value of the slopes of the roads from the places of loading to the sites for unloading (reloading) of dump trucks were taken into account. Data on the length of routes, inclines on ups and downs were obtained from the mine surveyors of the Kalmakyr Central and Vyskryshny quarries and the Sary-Cheku quarry.

The state of the road surface and the strength of the rocks from which they were dumped, as well as the strength of all rocks transported by dump trucks, were also examined, specifically for each transportation route in the Kalmakyr and Sary-Cheku quarries. Data on the rock hardness were obtained from geologists of specific quarries and were refined in the department of the Chief Geologist of the AMMC.

on the basis of studies of tire wear resistance in autumn (at positive temperatures), and also partially in winter, when, as is known, the intensity of tire wear decreases.

## RESULTS

The standard mileage of the bias tire 27.00-49 FT-115 "Belshina" of the TEREX 100 dump truck operating as a technological transport in the Kalmakyr quarry has been determined.

Bias tires of standard size 27.00-49, model FT-115, used on heavy-duty dump trucks TEREX-100, are manufactured according to TURB 14762133.114-97, on the basis of which the tire has a warranty operating time of 25000 km for III severe operating conditions.

The results of the work carried out to determine the wear resistance of radial tires 27.00-49 FT-115 are presented in the table.

Operational tests were carried out on 12 tires installed on two TEREX-100: No. 3 and No. 6.

Let us determine the average predicted standard mileage obtained by road research, according to the formula

$$L_{cp} = \frac{29622 + 27616}{2} = 28612 \text{ km.}$$

Considering that operational tests were carried out mainly in the autumn-winter period (with the capture of 1 month of summer - TEREX-100, No. 6), we will correct this mileage downward by 15%. We will receive the predicted mileage - it is equal to 24320 km. Now let's find the average value of the normalized tire mileage 27.00-49, obtained by 2 methods, according to the formula

$$L_H = \frac{24320 + 23690}{2} = 24005 \text{ km.}$$

For the standard value of the mileage of the bias tire 27.00-49 of the FT-115 "Belshina" model for the TEREX-100 dump trucks operating in the Kalmakyr open pit as a technological transport, 24000 km is taken.

We determine the standard mileage of the bias tire 33.00-51 of the FT-116AM2 "Belshina" dump truck BelAZ 75131, which operates as a technological transport in the Kalmakyr and Sary-Cheku quarries. Such tires are manufactured according to TURB 700016217.126-2001, on the basis of which the warranty operating time of the tire in the III severe category of operating conditions is established - 30000 km.

The theoretical calculation of the norms of the operational run of tires 33.00-51 according to the NII KGSH method, taking into account the real state of the opencast roads, the strength of the transported rocks according to the Protodyakonov scale, showed the following results: for the Kalmakyr opencast — 28428 km, for Sary-Cheku — 31,500 km.

Thus, the following can be noted:

one). For production reasons, it was not possible to install new and take control of tires 33.00-51 BelAZ 75131 in the Sary-Cheku quarry.

The operating conditions of the BelAZ-75131 heavy-duty dump trucks in the Sary-Cheku quarry, as well as in the Kalmakyr quarry, belong to the III severe operating conditions category. However, the specifics of the location of the open pit and the place of ore reloading ensure the movement of dump trucks with ore downhill at a distance of 70–80% of the route length. Calculations show that in general, about 50% of the transportation of rock mass on overburden and ore is carried out on the descent, which greatly facilitates the work of tires. In the Kalmakyr quarry, BelAZ-75131 dump trucks at the Vyskryshny and Tsentralny quarries carry cargo uphill, which on average is about 60% of the length of all routes.

The latest study of the open pit roads on Sary-Cheku dated March 24, 2021 showed their good condition, cleaning of excavator entrances and dumps.

Average mileage of discarded tires 33.00-51 in 2019 and 2020 to Sary-Cheku was 37442 km. This is 20% more than these tires for the same period in Kalmakyr.

2). In the Kalmakyr quarry, road tests of the wear resistance of the 33.00-51 tire were carried out. The predicted rate of operational mileage was 30502 km.

Considering that the tire tests also covered the winter months, this mileage was adjusted downward by 25% to 22876 km. Now let's find the average value of the normalized tire mileage 33.00-51, obtained by 2 methods, according to the formula

$$L_H = \frac{22876 + 28428}{2} = 25652 \text{ km.}$$

For the standard value of the run of the bias tire 33.00-51 of the FT-116AM2 "Belshina" model for the BelAZ-75131 dump trucks operating in the Kalmakyrk open pit, 25000 km is taken as a technological transport.

By analogy, the standard value of the run of the bias tire 33.00-51 of the FT-116AM2 "Belshina" model for the BelAZ-75131 dump trucks operating in the Sary-Cheku quarry, equal to 26000 km, is accepted.

The standard mileage of the radial tire 33.00R51 of the company "BRIDGESTONE" of the VRLS model of the BelAZ 75131 dump truck, which operates as a technological transport in the Kalmakyr quarry, has been determined. These VRLS models were installed on BelAZ-75131 # 021 on May 12, 2020. on the front axle and the right side of the rear axle and on May 22, 2020. on the left side of the rear axle.

The predicted mileage of the tire 33.00R51 based on road studies in the Kalmakyr quarry was 56712 km.

Theoretical calculations to determine the norm of the operational mileage of the tire 33.00R51 of the BelAZ-75131 dump truck operating in the Kalmakyr quarry, the value of 56875 km was obtained.

The results when determining the tire mileage using the two methods practically coincided. It should be noted that all observations of tires and calculations of their mileage were carried out on tires that have only natural wear and tear, excluding tires that were prematurely removed from service due to mechanical damage or peeling of the tread.

For the standard value of the run of the radial tire 33.00R51 of the VRLS "BRIDGESTONE" model for the BelAZ-75131 dump truck operating in the Kalmakyr quarry as a technological transport, an indicator of 57000 km is taken. However, this is not the limit for this standard specification bus. After carrying out activities in the Kalmakyr quarry to improve the quality and bring the quarry roads in line with at least the minimum requirements of the interstate SNiP 2.05.07-91 "Construction norms and rules. Industrial transport", the mileage of these radial tires should increase by at least 15–20%. In addition, these tires are significantly more cut-resistant. Their cuts begin on average after a run of 40,000 km.

### CONCLUSION

The cost of radial tires 33.00R51 "BRIDGESTONE" is more than bias tires of the same standard size produced by JSC "Belshina", and the mileage is 2 times higher. The most simplified calculations show that in case of switching to the purchase of 33.00R-51 VRLS tires instead of the 33.00-51 "Belshina" bias tire for 23 BelAZ-75131 dump trucks operating today, the annual economic effect on motor depot (a / b) No. 1 and a / b No. 4 will amount to more than USD 2 million. This will cover all the costs of purchasing additional road construction equipment, as well as strengthening the road service with qualified workers.

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