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STRAPS INCREASE THE SERVICE LIFE OF TIRES OF MINING DUMP TRUCKS

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Annotation:
This article discusses the problem of using tires for use in mountain conditions for mining and transporting rocks. In mountain conditions, crushed stone debris, characterized by high abrasive ability, distributed on a quarry road, is characterized by the fact that it is scattered on the hard base of the road surface, which leads to an increase in the intensity of abrasive wear of the tread pattern and, as a result, a reduction in tire service life. A number of measures to prevent tire wear are shown.

Keywords: dump truck, tire, operation, abrasive wear, rock, road, debris, road width, load capacity, quarry slope.

Introduction

Currently, the widespread use of dump trucks in open-pit mining is essentially increasing the production capacity of enterprises in harsh climates. In quarries, the main mode of extraction is mining dump trucks.

The costs of dump trucks account for 50-60% of the cost of transported rock mass, with the largest share being the cost of fuel (more than 50%) and large tires (25-30%) [1].

One of the main indicators of the quality of CGS is their durability. Durability refers to their service life until the tread pattern is completely worn out or they fail due to carcass rupture and tread delamination. The life of tires of mining dump trucks is influenced by many factors, including pressure and operating temperature in the tire [2, 6].

Quantification can be monitored using a tire pressure monitoring system. In the summer, up to 70% of all failures come as a result of thermal damage. For modern tubeless tires, temperatures t = 1200 C are considered critical [3].

At a driving speed V_{av}=17 km/h with an average ambient temperature t = 200 C, the dynamics of heating of “cold” tires depending on the operating time is shown. In the first 10 hours of operation, the tire heats up to maximum temperature values; during loading and unloading of the dump truck, the cylinder head does not have time to cool down; operation in such conditions leads to thermal destruction of the tire, which negatively affects the economics of the open-pit mining enterprise [7, 8, 9, 10].

Underutilization of the resource of large tires occurs for the following reasons:

- natural tread wear (81%);
- thermal and fatigue damage - cord delamination, tread and sidewall peeling (15%);
- mechanical damage caused by tire cuts (3%).

The life of tires of mining dump trucks is influenced by many factors, the main ones being:

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- load capacity utilization factor (γgr);
- average operating speed (Vex);
- longitudinal slope of the road (i);
- temperature of the determining air (to.в).

The above factors affect the thermal state of the tire and thereby its performance and mileage.

At temperatures above 1100 C, the mechanical properties of the tire material deteriorate, which reduces its reliability, wear resistance and strength. [3].

The cost of repairs and tire replacement over the life of the vehicle typically cost quarry owners an amount equal to the initial cost of a large mining truck. Today, with unprecedented demand and production unable to meet it, tires are no longer viewed as just an operating expense. They are extremely important for the operation of freight transport. To ensure the longevity of tires, special attention is paid to the preparation of quarry sites and roads.

About 45% of tires become unusable due to cuts, and almost 30% as a result of punctures, the rest depends on the acceleration and braking mode and the qualifications of the driver. Properly designed roads prevent tires from wearing out quickly.

According to Caterpiller operations consultant Kent Clifton, the best service roads should have raised straight sections, gentle curves, safety shoulders and gutters on both sides. When cornering, the tire can be subject to high lateral pressure, which leads to premature wear and peeling of the rubber. Road laying technology, in which the outer edge of the roadbed is at a higher level in relation to the inner edge when turning with a transverse slope, helps to reduce the influence of lateral pressure. When properly designed, this technology helps equalize the load and area of the tire, reducing lateral pressure on the tire carcass, as well as abrasion and wear of the rubbing surface. tires and their components. Slopes greater than 10% should be used with extreme caution. 20% lateral coefficient of adhesion, safe in all road conditions except slippery road surfaces. Caster angle is also important because it affects the distribution of load weight along the axles. According to Clifton, the ideal load weight distribution is 33% on the front axle and 66% on the rear. In some quarries, tire life varies from 4,000 to 5,000 hours; tire life in the eastern part of the United States is 11,400 hours [4].

To increase labor productivity and reduce material consumption, including tires, the following measures are applied:

- in order to increase the mileage rate of pneumatic tires, it is necessary to increase the reliability of the VADS elements and the overall efficiency of the system;
- reducing the degree of variation in the total weight of a vehicle transporting rock;
- developing measures to reduce the value of the generalized dynamic coefficient;
- maintain the tire in proper technical condition in accordance with the technical specifications and the nominal air value;
- periodically clean the surface of the tire tread from rock fragments stuck in its body;

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- develop measures for continuous monitoring of the technical condition of the car, road quality, driver qualifications and climatic conditions using modern innovative technologies [5].

Observing the above measures serves to prevent tire wear, and this leads to a reduction in tire operating costs.

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