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THEORETICAL ANALYSIS OF INCREASING CONVEYOR TAPE ENDURANCE

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Abstract
The article analyzes the operating parameters of the belts of conveyors used for cargo transportation, as well as makes a number of suggestions to increase the durability of the belts.

Keywords: conveyor, tape, wears value, strength, wear, friction, forging, reliability, magnetic pulse, layer, operating modes.

Introduction

Open-pit mining of large quantities of minerals determines the availability of a broadband transportation system. Of all the available means of transporting rocks, the most progressive is conveyor transport. When transporting materials on a conveyor belt, the specific capital costs compared to rail transport are reduced by 10-40%, specific metal consumption is reduced by 3-8 times.

Research methods

However, conveyor transport belongs to non-backup transport systems. In case of failure (damage) of one of the nodes of the conveyor, the whole conveyor will stop.

It is therefore necessary to ensure a high level of reliability and durability of its individual components.

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One of the important elements of belt conveyors is the conveyor belt.

The tape must be flexible, have high strength, simplicity of mass production and production capacity, have high durability under variable and abrasive load [1,2,3,4,5, 19,20,21].

Analysis of the performance of rubber-fabric conveyor belts in mining enterprises showed that the main reason for the replacement of conveyor belts is critical wear, which leads to a decrease in its durability and wear.

The study of studies [2 and 3] has shown that the types of tape damage are diverse and depend on the operating conditions. But all disruptions happen gradually.

Table 1. The main types of damage to the working coatings of tapes

Depreciation type	The nature of the forces acting on the tape	Depreciation rate (speed)	Approximate service life of the tape
Fatigue as a result of friction	Insignificant slip of rock mass up to 150 mm	Average	2-3 and more
Wear as a result of tattooing	Impact loads and strong displacement of rock mass with particle size 300 mm and more	Very strong	1-0.5 and less
Abrasive friction	Significant slippage of rock mass up to 300 mm	Strong	2-0.5 and less
Rolling friction	Clogged pieces of rock mass up to 300 mm in size	Very strong	1-0.5 and less

By processing with magnetic pulses, it is possible to reduce the distortion of the tape by increasing the strength of resistance to wear and fatigue [4,5,6,7,8,12,15].

We analyzed the failure modes and service life of the belts on the conveyors. (Figure 1)

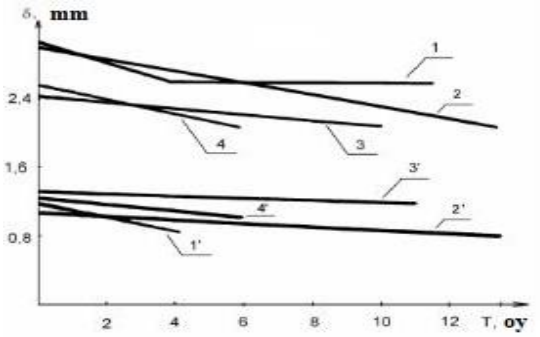

Figure 1. Density of wear of linings of rubber-fabric conveyor belts: 1, 2, 3, 4 - working linings; 1 ', 2', 3 ', 4' - non-functioning covers

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Table 2.

Function view	*A*	*B*	*R*
$Y = \frac{1}{A + B \times X}$	0.1697	1.1442× 10-3	0.991
$Y = \frac{X}{A + B \times X}$	-0,1941	0.2055	0.998
$Y = \frac{A}{B \times X}$	873,9105	148,3553	0.991

For the establishment of we used the method of regression analysis with the use of several types of functions, [9,10,11,13,14,16,17,18,].

Research Results

To determine the type of relationship, we used a regression analysis method using several types of functions. The analysis showed that the wear of the plates can be characterized by the following features:

$$Y = \frac{1}{A + B \times X}, \quad (1)$$

$$Y = \frac{X}{A + B \times X}, \quad (2)$$

$$Y = \frac{A}{B \times X}, \quad (3)$$

where Y - wear value, mm; X - time, month. In Table 2 the values of the parameters of the level A and B and the coefficients of the correlation R.
where Y is the amount of wear, mm; X - time, months. Table 2 shows the values of the parameters of equations A and B and the correlation coefficients R.
High values of the correlation coefficients indicate that the wear is functionally related to the operating time of the conveyor belt.

Conclusion

Preliminary results obtained showed that wear was reduced by 25–40% and that the service life of the listed tape types was increased by approximately the same amount. To increase the operating time before the critical wear of the conveyor belts, we used the magnetic pulse processing method. Preliminary test results have shown a 25% to 40% reduction in wear and hence a similar increase in belt life should be expected.

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