JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS
VOLUME 04, ISSUE 10
MOPNTHLY JOURNALS
ISSN NUMBER: 2751-4390
IMPACT FACTOR: 9,08

STRATEGIES TO ENHANCE THE OPERATIONAL EFFICIENCY OF TRANSPORT EQUIPMENT IN EXTERNAL LOGISTICS OF MINING AND PROCESSING FACILITIES

Khudoyberdiyev Lochin Nekovich
Bukhara. Asia International University,
Associate Professor of the Department of "General Technical Sciences"
Doctor of Philosophy (PhD) in Technical Sciences
(xudoyberdiyev.lochin@mail.ru)

Abstract: This study examines ways to increase the operational intensity of external transport and logistics equipment in the mining and processing complex of the gold mining zone, particularly focusing on BelAZ dump trucks. In evaluating the efficiency of dump trucks, key adjustment factors considered include the operating environment, climate zone, number of dump trucks in the enterprise's fleet, distance to major repairs, cargo transportation distance, road surface, rock strength, and maintenance frequency. Additionally, based on the maintenance and repair system, the possibility of achieving a productivity of 450-500 machine-hours per month has been identified.

Keywords: Gold mining, transport and logistics, dump truck, BelAZ, operation, maintenance, defect coefficient, efficiency, reliability, machine-hours.

Introduction

To determine ways to address the issues of increasing operational intensity of external transport logistics equipment in the mining and processing complex of the gold mining zone, the following factors were considered as adjustment coefficients: operating environment; climatic zone; number of dump trucks at the enterprise; distance traveled by dump trucks from initial operation to first overhaul, as a percentage of the established norm; cargo transportation distance in km; ascent length in km; ascent gradient in %; road surface; rock strength; total length of roads made with concrete and binding materials as a percentage, which is used in determining the main coefficients for maintenance adjustments; availability of paved roads (K01); ongoing repairs (K02); tire installation (K03); and service life of a dump truck before its first overhaul (K04), among others.

Based on the actual technical condition of the dump trucks, by implementing a system for maintenance and repair of dump trucks, it is possible to achieve a productivity of 450-500 machine-hours per month. This ensures the optimal operating mode of the dump truck based on planning indicators, corresponding to the costs of troubleshooting, repairs, and operational loads. The reduction in the permissible speed of dump trucks was 10-15%. The results are presented in Figure 1 and Table 1.

Materials and methods

Determining the defect coefficient, which reflects the average number of defects per unit of equipment for BelAZ-40-55 dump trucks, allowed us to establish the relationship between freight turnover and the defect coefficient (0.65-0.75). This characterizes their sufficient reliability and the probability of flawless operation within the established limits of all parameter values, described by an exponential relationship (R2=0.615). 1 - horizontal sections; 2 - inclined sections

Table 1

Permitted speeds of dump trucks, km/h

Class of irregularities, units	Height of unevenness, cm						
	3-5	6-10	11-15	16-20	21-25	26-30	>30
1-2	40*/43	30/32	20/24	16/18	10/11	8/10	4/4
>2	42/44	28/30	20/26	15/17	9/12	5/8	4/4

* in the numerator for BelAZ-40-55 tons, in the denominator for MAN 25-30 tons

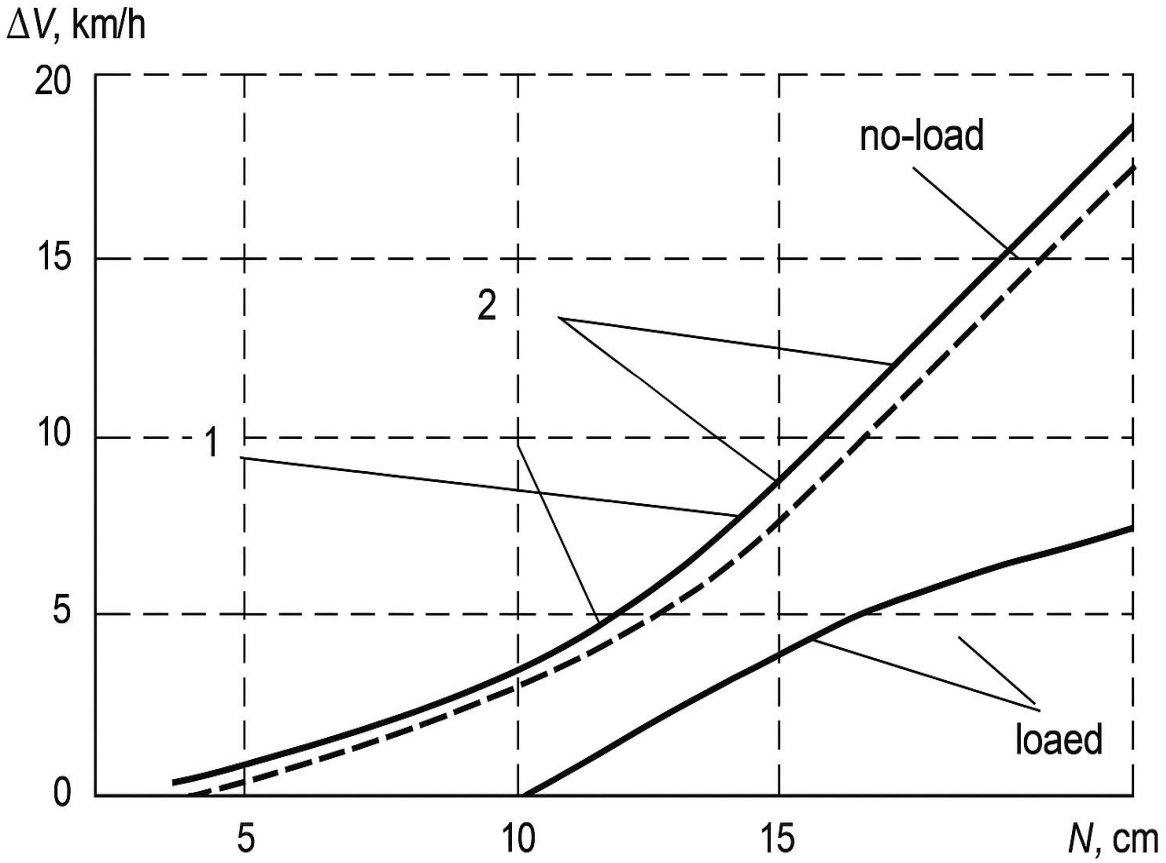

Fig. 1. Speed reduction of dump trucks due to road unevenness

It should be noted that the maximum defect level should not exceed the total operating time of the dump truck per month with a failure probability of 75-80%

Conclusions

The results of the conducted research demonstrate that the technical condition, operating conditions, and maintenance system of dump trucks are crucial factors for the effective use of external transport and logistics equipment in the gold mining and processing complex. The detected defect coefficient (0.65-0.75) in BelAZ-40-55 dump trucks indicates their sufficient reliability. It has been proven that through proper planning of maintenance and repair processes, it is possible to achieve a productivity of 450-500 machine-hours per month. Additionally, it was established that the operational performance of dump trucks is directly related to the climatic zone, road surface, rock strength, and other external factors. Therefore, optimizing the maintenance system and improving the operating mode is one of the main approaches for increasing the efficiency of transport and logistics processes.

REFERENCES:

1. Makhmudov A., Makhmudov Sh.A., Khudoyberdiyev L.N. Research and assessment of the technical condition of quarry dump trucks used in mining enterprises of Uzbekistan. Academic Research and Educational Science - Volume 3, Issue 7 - July 2022 - P 396-401
2. Makhmudov A., Makhmudov Sh.A., Khudoyberdiyev L.N. Research and assessment of the operational manufacturability of road transport equipment using modern on-board diagnostic and machine control systems // Universum: Technical Sciences: Scientific Journal. - No. 8 (101). Moscow, Part 3., - pp. 33-37. DOI - 10.32743/UniTech.2022.101.8.14167
3. Bobokulov A.N., Makhmudov Sh.A. Khudoyberdiyev L.N. Criteria for evaluating the performance of mining and transport equipment at mining enterprises // Scientific, Technical and Production Journal "Mining Bulletin of Uzbekistan" - Navoi, 2023. - No. 4 (95). - pp. 107-112. DOI:10.54073/GV.2023.4.95.025 http://gorniyvestnik.uz/assets/uploads/pdf/2023-oktyabr-dekabr.pdf
4. Makhmudov A., Makhmudov Sh.A., Khudoyberdiyev L.N. Methodological foundations for studying the reliability of mining dump truck components during operation "Mining Machines and Technologies" 2024, No. 2 (8) pp. 3-8