CARGO MANAGEMENT IN THE DEVELOPMENT OF DEEP OPEN PITS WITH COMPLEX MINING AND GEOLOGICAL CONDITIONS

Naimova R.Sh.

Doctor of Technical Sciences, Associate Professor Tashkent State Technical University (TSTU), Department of Mining, Tashkent.

Norova H.Yu.

PhD student Tashkent State Technical University, Department of Mining, Tashkent

Phone: +998 (93) 6585995

Email: norova 89@bk.ru

Annotation. This article discusses the issues of freight traffic management in open pit mining. The analysis of the use of technological transport deep quarries of far abroad, Russia, Uzbekistan. The development of automobile cargo flows characterized by a high concentration of traffic, the heterogeneity of the transported rock mass, and the instability of the main parameters are justified on the example of the deep mine of Muruntau. The use of specialized mobile equipment for the maintenance of mining and transport equipment, which reduces the complexity of operations, is substantiated.

Keywords: quarry, field, open cast mining, rock mass, overburden, opencast mining, minerals, mining, slaughter, cargo flow, dump truck, conveyor.

Introduction

With open-pit mining of deposits with complex mining and geological conditions, the basis of complex mechanization is mainly excavated-automobile complexes. This is due to the fact that in terms of the scale of a career in complex structural deposits, in particular, gold deposits, they are mainly classified as small and medium with annual productivity from 30 to 1,500 tons, and mining is carried out selectively with the selection of varieties of minerals of different quality. Moreover, even during the shift, the consumer properties of the rock mass in one face can change several times. Therefore, the productivity of elementary cargo flows in such

conditions is a random quantity, which greatly complicates the management of mining operations.

In deep open pits, open pit mining faces the challenge of maintaining a fairly high productivity and maintaining the pace of deepening mining, reducing the length of transport communications, and ensuring the necessary cost-effectiveness of development. As a rule, compliance with these conditions is achieved only through the consistent use of several modes of transport in a single transport network, i.e. a combination of vehicles. With combined use, each type of transport works in the most convenient and favorable conditions for it. In this regard, the choice of career transport, the assessment of its main parameters and technical and economic indicators are of particular importance.

The management of the qualitative and quantitative characteristics of elementary cargo flows during open-pit mining of deposits with complex mining and geological conditions is carried out on the basis of their strict interconnection by redistributing the degree of loading of mining equipment in accordance with the planned tasks at the current time.

The main type of technological transport in the mining of open-cut minerals remains automobile. It is used to transport approximately 80% of the total rock mass worldwide, including in the USA and Canada - 85%, in South America - 85%, in Australia - almost 100%, in South Africa - more than 90%. In Russia and the CIS countries, the share of open pit vehicles, taking into account all the sub-sectors of the mining industry, has approached 75% and will grow in the near future due to the expansion of the open method of coal mining [1].

The volumes of transportation of rock mass using conveyor transport at enterprises in Canada, the USA, Australia, Chile and other countries currently account for up to 50% of the total volume of extraction of mineral raw materials. The effectiveness of the use of conveyor transport has been proven by numerous scientific and design developments and, in part, the operational experience in the quarries of Russia, Ukraine, and Uzbekistan. At the same time, the share of conveyor transport does not exceed 10% in the total transportation volumes of rocky rock mass in quarries of the CIS countries. The problem is the difference in technological approaches.

For example, in the deep career of Muruntau, the depth of which is currently 600 meters, cargo flows are managed as follows. Each dump truck heading to the quarry receives a loading address at the distribution point, and the excavator driver receives the number of the dump truck sent for loading. The excavator driver confirms the correct arrival of the dump truck, loads it and, in accordance with the varietal plan of the face, informs the driver of the dump truck the unloading point, and the registration point - the number of the dump truck aimed at unloading. At the metering station, by the number of the truck, the correctness of its arrival for unloading is checked. Periodically, information about the number of dump trucks loaded by each excavator and arriving at each unloading point is sent to the quarry manager, who, if necessary, makes appropriate adjustments to the distribution of dump trucks by cargo flows, controlling their parameters.

The automobile cargo flows of the deep mine of Muruntau are characterized by a high concentration of traffic, the heterogeneity of the transported rock mass, and the instability of the main parameters. During the shift, there are 10-15 faces, from 5 to 10 transshipment points, forming about 100 routes. The maximum intensity of cargo flow on individual routes reaches over 35 thousand m3 of rock mass per shift. The peculiarity of the operating conditions of modern technological vehicles of the gold ore mine Muruntau is determined by the increasing depth of mining (over 600 m). This trend determines the predominant use of road transport (over 60%) as an assembly link, and the concentration of road freight traffic in the working area of a deep quarry with limited spatial conditions. Tracks of dump trucks with an average transportation distance of 3.73 km are characterized by a high weighted average slope of 6.1%, high complexity up to 3-4 turns per 1 km with a radius of 30 m. The share of downhole roads along traffic routes is 15-30%. Up to 80% of roads have a service life of up to 1 year. The complexity of the operating conditions is exacerbated by the high concentration of mining and transport equipment, minimal excavation front, cramped work and shunting sites.

The decrease in the productivity of technological vehicles with an increase in the transportation distance determines the need for periodic technical re-equipment of the open pit truck with new types of dump trucks. The transition to new, more productive dump trucks allows you to reduce their number and intensify transport work. The main trend in the development of

technological vehicles in the deep mine of Muruntau is an increase in average carrying capacity. Currently, technological quarry vehicles are represented by BELAZ-75131, CAT-785B, CAT-789C and R-170 dump trucks of BelAZ, Catarpillar and Euclid firms.

It should be noted that the rate of increase in the capacity of dump trucks significantly exceeds the growth rate of excavator capacity. This determines an increase in the share of loading and unloading operations in the transport cycle up to 30-40% with good quality preparation of the face at the loading point. With an average excavator bucket capacity of 14.9 m3, the number of loaded buckets reaches 6-7 pieces. The combination of the capacity of the excavator bucket and the dump truck body shows that a further increase in the transport vessel becomes impractical and in this situation, the capacity of excavators needs to be increased to increase the performance of the EAA.

With an increase in the depth of the quarry, the disadvantages of technological vehicles begin to be revealed. These include a decrease in operating efficiency due to an increase in the transportation distance, as well as an increase in fuel consumption and a gas contaminated quarry atmosphere. The transition to combined automobile and conveyor transport in 1984 allowed for ten years to stabilize the transportation distance along the quarry at 3.4 km. An analysis of the increase in the distance of transportation shows that, starting in 1993, there is again an increase in the distance of transportation of rock mass in the quarry.

The problem of increasing the reliability of the EAC in deep quarries is inextricably linked with ensuring the most efficient mining regime with minimal operating costs. In this setting, the primary tasks of its solution are the development and implementation of:

It should be noted that the rate of increase in the capacity of dump trucks significantly exceeds the growth rate of excavator capacity. This determines an increase in the share of loading and unloading operations in the transport cycle up to 30-40% with good quality preparation of the face at the loading point. With an average excavator bucket capacity of 14.9 m3, the number of loaded buckets reaches 6-7 pieces. The combination of the capacity of the excavator bucket and the dump truck body shows that a further increase in the transport vessel becomes impractical and in this situation, the capacity of excavators needs to be increased to increase the performance of the EAA.

With an increase in the depth of the quarry, the disadvantages of technological vehicles begin to be revealed. These include a decrease in operating efficiency due to an increase in the transportation distance, as well as an increase in fuel consumption and a gas contaminated quarry atmosphere. The transition to combined automobile and conveyor transport in 1984 allowed for ten years to stabilize the transportation distance along the quarry at 3.4 km. An analysis of the increase in the distance of transportation shows that, starting in 1993, there is again an increase in the distance of transportation of rock mass in the quarry.

The problem of increasing the reliability of the EAC in deep quarries is inextricably linked with ensuring the most efficient mining regime with minimal operating costs. In this setting, the primary tasks of its solution are the development and implementation of:

Reference:

1. Vasiliev M. V. Transport deep quarries / - Moscow: Nedra. 1983.- 295 p.

2. Kuchersky N.I. et al. Improving the processes of open-pit mining of complex structural deposits of endogenous origin / - Tashkent: “Fan” AN RUz, 1998. - 254 p.

3.V.L. Yakovlev, S.V. Kornilkov. Geotechnological problems and features of mining operations in deep quarries: GIAB-№7. - M.: Mountain Book, 2015.- P. 54-65.

4.Kornilkov S.V. Technological aspects of field development by deep quarries // Deep Careers: Sat. reports All-Russian scientific and technical. conf. with international June 18-22, 2012 / GoI KSC RAS. - Apatity; St. Petersburg, 2012 .-- S. 38-52.

5.N.P.Snitka Ore flow quality management in open pit mining with conditional ore body boundaries // Gorny Zhurnal.- 2008.- No. 8. S. 40-43.

6.Aristov I.I., Rubtsov S.K., Snitka N.P. The experience of phased improvement of standardization methods and accounting for ore dilution losses at the quarries of Navoi MMC // Mountain Herald of Uzbekistan. - 2006.- No. 4.- P. 38-45.

7.Yu.I. Anistratov, K.Yu. Anistratov. Quarry design. Ed. M.: 2003.