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Improvement and Achievement of Technical Results of Using and Developing the Expression of the DTC Complex

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Abstract: *Navoi mining and metallurgical combine (Uzbekistan) is characterized by continuous growth of production capacity, which is achieved mainly due to increased production intensity, which leads to a high rate of decline in mining operations. Thus, the rate of reduction of mining operations in local areas of the Muruntau quarry is 60-90 meters per year. Currently, the maximum depth of the Muruntau quarry is more than 600m, and the prospective depth is estimated at 950-1000m, which further exacerbates the economic problems of transportation due to the long distances of transporting rock mass. The use of cyclical-flow technology with a multi-link transport system requires rhythmic operation of the quarry, which excludes unproductive downtime of conveyor complexes. However, the use of cars in the system of loading and transport complex, as shown by the experience of both the Krivbass and Muruntau quarries, determines a significant variation in the parameters of cargo flows. This leads to uneven cargo flow entering continuous transport, and, as a result, to a significant decrease in the design performance of complexes with a corresponding deterioration in technical and economic performance indicators. Analysis of the study of dynamic characteristics of cargo flow shows that this process is generally carried out in two modes: stationary and transient (the beginning and end of the shift and the lunch break), which indicates a significant unevenness of cargo flow during the shift.*

Keywords: quarry, buffer, open pit mining, blasting, parallel-close charges, rock.

I. INTRODUCTION

When working out the Muruntau quarry, it was planned to increase the efficiency of existing transport systems. A significant reduction in the distance to move the mountain mass with dump trucks is achieved by using the combined automobile – conveyor transport, in particular by entering in the career of MRouter complex cyclic - flow technology (CCM) traditional design (150). The innovative development of the resource-saving CPT and its impact on cost reduction in the deep Muruntau quarry is presented below:

- On the South side of the quarry in 1984. a complex of CPT consisting of three crushing and reloading stations (DPP), one screen, two OSS-4000/125 dumpers and two conveyor lines of traditional design with a belt width of 2000 mm with a capacity of 7000 t/h was put into operation. The use of traditional CCT design in Muruntau possible to reduce the distance of transportation of rock mass on dump trucks by 30-40%, to reduce the height of its lift trucks by 50-70%, saving operating costs compared to road transport, to reduce the pollution in the quarry, to increase production capacity of the quarry in rock mass by 30% [1]. Thus, with a certain mathematical expectation of the average hourly value of cargo flow, which determines the throughput of the transshipment point, ensuring full loading of the conveyor complex, the actual receipt of dump trucks for transshipment in hourly intervals significantly changes. Variation in the parameters of existing cargo flows at the quarry can lead to underloading of conveyor equipment during its negative values, or to the inability to receive a part of dump trucks during peak periods (positive values of variation), which ultimately leads to a mismatch of the parameters of the entire system, and, consequently, the expected volume of work of the conveyor complex [2].

II. MATERIAL AND METHODS

During the period from 2007 to 2009.G. inter-stage loader with a steep-slope conveyor (CNC-30) with a lifting height of 30 m, a capacity of 3460 t/h, operated on the southern side of the quarry as part of the existing complex of TTC, good performance and prospects for the use of steep-slope conveyors (CNC) in the Muruntau quarry were shown [3]. Reduced the distance of rolling back ore by road by 480m, lifting height by 60m. Experience has been gained and the technology of ore transportation at the CNC has been developed [4-5]. As the transfer point of the quarry located on the Eastern side is eliminated, there is no need for a remote low-tilt conveyor. Specialists of the plant recommended not to do dismantling, but to perform a fan rearrangement of the conveyor line and change the direction of the remote low-tilt conveyor with a DPP based on a screw-toothed crusher in order to direct the flow of overburden rocks from the quarry to the existing surface conveyor line No. 1. The use of a conveyor with a DPP located in the zone of intensive mining operations in the transport scheme of the quarry will ensure minimum distances for transporting rock

mass by dump trucks. Experimental operation of the conveyor line No. 1 has established that the use of recommendations for the introduction of advanced technological schemes of cyclical-flow and in-line technology has allowed to increase the productivity of the CPT - breed complex from the existing surface conveyor line No. 1 by 50%. Taking into account the significant impact of the General complex of a traditional design and with a steeply inclined conveyor on the technical and economic performance of the quarry, there is a need to consider further operation of the complex and increase its efficiency [6]. The fourth stage of construction of the quarry provided for the elimination of existing conveyor lines of traditional design with DPP and the construction of new crushing and reloading units (DPU), including with a steeply inclined conveyor. Currently, according to the project, the screen and three DPP are dismantled for further mining of the ore body on the southern side of the quarry. Remounting of the inclined bottom-hole conveyor of the traditional design with the DPU with the KVKD-1200/200 crusher on the mountain+405m ...+420m was performed. The existing surface conveyor line No. 1 is used for transporting rock from the South-Eastern zone of the combined Muruntau - Mutenbai quarry to external dumps. In General, the transport system with the use of automobile and automobile conveyor transport for the removal of rock mass from the quarry is preserved [7]. The analysis of the work of the General complex of CPTs of traditional design and with a steeply inclined conveyor shows that with further improvement of the CPT at the Muruntau quarry, it is possible to significantly increase its adaptive capacity to changing development conditions. For this purpose, the specialists of the plant have developed and recommended technical solutions aimed at increasing the operational performance of the CPT complex. Thus, for powerful deep pits proposed a method for streamlining the development of mining, consisting in the development and implementation of the technological scheme in Muruntau, involving the use of CCT-ore from steeply inclined conveyor lift for the delivery of different varieties of rock, changing the direction of flow of ore and overburden from the open pit to a complex of CCT - ore with SIC, due to the parallel issuance of the excavation faces on DFS ore and overburden on the additional conveyor overpass [8].

The use of recommendations for the introduction of advanced technological schemes of cyclical-flow and in-line technology allowed to increase the productivity of the CPT - rock complex with the existing surface conveyor line No. 1 by 50%, and the CPT - ore complex with CNC by 20%.

III. RESULTS

Taking into account the prospects for the development of the quarry at a depth, the specialists of the combine recommended installing a second DPU on an inclined bottom-hole conveyor at a height of+405m ...+420m. to increase the productivity of conveyor line #1. In this case, the conveyor line will receive rock from two DPU based on crushers KVKD-1200/200 with a capacity of 1330m3/h.each [9]. After installation of the second DPP, the production link will be represented by two DPP, a conveyor line and ONE OSS-4000/125 dumper. When designing the CPT-ore complex with CNC, the equipment includes large reserves and the ability to increase the productivity of the CNC without significant investment and labor costs. In order to increase the productivity of the CNC, experimental and industrial work was performed to transport ore, mineralized rock mass (poor ores) and overburden through the CPT-ore complex with the CNC in parallel. It is established that the highest productivity of the complex is achieved by organizing parallel delivery of overburden rocks and mineralized rock mass from the excavator faces of the quarry at the CNC. Since 2013. to improve the efficiency of the CPT complex with the CNC, a combination of rock cargo flow and mineralized rock mass (poor ores) is used, and a parallel delivery of overburden rocks and mineralized rock mass from the excavator faces of the Northern and South-Eastern sides of the quarry to the DPP is organized.

Rational organization of preparatory work for vehicles will speed up the saturation of the traffic flow at the beginning of the shift, but can not exclude the irregular operation of vehicles during the shift [10].

The analysis of the obtained data shows that the choice of a rational number and type of transshipment point also cannot fully solve this problem, since the volume of the hopper in most cases is equal to 2-4 capacity of dump trucks.

Stabilize the load, as shown by studies on simulation models, as well as the practice of career Muruntau", possibly by creating an intermediate buffer store about transhipment point, which not only compensates for the effect of variations in traffic, but will also serve as a storage container when unforeseen downtime of the conveyor complex [11]. Commissioning of the complex of CCT external conveyor with the DPP on the basis of the screw-tooth crusher (2009), allowed to organize transportation in the transshipment point career (PPK) of ore from areas of intensive mining career Mutenbei and external warehouses. Reduced the distance of rolling back ore by road by 600 m. Commissioning of the CPT-ore complex with CNC in March 2011, reduced the distance of transporting the ore mass by road by an average of 3.5 km, the lifting height by 285-320 m, increased the productivity of technological transport by 30%, reduced the annual mileage of cars by 30.4%, the number of dump trucks, drivers and repairers – by 27.2%, the consumption of fuel and lubricants-by 37%. Reduced operating costs by $ 2.7 million per year [12].

IV. DISCUSSIONS

The basis of the CPT-ore complex is a steeply inclined conveyor linking a semi-stationary DPP located on a tselik with a slope of 450...500 on the mountain.+285...+300m., mounted in a quarry, with a warehouse conveyor located on its surface, transporting ore to an intermediate warehouse or railway dumpcars. On the Eastern side of the quarry, a new ore transshipment

point of the quarry (PPK-3) is organized, which is an integral part of the CPT-ore complex with CNC. The structure of the transshipment warehouse complex includes: conveyor warehouse KS-3500; loader stacker rock PSHS-3500; stacks of operational (conveyor) and automobile warehouses; EKG-10 excavators. The flow of ore issued through the CNC on Board the quarry is reloaded to the PSHS-3500 conveyor, which provides loading it into dumpcars or into a warehouse stack [13]. Thus, at present, the transport chain of the CPT complex: CPT-ore with CNC and CPT-rock of traditional design is a single scheme for delivering ore and rock from the quarry to the surface. Since the beginning of operation in November 1984. by 01.01.2014 about 460.0 million m3 of rock mass was shipped through the CPT complex, including more than 10.6 million m3 of ore were shipped from the CNC through the CPT – ore complex.the Use of organizational, technical and technological measures has ensured the maximum productivity of the traditional design of the CPT complex up to 22.3 million m3 of rock mass per year. The problems encountered and their solution during the commissioning of the CPT complex in the deep Muruntau quarry are described in detail in [14]. The maximum achieved productivity of the CNC was 1 million 190, 8 thousand tons / month. The systematization is based on the principle of satisfying the technological conditions for the completeness of loading of the conveyor complex of the CPT during non-rhythmic operation of cyclical road transport

V. CONCLUSIONS

The proposed method of rationalizing the development of mining, consisting in the development and implementation of the technological scheme in a career involving the use of CCT-ore from steeply inclined conveyor lift for the delivery of different varieties of rock, changing the direction of flow of the ore and rocks from the quarry to the CCM complex, due to the parallel issuance of the excavation faces on DFS ore and overburden on the additional conveyor overpass, which allows to increase the productivity of the complex of CCT-ore with SIC is 20%.

To do this, a conveyor trestle was constructed on the Northern edge of the work site to receive rock from the PSHS-3500. The recommended conveyor trestle allows you to organize parallel delivery of overburden and mineralized rock mass (poor ores) to the DPP through the CNC [15]. To lay the rock mass in the conveyor dump from the conveyor line # 2 of the traditional design, the dump conveyor was dismantled and moved to the CNC dump field (dump#10) together with the OSH-4000/125 type dumper, which significantly increased the flexibility of the system and in General increased the productivity of the CPT complex with the CNC. After the technical upgrade, the line's capacity is on average 4200 t/h. Thus, a mining transport scheme for the distribution of cargo flows in the combined quarry of kuruntau-Mutenbai was developed and implemented (Fig.3.5). In this case, it is planned to use a CRT-ore with a steeply inclined conveyor lift to deliver overburden and mineralized rock mass [16]. The fourth stage of construction of the quarry, the work of the existing PPK-2 located on the Eastern side is planned until the end of 2013, after which it will be liquidated. Specialists of the plant recommended that the railway tracks be dismantled and that the PPK-2 be moved beyond the boundaries of the fourth stage of the quarry. The flow of ore issued from the combined Muruntau - Mutenbai quarry by road will be reloaded to the sectors of the new transferred PPK-2. The main directions of increasing the efficiency of deep quarries with cyclical-flow technology are defined:

-It is established that the intermediate buffer temporary warehouse at the CPT in the quarry should have a maximum volume of receiving capacity equal to 220 thousand. When the height of the ledge is equal to 15-30m when forming a warehouse to ensure this volume, the required area should be 14.6-7.3 thousand m^2 [17]. the Use of compensating buffer warehouses at the quarry allowed to increase the productivity of conveyor systems by 30-39%.

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-It was found that intermediate buffer warehouses are economically feasible with significant losses in conveyor performance and long distances for transporting rock mass from the face to the dump [18]. The most appropriate buffer warehouses with the loading of rock mass by an EKG-8I excavator on vehicles (with a loss of conveyor performance of 3-15%) and warehouses with the loading of rock mass by a forklift on an intermediate conveyor (with a loss of productivity of more than 15%). If there is a small loss of conveyor performance (up to 3-5 %), it is advisable to transport the rock mass to the dump when the Central processing unit is stopped. Validated method of rationalizing the development of mining, consisting in the development and implementation of the technological scheme in Muruntau, involving the use of CCT-ore from steeply inclined conveyor lift for the delivery of different varieties of rock, changing the direction of flow of ore and overburden from the open pit to a complex of CCT-ore with SIC, due to the parallel issuance of the excavation faces on DPU ore and overburden. The use of recommendations for the introduction of advanced technological schemes of cyclical-flow and in-line technology allowed to increase the productivity of the CPT-rock complex with the existing surface conveyor line No. 1 by 50%, and the CPT - ore complex with CNC by 20%.

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