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Perspective Schemes Equipment Ultra-deep Shafts

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Abstract

When equipped with deep shafts to the sinking of the most difficult technical task is the organization of the recovery tunnel. It is solved in the preparatory period of construction of the mining enterprise. The duration of it depends on the selected scheme of the equipment and can last for 1.5 - 2.0 years or more. The article deals with modern problems of ultra-deep shaft equipping. The application of traditional approach for the organization of a sinking hoist does not allow providing the required capacity. It is defined that the employment of multirope hoists for shaft sinking purpose is the most potentially productive. The design hoisting capacity is twice more than upon condition of two stage system of hoisting and portable sinking machines.

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1. Main text

When equipped with deep shafts to the sinking of the most difficult technical task is the organization of the recovery tunnel. It is solved in the preparatory period of construction of the mining enterprise. The duration of it depends on the selected scheme of the equipment and can last for 1.5 - 2.0 years or more. Performance parameters of the tunnelling rise is also largely determine the main technical and economic indicators of the shaft construction: the speed, duration of work, productivity of drifters, specific energy consumption etc. [1-12].

Russia has accumulated great experience of applying a shaft equipping scheme involving the use of derricks and block-mobile sinking hoisting machines. For hoists of shall and medium depth, this scheme provides a minimum time of equipping and re-equipping of the shaft, as well as the necessary lifting performance. Nowadays he

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proportion of construction in deep and ultra-deep shafts (1500 m and more) is constantly increasing. When applying traditional approaches, material and time expenditures of setting up the tunnel lift increase and its performance is reduced. The possibility of applying the block-the mobile sinking hoisting machinery is almost exhausted. Therefore, the search for new solutions to equip the vertical shaft of great depth is very important.

For a long time, the optimal scheme of equipment of vertical shafts was considered to be a temporary scheme with the use of derricks and block-mobile sinking hoisting machines. Now, the machines MPP-6.3 a, MPP-9 and MPP-17,5 are widely used. The main features of the machines are: arrangement of several blocks of high operational availability; location of the power and accessories of machines for load-bearing rigid frames indoors container type; high degree of standardization of the mechanical parts of the machines with basic stationary shaft hoist machines; inner unification through the use of the machines MPP-9 and MPP-17,5 same units; demon version with mounting block machines for precast foundation. Control system actuator brake of MPP-6.3 - hydraulic, MPP-9 and MPP-17,5 - pneumatic. Control system, protection, alarms and interlocks ensure that the machines work in a mode of cage and kibble hoists. The vanishing of the rope from the reels of the machines is below. Power electric machines - asynchronous with wound rotor, high voltage; the speed regulation is provided by using resistors of resistances. There is a system of ventilation of the drives and rotor resistances. A mode of dynamic braking is designed for load levelling. A comprehensive analysis of the efficiency of the block-container type hoisting devices is carried out [13-15]. It is estimated that the improvement of technology of muck loading, the use of downhole cranes and use lifting machines providing a lifting speed not less than 8 m/s, allows to reduce the cycle time of the issuance of buckets by up to 43 to 51% and the duration of the sinking cycle for 15 - 25%. However, these studies examined depth of 1200 m [13]. The possibility of applying the series of WFP, as well as their Chinese counterparts MK in trunks greater depth is very limited (figure 1). The maximum depth of the trunk when using a lifting machine MPP-9, depending on the capacity of the buckets varies 1070, is 425 m, the machine MPP-17,5 appropriate range is 1270 680 m.

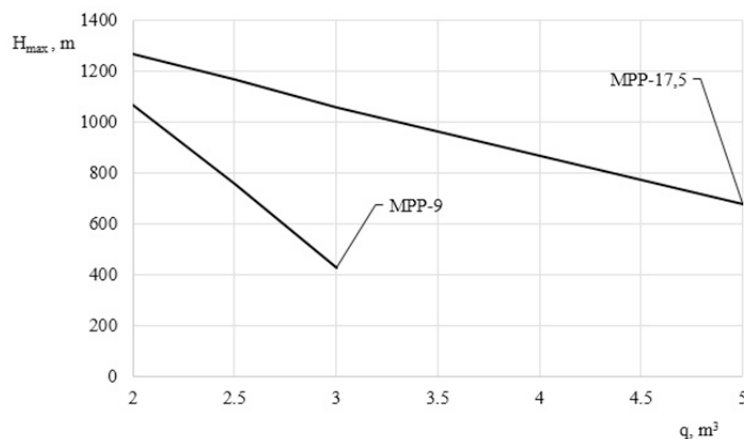


Fig. 1. Curves that define the maximum depth of lift depending on the capacity of the buckets

Analysis of scientific researches allows to allocate two directions of solving this problem:

1. Further development of the schemes of the equipment with the use of temporary sinking machinery.
2. The creation of effective schemes of equipment with the use of high-performance winders permanent type.

In the first direction, it is possible to mention the development of compact, low-mass direct-drive hydraulic drive without reducer mobile sinking hoisting machinery. [16-18]. It is established that for the same power drives of winders, the speed of shaft sinking with the use of machines with hydraulic drive for 5 - 7 m/month. Is higher than the machines with asynchronous drive. At the same time, the maximum depth of sinking shafts for lifting installations with asynchronous drive is limited by the depth of 1100 - 1200 m capacity rope and rate of penetration from 67 to 75 m/month, and lifting equipment with hydraulic motors driving velocity is at 71.5 to 80.5 m/month.

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