

83) Mining of Mineral Deposits

Volume 13, Issue 3, 2019, Pages 87-95

Selecting a variant to allocate a plant producing shotcrete while implementing method of “wet” pneumatic concrete placing in Orlovskaiia mine(Article)(Открытый доступ)

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Просмотр дополнительных организаций

Краткое описание Просмотр приставочных ссылок (21)

Purpose. Mining and geological conditions are complicated due to the decreased level of mining within deposits of West Kazakhstan. It results in significant increase in the amount of metal framed support which cannot always provide safety of mine workings. The problem may be solved by transition from heavy and labour-intensive in mounting metal special shape framed supports to the cheaper and more easily erected reinforced shotcrete with reinforced frames. “Dry” method of shotcrete application, used currently in Orlovskaiia mine, can provide neither high quality nor the required amounts of pneumatic concrete placing; in this context, “wet” method makes it possible to support rock mass at a high mechanization level, and development of premium durable pavement. Thus, in the context of Orlovskaiia mine it is required to solve the problems concerning selection of efficient schemes to deliver shotcrete mixtures or their components and to determine optimum location for a plant, producing shotcrete from the viewpoint of minimization of expenditures connected with shotcrete support. Methods. Calculations, determining the required shotcrete amounts to support mine workings, technological capacity of a plant to produce shotcrete as well as self-propelled mixers, have been performed. Basic production facilities for shotcrete operations have been selected. Three variants to allocate a plant for shotcrete manufacturing within Orlovskaiia mine have been considered. The discounted net cash flows have been compared ignoring sales of the finished product of Orlovskaiia mine in terms of the available and the proposed methods to support mine workings for the period of 2016 - 2025. Findings. Relying upon laboratory tests, carried out in Kazzink LLP as well as BASF and Normet Companies, efficient compositions of shotcrete mixtures, providing preparation of shotcrete mixture of the required quality in terms of minimal binder consumption have been identified. It has been recommended to use 3.5 m³ mining machine UnimecMF500 Transmixer by Normet Company as a mixture to deliver shotcrete; self-propelled equipment MeycoME- 3 (theoretical output is up to 20 m³/h) by AtlasCopco Company has been proposed to apply “wet” shotcrete. Use of underground 15 m³/h mobile plant on stands or on trailer of Normet Company has been substantiated to be mounted in a small-cross chamber with cement bulk storage or in big bags. Schemes to allocate concrete mixing plant have been developed for specific conditions of Orlovskaiia mine. Originality. Specific features of potential variants to allocate a plant, producing shotcrete to support mine workings in terms of Orlovskaiia mine, have been identified from technological and economic viewpoints. Practical implications. Economic expediency of a process line intended to support mine workings in Orlovskaiia mine using a “wet” shotcrete has been developed and substantiated. © 2019. A. Radkevych, V. Petrenko, O. Tiutkin, Yu. Horbatiuk, V. Parinov.