Considering seismic influence of explosion and dynamic shocks from mining equipment for estimating sustainability of open pit walls and dumps

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Improving the efficiency of open-pit mining at the present stage of scientific and technological progress depends crucially on the introduction of a rational combination of various resource-saving, low-waste and reproducing geotechnologies, with large-scale mass explosions, using large loading and transport equipment with a high dynamic effect on supports and cargo base, using intelligent equipment and automated control systems of mining operations, the widespread introduction of innovative telecommunicating technologies, navigation, physics, extending application of combined geotechnologies.

In 2017 IPKON RAS assumed the role of initiator of a project to develop Federal standards and regulations in the field of industrial safety "Rules for ensuring the stability of the sides and ledges of quarries, cuts and dumps"(hereinafter - FSR) to improve economic efficiency and ensure the required level of safety of open pit mining in modern conditions. The decision were made due to deep understanding the need to update the regulatory documents in the light of modern methodological advances and the development of geotechnologies, in accordance with the requests of major mining companies in Russia. Rostekhnadzor and Glavgosexpertiza of Russia support the project.

The seismic effect of technological explosions on the stability of the formed ledges appears in disclosure of existing natural and formation of artificial cracks, formation of a zone of residual deformations, including in the rock massif beyond the boundaries of the zone of blasting operations. Therefore, to ensure the sustainability of the ledges of quarries and cuts in the rock mass and semi-rock massifs near the marginal contour, the methods of drilling and blasting operations, the mass and type of charges, the distance from the site of the explosion must be taken into account.

Dynamic and static shocks from mining equipment should be taken into account when determining the common pitching angles of open pits, cuts, dumps. It is recommended to take into account the impact of equipment vibrations on the stability of the pit in the FSR only with long-term stationary placement of large-size equipment on the section of the array, which causes dynamic influence (crushing complexes, skip complexes and other lifting equipment, draglines, etc.). Short-term indluence arising from the movement of lighter mobile equipment (vehicles, excavators, drilling machines, etc.) in calculating the stability of the ledges should not be taken into account.

Development and approval of new FNPs on the geomechanical substantiation of the stability of the sides and pit ledges will expand the field of application of open geotechnologies, increase the reliability of calculating the parameters of the sides and ledges of quarries and dumps, the full reserves of the development of solid mineral deposits using open and combined methods, while ensuring the required level of safety of mining, to synchronize domestic and world standards for project justification of the stability of slopes in the mining enterprises of the Russian Federation, make easy the process of interaction of industrial, scientific workers, designers and experts.