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Surveying Support for the Integrated Development of Resources of Mining Regions

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Annotation: For the integrated development of the subsoil, a method has been developed that allows to significantly increase the efficiency of mining reserves under water bodies and prevent negative consequences for the environment. The essence of this method consists in the fact that lava is worked out directly under the water body in the safety tselik, the parameters of which are calculated so that through-water cracks connecting the river with the mine workings are not formed in the rock thickness.

Key words: mining-technical, mining geology, physical-mechanic, local, stocks for the mountain area, water supply, supplying of mine surveyor, glancing, fastest of deformation.

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The existing forms of subsurface development cause transformations of the environment and natural and artificial objects located in it and on its surface. The range of these transformations is very wide: from deformations of rocks barely detected by high-precision instrumental observations to fundamental changes in the state of the environment, accompanied by mountain impacts, sudden emissions of coal and gas, sinkholes on the Earth's surface, flooding, waterlogging, dehydration and gassing of significant territories and other harmful consequences.

These consequences occur not only during the construction and operation of mining enterprises or underground structures, but also during their liquidation and later. There are cases when the water filling the mine workings after the shutdown of the drainage system forced harmful gases accumulated in the workings, causing explosions and poisoning of people, through cracks to the earth's surface and into the basements of buildings. The rise in the level of mine waters often leads to contamination of drinking aquifers. Sinkholes on the earth's surface are formed after many years, sometimes decades, after the liquidation of mine workings. This aftereffect of mining enterprises and underground structures is one of the features of the development of the subsoil. Another feature is that the work on the development of the subsoil, unlike work on the Earth's surface, is carried out in a complex, poorly studied, constantly changing and potentially dangerous environment, which is an array of rocks.Under these conditions, the effective and safe development of the subsoil and other resources of the regions is ensured only if the parameters of mining operations strictly correspond to the state of the environment. But since this state is constantly changing, the adaptation of parameters to the changes taking place is not always technically possible and economically feasible, especially when using powerful modern technology characterized by high productivity, but insufficient maneuverability in cramped underground conditions.

It is more effective not to adapt the parameters to the state of the environment, but to influence this state of the environment in such a way that it corresponds to the rational parameters of mining and construction of underground structures. Such impacts are carried out by technological methods of controlling geomechanical processes, which are understood as a set of scientifically based technological techniques or operations that allow for the development of the subsoil to purposefully change the composition, properties and condition of the rock mass and ensure the development of processes of its deformation and destruction, as well as filtration of groundwater and gases in specified directions, volumes and within the established spatial and temporal limits.

Our research has allowed us to develop methods for controlling geomechanical processes in the complex development of the subsoil and to scientifically substantiate the areas of their application that best correspond to natural mining, hydrogeological and environmental conditions. In order to facilitate the selection and ordering of the application of these methods, their classification has been compiled [1]. The purpose of these methods is accepted as the main classification feature. The conditions, scope, place and time of application of the methods are also related to this.

The main technological methods include:

- harmonic development of formations based on such a procedure of mining operations in space and time, in which mutual compensation of deformations of different signs occurs;
- partial excavation of a mineral over an area in which rock deformations do not reach the earth's surface, which ensures the safety and normal operation of objects located on it;
- the extraction of minerals at incomplete capacity and the use of new types of laying of the developed space and cavities above it, which ensures the reduction of all types of deformations of the massif and the earth's surface;
- advanced mining of protective layers of minerals, preventing gas-dynamic phenomena during the development of the subsoil;
- mining of mineral layers with divergent faces, wide front and adjacent faces with a given advance, ensuring smooth development of geomechanical processes in the rock mass and uniform lowering of the earth's surface and objects located on it;
- mining of mineral layers by the method of paired drifts, which allows to regulate the development of geomechanical processes over time;
- changing the direction of the cleaning excavation and shifting the boundaries of mining operations, ensuring the development of deformation processes within the specified limits;
- the device of compensation trenches and unloading slots, which allows redistributing deformations in the rock mass and on the earth's surface and removing the boundaries of high-stress zones from protected objects;
- the use of shield tunneling complexes with hydro-loading on the face, ensuring the stability of the array when conducting tunnels in weak watered rocks under built-up areas;
- the use of special methods for strengthening the soil mass, sinking and fixing workings using freezing, cementation, chemical fixing, caisson and other technologies that allow bringing the watered array into a stable state.

Until recently, the issues of subsurface development were little linked with the issues of the use and conservation of other resources available in mining regions. These resources can be of both natural and artificial origin. Natural includes land, water bodies on the surface of the earth and aquifers in the rock thickness, artificial - buildings, structures, underground utilities, power lines, railways and highways, bridges and tunnels.

The sectoral regulatory documents reflect mainly short-term departmental interests and take little account of the long-term consequences of a regional scale. Thus, according to the current Rules for the protection of structures and Natural objects from the harmful effects of underground mining under the rivers flowing over the mine fields, safety targets are left [2]. As a result, rivers often turn out to be higher than the rest of the area that has settled under the influence of mining operations, and the natural flow of water into the river stops. To prevent flooding of the surrounding area, protective dams are being constructed, which require constant maintenance carried out by a mining enterprise. But as soon as this enterprise is closed, the dams begin to collapse, since local authorities, as a rule, do not have the strength and means to monitor the condition of these dams indefinitely and repair them in a timely manner. The destruction of damsleadst of looding of largeareas and shallowingofrivers.

Meanwhile, there are many ways not only to prevent these harmful environmental consequences, but also to extract additional mineral reserves. It is enough, for example, to plan mining operations in such a way that the riverbed falls into the compression zone, where water supply cracks do not form. The development of reserves under the rivers should be timed to the end of the mine operation. In this case, the water of the river can be temporarily passed through an artificial channel or through pipes.

For the integrated development of the subsoil, a method has been developed that allows to significantly increase the efficiency of mining reserves under water bodies and prevent negative consequences for the environment. The essence of this method consists in the fact that lava is worked out directly under the water body in the safety tselik, the parameters of which are calculated so that through-water cracks connecting the river with the mine workings are not formed in the rock thickness. Barrier pillars are left between the lava being worked out and the rest of the treatment workings, calculated according to the "Rules of technical operation ..." [3]. With this order of development of reserves, the water object will drop by an amount at which the slope of the surface in its direction will remain (which is also calculable), while hills will appear above the barrier pillars, replacing water-proof dams.

The uncontrolled development of deformation processes leads to unacceptable subsidence of the earth's surface, the formation of sinkholes and water supply cracks, drainage or waterlogging of land and other manifestations of the harmful effects of mining on the environment. The results of theoretical and experimental studies, tested by practice, show that by choosing scientifically sound parameters and the procedure for conducting mining operations, the mutual position of workings relative to each other and the protected object, it is possible to significantly reduce, and in some cases completely eliminate the harmful effect of mining operations on the environmental situation in the mining area [4].

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