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Research Article

ASSESSMENT OF HYDROGEOLOGICAL AND ENGINEERING-GEOLOGICAL CONDITIONS OF THE TUNGSTEN DEPOSIT (ON THE EXAMPLE OF THE SARYKUL DEPOSIT)

***Ashurov Olim G'ofurovich**
Hydrogeological engineer of the 2nd category
Senior Researcher Kurbanov Elboy Shavkatovich,
SE "Institute HYDROINGEO", Uzbekistan
**Author for Correspondence*

ABSTRACT
The article examines the hydrogeological and engineering-geological conditions of the Sarikul deposit by studying the groundwater level in water wells, changes in water consumption and comparing it with atmospheric precipitation. Chemical analysis of groundwater samples has been done and the division of rocks into sections (systems) properties and analysis of properties was done.

Keywords: *Underground Mining, Deep Horizons, Fractures, Disturbances, Flow, Collapses, Coal Falls, Stability, Stressed, Core*

INTRODUCTION
Currently, the fund of near-surface, easily discovered deposits is being exhausted at an increasingly rapid pace, and further expansion of promising ore areas can be carried out mainly due to the discovery of deep horizons in difficult geological conditions, as well as overlain by powerful rocks. For safe and effective underground mining of mineral deposits, it is necessary to conduct detailed hydrogeological and engineering-geological research. In this regard, the study, analysis and assessment of the disturbance and fracturing of rocks and their impact on the stability of mine workings are currently relevant and up-to-date [Plotnikov, 1979].

MATERIALS AND METHODS
"On measures to further improve the geological study of the subsoil and the implementation of the state program "development of metallurgical industries of the Republic of Uzbekistan, providing them with a reliable raw material base. One of the regions where intensive development of geological exploration and development of ore deposits is planned is the South Uzbek mining districts. In the coming years, existing enterprises will expand here and new enterprises for the extraction of various types of ore raw materials will be created. Ensuring high efficiency and safety of modern mining enterprises is almost impossible without a comprehensive study, analysis and assessment of engineering and geological conditions of field development at all stages of their exploration and operation [Kurbanov, 2020].

The main characteristics of cracks, in addition to length and width, are their shape, the morphology of the crack wall surface, the presence and composition of the filler, the orientation of cracks in space. To classify cracks by size, their length is usually used as the main feature, since it is the length that mainly determines the degree of danger of cracks for the stability of the structure. When constructing the classification of cracks on this basis, the practical side of the issue is usually taken into account, in particular, the possibility of studying cracks in sections, samples, walls of workings, outcrops, etc. [Ratz and Chernyshev, 1970].

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RESULTS AND DISCUSSION

Cracks with closed walls are called closed. The trace of closed cracks is usually clearly visible on the surface of the outcrop. However, there are also cases when cracks do not manifest themselves externally and are detected only during blasting or other mechanical influences; such cracks are called hidden. Apparently, these include, in addition to the cracks themselves, also various weakened surfaces, along which it is easier to break the continuity of the rock. Cracks whose walls are pushed apart (which do not exclude the possibility of their contact in a limited number of points) are called open. According to the width of the cracks can be divided into very narrow – up to 1 mm, narrow – 1-5 mm, medium – 2-20 mm, wide – 20-100 mm and very wide – more than 100 mm.

Noting the existing achievements in this field, it should be pointed out that many issues are still insufficiently studied, in particular, the analysis of the assessment of the disturbance and fracturing of rocks and their impact on the stability of mine workings due to the long-term operation of deposits, little attention is paid to the study of the physical and mechanical properties and stress-strain state of rocks in the massif, the prediction of various geological processes and changes in the engineering and geological conditions of deposits based on exploration materials.

Geologists in the study of fracturing have the goal of obtaining information about the presence of ore components or minerals in cracks, quartz sulfides, pyrite, mica, gas and many others, and without an ore crack (or even a zone of increased fracturing) are ignored.

The second direction, i.e. the study of fracturing and engineering-geological purposes, covers all the cracks inherent in the array. Cracks with weak fillers or without them, as well as cracks that are unfavorably oriented in relation to workings, are particularly studied.

The third direction is the study of fracturing with a hydrogeological purpose: the discovery of (gaping) cracks with filler is mainly studied in order to solve two issues: a) leaching of the filler; b) the susceptibility of the filler to the suffusion process.

Based on these directions, a number of fracturing classifications based on genetic, morphological, geometric and other qualitative and quantitative parameters have now been developed.

Static processing of the obtained field and laboratory results was used to obtain qualitative and quantitative indicators of rock fracturing. The result of the processing is an analysis of the relationship of fracturing with the structures of the work area and its impact on the stability of the sides of the quarry.

Administratively, the Sarykul site belongs to the Nurabad district of the Samarkand region of the Republic of Uzbekistan.

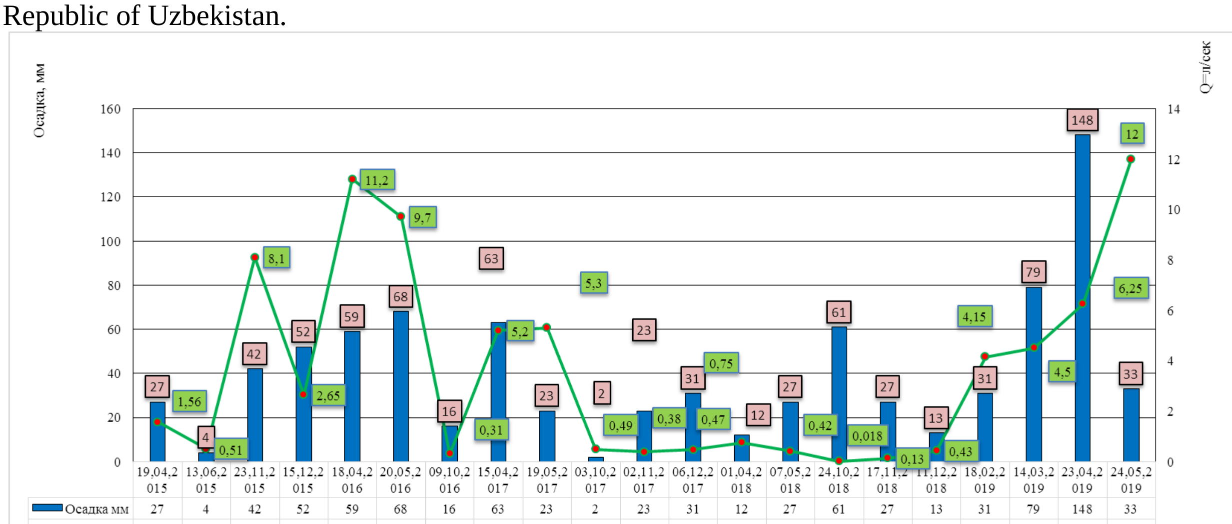

Figure 1:Combining the graph of changes in the flow rate of spring No. 1 in precipitation in the period from April 2015 to May 2019.

A feature of the geological structure of the Karatyubinsky ore field is the presence of two structural tiers, with occurrence in the autochthon of the middle-upper-stone-coal terrigenous-olistostromic formations of the Marguzor formation, and in the allochthon (probably in the form of remnants of the regional sharyazh) - carbonate rocks of the Madmon formation and siliceous rocks of the Akbasai formation.
According to the conditions of feeding, distribution, circulation and unloading within the field, fractured waters of Upper Paleozoic rocks and fractured-vein waters of tectonic disturbance zones are mainly allocated.
Hydrogeological studies of underground mine workings No. 1, (routine observations of water flows) have shown that the main ways of groundwater entering the workings are zones of tectonic disturbances, zones of crushing and increased fracturing, which are fractured-vein waters.
The spring is directly dependent on the amount of precipitation, the main flow is in the winter-spring period. By consumption, the maximum consumption is 12 l/s (may) 2019, the minimum is 0,018 l/s (October) In 2018, the average annual consumption of 4,0 l/s (Fig. 1) [Kurbanov, 2019].
The depth of the groundwater level will change from 5,6 to (borehole No. 310) to 12,75 m (Fig. 2). The water content and filtration properties of loose sediments are characterized by pumping data from wells. The flow rate of wells will change from 0,046 to 0,2 l/s with a decrease in the level, respectively, from 9,91 to 8,19 m, the specific flow rate changes from 0,31 l/s to 0,85 l/s. The filtration coefficient varies from 0,026 to 0,25 m/day.

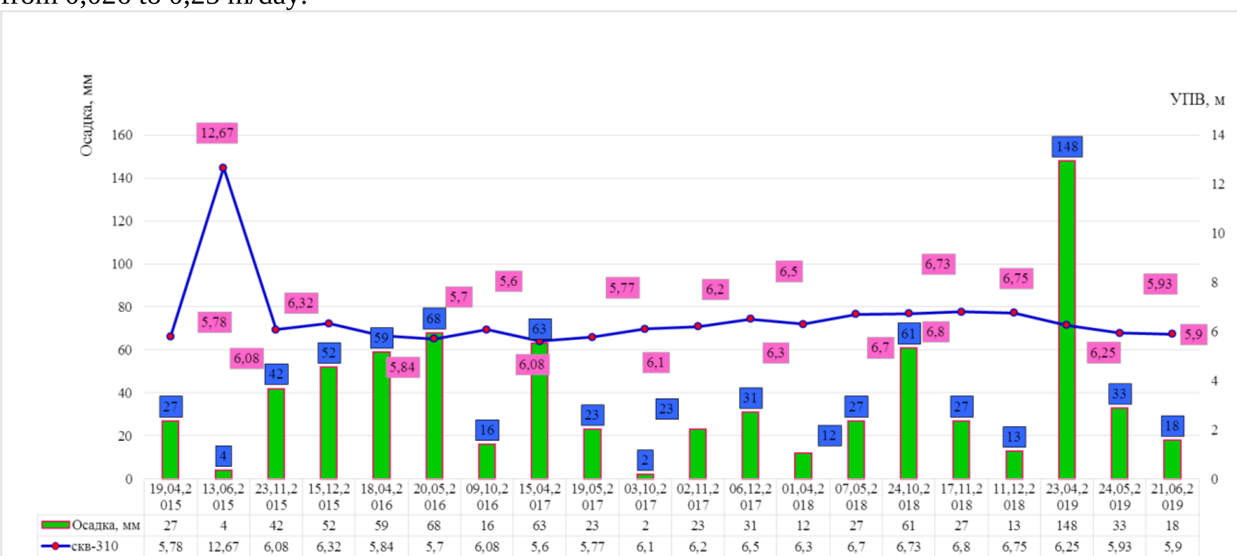

Figure 2: Combining the graph of changes in the groundwater level (SLE-310) in precipitation, in the period from April 2015, until June 2019.

By chemical composition, the groundwater is bicarbonate-sulfate, calcium, magnesium-calcium with a mineralization of 0,210-0,36 g/l, pH from 7,0 to 8,0 mg-eq/l, soft water.
On the Sarykul site, tectonic cracks have been mainly developed, in addition, there are cracks of unloading and artificial origin. Tectonic cracks are provided by separation cracks. The separation cracks are steeply inclined, vertical, contribute to the formation of dislocations. Artificial cracks appeared under the influence of weathering.
The Sarykul field, according to the degree of complexity of hydrogeological conditions, according to the classification of N.I. Plotnikov, belongs to the category of medium complexity. The complexity of the hydrogeological conditions is due to the thick thickness of the cover watered Neogene-Quaternary deposits, the presence of numerous tectonic disturbances, the predominant spread of fractured-ground and fractured-vein waters, the proximity of the surface watercourse [Plotnikov,1979].

Thus, there will be a water inflow when opening the full capacity of neogene-quaternary deposits, at a depth of 10 m, the sinking of the mine shaft should be carried out simultaneously with drainage. With tributaries exceeding 30 m^3/h (S = 20 m), the cementation of the passable rocks through boreholes or a system of wells of small diameter should be carried out and only after the tributaries decrease, the sinking resumes.

When Paleozoic rocks are opened by the bottom of the mine and the walls of the mine are completely cemented by Neogene-Quaternary deposits, the water flow into the mine shaft will decrease due to the low water content of Paleozoic rocks.

It should be noted that the above factors significantly complicate the development of the field. When carrying out engineering and technical works, it is necessary to take into account the complexity of hydrogeological conditions. Constantly monitor changes in water-saturated rocks.

The parameters of fracturing and disturbance in depth were measured from the cores of exploration wells. The main purpose of studying fracturing is to use them to assess the stability of the rock mass and possible water flows. Any crack, regardless of their type and origin, directly or indirectly affects the state of the rock mass. Therefore, we consider all cracks, in general, without distinguishing them by genetic types.

The fracturing of rocks at the deposit was studied by sites, by key areas of size, 1x1m^2. Based on the results of fracture measurements, tables and graphs were compiled, circular fracture diagrams were constructed, quantitative indicators of rock fracturing were calculated (Fig.3).

According to the results of fracture measurements, circular fracture diagrams are constructed. At the sites of mine No. 1, the Sarykul site has two crack systems:

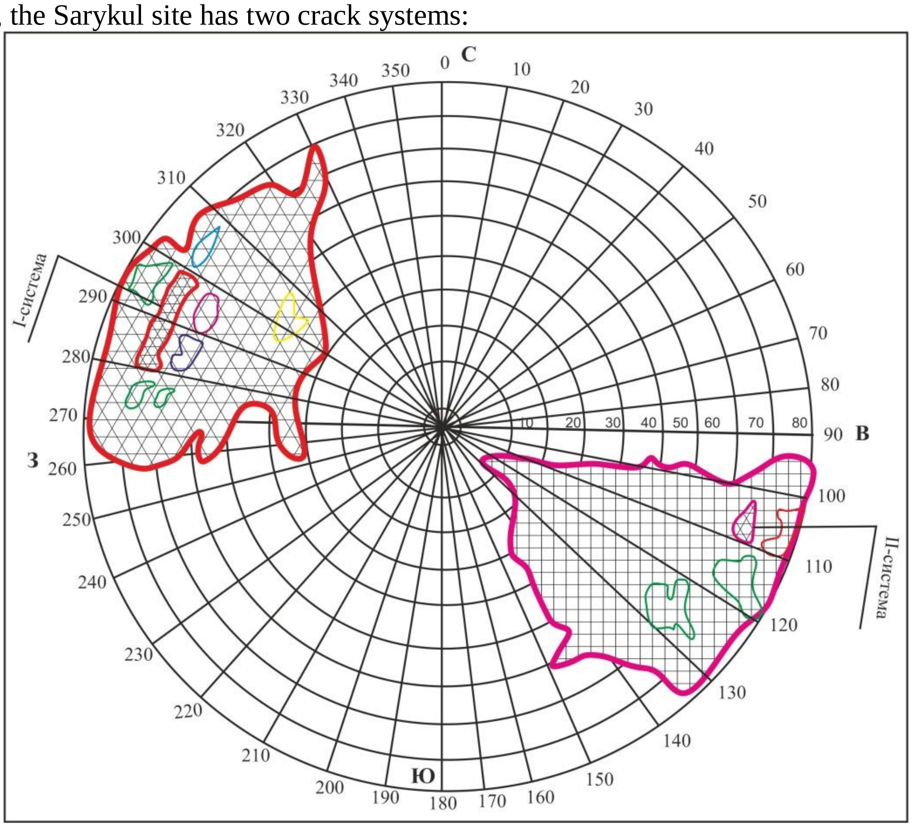

Figure 3: A pie chart of rock fracturing.

System: I – azimuth of incidence S.Z. 260 to 320°, angle of incidence 85-88°; II – azimuth of incidence Y.V.100 to 140°, angle of incidence 75-85°; Number of points from the total number of measurements, % – 1-14.

The geometric parameters of cracks on outcrop sites vary within the limits: width from 1 mm to 18 mm, crack length from 26-100 sm. The number of cracks on the sites varies from 3 to 7, the average width of the cracks is 2 mm to 12mm, the length of the cracks is 5 sm to 12 sm. Determination of fracture voidness at sites on outcrops, the coefficient of fractured voidness varies from 0,4-4,9%, the fractured voidness of rocks from 0,9 to 3,2% [Kurbanov E Sh and Akhunzhanov A M and Ashurov O G 2021], (Table 2).
In the exploration of a deposit of solid minerals, the physical and mechanical properties of rocks are given great importance. This is due to the fact that the physical and mechanical properties of rocks significantly depend on the design of mine workings, their stability, the development of various adverse geological phenomena, as well as the choice of the method of underground mining and the system of field development and, in general, the conditions of mining operations [Aripova and Miraslanov 2006]. According to the selected rock samples, a set of indicators of the physical and mechanical properties of rocks was determined. The results of laboratory tests of the physical and mechanical properties of rocks are given in the table (table 1).

Table 1:Results of physical and mechanical properties of rocks of the Sarykul deposit

Place of selection (sampling interval), m	Tensile strength, MPa	Compressive strength, MPa		Softening factor	The strength coefficient according to Protodyakonov	Lithological type of rocks
		In its natural state	In a water-saturated state			
1	2	3	4	5	6	7
1-mine 1-kvr	4.3	42.6	38.6	0.8	4.6	Slate
1- mine 34-35m	5.0	59.8	-	0.6	6.0	Metasomatic changes
1- mine 110m	8.7	93.8	84.2	0.87	8.5	Skarny

Table 2: Determination of fractured voidness at sites based on outcrops of the Sarykul deposit

Location site	The average distance between cracks in the ai system, (sm)	Average crack width in the system, Bi, (sm)	Fractured voidness , (%)	Classification according to M.V. Ratsu
1	2	3	4	5
1-mine	24,2	0,18	0,7	average
	23,7	0,4	0,7	large
	12,5	0,12	1,6	large
	14,1	0,13	0,9	medium
	25,0	0,83	3,2	very large
	24,0	0,23	0,9	medium
	13,4	0,18	1,2	large
	21,2	0,22	1,0	medium

The ore massif is divided into several groups, differing in the intensity of fracturing developed in them: weakly fractured, moderately fractured and intensely fractured.

Conclusion

I. The zone of weakly fractured rocks (stable areas) is characterized by higher values of strength indicators, varying in the range up to Csn = 93,8 MPa (table. 2), water-resistant, with their water-saturated state slightly decreased (up to 10%).In these areas, the zone of fracturing and disturbance of rocks is almost absent. Scarn is observed here, metasomatic changes of the rock are dense, massive. The crack voidness coefficient ranges from 0,7 to 1,0%. The fracture modulus is 10-20%. Cracks of the south-eastern direction with angles of incidence of 34-64° and south-south-western – 34-35°. Regardless of the location of cracks in the mine workings, engineering-geological processes are not observed; underground waters in the form of wells are found on hydrogeological sites.

II. The zone of moderately fractured rocks (limited stable areas) are located in the zones of impact of discontinuous faults and in places unevenly moistened by groundwater. The rocks are medium-fractured, the strength varies within the range of up to Csn = 59,8 MPa in medium-resistant ore zones where a weak collapse mining system is used. The coefficient of fracture voidness ranges from 1,0 to 1,5% (table 1). Here the rocks are medium-resistant, the physical and mechanical properties change, new cracks form, the width, length, humidity increase around underground mine workings.

III. The zone of intensely fractured rocks (unstable areas) is confined to discontinuous faults composed of intensely fractured and fractured, crushed sericitized rocks. The rock strata are heavily moistened by numerous groundwater outlets. On the walls of underground mine workings, a floor-by-floor collapse development system is mainly used here, characterized by the lowest values of strength indicators (Csn = 42,6 MPa). The fracture voidness coefficient is 1,5-4,9%, the fracture modulus is 15-30%, the crack system is south-west-northwest with angles of incidence of 65-88° and east-southeast with angles of incidence of 34-55°. Blasting works have a double effect on this site, various types of artificial cracks are formed in rocks and under the influence of rock pressure during their development by underground deep workings, etc. During the exploration and operation of underground mine workings it can be seen that under equal conditions of fracture characteristics (width, length, composition, filler properties) and for assessing stability, the angles of incidence of the crack in relation to the roof play a major role. Unfavorable spatial orientation of the angles of incidence in relation to the contours of undergrounds mine workings is an important factor affecting the efficiency and safety of the development of mineral deposits. Thus, the deformations of underground workings are mainly confined to zones of increased fracturing and tectonic disturbances, which serve as weakening surfaces and cause rock collapses. The effect of cracks of different genesis, having different lengths, widths, morphologies, etc., on the stability of the array is not the same. In this regard, special attention was paid to the study of rock fracturing in the massif, where these parameters can be directly measured [Kurbanov, 2019].

Thus, during the development of deposits, mining and tunneling operations must be carried out taking into account engineering and geological features, geological and tectonic structure, identified zones of crushing and fracturing and disturbance of rocks. Under these conditions, workings that are in a stress-strain state cause complications on the mine horizons, expressed in the form of deformation, collapse of the roof of underground workings, extrusion of rocks and breakthrough of underground waters of the developed space.

The revealed regularities and zonality of the formation of engineering-geological processes are the basis for identifying hydrogeological and engineering-geological factors and causes of the formation of processes that complicate the development of deep horizons of deposits of solid minerals.

REFERENCES

Aripova F M and Miraslanov M M (2006). Physical and mechanical properties of rocks of ore deposits of Uzbekistan. Guide Tr. HYDROINGEO. T. 101–107.

Kurbanov E Sh and Akhunzhanov A M and Ashurov O G (2021). Analysis and evaluation of engineering-geological factors in the underground development of the Sarykul deposit. Bulletin of UzMU, No.3/1, 173–176.

Kurbanov E Sh (2019). Sarikul wolfram foidali kazilma konining hydrogeologik sharoitini shrganish va taxlil kilish. Bulletin of NUUz, No.3/1, 88–93.

Kurbanov E Sh (2020). Engineering and geological conditions for the stability of mine workings during development (for example, the tungsten deposit Khodjadik).// International Journal of Geology, Earth & Environmental Sciences. pp.158–163.

Plotnikov N I (1979). Operational exploration of underground waters. M.: Nedra, 271 p.

Ratz M V and Chernyshev S N (1970). Teschinovatost and properties of fractured rocks. –M.: Nedra,– 158 p.