

ANNOTATION

**For the dissertational work of Kurmanbaev Olzhas Seitbotanovich
"PERFECTION OF GEODESIC METHODS OF OBSERVATION FOR
THE DEFORMATIONS OF ENGINEERING STRUCTURES" (under the
conditions of the Maikain deposit),**

**prepared for PhD degree
on the specialty 6D071100 - "Geodesy"**

Actuality of the dissertation topic. Modern mining in Kazakhstan is characterized by a steady increase in the capacity of enterprises, the intensification of production processes, an increase in the depth and service life of quarries. In these conditions, the problem of ensuring stability, both in the instrumental massifs of quarry slopes, and in engineering structures, in communications located at the mining site of an enterprise, is of particular urgency. Under the constructions of the industrial site, one should understand a complex of buildings (concentrating factories, mini-plants, electrical substations) and facilities that provide mining production with energy and transport.

In this connection, it becomes necessary to carry out geomechanical monitoring and improve its geodetic survey methods, to ensure long-term stability of the quarry pits and the operational suitability of the industrial site facilities. Therefore, to assess the technical condition of engineering structures in quarries, stability studies of rocks of the instrumental massifs are conducted. This problem, which is closely connected with the long-term exploitation of engineering facilities located on the industrial site, never goes off the agenda at all stages of field development.

The technical level of traditional geodetic observations during geomechanical monitoring does not always meet the requirements of mining enterprises, since working with them requires a lot of working time and there is no possibility of promptly obtaining information on the deformation state of the rock massif. Therefore, the use of modern geodetic instruments (electronic total stations, GPS technologies and laser scanners) in geomonitoring and improving the methods of working with them, we believe is closely related to the increase in the level of innovative directions.

These issues are regulated by the laws of the Republic of Kazakhstan "On Subsoil and Subsoil Use", "Geodesy and Cartography". In accordance with these laws, mining enterprises are entrusted with carrying out systematic observations of the state of the rock massif, preventing and eliminating the harmful effect of mining on engineering structures for ensuring the normal operation of the enterprise and predicting dangerous situations.

This confirms the importance of improving the methodology for geomechanical monitoring using modern geodetic devices as the basis for solving the scientific and technical problem.

Another proof of the relevance of the topic of the thesis is that the studies were carried out in accordance with the program of Project No.757.MON.HF.15.RIPR.44 "Reducing the risk of technogenic catastrophes by developing innovative management methods" conducted by the Department of Mine Surveying and Surveying KazNITU im.K.I.Satpayev in 2015-2017 with the participation of the author.

Objective. Perfection of the method of geodetic observations of the assessment of the technical condition of engineering structures located on the industrial site of mining enterprises by using modern instruments to ensure their reliability, safety and functional suitability.

The idea of work. Improvement of methods of high-precision geodetic measurements with the use of modern equipment for monitoring of instrumental massifs and stability of engineering structures.

Objectives of the study:

- identify objects, buildings, engineering structures and communications located on the industrial site of the Maikin quarry, which may experience negative impacts on their bearing capacity from the mining process;

- investigate the strength properties of the rocks of the instrumental massifs and the structural features of the rocks;

- analyze the practice of monitoring using electronic total stations, GPS technologies and laser scanners;

- improve the method of conducting geodetic observations during geomonitoring;

The object of research is the array of rocks of the Maikain deposit, engineering structures and communications of the industrial site.

Methods of research. To solve these problems, a comprehensive research method was used, including analysis of literature sources, geodetic methods of observations, modern instruments and technologies for geomechanical monitoring, and estimation of the accuracy of methods of geodetic measurements.

Protected scientific positions:

1. Improvement of the method of conducting geodetic observation and processing of their results using modern software packages provides an increase in the accuracy, reliability of measurement and labor productivity in monitoring deformations of rocks and engineering structures.

2. Monitoring of the condition of the pit array of quarry and engineering structures of the industrial site in a single coordinate system allows us to establish a direct connection between the displacements of the massif and the deformations of the bearing structures of engineering structures.

The scientific novelty of the results of the work is:

1. Improvement of geodetic methods of observing the array of arrays and assessing the technical condition of engineering facilities using modern instruments.

2. Development of a comprehensive monitoring program, engineering facilities and communications of industrial sites and geomonitoring of the instrumental array located in a single system of spatial coordinates;

The validity and reliability of scientific positions and conclusions is confirmed: the volume of geodetic measurements made in the conditions of the Maikain deposit, their mathematical processing; a positive evaluation and testing of the results of the work at various conferences and in the press; implementation of the results in the educational process and production (acts of implementation).

Scientific significance of the work is to improve the geodetic methods of monitoring the state of the rock massif of the engineering structures of the industrial site using modern instruments and to estimate the accuracy of geodetic measurements.

The practical importance of the work consists in the introduction of improved methods of conducting geomonitoring in production and in the educational process of the KazNITU named after K.I. Satpaev.

Approbation of work. Approbation of the results of work.

The main provisions and results of the dissertation work were reported and discussed at the following scientific and practical international conferences: 15th International Multidisciplinary Scientific GeoConference SGEM-2015, (Albena Resort, Bulgaria, 2015), "Problems of subsoil development in the XXI century through the eyes of the young" (Moscow, IPCON RAS, 2014, 2015); "Innovative technologies in surveying and geodesy" (Almaty, KazNTU, 2015); "Deformation and destruction of rocks" (Crimea, Alushta, 2016), "Scientific and Personnel Support of Innovative Development of the Mining and Metallurgical Complex" (Almaty, 2017), XIII European Conference on Innovations in the Technical and Natural Sciences (Austria, 2017) .) at the scientific seminar of the Department of Mine Surveying and Geodesy (Almaty, KazNITI, 2017).

In the thesis work on the basis of geomechanical monitoring of the instrumental massif and engineering structures of the industrial site, a solution was given to the scientific and technical task of improving geodetic survey methods by using modern instruments and software to ensure efficient and safe development of subsoil resources. The main results of the dissertation work are as follows:

Main scientific and practical results:

1. Based on a comprehensive analysis of domestic and foreign scientific and technical literature, work experience in the field of studying geomechanical processes and deformation of engineering structures located on the site of the enterprise, geodetic methods and means of observing deformations, a comprehensive methodology for performing geomonitoring using modern high-accuracy geodetic measurements .

2. According to the 1 and 2 blocks of the recommended methodology, the geology and tectonics of the area of the deposit were studied, the strength properties and structural features of the rock massifs were studied. The results obtained will be used in assessing the stability of the array of massifs and engineering structures.

3. The existing methods of conducting geodetic measurements using GPS observations, an electronic total station and a laser scanner have been improved, namely:

- use of deformation (luminous) marks;
- the establishment of permanent subsoil benchmarks;
- when studying the fracturing of rock massifs instead of a mountain compass using a laser scanner;
- Observation of engineering constructions of industrial site and quarry sides along single profile lines.

Thus, the defended first scientific position is confirmed. "Improving the methods of conducting geodetic observation and processing their results with the use of modern instruments provides increased accuracy, reliability of measurement and labor productivity in monitoring rock deformations and engineering structures."

4. Analysis of the results of observations of the condition of the instrument massif and the stability of the engineering structures of the company Maikain showed that the steady state of the pit edges is generally ensured, and there are local deformations in some areas. On monitoring engineering facilities received:

a) according to the columns of the substation building, it can be concluded that the FK-3 / 1c, D / 1c column has a deviation of the axis from the vertical plane of 17.49 mm; the received value exceeds the allowable value of SNiP RK 5.04-18-02, Table 26, p.4 (the admissible value is 12 mm);

b) according to the results of deformation marks of power transmission line structures, it can be concluded that the LEP supports have a vertical displacement of up to (-) 36 mm, the maximum horizontal displacement of the transmission line towards the quarry is 58 mm;

c) some supports of power transmission lines located in the southwestern part of the quarry fell into a zone of dangerous deformations;

d) according to the data in Table 4.3 on the beams of the building of the concentrator factory, it can be concluded that beams A-08-8, A-07-8 have a deflection value of 0.01965mm, 0.02185mm, respectively, the values obtained do not exceed the allowable value of SNiP 2.0107-85 Table 19 item 2 (the acceptable value is 37mm).

5. The developed complex monitoring program for the stability of the instrumentation arrays of quarries and engineering structures of the industrial site allows establishing a direct connection between the displacements of the massif and the deformations of the engineering structures. On the basis of the complex geomonitoring carried out, regularities in the development of geomechanical processes at the Maikain deposit are established, the results of which are published in the journal of the Scopus database included in the database.

Estimation of the completeness of the solutions to the tasks.

As a result of scientific research and instrumental observations at the Maykain mine, the following tasks have been accomplished:

- identified objects, buildings, structures and utilities located on the industrial site of the quarry, which lose their bearing capacity from the technological process of mining;
- the strength properties and structural features of the rocks of the instrumental massifs are studied;
- the methodology of surveying and geodetic observations of the instrumental massifs of quarries and structures of industrial site with application of modern equipment and instruments is grounded;

Development of recommendations and initial data on the specific use of results. The results obtained from the reference points of the earth's surface of engineering structures, as well as graphical shifts, are used in the educational process of the KazNITI named after KISatpaev at the Department of Mine Surveying and Geodesy on the subject "Observations of deformations of structures", which is confirmed by the act.

And also the received results are recommended for use in the educational process of the IOC, where the applicant is currently working.

Assessment of technical and economic efficiency of implementation.

The results of performed studies on the field, given in this work and the methodology for monitoring the study of the array of arrays and assessing the technical condition of the structures were implemented at JSC "Maikainzoloto" in the form of a regulatory document "Methodological guidelines for monitoring the movement of the earth's surface."

Publication of the work. According to the main content of the thesis, 13 scientific works were published, including 4 articles in scientific publications recommended by the Committee for Control in Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan, 7 - articles in materials in international and foreign conferences, 1 article published in the Scopus database and 1 study monograph .

Scope and structure of work. The thesis consists of an introduction, four chapters and a conclusion, which consists of 120 sheets of computer text. Includes 17 tables, 77 drawings, conclusions, a list of sources used and 2 applications.