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BACKGROUND OF THE OPTIMAL METHOD OF THE SURVEY GRID CREATION IN THE CONDITIONS OF BEREZOVSKY-1 OPEN-PIT MINE

The current question is the assessment of the reliability of surveying support grids at mining enterprises, since the last alignment of the survey support grids was realized 10 years ago. The demand for break stone is increasing every year. Precisely because the production rates at mining enterprises are increasing, the advance of the mining operations is accelerating, mining and geological conditions are becoming more complicated, and the depth of workings is increasing.

All of the above factors can lead to the loss of surveying support grids, due to this case occurs a need for reconstruction, as well as an analysis of the accuracy of created or designed surveying support grids.

The accuracy of the creation of surveying grids is greatly influenced by the errors of angular measurements, errors of linear measurements, errors of measurements of the coordinates of the basepoints and angles of the directions of the source sides. These errors also have a significant effect on the position error of the outermost point. All of this is necessary to assess the accuracy of existing and designed surveying support grids.

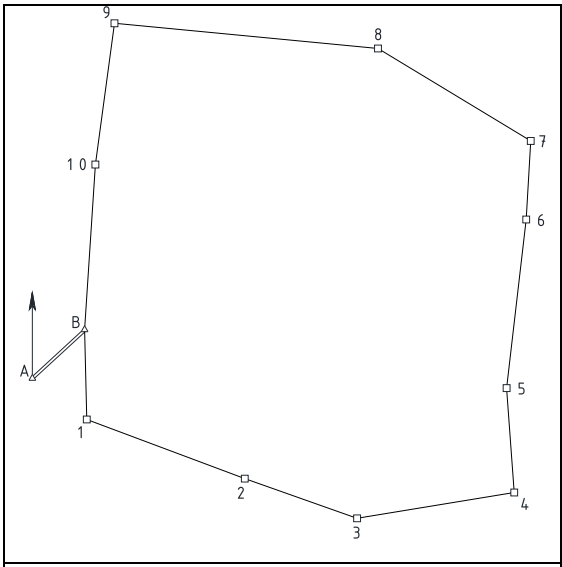
The analysis of the accuracy of surveying grids is to study the accuracy of the construction of surveying support grids, as well as to study the survey process. It is an integral part of the design of mining operations at a mining enterprise.

Mine support survey and survey grids are created by mine surveyors or third parties in addition to existing station points for mining operations at mining enterprises, in accordance with the requirements set out in the Mine Production Guidelines.

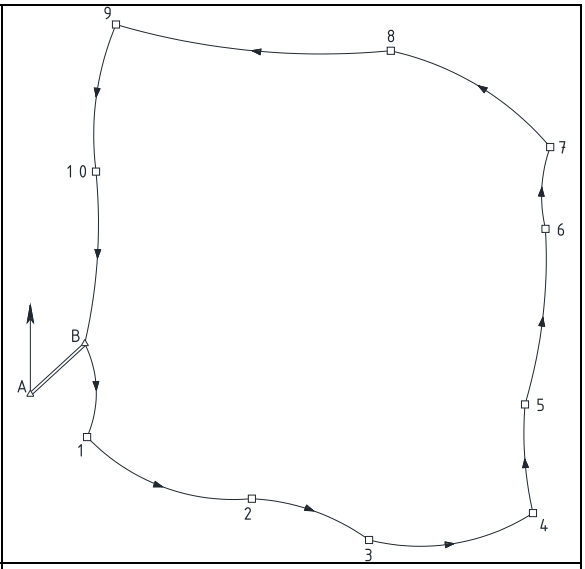
There are three known options for designing a survey geodetic grid, such as polygonometry, triangulation and trilateration. According to the instruction GKNTA-2.04-02-98 the most appropriate and cost-effective solution would be to create a survey grid using the method of polyginometry. Because trilateration requires to use high-precision position finders, and a method of triangulation is only used when it is impossible or impractical to use polygonometry for any reason.

In this work has been found the most optimal way to create a survey grid in the conditions of Berezovsky - 1 open-pit mine.

For this purpose, grid of fourth-order polygonometry was designed and, under the conditions of the Berezovsky-1 open-pit mine, a planimetric grid was constructed with the help of the 2T5K theodolite (Pic. 1). Third-order levelling grid was designed with the help of N3 leveler, and a vertical control survey grid was constructed (Fig. 2).



Picture 1. Planimetric geodesy grid



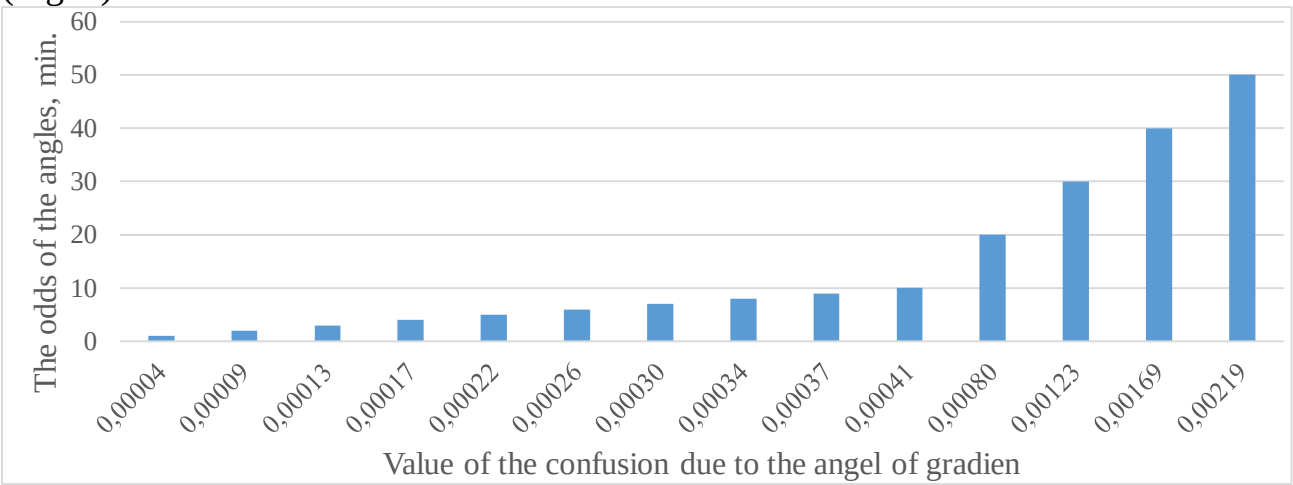
Picture 2. Vertical control geodesy grid

Requirements and recommendations for fourth-order polygonometric grids are taken into account to avoid significant confusions:

- while designing the sides of the polygonometry, there is no transition from very short sides to the longest,

- the number of angular and linear closure errors to the boundary does not exceed 10%.

Although difference of height between some points exceed 5 meters, a considerable distance between the points eliminates this problem, so it was decided not to use trigonometric levelling. The histogram shows the dependence of the change in the value of the confusion due to the angel of gradient of the collimation line on the odds of the angles of gradient of the collimation line between two points (Fig. 3).



Picture 3. Histogram of the functional connection of the confusion value due to the odds of the angle of gradient and the odds of the angles

All the measurements and calculations fit the grid requirements. The calculation of the designed grids was also performed, in which the general confusion value of the disposition of the point (Table 1) did not exceed the permissible values.

Table 1. Fundamental calculations of the accuracy of the surveying grid

Term of the confusion value	Measuring the lengths of the sides		Observation	Tools	Measure the angle	The mean squar coordinate of th poi		Disposition of the point
Symbol	m_{xs}	m_{ys}	m_0	m	m_β	M_x	M_y	M
Value	0,032	0,031	10,47	5,45	3	0,037	0,045	0,058

The best option for creating a survey grid is the polygonometric method, because it is simpler to perform, more flexible than other methods, and allows you to survey with a minimum amount of equipment. On the territory of the fields there is rarely a flat terrain, it has many hills and pits, so the difference of height between the points also ranges from 0.5 to 5 meters for this field. The difference of height and distance between points affect the angle of gradient of the collimation line. The pattern has found if the distance between points increases, the effect of the difference of height on the confusion value due to the angle of gradient is reduced.

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