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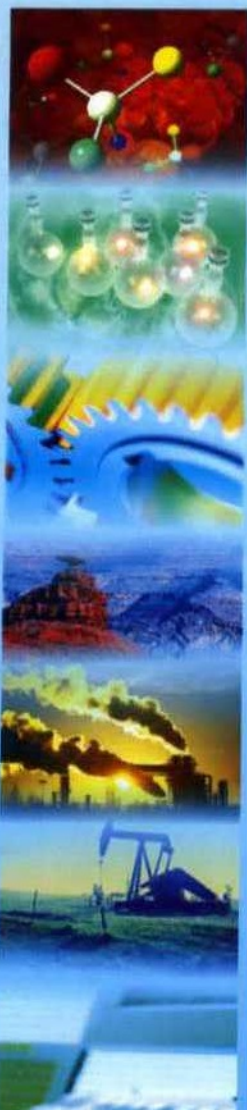
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УНИВЕРСИТЕТІНІҢ

ХАБАРШЫСЫ ВЕСТНИК

КАЗАХСКОГО НАЦИОНАЛЬНОГО
ТЕХНИЧЕСКОГО УНИВЕРСИТЕТА
ИМЕНИ К.И. САТПАЕВА



ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
БІЛІМ ЖӘНЕ ҒЫЛЫМ МИНИСТРЛІГІ

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ
РЕСПУБЛИКИ КАЗАХСТАН



КазНТУ ХАБАРШЫСЫ _____

ВЕСТНИК КазНТУ

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Картабай А.Т., Кусайнова Г.М., Тайбагаров Е.

Оценка эффективности гидроразрыва пласта в месторождениях РК

Резюме. Дано обоснование к внедрению методов регулирования разработки нефтяных залежей, важной задачей которых является достоверный прогноз их основных технологических показателей.

Так же приводятся данные исследования направленные на совершенствование методов прогнозирования в условиях месторождений полуострова Мангыстау, с целью установления кривых фазовых проницаемостей, уточнения неоднородностей пластов и технологических показателей нефтедобычи пластов по геолого-промышленным данным.

Ключевые слова: гидро разрыв пласта, добыча нефти, нефтяная залежь, нефтеотдача.

Kartabai A.T., Kusainova G.M., Taibagarov E.

The following article justifies introduction of oil fields development regulation

Summary. The following article justifies introduction of oil fields development regulation methods, which are used, most importantly, to make a reliable prediction of basic production data. Also there are results of the research aimed at enhance prognosis of Mangystau oil fields in order to plot the phase permeability curves, check the strata inhomogeneity and their oil production data based on geological information.

Key words: oil production, oil reservoir, forecast, performance curve.

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PHYSICAL PHENOMENA IN THE TOOL ZONE DURING THE HOLE-MAKING OPERATIONS OF THE TOOL SLIDE BUILT-UP REAMER

Abstract. The process of cutting during the hole-making operation is under the way of tool overcoming of forces of resistance to the destruction of the relations of the cut layer and its transformation into the shavings from the action of cutting forces, arising due to the main rotational motion of cutting and axial direction. The investigation of cutting force during the hole-making operations and the slide built-up reamer with peakless teeth, which was developed as original designed of metal-cutting tool were executed. In the cutting process during the turning on of the fourth tooth-cutter in the work, there is balancing of the radial component of the cutting force, hence, stability of processing and decrease in the pressing, vibrations, thereby the accuracy and quality of processing of apertures is increases. The mechanism of action, and distribution of cutting forces in the hole-making operations of the tool slide built-up reamer will allow make the theoretical model and the mathematical description of the process of cutting. On the basis of the theoretical model of the process of cutting the numerical values of the cutting forces and an optimum modes of cutting should be determined.

Key words: cutting, strength, direction, distribution, holes, friction, design, geometry, accuracy, and quality.

On the front surface the greatest pressure $P_{\max}$ operates close to the cutting edge (point 1). In process of removal from it of the pressure P is decreasing, and in point 2, which will terminate the contact ran shaving with the razor, the pressure is 0. The width of 1-2 of the contact area with the formation of brittle materials, such as cast iron, is equal to or slightly greater than the thickness of the removing layer. In processing of plastic materials width of the contact area is greater 1,5...3 times than the thickness of the removing layer. There is influence of the non-uniformly distributed load on the rear surface of the blade P' .

For the solution of practical tasks, the distributed loads on the blade are replaced to the equivalent in amount and the direction of the resultant force of cutting R . The point of the application of this force is on the working part of the cutting edge [7-9].

In the General case, the power of cutting is not located in the main intersecting place, and makes it a certain angle. During changing the processed material, geometric parameters of the tool, the cutting power of cutting R not only its size changes, but also the direction in relation to the details and the tool can change. Therefore, in the calculations of the strength of cutting R is shared into three coordinate axes Z , Y , X , receiving projection P_z , P_y and P_x .

Force P_z – is enclosed power (tangential) or the main component of the cutting forces are acting in the place of cutting in the direction of the main traffic and determines the load on the machine and the tool. The value of P_z determines the torque of the M_{tor} , on which the gear wheels and shafts of gears of a machine is calculated.

The power of P_y – is radial component of the applied perpendicular to the axis of the work piece. This component determines the strength of spinning cutter from the work piece and the deflection of the work piece, causing the accuracy of the details. The value of P_y is necessary for calculation of bed and rest of the machine.

The power of P_x – is axial component which is acting along the axis of the work piece in parallel to the feed direction. This component determines the load feeder of the machine. The size of P_x is the starting point for the calculation of the links of the feeder of the machine.

These three components of the forces are mutually perpendicular, therefore, the magnitude and direction of the resultant force is defined as the diagonal of the parallelepiped:

$$R = \sqrt{P_z^2 + P_y^2 + P_x^2}.$$

The correlation of values of the components of the forces P_z , P_y , P_x does not remain constant and depends on the geometric parameters of the working part of the tool, elements of cutting modes, tool wear, the processed material, the conditions of cutting.

The tangential component of the cutting force has the greatest importance. It is directed perpendicular to the front surface of the plate and provides spinning cutter in the vertical flatness. It is important to note that the tangential component of the cutting force is applied to the top of the cutting of plate and does not pass through the axis of the frame. Thus, if power is the prop, it is appeared a point, which twists the frame relative to its axis.

The second largest value has the axial component of the cutting forces, but it works parallel to the axis of the frame, therefore it does not cause the spin. Radial component of the cutting force is directed perpendicular to the axis of the frame and causes spinning.

Thus, only tangential and radial components of the cutting forces cause the spinning boring cutter. It was considered for many years that the axial and radial components of the cutting forces are equal to 50 and 25 percent of the tangential respectively. Today this ratio is wrong, because it depends on the being processed material, its hardness, the conditions of cutting and radius at the top of the insert [10-12].

2 Substantiation of the line of research

It must be known the magnitude of these forces for calculating the power of the actuator and the rigidity of the machine, as well as to determine the strength and stiffness of the instrument and adjustment. The research in this direction in the field of dynamics of cutting forces, can be divided into two groups:

- 1) the theoretical conclusions of equations for the reckoning of cutting forces on the basis of the analysis of the process of removing work chips as one of the particular cases of plastic deformation;
- 2) experimental determination of the cutting forces.

The theoretical determination of the normal force, as the studies show, is determined by the complexity of the calculations. In the General case for the determination of the cutting forces it must be known the characteristics of the plastic deformation of the material being processed, the parameters of the cut section, coefficients of friction and shrinkage of the chip and the angles of the cutting tool. The complexity and discrepancy of theoretical calculations are the interdependence of the chip's shrinkage and a number of factors. And it influences the cutting forces. Moreover, in determining the characteristics of the processed material, it is not possible to create such conditions, which really comes down taken chips. So for engineering calculations the empirical dependencies of the cutting forces on the conditions of processing are more often used. The most part of the cutting forces, on the basis of direct measurements with the help of special devices are determined.

There are a large number of devices for measuring cutting forces. They are called the dynamometers. Regardless of the structures they consist of the following main parts:

- the load received transmitter;
- the load registered receiver;
- subsidiary links that connect the transmitter to the receiver.

Dynamometers are divided into three groups: hydraulic, mechanical and electrical.

It is impossible to use dynamometers in a production environment for the determination of the cutting forces, to be calibrated, the use of expensive and sensitive measuring devices frequently or each time. Therefore, or taking an account of interdependences $P_z, P_y, P_x = f(b, a, C_M, C_{HH}, \nu, \gamma, \alpha, K_{cool})$ in practise using data and simple formulas, it is usually detected in advance, what parameters and in what measure them of the process can affect to the cutting forces.

The nature of these dependencies, is found out after carrying out the experiments and mathematical processing of the received data [13-18].

3 Cutting forces in the hole-making operations

For processing holes it is proposed the tool slide built-up reamer with unpicked teeth [19]. There is no pick on the teeth-cutters of the instrument; cutting edge is executed in an arc of a circle with inclination of the plane of the main cutting edge relative to the plane perpendicular to the axis of the sweep. Power and thermal voltage on the cutting edge is reduced, it reduces running out and increases the resistance, improves the quality of the processed surface on a number of parameters, including the roughness decreases due to the change of conditions and shave appeared kinematics.

For processing holes the reamers' teeth-cutters (their number preferably four) are located on the permanent displacement along the axis, so that the appropriate point tooth-cutters are on a spiral. In some cases, to improve the quality of the treatment, alternating angular step between the teeth of the sweep is performed. For the same purpose, non-uniform axial step sweep is performed to. All teeth-cutters are cutting edges, formed as an arc of a circle, the plane of which is inclined at an angle to the axis of rotation (holes). On a circular area teeth-cutters excluded the top, and improvement of conditions of cutting. All teeth-cutters are of the same size in height, i.e. are adjusted to the processing of the same diameter of the hole. Minimum beats cutting tooth provide high accuracy of processing. To improve the accuracy of processing on the housing reamer there are guiding elements. Mount teeth-cutters on the unfolding is performed with the help of special clamps and screws. Teeth-cutters are made of high-speed steel or equipped with plates of hard alloy.

The scheme of processing of tool slide built-up reamer with unpicked teeth is presented in figure 3. In figure 3 are designated: 1, 2, 3, 4 – the ordinal number of the tooth-cutters reamer; 5 – housing reamer; 6 – four are displaced relative to each other cutter reamer; 7 – mounting screws; 8 – clamp; 9 – piece of work; 10 – a flat compensation plate with holes for mounting screws; 11 – rails on the frame reamer; D – diameter of the reamer (holes); D_n – neck diameter, L – is the length of the work piece; ℓ_r – length of working part of the scan; ℓ_n – neck length; S – axial feed the tool; V – speed of rotation of the tool; V_e – is the total speed, t_1 – allowance, your first tooth-cutter; t_2 – allowance, the second and the third-tooth-cutters.

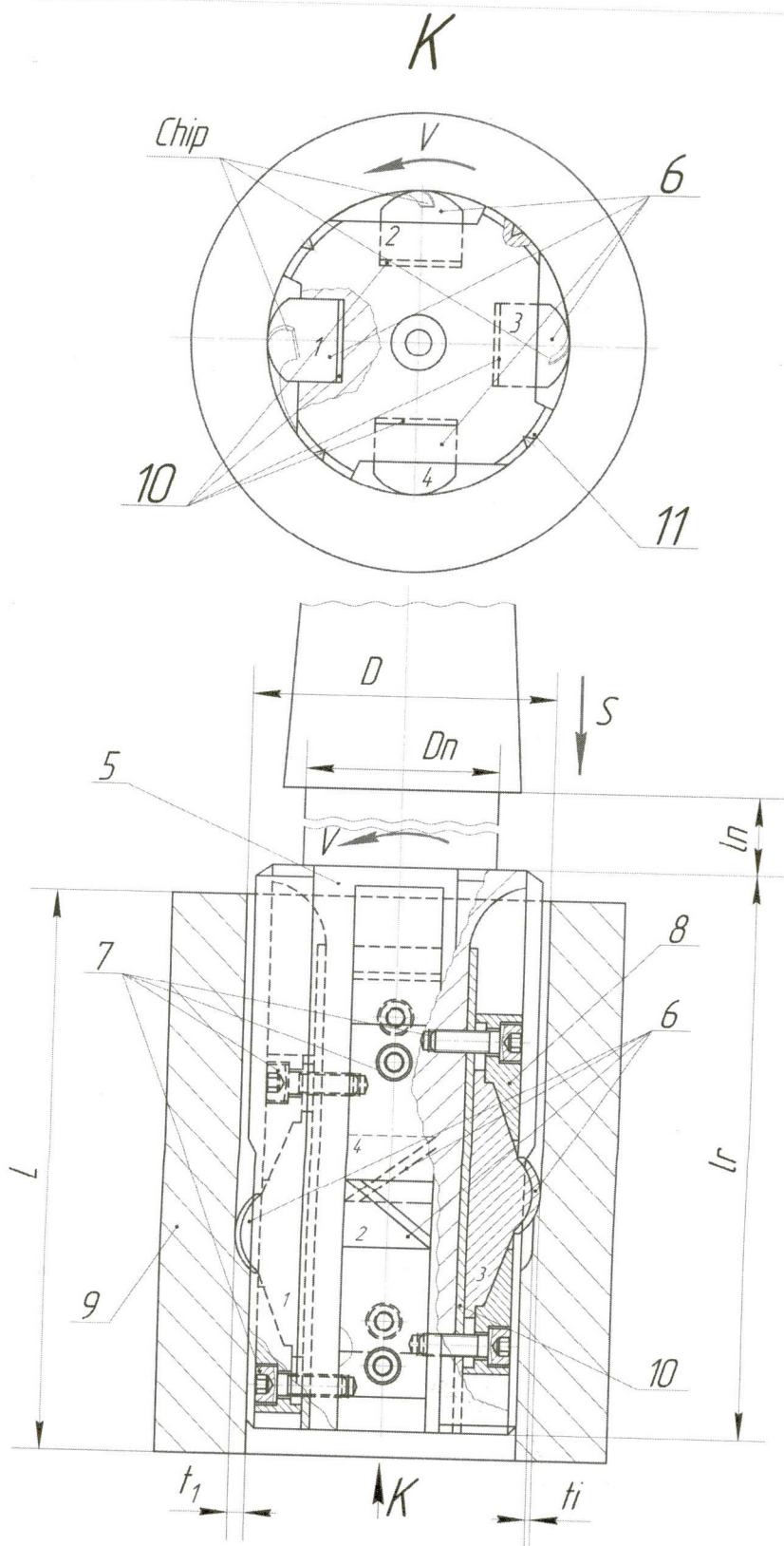


Figure 3. Scheme of processing of the hole team scan

The processing of the holes on the national team sweep of the cutting forces (figure 4).

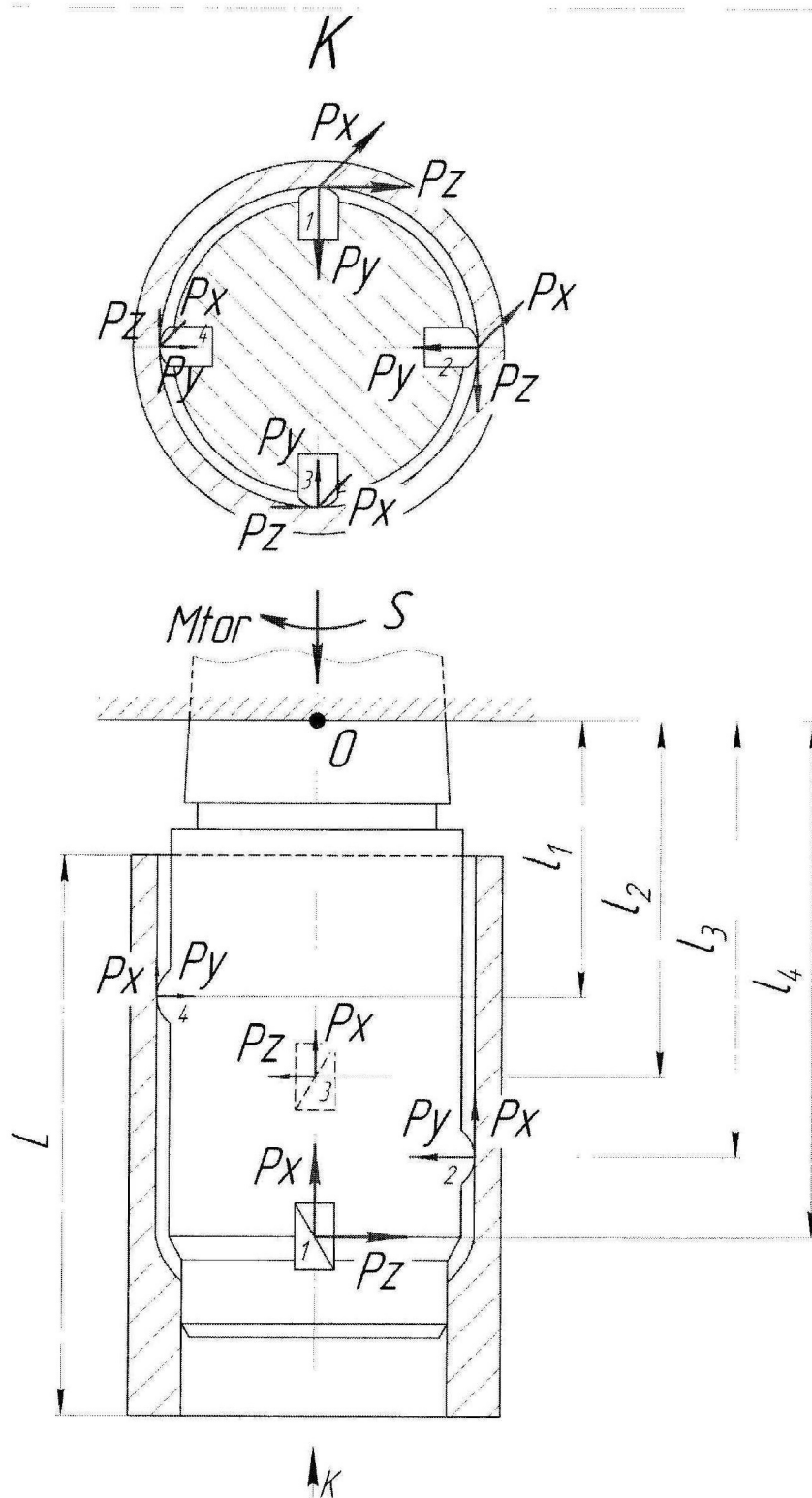


Figure 4. The force of tool slide built-up reamer

4 Results and discussion

During the processing holes of the tool slide built-up reamer the first tooth-cutter removes all of the allowance for processing, and the rest - gauge the hole, which reduces the roughness of the surface and increases accuracy.

The main job of cutting performs the first tooth-cutter. The rest of the series gauge the hole. Chips, the first tooth-cutting, build a broader, and the second and third build narrow one.

Thus, the investigations for determining the actions and direction of the cutting forces in the processing of holes, developed by the original design of metal-cutting tool were conducted. As can be seen from figure 4, in the cutting process during the turning on of the fourth tooth-cutter in the work, there is balancing of the radial component of the cutting force, hence, stability of processing and decrease in the pressing, vibrations, thereby the accuracy and quality of processing of apertures is increases.

5 Conclusion

On the basis of the above-mentioned material it is possible to formulate the following conclusions:

1. The mechanism of action, and distribution of cutting forces in the hole-making operations of the tool slide built-up reamer will allow make the theoretical model and the mathematical description of the process of cutting.

2. In the process of the operation is balancing of the radial component of the cutting force, hence, stability of processing, decrease in the pressing, vibrations, thereby the accuracy and quality of processing of apertures is increased.

3. On the basis of the theoretical model of the process of cutting the numerical values of the cutting forces and an optimum modes of cutting should be determined.

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Таскарина А.Ж., Мендебаев Т.М., Дудак Н.С., Итыбасва Г.Т., Мусина Ж.К., Касенов А.Ж.

Тесіктерді құрастырылған кескішті ұңғылағышпен өңдеу кезіндегі кесу аумағындағы физикалық көріністері

Түйіндеме. Мақалада дәлдігі жоғары тетіктердің ішкі беттің өңдеуге арналған жаңа құрылымды металл кескіш болғандықтан тесіктерді құрастырылған кескішті ұңғылағышпен өңдеу процесіндегі кесу күш реттеуі және олардың бағыттары, кесу аумағындағы физикалық көріністері туралы сұрақтар қарастырылған. Тесіктерді өңдеу кезінде кесу күштерді анықтау бойынша зерттеулер орындалды, бет сапасы және өңдеу дәлдігі жоғары

тесіктерді ұңғылау үшін төбесіз тістерімен құрастырылған кескішті ұңғылағыштын өзіндік құрылымы құрастырылды.

Негізгі сөздер: кесу, күштер, бағыт, үлестірім, тесіктер, үйкеліс, құрылым, геометриясы, дәлдік, сапа.

Taskarina A.Zh., Mendebaev T.M., Dudak N.S., Itybaeva G.T., Musina Zh.K., Kasenov A.Zh.

Физические явления в зоне резания при обработке отверстий сборной резцовой развёрткой

Резюме. В статье рассмотрены вопросы физических явлений в зоне резания, распределения сил резания и направления их действий в процессе обработки отверстий сборной резцовой развёрткой, т.к. металлорежущий инструмент является новой конструкцией для обработки внутренних поверхностей высокоточных деталей. Выполнены исследования по определению сил резания при обработке отверстий, разработанной оригинальной конструкцией металлорежущего инструмента – сборной резцовой развёртки с безвершинными зубьями для разворачивания отверстий высокого качества поверхности и точности обработки.

Ключевые слова: резание, силы, направление, распределение, отверстия, трение, конструкция, геометрия, точность, качество.

Taskarina A.Zh., Mendebaev T.M., Dudak N.S., Itybaeva G.T., Musina Zh.K., Kasenov A.Zh.

Physical phenomena in the tool zone during the hole-making operations of the tool slide built-up reamer

Summary. In the given article questions of physical phenomena in the tool zone, distribution of the cutting forces and directions of their actions during the hole-making operations of the tool slide built-up reamer are considered because the metal-cutting tool is a new construction for inner surfacing of high-precision parts. The investigation of cutting force during the hole-making operations and the slide built-up reamer with peakless teeth for rolling-out high-quality surfaced and accuracy worked bores, which was developed as original designed of metal-cutting tool were executed.

Key words: cutting, strength, direction, distribution, holes, friction, design, geometry, accuracy and quality.

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УСТОЙЧИВОСТЬ КОНСТРУКТИВНЫХ ЭЛЕМЕНТОВ КАМЕРНО-СТОЛБОВОЙ СИСТЕМЫ ПРИ ОТРАБОТКЕ НАКЛОННЫХ ЗАЛЕЖЕЙ

Аннотация. Рассмотрено геомеханическое обоснование отработки участков наклонных залежей видоизмененными вариантами камерно-столбовой системы, где подрабатываемая толща пород поддерживается междуканальными целиками, расположенными по определенной схеме, панельными и барьерными, размещенными на границах очистных панелей обширных залежей или междуканальных целиков и кромками залежей при их ограниченных размерах, вопрос устойчивости конструктивных элементов камерно-столбовой системы разработки.

В результате исследований получен коэффициент, учитывающий влияние угла наклона и в соответствии с этим введены поправки на касательные напряжения при различном боковом давлении на целики. Проведены исследования по расчетам высоты потолочины-моста, обеспечивающего устойчивость всей конструктивной системы при двухъярусной отработке.

Ключевые слова: целик, наклонная залежь, устойчивость, боковое давление

Отработка первых панелей и блоков Анненского района Жезказганского месторождения выявила необходимость существенной корректировки технологических схем отработки, применяемых в измененных условиях и, в частности, при выемке запасов наклонных залежей мощностью более 18 м с углом падения 25-35°. Согласно методическим указаниям и рекомендациям по выемке запасов руды из свиты залежей Анненского рудника, на участках залежей указанного типа сконцентрировано 9,3% общих запасов [1]. «ПТЭ рудников, приисков и шахт, разрабатывающих месторождения цветных, редких и драгоценных металлов» ограничивают применение камерно-столбовой системы на залежах мощностью не более 18 м и углами падения 25-35° [2]. Переход на системы другого типа и класса потребует время на их освоение, изменения сети подготовительных,

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