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УДК 621.791

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DIRECT FAILURE ZONE ANALYSIS OF EXCAVATOR BUCKET TEETH CORROSION MECHANISM

Because the initial hardness of the 110G13L steel used for the production of excavator bucket teeth is much lower than the hardness of iron quartzite's, then according to equation (2), the mode of extreme corrosion (high specific pressures, blasted rock Due to the large number of convenient cutting edges on the surface of rock fragments, etc.), a dominant micro-cutting occurs in the excavation of the blasted rock mass.

Key words: excavator, bucket, tooth, protective element, efficiency, working time, reliability, stone, abrasive wear.

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АНАЛИЗ ЗОНЫ ПРЯМОГО РАЗРУШЕНИЯ МЕХАНИЗМА КОРРОЗИИ ЗУБЬЕВ КОВША ЭКСКАВАТОРА

Поскольку исходная твердость стали 110Г13Л, используемой для изготовления зубьев ковша экскаваторов, значительно ниже твердости железных кварцитов, то согласно уравнению (2) режим экстремальной коррозии (высокие удельные давления, взорванная порода) из-за больших количество удобных режущих кромок на поверхности обломков горных пород и др.), при выемке взорванного массива горных пород происходит преобладание микрорезьев.

Ключевые слова: экскаватор, ковш, зуб, защитный элемент, эффективность, рабочее время, надежность, камень, абразивный износ.

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ЭКСКАВАТОР ЧАКА ТИШТЕРИН КОРРОЗИЯ МЕХАНИЗМИНИН ТҮЗ БУЗУЛУУ ЗОНАСЫНЫН АНАЛИЗИ

Экскаватордун чакасынын тиштерин өндүрүү үчүн колдонулган 110G13L болоттун баштапкы катуулугу темир кварциттеринин катуулугунан бир топ төмөн болгондуктан, (2) теңдемеге ылайык, экстремалдык коррозия режими (жогорку салыштырма басымдар, жардырылган тоо тектеринин чоңдугуна байланыштуу) тоо тектеринин сыныктарынын бетиндеги ыңгайлуу кесүүчү кырлардын саны ж.

Ачкыч сөздөр: экскаватор, чака, тиш, коргоочу элемент, эффективдүүлүк, иштөө убактысы, ишенимдүүлүк, таш, абразивдүү эскирүү.

Introduction: By studying the processes characteristic of impact-abrasive wear of excavator bucket teeth, it is an important factor in the design of their working surfaces. Studying the laws characteristic of impact-abrasive wear and taking them into account in projects allows a more rational approach to the selection of materials for further research.

With the shock penetration of abrasive particles, the height of the convexity around the pits becomes much larger than the convexity of the pits formed by static dipping to the same depth [1], which helps their rapid migration during the subsequent shock-abrasive impact. Impact-abrasive corrosion processes are characterized by a high degree of deformation of surface micro volumes.

For brittle materials, the direct dynamic introduction of hard abrasive particles at the critical impact energy creates very favorable conditions for the appearance of brittle cracks in the metal at the micro and macro level. When dipping, changes in movement occur with the formation of holes with a natural central. Figure 1. The scheme of the formation of convenes by dipping a conic triple [2]

Relevance: When choosing alloys resistant to impact-abrasive corrosion, there is a certain conflict between the requirements to increase the strength properties (yield and strength limits, hardness, etc.) and to provide high resistance too many plastic deformations by increasing the resistance to brittle fracture. In order to fulfill such a requirement, the authors of [3] propose a complex criterion of resistance to impact-abrasive corrosion of steels, and here it is emphasized that the sb-strength limit, ps, should be approached taking into account the relative narrowing.

Information on the use of some alloys for impact-abrasive wear is very contradictory, V.N. According to Vinogradov [4], the maximum resistance to impact-abrasive corrosion is characteristic of alloys located at the limit of the transition from ductility to brittle fracture.

In his work, Vinogradov [5] tested high-alloy welding alloys (alloyed alloy system C-Cr-W-Ti) on non-slip impact-abrasive wear of abrasive particles heat-treated and low-released (hardness 50HRC) 45 steel. Had low indicators.

Brittle fracture of the surface layers was observed, their microstructure consists of strongly deformed and weakly bonded grains with carbide inclusions, which indicates softening of the corrosion surface of the metal. However, when saturating the surface of the metal with abrasive particles, the surface of the material with abrasive materials, the use of highly alloyed alloys in combination with impact loads to harden the parts operating under conditions of abrasive corrosion, the efficiency of using corrosion-resistant alloys increases many times, for this many times there are play examples.

Research results: With an increase in the impact force, the size of the destructive stress zone is compared to the size of the eaten part, the risk of breaking the part by the brittle fracture mechanism (splitting of large particles, displacement of the weld coating) increases and during plastic deformation, the shape and unacceptable variations in size occur.

In a number of works, abrasive wear is called impact-abrasive wear in the presence of dynamic loads [6,7]. In fact, to clarify, it should be added that in this case there is a superposition of the processes of abrasive wear and impact-abrasive wear according to the terminology [8].

Depending on the operating conditions, one of the superposition processes may prevail. At critical values of dynamic loading, macro splitting of welded coatings or parts in general, i.e. fracture process, may occur. In practice, it is convenient to estimate the degree of dynamism using the dynamism coefficient Kd, which takes into account the distribution of hardness over the depth of reinforced parts or samples made of 110G13L steel as a result of external impact during stable corrosion (Fig. 1.).

Certain to assumptions according to cycles number was N<10 small cyclical breakdown directly to be can Curved of the line The form p(s) , i.e. eating intensity a lot in terms of being eaten of the material hardness N_m and abrasives N_a to the ratio depends . Comparison abrasive in table 1 for materials and iron of alloys structural parts hardness shown [9].

Table 1

Abrasive of substances hardness values and of alloys structural parts.

Abrasive	Hardness HV, GPa	Structured element	Hardness HV, GPa
Coal _	0.3- 0.4	Ferrite + Perlite	1.2-2.8
Limestone _	1.2-1.9	Austenite (high alloyed)	3.0-6.0
Field spar	4.6-7.5	Martensite	6.7-10.0
Flint	9.0-10.0	Cementite	8.4-11.0
quartz	9.0-13.0	Chrome carbide Cr_7C_3	12.0-16.0
Corundum	18.0-22.0	Vannadium carbide VC	24.0-30.0

Figure 1 shows a typical curve of metal corrosion Dm against abrasive hardness [16, 27].

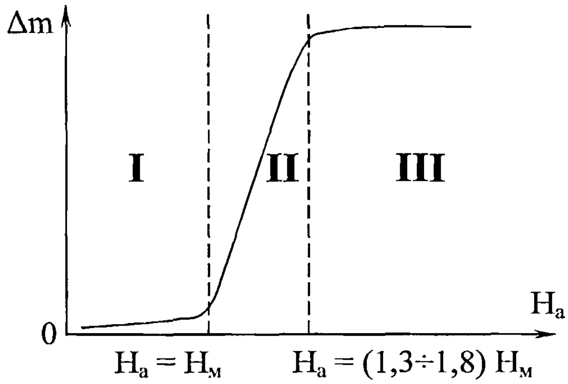

Figure 1. Dependence of metal corrosion on hardness of abrasive.

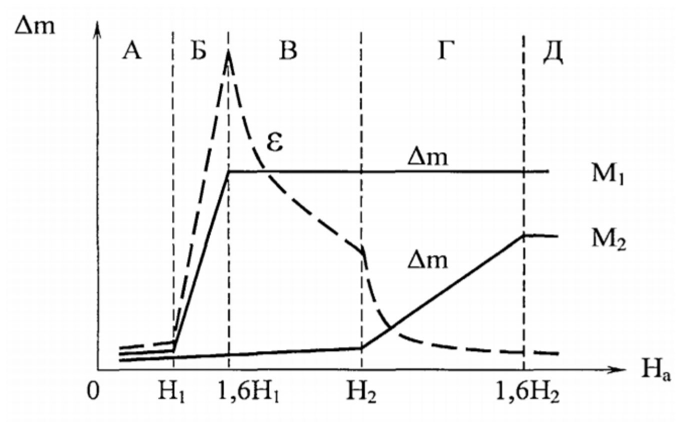

Figure 2 H_a of relative to eat dependence graph.

Zone A - $N_a < N_1$ D_m for both materials important not ε-1.

Zone B -$N_1 < N_a < 1.6N_1$ ε - ε_{max} 1.

B zone-1.6 $N_1 < N_a < N_2$; very important if, M_2 material if left M_1 curve r (s) in the region d works , M_2 while ɣ is in the region works

G zone - $N_2 < N_a < 1.6 N_2$; ε to the area fast down leaving observed .

D zone - $N_a > 1.6 N_2$; ε of the area not important. Her both materials are curved r (s) in the region d works.

Eating in zone I ($H_a < H_m$). Very small (many plastic deformation). $H_a >> H_M$ in zone III at eating maximum and stable continue is enough How much material hard S- curve in zone III line will be so low . Zone II transition period is counted. It's abrasive of hardness increase with eating of the amount sharp increase with is described.

In Figure 2 ε(H_a) is relative eating dependence graph cited , M_2 metal and S- curve for standard M lines using built _ In it five characteristic zones isolated [9].

B (Na) dependence very indicative image from of St 3 (HRC 20) and 45 (HRC 50) steels in Fig. 3 comparative tests is information. Kp of the criterion value relationship with is determined [7].

$$Kp = \varepsilon_2 / \varepsilon_1 \quad (1)$$

this on the ground $\boldsymbol{\varepsilon_1}$ is relative to eat resistance St 3, 1.0 ha equal, $\boldsymbol{\varepsilon_2}$ - of steel relative wear resistance 45 (HRC 50).

Here, during tests on the X4-B machine, the increase in the number of direct disintegrating work is achieved by increasing the content of the C_{cor} core of highly abrasive corundum particles in the quartz layer . The zone between lines 1 and 2 corresponds to the direct transition from the cycle of full decomposition to partial decomposition[12, 13].

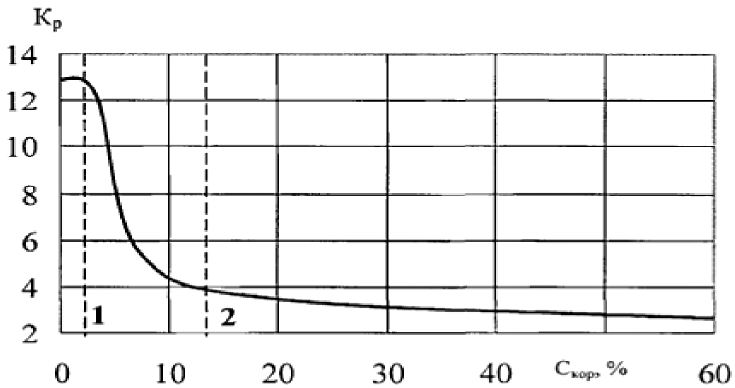

Figure 3. St 3 and 45 steals for K_p of the ratio quartz in the sand corundum quantity increase with change.

The analysis in [10] showed that the empirical equation for the relative wear resistance in the case of abrasive wear is ε

$$\varepsilon = a + bH_\mu + ce^{a_1 (K_т - 0,6)^{b_1}} \quad \textbf{(2)}$$

This on the ground a _ a_1, b, b_1 , c – empirical coefficients;

$$K_T = H_M / H_a$$

First and second terms (2) of MM Khrushchev [11] corundum jilvir paper using micro-cutting conditions eating tests for famous formula represents (K_t « 0,6). Exponential expression d - d +ɣ-ɣ scheme according to eating of the process change as a result to eat of resistance increase account takes $K_T < 0.6$ at it is zero tends to , at $K_T > 0.6$ while fast increases .

Because excavator tub teeth work release form of steel 110G13L used initial hardness iron of quartzite's from hardness will be much lower, then to equation (2). According to, extremely heavy eating mode (top to himself characteristic pressures, blasted rocks _ pieces on the surface a lot numerous comfortable cutting edges and others) due to blasted rock mass in digging superiority doer micro-cutting fruit will be

Micro cutting 110G13L steel in conditions thermal processing given carbonaceous steels with one different level to eat to resistance have [11, 12]. That's it with together with hardness from quartz high has been phase many surface alloys a lot periodic decay conditions works and to zone B of the $\varepsilon(H_a)$ dependence falls _ That's it due to , 110G13L steel and carbide alloys for seeing developed in the circumstances abrasive eating during to eat of resistance X 4- B in the car corundum in jilviri from being eaten all alloys micro cutting conditions from working according to significant difference to do observed [11].

Conclusion: Due to its combination of high plastic properties and corrosion resistance with low cold brittleness limit, 110G13L steel has no suitable cost-effective substitutes as a material for the supporting structure of a full cast excavator bucket tooth. However, the corrosion resistance of the working part of the excavator bucket tooth is insufficient. Existing methods for improving the performance of cast teeth made of 110G13L steel (optimization of chemical composition and heat treatment) are primarily aimed at increasing the load-bearing capacity of teeth by increasing ductility and fracture resistance. Therefore, even today, the issues of increasing abrasive corrosion resistance remain open.

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УДК 621.798.151

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SELECTION AND RESEARCH OF THE MATERIAL PACKAGE OF THE OUTER PRODUCT

The article discusses the properties and types of textile materials, discusses their impact on the human body layer. Methods of designing the properties of complex materials and packages of materials based on the assessment of characteristics that meet consumer requirements, using information technology, studying the requirements for a package of materials for the upper product are also considered. New problems of the influence of the number of layers of outerwear on the maintenance of the microclimate in the underground space, affecting well-being and health preservation, are considered.

Key words: Thickness gauge, microclimate, polyester fiber materials, innovative materials.

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ВЫБОР И ИССЛЕДОВАНИЕ ПАКЕТА МАТЕРИАЛА ДЛЯ ВЕРХНЕЙ ОДЕЖДЫ

В статье рассматриваются методы проектирования свойств сложных материалов и пакетов материалов на основе оценки характеристик, отвечающих потребительским требованиям, с использованием информационных технологий, изучение требований к пакету материалов для верхнего изделия. определение физико-механических свойств пакета материалов. Рассмотрены новые проблемы влияния количества слоев верхней одежды на поддержание микроклимата в подземном пространстве, влияющего на самочувствие и сохранение здоровья.

Ключевые слова: Толщи номер, микроклимат, материалы из полиэфирного волокна, инновационные материалы.

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