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RESEARCH OF WEAR RESISTANCE OF MATERIAL HAMMERS FOR CRUSHERS IN ABRASIVE ENVIRONMENT

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The construction of experimental apparatus for research of materials in an abrasive environment is worked out and the comparative tests of wear resistance of hammers of crushers, made from steels 35Х2СЛ, 65ХГСЛ, 110Г13Л, 250Х25НТ, 320Х20Н and 27ХГСМДТЛ are executed. It is reveal that the best complex of necessary properties is owned by hammers from steel 320Х20Н.

Keywords: hammer crushers, abrasive wear, wear resistance, material of hammer, experimental apparatus

Introduction. The substantial lack of hammer crushers is them insufficient reliability which is conditioned, first of all, by the minimum resource of hammers comparatively with other its organs. Main reason which limits the safety of work and causes the losses of capacity of hammers of crushers, there is an abrasive wear. On statistics, most hammers (90-95 %) fall out as a result of wear of their surfaces. So, first of all, it must to observe the special requirements to materials, from what of them make.

Choice of wear resistence materials is one of effective methods of necessary resource of hammers which work in the conditions of abrasive wear. For this purpose it is necessary to execute previous researches in relation to determination of actual character of loading and processes of friction. It, in turn, creates pre-conditions for development of different devices and apparatus in relation to research of materials on a friction and wear in an abrasive environment. Conception of wear processes of details helps to decide the practical questions for increase of durability and reliability of machine on the whole.

Processes of wear of metals during co-operating with abrasive environments are the subject of research of many domestic and foreign scientists. Substantial payment in the studies of the phenomena, which take place during an abrasive wear I. Krigelskiy, M. Khrutshov, B. Kostetskiy and etc. are injected [1,2]. Researchers mark the variety of factors which determine that or other type of wear and mechanism of its development. The basis of mechanism of abrasive wear co-operation of abrasive particle with material, which develops in two stages: dip of abrasive particle in material and gradual moving it's along a surface.

There is a necessity of development of methods of laboratory researches, which allow to determine parameters by means of which it is possible to estimate the wear of working organs of machines.

Main part of researches. Factors which determine intensity of wear of hammers of crushers can be divided into three groups [3]:

– structural parameters (thickness, geometry of hammer and others like that);

– modes of the crushing (presentation, angulator of rotor, degree of growing shallow and others like that);

– physical and mechanical properties of materials (hardness, humidity and others like that).

For determination of wear resistance of samples of materials of hammers fo crushers at the laboratory conditions of department the «Metallurgical equipment» of ZSIA apparatus for research of materials on a wear and friction in an abrasive environment is worked out.

The select method of research on an abrasive wear is based on the friction of samples which are revolved, about the poured layer of abrasive environment (to the pitch coke). For basis a drilling machine-tool was taken with adjusting of speed of turns by means of transmission of pass. In a cartridge drilling to the machine-tool fasten a billow on which fasten a cross-piece with the elements located on it's for fixing of samples of material of cylindrical form for research. The collected apparatus is dipped in the capacitable set on a table with high-usage to its abrasive material (by a pitch coke). Apparatus allows to change the linear rate of movement of samples within the limits of a 4.7-12.6 m/s.

Apparatus allows to investigate a friction and wear of different materials on various modes of work in different abrasive environments.

In work as a weekend was accepted the followings materials^ steel 40, 35Х2СЛ, 65ХГСЛ, 110Г13Л, 250Х25НТ, 320Х20Н and 27ХГСМДТЛ.

For creation of more aggressive environment in comparing to the real conditions of work as abrasive material was used the sifted from faction of pitch coke a 1-2 mm.

The test of cylindrical samples by diameter 10 mm and long 100 mm for steel of different brands produced on abrasive wear. Samples which added to the test dipped in an abrasive environment on the depth of 50 mm, where they were revolved with linear speed by a 12.6 m/s. Common time of experience – 50 hours.

The wear resistance of materials of samples was set by means of measuring of wear by weighing as one of methods which use most often. Weighing of samples executed to and after to experience on analytical balances with the cost of division of 0.1 mg.

Relative wear resistance of sample of material, that investigated, calculated on a formula:

$$I = \frac{\Delta P_{st}}{\Delta P_{sam}} \ , \qquad (1)$$

where ΔP_{st}, ΔP_{sam} – a loss of standard and sample mass respectively.

Table 1 – Results of comparative research of samples of steel on an abrasive wear

Mark of steel	Relative wear resistance
320Х20Н	7.0
250Х25НТ	6.8
27ХГСМДТЛ	3.6
65ХГСЛ	3.0
35Х2СЛ	2.7
110Г13Л	1.6

As the result of researches of material accepted its relative wear resistance. The results of the executed researches on wear resistenceness testify (table 1), that minimum loss of mass, and, thus, and samples have a minimum wear from steel of 320Х20Н, respectively a most wear is looked after for samples from steel of 110Г13Л.

Conclusions. Application of apparatus of the offered construction for research of materials on a wear and friction at laboratory conditions provides similarity of conditions works of hammers, which work in an abrasive environment, allows more exactly to forecast wear resistance of hammers of crushers at the real conditions, and also to work out the methods of protecting from a wear on the stage of planning. Complex researches of crushers hammers materials allow to recommend for the use as material steel which works in the conditions of not only shock-abrasive, but also cleanly abrasive wear.

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