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THEORETICAL BASIS OF THE METHODOLOGY OF SELECTING WEAR-RESISTANT MATERIALS TO ABRASIVE CORROSION

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Abstract: This article presents the theoretical foundations of the method of choosing abrasive-resistant inedible materials. Futurmore, the concepts of abrasive eating are covered more broadly. In agriculture, it is mention about the current state of consumption of the material of the working bodies of soil processing machines. Also, abrasive anti-eating methods have also been cited, and the carbon content of the steel material, its hardness, and relative wear resistance, based on the amounts of chromium, have been analyzed.
Keywords: lemex, abrasive corrosion, soil, resource, sand, stone, material, relative corrosion, special alloys.

Introduction. In agriculture of our republic, high-performance and powerful techniques are used. The result is an increase in the yield of cultivated crops and a decrease in manual labor and cost of production. These activities are important in providing the population with food.

One of the sides to the use of agricultural techniques itself is their operation in direct contact with the soil. As a result, the working organs of these techniques quickly become edible and unsuitable for work as a result of friction with the soil. This results in one-third of the world's energy being used to overcome friction, and one-quarter of the annual production metal is used to recover some of the lost by eating in machine details and compounds [1].

Along with the above, the resource of the working bodies being supplied for soil processing machines in our Republic is significantly lower than the norms established in the technical requirements, which makes them eat up and fail even more quickly. This situation is becoming more serious with the fact that such properties as the composition, structure, hardness of the material of working bodies produced in our Republic are not based and are made of low-carbon steels without increased thoroughness or thermally processed.

As a result, agricultural producers are significantly increasing their costs due to the large purchase of these working bodies as spare parts, delaying the deadlines for carrying out work by lowering the quality of fieldwork and work productivity. For example, in our republic, more than 250,000 lemexs per year become unusable. Since these lemexes are made without having the necessary structural parameters and without being based on materials and without following the rules of production technology and thermal processing, this number is increasing from year to year and, as a result, in our republic, more than 1250 tons of metal rolling for lemexes alone or, in other words, 4 billion. about the sum is being spent.

Therefore, today, when the world's fuel and material reserves are decreasing, the requirements for the reliability and durability of machines are increasing, reducing these costs and effectively using existing agricultural techniques are important tasks. All of the above happens due to the abrasive eating of the working organs of soil-processing machines.

Abrasive eating is the decay of the surface of the detail under the influence of solid grains of abrasive. There are two different types of effect of the abrasive grain on the surface of the detail. In the first, the abrasive grain affects the surface by falling between the rubbing surfaces of two details. In the latter case, the rubbing surface of the detail is affected by abrasive particles in the composition of a solid (such as soil, sand, stone, mining rocks) medium.

Methodology and empirical analysis. Here we will first consider the methodology for choosing an abrasive refractory material after choosing an edible material in the general case.

The choice of edible material is carried out in the following order. First it is determined how many times the service life (resource) of the detail should be gained. To do this, the average working resources of working bodies working in abrasive eavesdropping conditions and made of available materials are determined and analyzed. Based on the results obtained, the desired edible tolerance, relative edible tolerance, or relative edible rates are calculated. This uses the following formulas:

$$i = ni_r,\ \ \varepsilon = n\varepsilon_r,\ \ \gamma = {}^{\gamma_r}/_{n}\ ,$$

Several materials are then selected to match the increased index of edible resistance, and are subjected to laboratory tests on edible resistance. Based on the results obtained, these materials are sorted according to the index of edible resistance. From the selected line of materials, materials that meet the requirement to achieve edible resistance are extracted. From these selectable materials, a work organ is made and they are put to the production test. On the basis of the results of the production test, the desired material is selected and it is based on the feasibility [2].

The choice of material for combating abrasive eating is carried out as follows. First it is determined how much it is necessary to increase the service life of the detail. To do this, the average values of the service life of the details of the machine are estimated. In doing so, their serviceability is determined by constructing a resource diagram. At the same time, work is carried out to alleviate the working conditions of the detail and improve it from a constructive point of view. The following expressions can then be used to calculate whether the detail is the required edible resistance, relative edible resistance, or relative edible.

$$i = ni_p, \qquad \varepsilon = n\varepsilon_p, \qquad \gamma = \frac{\gamma_p}{n},$$

Results. The type of edible detail is then determined based on the classification of edible species. Based on the above, the material will proceed to the selection stage. At this stage, laboratory studies are carried out on a number of materials, and based on its results, several of the most edible of the tested materials are selected. Based on these results, an edible Resistance series of materials that have been tested again can be compiled. To proceed to the next stage of testing, the cost-effectiveness of applying selected materials is calculated. Then details made of selected materials are tested on a stand suitable for its working conditions in the car. If the results obtained do not break, tests can be carried out at an accelerated rate. A detail made of the newly selected material is put to the production test and its service life is determined. To ensure the reliability of the results obtained so that random factors do not affect the results of the test, it is recommended to conduct tests at special landfills, and the tests must be repeated sufficiently.

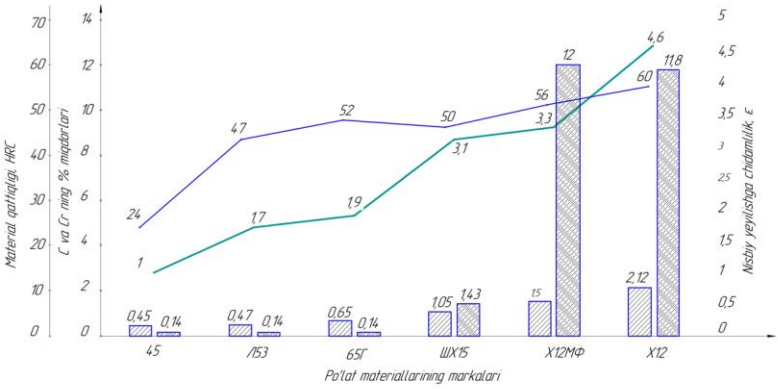

Figure 1. The effect of the composition of its material on relative edibility and its hardness.

Based on the results of production tests, a final conclusion is made on the choice of material and its economic effectiveness in applying it to the same machine is assessed [3]. The graph of the dependence of the composition of steel material of different brands on their hardness and resistance to eating is presented in Figure 1.

A series of stamps of Steel have been recommended for making lemexs based on research over the years. For Example, Novikov B.C. research has been conducted by to determine the abrasive wear resistance of steels such as 45, 65Г, Л53, 40Х, ХI2, 30ХГСА, ШХ15, Х12МФ, 4Х5В2ФС, ХГ, ХВГ. The determined relative edible resistance of these steels is shown in Table 1 below.

Analysis of the results of the study obtained showed that their relative absorption resistance depends on the amount of decaying elements such as carbon and other Chromium contained in the steel material, as well as on hardness [4].

Table 1. Dependence of the relative edible resistance of steels on chemical composition and hardness

№	Steel brand	Chemical composition, %					Hardness, HRC	Relative eating resistance, ε
		C	Si	Mn	Cr	Other		
1	45	0,45	0,25	0,67	0,14	-	HRB 90	1
2	45	0,45	0,25	0,67	0,14	-	45	1,4
3	Л53	0,47	0,25	0,67	0,14	-	47	1,7
4	65Г	0,65	0,25	1	0,14	Ni-0,2 Cu-0,18	52	1,9

5	40Х	0,4	0,27	0,65	1	Ni-0,21	55	2,7
6	30ХГСА	0,3	1	1	1	-	55	2,5
7	Х12	2,12	0,38	0,37	11,8	W-0,04	60	4,6
8	ШХ15	1,05	0,28	0,3	1,43	W-1,38	50	3,1
9	4Х5В2ФС	0,4	1	0,35	1,5	W-1,9 V-0,7 Cu-0,25	52	2,5
10	Х12МФ	1,5	0,25	0,3	12	Mo-0,5 V-0,2 Cu-0,25	56	3,3
11	ХГ	1,51	0,27	0,53	1,45	-	52	2,7
12	ХВГ	1,06	0,28	0,85	1,02	W-1,3	51	3

Conclusions. The choice of edible Steel Brands is important to ensure the efficiency and long-term operation of soil-processing machines. High carbon steels, special alloys and chromium-molybdenum Steels increase the edible resistance of working organs, significantly prolonging their working resource. The use of such materials reduces production costs and ensures long-term operation.

The test results found that chizel-cultivator lemexes made from shx15sg brand Steel were eaten on average 3.47 gr per hectare. While lemexs made from the same brand of thermally processed steel were on average 2.21 gr eaten, lemexs made from the same brand of thermally processed 45 G were on average 1.13 gr eaten.

In the tests, the work resource of lemexs with increased resistance to eating by thermal processing increased by up to 3.06 times. While extirpation part consumption decreased by 63.2%.

The methodology for choosing abrasive wear-resistant materials is based on the study of the physical and mechanical properties of the material, chemical composition, microstructure and abrasive tests. With the help of this methodology, the most suitable materials for the working bodies of soil processing machines are selected, and the increase in their working resource is ensured.

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