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CONSTRUCTION strengthening coatings TAKING INTO ACCOUNT THE REAL wear MACHINES

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The influence of design reinforcement coating for durability working parts of agricultural machines. It is shown that the best performance and most resources are consolidated powder machine parts karbidostalyamy brands X17N2, X13M2 of chromium and titanium carbide.

Ploughshare, wear resistance, the effect samozahostryuvannya, cutting edge, argon arc welding, karbidostal.

Problem. Technological methods to strengthen the surface layers of machine parts, providing change their mechanical, physical and chemical properties play an important role in increasing the durability and longevity of machine parts. Using different methods of strengthening combined with design tools allows you to create friction when working couples conditions under which formed a universal phenomenon structural adjustment friction material that makes installation of dynamic equilibrium and self-regulation of activation and passivation of the surface layers [1]. It is known that the physical and mechanical properties of most construction materials and protective coatings measured in the laboratory does not correspond to the same parameters when it comes to operation in a production environment.

Many types of wear of machine parts and the conditions of their formation and causes a large number of methods for removing or wear localization. Improving the durability resulting from use of different methods of strengthening is achieved by increasing the hardness and ductility decrease the surface layer, and in some cases, due to the chemical and phase composition of this layer. Modern farming is energy-complex machines that perform complex operations in difficult field conditions. Techno-economic performance of many agricultural machines are still very low because of the small lifetime of working bodies and forced outages in recent periodic replacement that requires a significant investment of funds for repairs and spare parts.

In particular this applies tillage machines and tools, working bodies are working in difficult field conditions at heavy loads, vibrations, bumps, warps. Rapid drawdown blade plowshares and clutches cultivators leads to poor performance units and the quality of performance and, ultimately,

to increase the cost of agricultural products. In arid southern regions of Ukraine Ploughshares and legs cultivators have to repair or replace thatchanges [2]. Thus, the number of farms in Zaporizhzhya, Dnipropetrovsk, where the fields dominated by sandy soils, often on plows plowshares can be seen on the bow are some places worn through. Numerous studies have shown that plowshares different soils of varying intensity spratsovuyutsya [2]. This is due largely different ratios in the soil basic mechanical components, clay and sand.

Analysis of recent research. Currently, the use of surfacing to enhance the durability plowshares limited idea of the cost of this method of consolidation. However, if we analyze the cost and increase the lifetime of plowshares economic efficiency is obvious. Statistics show that the average ploughshare be replaced after an operating time of 20 hectares (this figure may vary, depending on the treated area), surfacing wear-resistant materials allows to operate the opener to 100 hectares. Thus we get a fivefold increase in service life, and just double increase in the cost of blade. Modern technological methods of surface hardening opening unlimited possibilities to create protective structures triathl technical, ensuring reliable operation of the machine parts in a variety of conditions, namely heavy loads, high speeds and temperatures friction, exposure to vibration, cavitation, corrosion and abrasive environments.

Analysis of recent studies [3,4,5] allows defining the basic methods of wear resistant coating machinery parts and components: Modification of the surface layer of doped its various elements; changes in the structure of the surface layer external mechanical (or heat) influence without changing its chemical composition; technology to increase durability of machine parts restoration and strengthening work surfaces combined methods; drawing on the friction surface protective coatings; increase resource machines using powder metallurgy techniques.

The design strengthens what coverage is necessary to choose this kind of friction, the geometric dimensions of the working surfaces, the optimum combination of materials to the durability of this unit has been increased and damage-no. The basic principle of design and calculation of rubbing parts, is to provide a specified range of speeds and loads slip under normal friction [6]. This can be achieved by the correct choice of materials and structural means to removing the main reasons that generates a specific type of damage. It also established a positive effect of soft metal thin film deposited on the surface of a solid, in terms of [7] theory of welding bridges. Currently, the friction in machines using metallic, non-metallic and composite materials, solid and porous, which have both homogeneous and heterogeneous structure. These materials are produced by methods casting, powder metallurgy, welding, spraying, etc. Etc.. Overall, the structural strength of materials is achieved with the

optimum combination of volume characteristics of hardness, toughness, borders strength, yield strength and fatigue. Thus, some of the conditions under which the friction pair should work on structural adjustment [8], because, in these circumstances, there is no surface damage, and the intensity of surface destruction is less compared to other processes in friction.

In materials obtained powder metallurgy, strength is achieved both by heterohenizatsiyi structure and due to the formation of optimal porosity. Wear resistance is determined, first of all, the ability of the material to the formation and regeneration films secondary structures. Protective functions of secondary structures are not only live screening surfaces and prevent damage processes (seizure, corrosion, erosion), but also in improving the lubricating action [9]. Improving the durability of parts against abrasive wear can be achieved using these methods to strengthen that allow you to increase the hardness of the surface layers of machine parts higher hardness abrasive particles.

Surfacing is widely used to restore the size worn machine parts. The thickness of the deposited layer set depending on the circumstances of detail and depth of wear surfaces. For parts that are to be erased, it should not exceed 4 mm, work surfaces tool-3mm, for parts working in conditions of shock, 2 mm. The hardness of the deposited layer is within 45 ... 65 HRC and heat resistance - 1000 ... 3000 ° C. Surfacing special electrodes carry no more than three layers. Surfacing of cast iron parts perform only a single layer.

The purpose of research is the development and design of wear-resistant coatings to protect the working parts of agricultural machines abrasion wear technology and design tools.

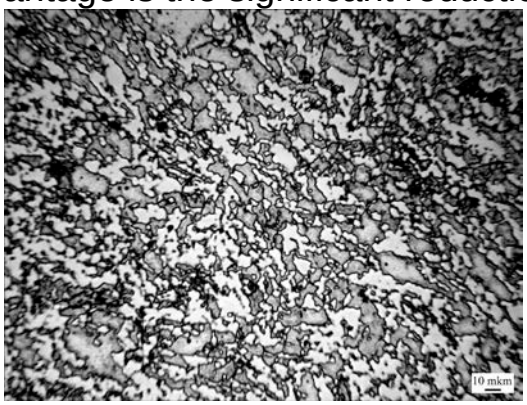
Results. The department of technical service and engineering management is working on research and design of wear-resistant coatings obtained point arc welding (TPA), micro processing cored wire PP-AN148 (MPO), induction surfacing hard alloy PG-C27, eutectic coating system Fe-Mn-CB (EP), powder karbidostali from chrome steel grades X17N2, X13M2 of chromium carbide and titanium carbide, steel 65G, the use of powder composites KHZH70, KHNF15, KHZH50, KHTNF25.

For a comprehensive study of abrasive wear investigated over 250 working parts of the machine: ploughshare plow, cultivator paw, disc harrow, working bodies forage machines. The most significant effect of increased durability in abrasive wear is the use of special carbide [10, 11]. Resolving fatigue or increase resistance to this type of destruction can be achieved when the load friction rolling below the yield surface layers of metal with particularly stressful situation. Company Farmet produces a large number of variables of machine parts on their business

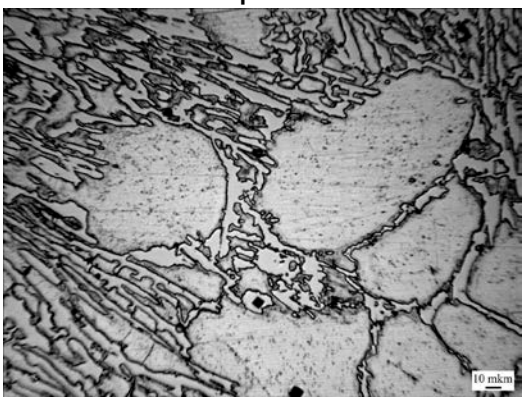
and their production technology. Optimized composition of hard alloy and special low-temperature soldering technology provides resistance to abrasive wear as well as to attacks on stones (Fig. 1).

Fig. 1. Construction workers of firm Farmet.

In operation after rising hard metal paw cultivator has durability is 2-3 times higher compared with induction welding. But the main advantage is the significant reduction in fuel consumption.

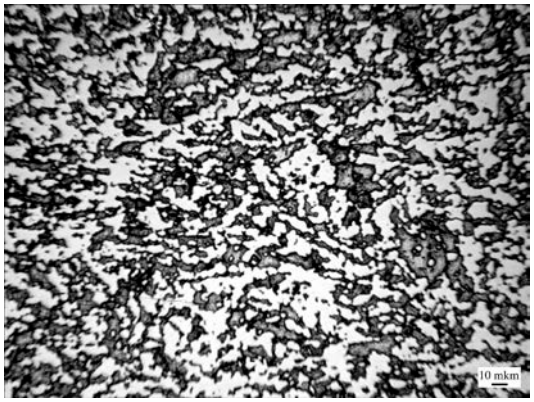


a) 1200 ° C

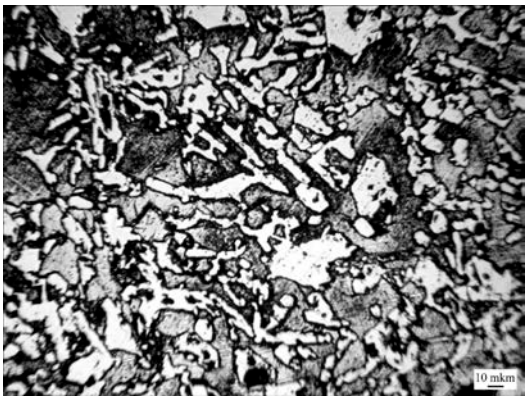


b) 1250 ° C

The microstructure of the steel H13M2-22,5% vol. Cr3C2, sintered at ° C

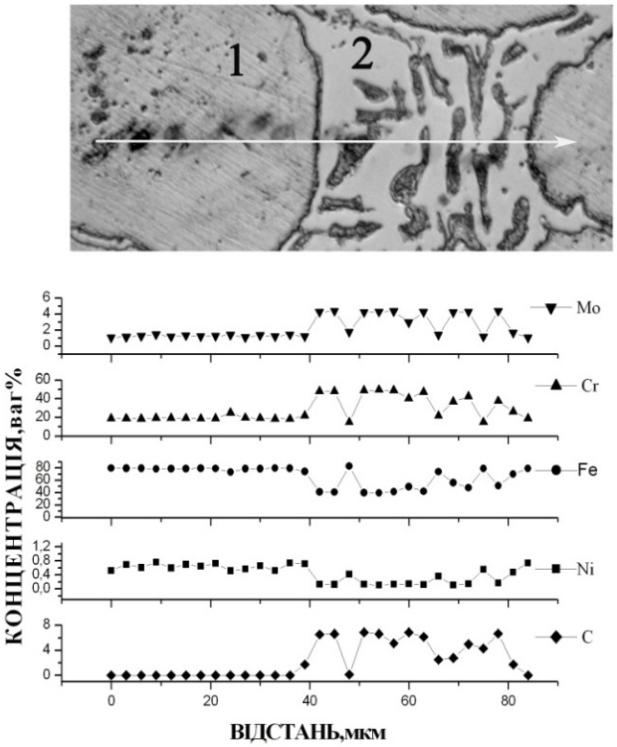


a) 1200 ° C



b) 1250 ° C

The microstructure of the steel H13M2-30% vol. Cr3C2, sintered at ° C



distribution of Cr, Ni, Fe, Mo, C in the sample (H13M2-15% vol. Cr3C2) - sintering in vacuum at t = 1300 ° C (1 - carbides 2 - metallic phase)

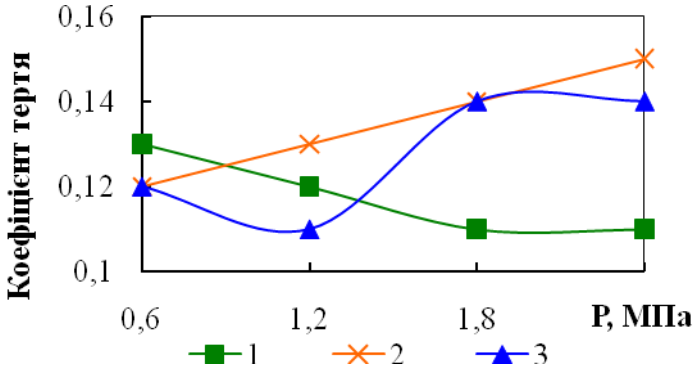
Fig. 2. Microstructure of steel X17N2 after manufacture.

Save fuel is about 10-15%. It is possible that with the gradual wear does not change length and geometric parameters paws cultivator. Known methods of restoration and strengthening plowshares is limited, and in some cases not at all be used. For example, backstay toe blade is used only once. According to specifications, plowshares with wear thickness 5.6 mm, subject to rejection. The high cost of Ploughshares, paws cultivators domestic production lead to finding new ways to increase their resources, such as wear-resistant welding overhead items. In accordance with the objective of developed technology renewal and strengthening Ploughshares welding metal plates from steel grades X17N2, X13M2 of chromium carbide and titanium carbide by argon-arc welding.

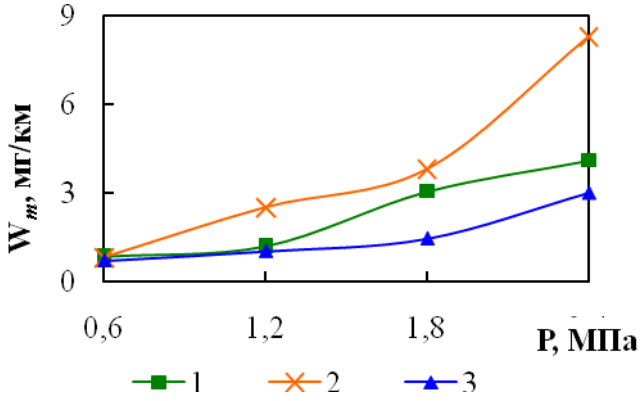
Carbide powders are heterogeneous composite materials, which consist of solid refractory compounds distributed in the plastic matrix of iron triad metals. Karbidostali in their properties are intermediate between hard alloys and tool steels. We proposed karbidostal as a basis which used steel chromium ferritic and martensitic ferrite-classes with relatively low content of carbide component (7,5-30% vol.) Corrosion-resistant chromium carbide higher Cr3C2. To receive them, along with the rare phase sintering can be used alternative methods: hot stamping and hot pressing pulse in a vacuum. An analysis of the impact of content on the structure of sintered components karbidostali, the effect of grinding microstructure with increasing amounts of chromium carbide

vid7,5 30% vol., Allowing you to control structure formation to achieve the required properties karbidostaley (Fig. 2). Found that hot stamped karbidostal has anisotropy base metal grains in the direction perpendicular effort stamping. The feature of the structure of hot pressed karbidostali is no transition zone in contact with the metal carbide grain base. It sometimes helps to increase strength karbidostali that provides general increase mechanical properties of the material.

Introduction Cr3C2 increases resistance to abrasive wear of sintered material 20 times compared with the original steel. Karbidostali based X13M2 durability are 1.5-3 times higher compared to karbidostallyu H17N2-Cr3C2. This is explained by the presence of 2% molybdenum, which increases the diffusion mobility of chromium and lead to an increase in its concentration in the surface layers and which is known to increase wear resistance (Fig. 3).



dependence of friction on load sintered at 1250 ° C karbidostaley: H13M2-15% vol. Cr3C2 (1); H13M2-22,5% vol. Cr3C2 (2); H13M2-30% vol. Cr3C2 (3) and



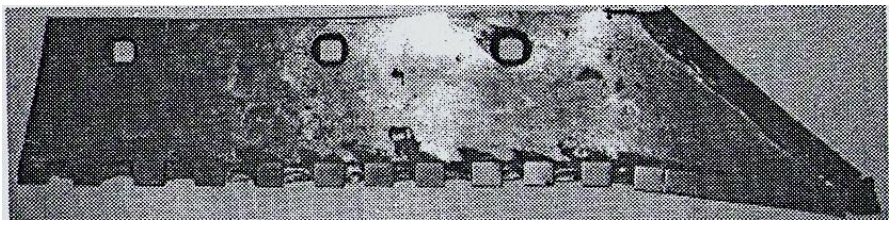
dependence of mass W_m (Mg / km) depreciation of loading sintered at 1250 ° C karbidostaley: H13M2-15% Cr3C2 (1); H13M2-22,5% Cr3C2 (2); H13M2-30% Cr3C2 (3) b

Corrosion resistance of sintered karbidostaley

Number of sample	Composition,%		Relative density ρ, %	Corrosive properties					
				30% NaOH		3% NaCl		20% HNO3	
	steel	Cr3C2		P, mm /	Score *	P, mm / year	Point	P, mm / year	Point

				year					
1	H13M2	15	0.93	-	10	0.33	3	0.11	4
2	H13M2	22.5	0.95	0.41	3	-	10	0.06	4
3	H13M2	30	0.97	0.03	4	0.59	2	0.31	2

* On a ten point scale.



ploughshare plow armored plates cermet carbide steel H13M2 - 30% of their continuous and intermittent location

Fig. 3. Dependence of friction (a) mass and deterioration (b) the load karbidostaley samples from H13M2.

Research results abrasive wear resistance of steel samples X17N2 shown that they have been catastrophic wear under a load of 0.6 MPa. Introduction to charge carbide impurities significantly changes the nature of durability, increasing it 50 times. Comparison of durability karbidostaley shows that the intensity of wear karbidostali Cr3C2 13.5 times less than karbidostali of TiC. This may be due to the higher concentration of Cr in the metal component of Cr3C2 karbidostali also possible due to low intensity TiC interaction with a steel base and a weak adhesive bond between the particles of titanium carbide and matrix.

The increase of carbide leads to increased wear resistance, which is caused by an increase in the proportion of the solid component by hetero phase interaction with the base size and milling metal phase, abrasion wear on fixed particles leads to increased durability. The proposed technology provides restoration and strengthening strong connection plates and metal blade that increases its life. Use stabilization blade wear resistant plates allows continued to keep the original geometry dolotopodibnu blade.

Conclusions

1. Based on the results of theoretical and experimental studies of practical recommendations on the technological process of restoring and strengthening Ploughshares argon-arc welding metal plates karbidostaley X13M2.

2. It is established that for maximum physical and mechanical properties karbidostaley most appropriate method using hot stamping.

3. Due to the location of intermittent metal plates significantly reduced traction resistance, thus increasing the operating speed of the arable unit and its performance.

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Effect of research structures uprochnyayuschyh coatings on parts Durability workers organs agricultural machines. Shown something nayluchshye characteristics and resource naybolshyy ymeyut machine parts uprochnennыe metalokeramycheskymy plates poroshkovыmy karbidostalej brands X17N2, X13M2 karbydom with chromium and titanium karbydom.

Lemekh, yznosostoykost, samozatachyvanyya effect, rezhuschaya edge, Argon-Arc welding, steel hromystaya.

In paper the results construction hardening coating the test durability working tool cultivation. Demonstrate, what the greatest effective method force part cultivation machine plate wear carbidosteel X17H2, X13M2.

Blade cultivator tooth, wear resistance, effect self-sharpening, argon arc welding, and chrome steel.

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