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Eutectic structural steel COVERING: FOR AT microwave heating, the structure and properties

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In this paper, the influence of process parameters and saturation destruction by abrasive particles undocked working of agricultural machines and change the state of the friction surfaces eutectic coatings for structural steel (steel 45 and 65G).

Abrasive wear ploughshare plow, eutectic coating samozahostryuvannya blades, strengthening the surface.

Formulation of the problem. Improving the reliability and durability of machine parts and tools - one of the main tasks of engineering, which largely determines the economic development of Ukraine and is an integral and important part of scientific and technical progress. Background increase durability of details of agricultural machinery is growing every year.

This is because the increasing demands for machine reliability, continuously increasing the speed, performance and accordingly the intensity of use. In practice, many cases where low durability of working parts limits the further improvement of technical and economic performance cars.

In agricultural machines such details have paws cultivator, plow blades, knives forage machines and shredders, mowers segments cutting machines, cutting a pair of clippers sheep. Small lifetime of these parts need vyzyvaye making a huge number of them as spare parts, significantly reduced performance cars. For example, the implementation of new methods of strengthening limit blunt cutting machines stryhalnyh pairs formed by 1.5-2 hours of continuous operation, segments mowers, 4-6 hours, clutches cultivators in 6-8 hours, after which the field had sharpen the blades. [1] Modern agricultural machinery Ukraine needs a reliable working bodies that must have

high strength and ductility, and corrosion resistance znoso-. This important role is played by the development of new materials for structural components that are subject to wear.

Getting eutectic alloys on the basis of Fe-Mn-CB allows you to select alloys with the appropriate content of alloying elements (such as Si, Ni, Cr, W, V, etc.), as components that provide desired properties which are required when designing appropriate friction pair .

Analysis of recent research. For surface hardening of metals and alloys to form a eutectic coating layer usually use (paste), followed by brief (2-30 seconds) microwave heating [2, 3, 4]. A. Pinyochcho, R. Kahyk suggested way Boriding machine parts, working in conditions of abrasive wear at 811-1144 K, which zaklechayetsya as follows. Detail heated to 1033-1366 K (optimal heating temperature 1,253 K) and placed in a sand mold. The top layer and covered alyumotermichnyy levy its graphite plates. The mixture is then ignited. Its thickness is selected so that the burning was provided in the required temperature and duration of isothermal holding [5].

For multi-coating thickness and increasing the diffusion layer pre-saturate the surface layer of the product element that lowers its melting temperature. Then perform saturation at the melting point obtained in the surface layer of the alloy [6].

The theoretical results by distributing concentration of elements provided concentration dependence of the diffusion coefficient and rate of change of eutectic concentration depth and time [2] clearly can establish the sequence of their diffusion in steel [3]. Pere distribution of boron, manganese, silicon and alloying elements occurring in the liquid phase, which is formed by the (CTR) contact eutectic melting of iron and carbon powder melting [2]. The leading role in the formation of eutectic coating system Fe-Mn-C-B at the CEP with metal bases (γ-iron) are carbon and boron [4]. Based on the results of theoretical and experimental studies may be argued that in the contact elements eutectic melting mixture of powder metal based on the first diffusing carbon in the iron, forming Fe3 C or remaining in a free state. Boron is distributed in liquid phase, he alloying cement to form Fe3 (C, B). The melting temperature of 1373 K. borotsementytu

The formation of metastable carbide Fe0,4 Mn3,6 C (stable phase (Fe, M) 23 (C, B)), solid solution Mn, Ni, Cr, Si in α and γ iron in the liquid phase is formed on the metal surface . Structure and properties of coatings regulated eutectic concentration of powder material elements, their ratio at the eutectic formation and technological factors discussed [5]. Analysis of the literature on the effects of time and temperature on the saturation depth diffusion layer showed that with increasing temperature, the rate of increase of the thickness of the hardened layer significantly increases. The growth of diffusion layer depth as a function of temperature obeys the exponential dependence.

With the aim of intensification of high-temperature (1162K) high-speed gas carburizing [6] cementation in a liquid medium, molten salt or aqueous solutions appropriate zyednan [7], the diffusion cyanidation [8], plating [9] Boriding and chromium using special obmazok (paste) using microwave heating, thereby reducing the following processes from several hours to 45-75 seconds. The thickness of the compacted layer still limited penetration depth of the diffusion of active atoms saturating the mixture into a solid substrate and is usually not more than 10.3 m.

The purpose of research is the study of patterns of structure and properties of eutectic coatings obtained by melting powdered mixtures based on iron, and their impact on the performance of steel with wear.

Results. The process of applying for a work hardened surface layer parts consisting of the following: preparation of powder surfacing materials, preparation details for building, debugging mode, applying a layer of hardening, cooling parts, machining, quality control. In implementing the known method [6] for 10 seconds at a thickness of 3 mm mix and microwave heating to 1553 K to 45 are steel cover thickness of 0.7 mm. The proposed method allows 2 times to increase the thickness of the hardened layer.

The choice of methods of surface doping carried out taking into account the requirements for coating properties (physical and mechanical properties, adhesion with the base metal or alloy, corrosion and wear resistance, coating thickness, quality of the resulting surface). Earlier on us for metals and alloys of iron-based VC firm used (solid phase) saturation method from powder mixtures and obmazok (shlikernyy way). This mixture was used stove heating, microwave heating of the substrate coatings for internal and external (by centrifugal bimetalizatsiyi) surface and surface alloying of steel casting [7-9]. Obtained in ways EP characterized by good adhesion of the base metal, which is achieved by counter diffusion of atoms of element substrate and the reaction mixture that results in contact eutectic melting transition zone metal coating. Experiments were performed on samples of steel grade 20, 45, U8, 20x and 65G. Application eutectic coating carried by the high-speed furnace heating and microwave heating to a temperature of 1553K during 2-40 sec.

Developed eutectic alloys are composites reinforced alloys bahatofazovi variance of gradient structure. The structure of alloys of Fe-Mn-C-B consists of eutectic type doped ferrite (austenite) (Paperback-phase basis) - marhantsevystyy iron carbide Fe0,4 Mn3,6 C (frame). The dispersion strengthening alloy is eg chromium carbide Cr7 C3 and iron boride Fe2B (Fig. 1).

Fig. 1. eutectic microstructure coating (EP) №1, (x 400).

When heated microwave and emerging micro areas α-iron, γ- (Fe, Ni) and γ- (Fe, Cr) in width to 35 mm, while maintaining the phase composition of coatings. This is dictated by the growth duration of the deposition, which for details sectional diameter of 20 mm and a length of 100 mm is about 0.5 minutes. In the coating system Fe-Mn-C-B-Si-Ni, Fe-Mn-C-B-Si-Cr and Fe-Mn-C-B-Si-Ni Cr formed in the area of fusion alloyed nickel or chromium austenitic layer thickness of 15 microns. [10].

The essence of the method of formation of large thickness EP, is that in the powder mixture may use most of the elements of the periodic system consists of heating the metal or alloy powder mixture to the melting point fusible component mixture (MF 20 F Mn 1,5), for the provided that the mixture has elements (eg, C, B), which form a eutectic with the metal substrate at a temperature less than the saturation temperature. Formation of eutectic coating is for contact and contactless saturation. For contactless saturation thickness of the hardened layer thickness is limited CEP mix elements and metal substrates and do not exceed in structural steels 10-3 m. The thickness of the deposited layer of powder mixtures is determined by the number and depth of CEP metal that strengthens and physical and mechanical properties, features CTR and the nature of the interaction of elements in the powder mixture TN. At a concentration of 0.5 ... 0.6% and higher silicon regard as alloying element, which increases the hardness and tensile strength of the alloy at high temperatures and corrosion resistance at low and reduces ductility.

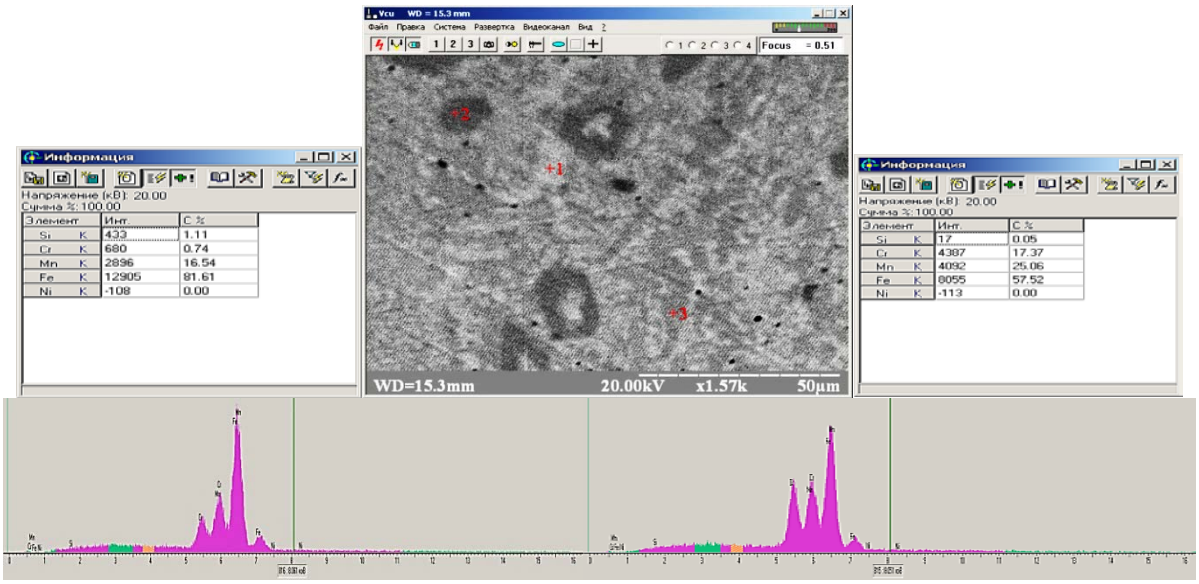

Fig. 2. Electron microscopy and chemical analysis of specific areas eutectic structure of the coating.

Iron-base element that is part of the reinforced products, forming solid solutions, chemical compounds and carbide element. Carbon and boron form a eutectic type diagram iron and high iron carbides and borides. Carbide manganese Mn3 C and iron Fe3 C rozchynyuyutsya virtually without restriction. It should be noted that the increase in content of manganese in steel, increases the degree of dispersion of perlite. At a concentration of 0.5 ... 0.6% silicon and above is considered as alloying element, which raises some hardness and tensile strength of alloys at high temperatures and corrosion resistance at low and reduces ductility (Fig. 2)

Alloys of Fe-Mn-C-B received by induction heating or heating furnace at this. The powder mixture covered in fire-carts form Quartzite or carbo corundum crucible, heated microwave, or placed in a preheated up to 1280 ° C furnace (exposure time 10 minutes isothermal holding time
8 minutes). The process which strengthens the application layer on a work surface details consist of the following: preparation of powder materials, preparation of parts for reinforcement, strengthening adjustment mode, which strengthens the application layer, cooling parts, machining, quality control.

As the X-RAY DIFFRACTION study reinforced layers obtained by heating a microwave system using a mixture of Fe-Mn-C-B, includes a main phase γ-Fe. In the clad layers, the presence of carbides Fe0,4 Mn3,6 C, Fe3 C, and as a consequence, impurities Fe2 B-phase.

Conclusions

1. Eutectic coating is formed in the contact elements eutectic melting mixture of powder and metal nasychuyemoho

2. The resulting functional eutectic coating can be used in agricultural machinery to strengthen the working friction surfaces of tillage machines (ploughshare plow, paw cultivator, disc harrows).

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In the work of research tehnolohycheskyh Effect parameters nasыschenyya and abrasive particles razrushenyya nezakreplennыm workers in agricultural machines and organs Changing STATUS surfaces trenyya konstruktsyonnыh eutectic coatings on steel (steel 45 and 65G).

Abrazyvnoe yznashyvanye, Lemekh plow, эvtektycheskye pavement, samozatachyvanye blade, uprochnenye surface.

In paper influence of technological parameters of saturation and abrasive destruction on loose particles of working bodies of farm machines and change of condition of surfaces of friction of the eutectic coverings on constructional steels (steel 45 and 65G) Is investigated.

Abrasive wear, plow ploughshare, eutectic coverings, self-sharpening of an edge, hardening of surface.

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COST STORING OILSEEDS

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Simulated cost of storing oilseeds. Depending installed cost of storing oil seeds of its humidity, pollution, yield (mass storage) and process equipment

Oilseeds, winter rapeseed, soybean, sunflower, oil, storage, cost, yield, moisture, debris

Formulation of the problem. As a result of the processing of oilseeds obtained 30-40% vegetable oil and 60-70% of cake or meal. Vegetable oil is a valuable food product that is exported from Ukraine in many countries. It is used for the production of margarine, mayonnaise, confectionery and so on. In addition, the oil can be recycled methyl ester, which is a substitute for petroleum diesel. Oil cake or meal - a valuable food for farm animals.

However, the seeds after harvest on immediately comes to recycling. Freshly grain weight uniform moisture and ripeness of individual grains has high physiological-biochemical and microbiological

activity, reduced vigor and germination, poor technological properties. To prove the seed to normal, it must go through the stage of post-harvest ripening, which can be up to several months. In addition, the facilities of oil, fat and complex installations for the production of biofuels can not recycle all the seeds immediately. So oilseeds to send them for processing to keep some time because of the loss of seeds and reduce the oil content in it depends on the cost of the final product.

Analysis of recent research. IN [1, 2] proved that the deposit oilseeds affect its debris and temperature environment. According to [3], the safety of oilseeds is greatly influenced by the high content collapsed and broken seeds. This is the first seeds exposed to mold, which damages primarily embryo. Oil from him quickly hirkne as air access to such seed facilitated by the absence of fetal membranes (hulls). Technology and hardware for storing oilseeds are given in [4]. However,