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TECHNOLOGICAL PROVISION OF INCREASING THE WEAR RESISTANCE OF SOIL PROCESSING MACHINE PARTS

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The technology of increasing the efficiency of the surface strengthening of plow blades by means of semi-automatic vibro-arc surfacing of the most loaded zones and improving the uniformity of the blade is substantiated.
Key words: *strengthening, wear, waste, thermal influence, surfacing.*

Problem. The intensity of wear and tear of parts of the working bodies of tillage tools, including plow blades, on different soils will differ significantly due to the difference in their wear and tear, the average work-to-failure for the chest of the blades can be from 10 to 100 ha, for the wings of the blades, it can be from 40 up to 270 hectares. The analysis showed that the parts of the plow bodies wear out unevenly. The presence of irregularities, dents, cracks, and corrosion areas on the working surface leads to the sticking of soil in such places, the plowing process, and an increase in the traction resistance of the plow. As a rule, the field edge of the dump is intensively worn.

Analysis of research and publications. Currently, a large number of technological processes have been developed for tillage machines, often unequal in their technical and economic indicators. The main methods of strengthening plow shafts are: manual arc surfacing - continuous or in the form of a grid; installation of ceramic plates; application of composite coatings [1]. When using composite materials and ceramic plates, they are installed in the most worn places. However, it should be noted the relative complexity of the technological process when milling nests on the dump chest due to the geometry of the surface and cementation of the upper layer, as well as the fact that when working on stony and clogged soils, there is a high probability of detachment of the plates during the work. The use of an abrasion-resistant dispersion-reinforced composite based on epoxy resin is suggested for the restoration of plow dumps. This method allows you to eliminate through wiping while preserving the mechanical properties and shapes of the part, which is restored without thermal and deformational influence during the formation of the coating. At the same time, the above-mentioned scientists suggest the use of a booking method for the surfaces of dumps with radial wear.

Research results. To strengthen the plow shafts, it is advisable to use the surfacing method with minimal heat deposition in the base metal. Vibrations of the wire significantly affect the entire stroke. Due to the vibrations of the wire, there is an alternation of very short cycles consisting of a circuit break, an idle run and a short circuit [2]. In connection with the unevenness of the wear of the working surfaces of the dumps, as a criterion for the technical optimality of the applied strengthening technology, it is advisable to adopt the provision of equal wear resistance of the entire working surface of the dumps. This approach allows, on the one hand, to minimize the area of the areas subject to strengthening, and on the other hand, to eliminate additional costs for the formation of reinforced layers with excessive wear resistance. At the stage of wear (when working under normal operating conditions), the rate of change of wear is almost constant, the wear of parts changes linearly over time. Thus, during the period of wear and tear, the wear is proportional and the coefficient of local intensity of wear will also be proportional to the working life. After the end of the period of normal operation, due to wear and tear and removal of the strengthened layer of parts, more intense emergency wear occurs. Due to the uneven wear of the surface of the plow blade, the criterion of optimality of the applied strengthening technology can be the provision of equal wear resistance of its entire working surface [3]. Thus, it is possible to minimize the area of areas subject to strengthening, and, therefore, to additional thermal and mechanical impact, and at the same time to eliminate additional costs for the formation of over-reinforced zones. The height of the deposited metal rollers and the hardness of the deposited layer are important indicators characterizing the amount of deposition and the wear resistance of strengthened parts. The correct choice of these parameters will allow to obtain the optimal ratio between the cost of strengthening and the resource of the parts being strengthened [4]. As a result of the thermal effect during application of points made of high-carbon filler metal (hardness HRC 60), the base metal of the part in the vicinity of the points is strengthened by 8-10 units on the Rockwell hardness scale. The thin-walled parts of the dump bodies of plow bodies with a thickness of up to 8 mm must be strengthened using small welding currents in order to avoid burns and thermal deformations. The experience of using the spot surfacing technique shows that with a welding current of 120-140 A for a time of 1-1.2 seconds, the volume of the surmounted metal acquires a hemispherical shape with a diameter of 6-8 mm. With a longer arc burning time, the volume takes the form of a spherical drop. This form is undesirable, because it increases the probability of separation of the volume of deposited metal from the main one during the operation of the part. Thus, the optimal diameter of the welded metal points for thin-walled parts is a diameter of 6-8 mm. Let's calculate the number of points that must be applied to the strengthening surface of a part with an area of S in order to increase its wear resistance by n times. The distance between points depends on their location. The most promising increase in wear resistance is the staggered arrangement of points. The strengthening of the deposited metal layer occurs directly during the surfacing process due to intensive heat removal into the body of the part and forced cooling of the surface of the part and the surfacing zone with a cooling liquid, usually water [4]. Taking into account that the production process of strengthening parts is, as a rule, of a single or small-batch nature, it becomes clear the importance of a preliminary assessment of the expected "spotty" of the surface hardness depending on the surfacing modes. It is proposed to determine the strengthening zones on the basis of wear measurements of the dump, which was in operation, and further calculation of the proposed coefficient of local wear intensity kи. Zones with k and >1 are subject to strengthening. It was established by calculation that the use of vibro-arc surfacing of thin-walled parts allows reducing the width of the softening zone to 1...2 mm and reducing the softening from 10 to 3...6 units on the HRC scale.

Conclusions: The surfaces and edges of the plows are subject to uneven abrasive wear during operation, which makes it necessary to additionally strengthen the most heavily loaded areas. An effective way to increase the wear resistance of plow parts is arc welding with non-overlapping rollers. To reduce heat deposition in the base metal, it is advisable to use vibrating arc surfacing in water jets.

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