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RESTORATION OF DETAILS - A SECOND LIFE OF AGRICULTURAL ENGINEERING

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В даній статті йдеться про раціональне використання відновлення деталей тому , що досвід повторного використання сільськогосподарської техніки свідчить, що відновлення працездатності деталей — це технічно й економічно обґрунтовані заходи, які дають можливість скоротити час простою, реально поліпшують показники надійності та використання машин.

This article is about the rational use of parts restoration because the experience of reusing agricultural machinery shows that restoring the efficiency of

parts is technically and economically sound measures that make it possible to reduce downtime, really improve reliability and machine performance.

In economically developed countries, spare parts are prevalent in the spare parts market, as they are 1.5-2.5 times cheaper than new ones, and are usually not inferior to the resource. This is mainly achieved through the participation in this market of machine-building firms and specialized firms for the restoration of machined parts.

Recently there is a tendency to decrease the quality of parts. This is due to the fact that their production and reconstruction are currently undertaken by enterprises that have not yet done so. Therefore, often the production technology does not meet the established standards, as a result - the geometrical parameters of the parts and their physical and mechanical properties change. Research institutions have developed a range of methods and methods of restoring the working capacity of agricultural machinery parts and equipment for processing agricultural raw materials by their physical nature.

Let's take a look at the features, advantages, and disadvantages of repairing the parts that the machine's life depends on.

Body or basic parts of the tractor chassis. This is the type of parts that provide the design of the machine mutual placement of mechanisms and parts, the appropriate coordination of the landing and landing surfaces. They assume most of the internal and external loads that affect the tractor during its operation. Most of these parts are made thin-walled and with great variety. The material for their production is cast iron brands: MCH-15; MF-18; MS-21; MF-24 of medium and high quality - in the manufacture of such parts of complex construction, as a rule, they have high internal residual stresses, acting independently of external ones. To prevent deformation, deformation of the walls and, as a result, cracks, they resort to artificial and natural aging, which significantly reduces the level of residual stresses, or even conducts their basic relaxation. The internal stresses of the basic parts that were in operation have a much lower level.

The process of restoring the health of the body parts is fraught with considerable difficulties. This is primarily due to the peculiarities of the material - cast iron, as well as the complexity of the form, the massiveness, the considerable overall dimensions of these parts. The original parameters for the recovered parts that meet the specifications of the technical documentation can only be obtained when such technological conditions are created, under which the details will not allow the appearance of additional stresses and, accordingly, no significant deformation and warping will occur. About 30 different ways of repairing defects of cast iron body parts have been developed. Practical experience has shown that only a small number of them can be effectively applied, for example: cold welding and surfacing of self-protective PANCH-11 wire, semi-automatic welding of MIZHKT-5-1-02-02 wire, implementation of combined methods, especially of casting, application of inserts-ties , as well as the rolling of the swirling rings and more.

When surfacing in a shielding gas environment, the wire must contain deoxidizers (aluminum, manganese, silicon, titanium). Such wires include Sv-08G2S, Np-30HGSA, Sv-18HGSA and others. Semi-automatic hose units are used for surfacing: A-825M, A-547U, A-1035, A-765 and others. The wire is fed into the burner, which has special nozzles for the wire and shielding gas. The disadvantages of this method include: significant losses of weld metal (up to 15%), the surfacing is less smooth than in surfacing under a layer of flux.

Powder wire welding with internal protection is the most promising way since it allows to obtain weld metal with alloyed elements of chromium, nickel, titanium, molybdenum, boron and others. In addition to alloyed elements, gas and slag components, deoxidizers and other substances are introduced into the powder wire. The most common powder wire diameters are 2, 2,6, and 3 mm, which are used to restore parts of agricultural raw materials processing equipment.

For restoration of the worked details from aluminum bronzes, and also drawing of a bronze layer on steel products (sliding bearings, etc.). EA Paton has developed a series of copper-coated powder wires: PPBr AH9-4 (8-10% Al; 2-4%

Fe; 0.2% Si; 2% additive; the remainder is copper). For the restoration of aluminum bronze parts by surfacing in a shielding gas, PPBr 8-21 (7-9% Sn; 19-23% Al; 1% additives, the remainder copper) is used. The AN-60 is used for welding the bronze layer on steel products and for repairing the tin-lead bronze cast parts under flux.

The method of electric arc welding in the environment of the protective gases restore only the rounded part of the teeth. The peculiarity of this method is that the surfacing is conducted without interruption of the arc during small fluctuations in thermal power. This provides high-quality surfacing of the material, that is, in the zone of thermal impact there are no pores, sinks, cracks and there is a slight increase in the grain size of the metal. The depth of this zone (taking into account the transition zones) is 4-6 mm. After surfacing, the parts are machined on the lathe at the ends and the diameter of the projections. Cutters with inserts made of hexanite-R are used for this purpose. Further rounding of the end surfaces of the teeth is carried out by electrochemical treatment.

The disadvantage of this method is the inability to restore such parts with the actuation of the end surface of the teeth, exceeding 4 mm, because this technology does not involve the formation of involute surface. The uneven hardness of the welded material of the tooth and the presence of hardening structures in the welding zone cause a decrease in the resistance to shock loads, which cause its chipping.

The advantage of such recovery methods is the ability to use durable materials, which increases the resource of recovered parts. With the restoration of the parts in a carbon dioxide (CO2) environment, the welding is carried out under DC reverse polarity. The CO2 consumption sufficient to protect the weld zone from the air is 7-10 l / min. As the current density increases, the gas flow rate increases.

Restoration of plastic deformation is based on the redistribution of metal from the rim of the hub of the gear wheel into the actuation zone. There is a method that involves the compression of parts in a closed die with preheating to a temperature of 1200… 1250 ° C. If necessary, compensation for working on non-working areas of the teeth is welding metal. This method allows you to restore all surfaces for the protraction of the tooth up to a length of 12 mm.

This method is quite time consuming, since the workpiece is restored to almost the appearance of a workpiece with a certain allowance for clean processing, and for this there is a need to use a heavy-duty press (up to 6,103 kN).

In this case, the weld metal will be squeezed out evenly in all directions, spreading out to the uneven areas of the teeth as inflows. Application of plastic deformation effect allows to obtain a highly dispersed metal structure with no anisotropic properties. At the same time the recovered parts have practically no defects (cracks, peeling).

Common to methods of restoring plastic deformation is the simultaneous movement of the metal of the workpiece in the actuation zone, where rolling is provided by the formation of teeth.

Surfacing. A part for automatic electric arc surfacing under a layer of flux is installed in a cartridge or centers of a specially converted lathe, and a surfacing apparatus of type A-580M or PAH-1 - on its caliper. The electrode wire from the cassette rollers of the feeder of the surfacing apparatus is directed into the combustion zone of the electric arc. The movement of the electrode along the weld is achieved by rotating the workpiece. Moving the electrode along the surfaced surface is ensured by the longitudinal movement of the machine caliper. The surfacing is carried out by screw rollers with their mutual overlap approximately one third. Flux enters the combustion zone of the arc from the hopper.

Flux welding ensures the highest quality of weld metal, as the welding arc and the liquid metal bath are completely protected from the harmful effects of oxygen and nitrogen, and slow cooling contributes to the removal of gases and slag inclusions from the weld metal.

Plasma surfacing is a new, but very promising way of applying metal coatings to the workpiece surfaces of a workpiece for the purpose of restoring them. Plasma jet is used as a source of thermal energy by plasma surfacing. Plasma is a partially or fully ionized gas heated to a very high temperature and has a conductivity property. Plasma surfacing uses low-temperature plasma, whose temperature is 10 ... 30 thousand ° C. Plasma jet is obtained from special devices called plasma torches or plasma torches. The plasmatron consists of two main parts: the cathode and the anode. The plasmatron cathode is a rod with a diameter of 6-8 mm, made of lanthanum tungsten, which is cooled with running water through a water jacket. The anode part (nozzle) is made of copper and is also cooled by water.

In order to obtain a plasma jet between the anode and the cathode, an electric arc is formed and a plasma-forming gas is introduced into its combustion zone, which, when passing through an arc gap, is heated to high temperature and is ionized, ie it splits into positively and negatively charged ions.

Gas-flame spraying is carried out with the help of special apparatus in which the melting of the sputtered metal is carried out by acetylene-oxygen flames and its sputtering by a stream of compressed air. The wire is fed at constant speed by rollers driven by an air turbine built into the machine through a worm gearbox.

The deposited material in the form of a wire is fed through the central hole of the burner and, when it enters the flame zone with the highest temperature, it melts.

Developed technologies are of great interest to manufacturers, especially those that enable the commissioning of complex, massive, high quality materials made of high quality materials. This article presents only a small fraction of the methods and methods for recovering parts, in fact, many more.

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