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CONTENTS

MEDICAL SCIENCES

AGRICULTURAL SCIENCES

TECHNICAL SCIENCE

5. Kuzmenko Vladimyr. Исследование влияния параметров измельчающего аппарата на энергоемкость процесса резания / Vladimyr Kuzmenko, Oleksandr Kholodiuk // Motrol: Motorization and power industry in agriculture. – 2016. – Tom 18, № 3. – P. 262–271.

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ВОССТАНОВЛЕНИЕ КОРПУСНЫХ ДЕТЕЛЕЙ

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RESTORATION OF BODY PARTS

Аннотация.

Корпуса представляют собой детали коробчатой формы с наличием базовых плоскостей и координированных с ними и между собой точных посадочных отверстий.

Основное назначение корпусных деталей - обеспечение заданного взаимного расположения различных сборочных единиц в течение заданного промежутка времени (ресурса) как в статическом состоянии, так и при заданных режимах эксплуатации, плавности их работы, а также выполнение ряда функциональных назначений (герметизация, теплоизоляция и др.).

Конструкции корпусных деталей разные. Условно можно выделить два основных типа корпусных деталей: призматические и фланцевые. Для первого типа характерно наличие развитых наружных плоскостей и основных отверстий на нескольких осях. В деталей второго типа плоскостями служат торцевые поверхности основных отверстий с центрирующими выточками, буртами, которые определяют их обработку точением.

В работе разработано приспособление для востановления посадочных мест для коренных подшипников двигателей внутреннего сгорания.

Abstract.

Housings have the form of a box-shaped part with the presence of base planes and precise landing holes, coordinated with each other.

The main purpose of the body parts is to ensure a given mutual placement of different assembly units for a certain period of time (resource) both in static state and at given modes of operation, uninterrupted operation, as well as a number of functional purposes (sealing, insulation, etc.).

Designs of case details are various. There are two main types of body parts: prismatic and flanged. The first type is characterized by the presence of developed outer planes and main holes on several axes. In parts of the second type, the planes are the end surfaces of the main holes with centering recesses, flanges, which determine their machining turning.

In the work, a device has been developed for restoring the seats for the main bearings of internal combustion engines.

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Keywords: *housing, part, holes, bearings, restoration.*
Ключевые слова: *корпус, деталь, отверстия, подшипники, восстановление.*

Introduction

Privatization processes, which began in our country in accordance with the adopted regulations, also affected the agricultural service. In agriculture, the scale of its privatization largely depends on the pace of agricultural reform. enterprises. At other levels, 21% of privatization service structures therefore have some experience.

In this regard, there is a need for its generalization and analysis of positive and negative trends in order to develop proposals for the normal post-privatization development of reformed agricultural structures.

It should be noted that in the agro-service sector still use different methods of privatization of the service of a collective agricultural enterprise is carried out simultaneously with the main production. Currently, their property is distributed (personified) free of charge among members of the workforce by providing land shares. In relation to other levels, there are 25 repair and transport enterprises, 21 district suppliers and plants, privatized through the purchase of property by labor collectives and transformed into closed joint stock companies, one part of which was reformed through lease with redemption, or limited liability companies which were reformed through open sale of shares. [2]

Replacement of forms of ownership necessitates the acceleration of restructuring and integration processes both within the enterprise and at the level of the agro-service industry and the entire agro-industrial complex. The main direction of their implementation should be the reform of existing agro-service enterprises at all hierarchical levels, the creation of an appropriate competitive environment and an extensive network of intermediary formations, the development of direct relations between producers and consumers of technical means.

In previous years, a lot of work was carried out in Ukraine, numbering 52.2 thousand objects. In these farms 50.4 thousand, in the system of "Agropromservice" 1.8 thousand, including 576 special repair shops. About 0.5 million executive workers are employed in repair and maintenance work.

To maintain a high technical level in machine and tractor fleets, it is necessary to perform significant amounts of repair and maintenance work, amounting to more than 2.6 million total repairs.

Since 1992, there has been a sharp decline in production at repair and maintenance companies. Technical re-equipment of repair and maintenance facilities is practically not carried out because there is a lack of diagnostic, control-measuring, regulating and serviced means.

To re-equip specialized repair shops, it is necessary to attract investors, for this purpose the Cabinet of Ministers of Ukraine adopted Resolution № 1953 of December 10, 1998, according to which financial assistance is provided to rural producers, agro-industrial services and repair companies for purchase of spare parts and repair materials. repair companies.

The system of technical service and repair of equipment should focus on the creation of an extensive network of technical service enterprises in the state, which should include branded technical centers of manufacturers, equipment and material supply base of "Ukrtechservice", farms, private maintenance and other technical formations. [3]

This network must maintain the equipment in working order during the warranty and post-warranty periods. The agricultural producer has an opportunity to freely choose executors of technical services depending on their quality, terms of performance, cost.

The main material

Criteria for choosing the most profitable way to restore machine parts. At the modern technical equipment of the repair enterprises details it is possible not only to restore, but also to increase their service life. The durability of parts after repair largely depends on how they are restored and how it is organized. The use of the most effective methods ensures long service life of parts, reduces the cost of spare parts, materials, labor costs, and so on. Along with the use of rational methods for high-quality restoration of parts with the lowest cost of labor and resources, the organization of production is also important. In this regard, a great role is played by centralized restoration in specialized plants and shops and workshops that are well equipped with modern equipment, devices, tools. The choice of the method of restoration of the part should be made taking into account a comprehensive analysis of the technical and economic feasibility of their use. The following criteria are used to select how to restore machine parts. [2]

1. Applicability criterion. The choice of method of restoration primarily depends on the design and technological features and operating conditions of parts, the magnitude of their operation, the performance properties of the methods themselves, which determine the durability of repaired parts, and the cost of their restoration. Structural and technological features of the part are determined by: a) geometric shape and size; b) material and heat treatment, surface hardness; c) manufacturing accuracy and surface rigidity - ie structural characteristics; d) the nature of the connection (type of landing); e) working conditions and environmental impact (nature of the load, type of friction, the amount of operation during the operating period). Knowledge of structural and technical characteristics of parts, conditions of their work, allows to solve a question of possibility of application of this or that way of restoration. With this analysis, you can determine which of the parts can be restored in several ways, and which by their structural characteristics allow only one method of restoration. This criterion allows to determine the possibility of applying recovery methods to specific parts and can be called a technological criterion or a criterion of applicability. Thus, we can preliminarily say that parts of small diameter, which have high surface hardness and insignificant operation, are irrationally restored by metallization and surfacing by manual electric arc welding and automatic submerged arc welding.

It is also not possible to use chrome plating for high-performance parts. The criterion of applicability cannot be expressed in numbers and is essentially preliminary, because with its help it is impossible to solve the question of choosing a rational way to restore machine parts, if there are several ways. The criterion of applicability allows you to classify the parts by the method of recovery and identify a list of parts that can be restored in different ways.

2. Criteria of durability - an assessment of recovery methods in terms of durability they provide. Durability depends on performance. The most rational way here is the one that provides the greatest durability of the restored part. This criterion is expressed numerically through the coefficient of durability for each of the methods of recovery. The coefficient of durability is the ratio of the durability of the restored part to the durability of the new one. The higher this ratio, the more perfect the recovery method.

3. The criterion of economy determines the cost of restoration of machine parts in this way. It is expressed through the cost of restoring the part, which is determined by the formula:

Also, for timely and high-quality repair work, farms must be equipped with modern equipment, repair shops with sufficient production area and reliable washing facilities.

$$C_в = \left[C \cdot \left(1 + \frac{H_1 + H_2}{100} + M \right) \right] \cdot \left(1 + \frac{П}{100} \right)$$

where C - basic salary, UAH;

H_1 - incidental shop costs, as a percentage of basic salary;

H_2 - incidental general expenses, as a percentage of the basic salary;

M - the cost of materials for coating, UAH;

$П$ - profit planned by the repair company,%.

4. Technical and economic criterion. Is a generalizing criterion that connects all the above criteria. According to this criterion, you can finally decide on the choice of a rational way to restore the part. Technical and economic criterion is determined by the formula:

$$C_в \leq K_д C_н ,$$

where $C_в$ - the cost of the restored part, UAH;

$C_н$ - the cost of a new part, UAH

Details of this subclass have significant overall dimensions - length up to 1600 mm, width up to 500 mm, height up to 750 mm. Weight 50% exceeds 50 kg and reaches 233 kg.

The main structural elements are holes for bearings in the outer and sometimes in the inner walls (individual parts have more than 8 such holes). The diameter of these holes is in the range of 50 - 298 mm, and the length of the generating - 10 - 30 mm. They are made with an accuracy of not more than 7 quality and a roughness parameter of not more than Ra 40. The diameter of the threaded holes varies from 6 to 20 mm.

Housing parts are made of gray (MF 15-32, MF 18 - 36, MF 21 - 40), malleable (MF 95 - 0), high-strength and special cast irons, as well as (up to 15%) of aluminum alloys by casting, rarely stamped and welding. [1]

A characteristic feature of these parts is the presence of precise coordination of the holes (in relation to each other and to the main installation bases of the body part). As a rule, these holes are processed not lower than the second class of accuracy.

Defects of body parts include: [2]

- cracks in the jumpers between the holes, on the side and bottom holes;
- damage to threaded holes;
- surface wear under rolling and sliding bearings, under bearings (housings), under axles, fingers, bushings, pins;
- exceeding the allowable values of deviation from the alignment of the axis of the hole relative to the common axis of the holes, deviation from the parallelism of the axis of the holes, bellows axial distances, deviation from the perpendicularity of the axis of the hole to the plane;
- exceeding the permissible deviations from the straightness and from the flatness of the landing surfaces.

Defects of parts of the subclass "Housings" can be depicted in the form of Fig.1 Examination using a magnifying glass reveals cracks, fractures. The condition of the threads is assessed by tightening the thread gauges. The sizes of diameters of openings under rolling bearings, glasses of bearings, axes, fingers and plugs are controlled by the indicator gauge, micrometric gauge, hummingbirds stoppers.

Control of deviation from the alignment of the holes in the body parts is performed by indicator optical-mechanical devices.

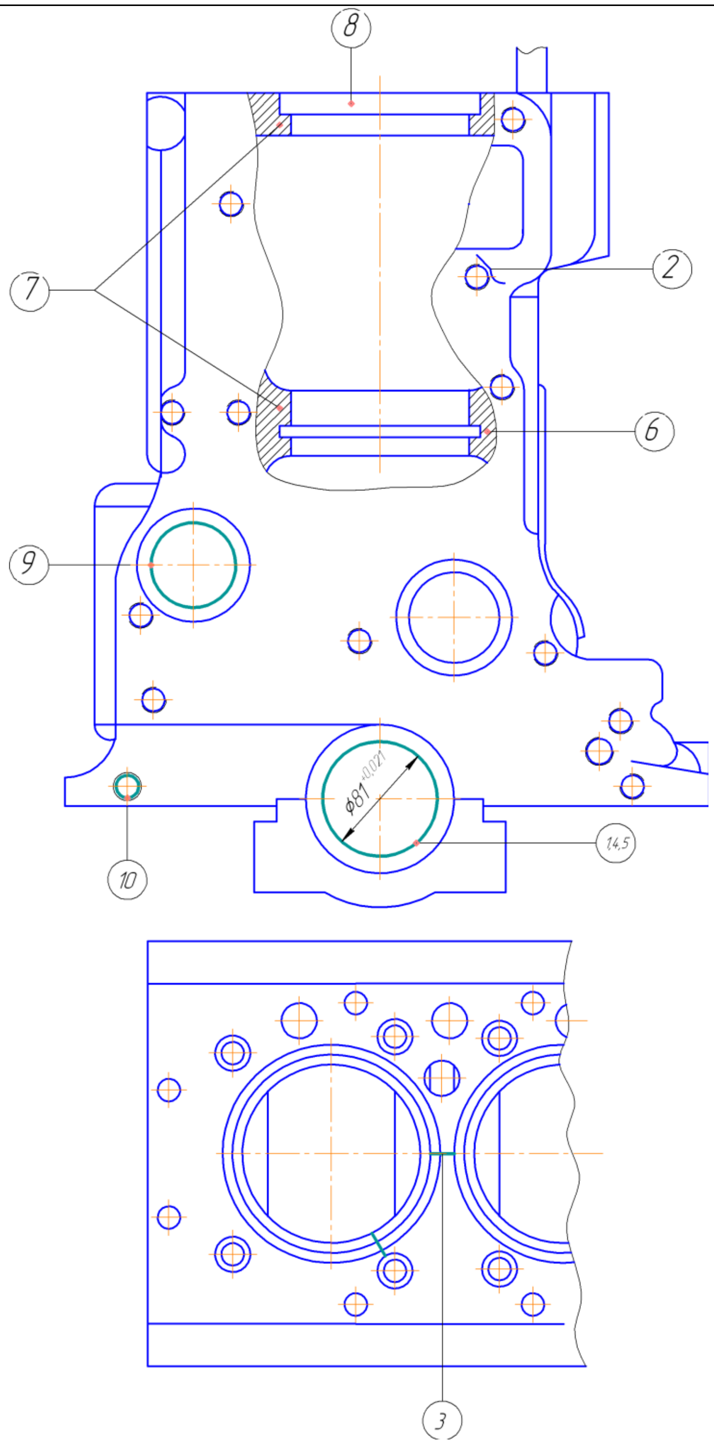
When checking the deviation from the alignment rotate the sleeve with the indicator and measure the amount of radial beating. Radial beating will show the magnitude of the deviation from coaxiality.

Optical-mechanical methods of control of parameters of spatial geometry of case details can find application at the big repair enterprises in the conditions of specialized shops as do not possess universality.

Control of axial distances and deviations from the parallelism of the axes is performed by measuring the distance between the inner forming mandrels using indicator and micrometer gauges.

Deviations from the parallelism of the axes of the holes are defined as the difference of measurements along the length.

Control of deviations from the perpendicularity of the axis of the hole to the plane is performed using an indicator device or a special caliber.



1 - Damage to the socket of the main bearing; 2 - cracks, holes in the walls of the water jacket; 3 - crack on the jumper between the seats under the cylinder liners; 4 - wear, ovality and taper of the surfaces of the holes under the inserts of the main bearings; 5 - Misalignment of supports under the bearings of the main bearings in the absence of other defects; 6 - corrosion and wear of seats under the lower belt of the cylinder liner; 7 - ovality at the seats under the cylinder liners; 8 - wear, dents on the end surface of the socket of the cylinder blocks under the flange of the sleeve; 9 - wear of the inner surface of the camshaft sleeve; 10 - damage to the thread of the studs and threaded holes, breakage of the studs.

Figure 1. - The main defects of the cases

In the first case, the deviation from the perpendicularity of the axis of the hole to the end plane in diameter is defined as the difference between the readings of the indicator when rotating relative to the hole, otherwise - by measuring gaps at two diametrically opposite points on the periphery of the control disk. The deviation from the perpendicularity in this case is equal to the difference in gaps in diameter.

The content and construction of technological processes of restoration of body parts depends mainly on defects, their recurrence, structural shape, size and weight of the body, technical requirements for the restoration of parts and type of production [2].

The sequence of operations of the technological process of restoration of body parts is determined mainly by methods of establishing defects, and subsequent machining - the choice of bases and schemes of dimensional connections of different surfaces of the body.

The technological arsenal of restoration methods, accumulated by domestic practice, allows to exclude most of the defects that occur in the body parts as a result of gradual tempering (fatigue cracks, wear, deformation, etc.). Methods for restoring body parts are described in more detail below.

The choice of technological bases is a responsible moment in the development of the technological process of restoration of body parts, as it determines the accuracy and cost-effectiveness of their restoration. The selection should begin with an analysis of the functions assigned to the surface of the part for its intended purpose and the dimensional relationships established between its surfaces. Examining the functions of surfaces and the requirements that relate to their relative position by the official purpose of the part, find the surfaces in relation to which is set and the most responsible limited position of most of its surfaces to be restored.

To achieve the required accuracy of dimensional connections of the parts, the surfaces of the part that provide the shortest path of the dimensional chains should be used as technological bases. It is desirable to use these bases on the majority of operations of technological process of restoration of the case and to try to processing of a detail from one installation.

Very often the technological bases prepared by the manufacturer lose their exact parameters during the manufacture or operation of the machine.

Therefore it is most favorable to choose bases of the case as technological bases as position of the majority of surfaces is set from the basic bases of a detail. It is necessary to try to keep the principle of unity of bases during all regulations of technological process of restoration of the case.

Deviation from the rules of unity of bases can be caused by the fact that the position of most of the restorative surfaces of the part is not relative to the main bases, but relative to other surfaces, such as auxiliary bases, or that the overall dimensions and length of the main base surfaces are insufficient. installation of details.

There are cases when the main base surfaces of the part are physically inconvenient to use as technological bases, then they must be created artificially.

In practice at restoration of case details three ways of basis are most often applied: on the plane and two apertures processed on the second class of accuracy with landing on the established fingers of the device; along the axis of one of the main holes, the support on the point of the other main hole and the support on one of the planes; on three planes which form a coordinate angle.

Given the advantage of the principle of unity of bases, its observance must be approached carefully. In operations where it is required to ensure high accuracy of the sizes which are set from surfaces, are not technological bases, observance of the principle of unity of bases leads to more quantitative technological chains.

For example, the processing of cylinder blocks from the technological bases of the manufacturer leads to the inclusion in the dimensional technological chain of an additional component in the form of the distance from the plane of the splitter with the crankcase to the axis of the main supports. In these cases, it is possible to move away from a single database. It is reasonable to use as technological bases directly those surfaces of a detail from which the keeping sizes are set. For example, in the cylinder block, the plane of separation with the block head or the axis of the root supports should be used as the installation technological base, depending on the defect, ie the chain method of achieving accuracy over the coordinate method should be preferred. [1]

Considering these circumstances and deciding on the technological bases, for most technological operations of restoration of body parts should determine the sequence of elimination of defects of the body, ie basing the part on the first or first operations to prepare its surfaces as technological bases for subsequent operations.

There may be several options for solving this problem. To choose the most rational, it is necessary to analyze the various options for basing the body and assess the consequences of the choice [4-7].

The analysis should begin with identifying the tasks that need to be solved when restoring the body part, and clearly articulate them. Given the special role and importance of the first operation in the technological process of restoration of the part, first of all it is necessary to find tasks related to the preservation of dimensional connections that do not require restoration, as well as ensuring uniformity of allowances on surfaces to be treated. these tasks may appear not in the first operation, but in the second stages of the technological process of restoration of the body part.

Milling, turning, grinding, planing and drawing are used for processing of external surfaces of case details. [4-5]

Restoration of openings by means of welding of a steel tape.

When restoring the body parts, the most difficult operations are to restore the size of the holes, their accuracy relative to the geometric location and the original surface roughness.

Recommended technological processes and equipment for restoration of cylinder blocks are based on a method of contact welding of a steel tape on the worked surfaces of a detail. For the first time the schemes of basing of blocks of cylinders at machining, application of honing of a surface of radical support in the course of their final processing are caused. [6-7]

The advantage of the design is the exclusion of heating of the body parts, as heating during welding leads to deformation. The resource of the restored case details should be on the restored working surfaces not lower, than at a new detail. The introduction of this technology leads to a reduction in manual labor and improved working conditions.

For welding a steel strip with a thickness of 1 mm of steel 20 to the surface of the block, the following mode is recommended: welding current 6 - 8 kA, pulse time 0.14 - 0.2 and pause 0.06 - 0.08 s, compression force 1.7 - 2.5 kN, welding speed 0.5 - 0.6 m / min.

Machining of the bearing seat during the restoration of the cylinder blocks is performed in three operations: two boring and honing.

At the first boring operation the worked and deformed nests with increase in their diameter by 0,8 - 1,0 mm on the modernized horizontal boring machine are drilled. To ensure the correct spatial location of the axis of the bearings of the main bearings, boring is performed on the installation device of the machine, which eliminates turning.

After electrocontact welding of the tape, the unit is fed to the second boring on the same machine, which provides rough and clean boring of the welded sockets. Application at finishing of cutters from hexanite allows to receive surface roughness of 1,25 microns and accuracy within the first - the second classes.

Honing is performed on a horizontal honing machine with a special honing head. The base of the unit is performed without calibration of the mounting plate located on the upper plane of the machine.

The honing head is made for the entire length of the machining unit and simultaneously processes all the bearings of the main bearings. It is made of tubular elements, which are connected by stiffeners with radial grooves. Honing is carried out by bars which are fixed on blocks. The bearing pads are freely installed in the guide stiffeners and when the tool rotates under the action of centrifugal force diverge and press the diamond bars to the inner surfaces of the slots. Diamond bars are located on the pads in the appropriate areas of the nest in the processing of which they participate. The length of the bar must be equal to s the length of the machining surface of the socket. Kerosene with 5% oil additive is fed into the treatment zone. [1]

Restoration of openings of case details by means of traditional methods.

Defects of case details include operation of openings under bearings within 0,2 - 0,4 mm on the party, operation of landing belts under sleeves. When restoring them, traditional methods are used: installation of repair bushings, application of polymer and electrolytic coatings, micron smelting, electrospark treatment, etc. Restored parts must have hardness and wear resistance with the parameters of the material of the reducing part (deviation 10 - 15%), have sufficient adhesion to the base metal, corrosion resistance in a humid environment, provide maximum contact area with the conjugate part, no pores, slag, foreign inclusions .

The method of restoration must eliminate the thermal impact on the part and be cost-effective.

Polymer compositions are usually brittle, subject to breakage and leaching. Surfacing causes warping of the part, bleaching of cast iron, the formation of slag and pores in the deposited layer. The electrospark coating method does not provide sufficient contact area with the conjugate part.

The use of electrolytes for iron seats in some enterprises is aggressive, unstable, requires heating or the use of expensive thyristor power supplies, followed by machining, as the microhardness of precipitation reaches a large value depending on the composition of the electrolyte and process modes, have high internal voltage.

The YaMZ-236 and YaMZ-238 engines, which are undergoing major repairs, have significant corrosion and erosion in the area of the lower seat belts under the sleeves in the cylinder blocks, which are shells up to 2-3 mm deep. These damages lead to a breach of the seal between the liner and the unit and the penetration of water into the crankcase. They are caused by the phenomenon which arises during fluctuations of a sleeve at the movement of the piston.

To change the design of the lower belt of the sleeve instead of two narrow rings use three: one flat wide, which is worn with tension on the sleeve at the top of the lower seat belt, and two narrow. To improve the disassembly of the sleeve from the cylinder block recessed recess under the ring in the sleeve.

When restoring the lower seat belts, the most widely used methods were: boring the lower seat belt to the repair size and installing the repair part - the sleeve; applying a polymer composition to the damaged surface and installing a gauge mandrel to form the correct geometric shape of the seat belt during curing of the composition.

The first method has disadvantages, the most significant of which - high complexity and high cost.

The second method is more economical. The surface restored by it provides reliable work of the engine within the repair period. However, when using it, there is often a violation of the geometric shape of the recovery surface (displacement of the upper and lower seat belts, mismatch after restoration, etc.), this is due to the fact that the device does not provide accurate installation of the gauge mandrel.

But a technological process of restoring seat belts was developed, which did not reveal any previous shortcomings. This is achieved by using specialized equipment that allows the polymer composition to restore the damaged surface to the nominal size.

As a base surface adopted the upper seat belt, which wears little during operation. A power pneumatic cylinder is connected to the device to move the calibrating mandrel.

The average operating time of the engine without repair before leaving the allowable size of the upper seat belt is 324 thousand km, which practically ensures the stability of the geometric shape of the seat belt during the two repair cycles.

Restoration of landing openings by installation of rings

Developed technology and equipment for the restoration of landing holes by installing rings on the epoxy warehouse. The ring (sleeve) is made in the device from a steel tape 0,5 mm thick. The manufacturing process consists of the following operations: cut the tape lengthwise and, if necessary, width, fold the ring for welding, while the tape is clamped around the precision mandrel, and spot welding of the ring [1].

The manufactured rings together with the mandrels are installed in the corresponding holes of the housing on the adhesive composition, orienting them on the inner surfaces relative to each other and the base surfaces of the housing in the device.

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The rings have a final size in accordance with the requirements of the working drawing and are not subject to further processing.

One of the ways to restore the landing holes in the body parts of machines, by installing turning sleeves on the glue, followed by unrolling them in the parts depending on the configuration and size on lathes and drilling machines.

The results of checking the cylinder blocks for tightness show that it is not always possible to obtain a tight coupling. Analysis of the engine, which was under supervision, says that the method of restoring the cylinder blocks by ringing with the use of sealing compounds, can not provide mass recovery of cylinder blocks with after repair life of not less than 80% of the new life.

The use as a sealing component of the compound KLT-30 brand B TU 28-103-262-75 allows you to easily and evenly apply a layer on the mating surfaces, easily remove excess, does not require compliance with certain temperatures, no time is spent on cooking the component.

Self-vulcanizing compound KLT-30 is a liquid homogeneous mixture, which is packed in aluminum pipes of 0.05 - 0.3 kg. It is intended for sealing of a surface and can keep the properties for a long time at work of engines in the conditions of vibration at a temperature from - 60 to + 300 degrees.

It takes a solid state under the action of moisture at a temperature of 0 to 40 degrees for 15 - 20 minutes. with the formation of a rubber-like material.

Checking the blocks restored by the ringing method using the sealing composition KLT - 30, for tightness gives 100% yield. The tightness of the coupling provides an 80% resource.

Restoration of openings by electrolytic rubbing

It would seem possible to use galvanic methods to restore the openings of body parts. After galvanic build-up "in size" by some metals (zinc, copper) no further machining is required. The equipment used for this purpose is simple, the coating process is stable.

But attempts to use galvanic baths to restore the openings of body parts were unsuccessful due to the many positions of operations, complex system of isolation of uncovered places, low build-up speeds, inability to visually observe the process, intensive growth of dendrites with increasing coating thickness.

Theoretical developments and research have revealed a number of methods known collectively as "electrolytic rubbing". Their essence is the deposition of the coating from the microwave, which is formed by an anode swab, which is moistened with electrolyte and pressed against the treatment surface of the recovery part. The tampon should fit snugly over the anode, and absorbent fabric is used as the material. In the process of electrical deposition, dendrites are removed and the sediment structure is partially compacted as a result of the anode pressure through the absorbent tissue. The disadvantage of this method is the sludge filling of the absorbent fabric, which leads to its introduction into the coating and the possibility of closing the circuit during local abrasion of the fabric.

More effective can be considered a method of deposition of the coating in a stream of electrolyte with mechanical activation of the surface, in which the removal of dendrites and compaction of the structure of sediments is carried out by devices (activators) mounted on a rotating anode. These include brushes made of non-conductive material, inert in this electrolyte, and bars fixed on an insulating base and made of materials whose microhardness

should be greater micro hardness of the deposited coating. The force of pressing the device to the treatment surface is chosen so that the structure is better compacted, it was possible to activate it and there was no growth of dendrites. However, this method is not yet sufficiently developed, the anode is difficult to manufacture.

Recently, in the repair industry, the method of deposition of the coating in the flow of electrolyte with simultaneous rotation of the anode has proved itself. At such restoration between a cathode and an anode which are covered with a cover from absorbing fabric, leave a backlash of 1,5 - 3 mm which is filled with a stream of electrolytes. The anode, as well as when rubbing, is given a rotational motion, but the speed increases by 2 - 5 times.

Reduction of dehydrite formation is achieved by increasing the flow rate of the electrolyte to 0.5 - 1.5 m / s and gives it a rotational motion in the electrode space.

Housing parts orient the moving parts of the unit during its operation. The defining features of the body part are: box shape, necessary for the formation of a closed working volume in order to accommodate the various mechanisms of the unit; rigid walls with ribbed tides, subjected to static and dynamic loads, in which smooth and threaded holes are made; the presence of long holes made in the assembled parts (including various materials), when the plane of the connection passes through the axis of the holes; the presence of butt planes; low roughness and high accuracy of the sizes, the form and an arrangement of the basic cylindrical and flat surfaces. The main defects of the body parts: cracks in the walls, cracks, curvature or wear of the joints, the destruction of the threads, deformation or wear of the guide and support elements, corrosion. Parts with cracks passing through the tides with precise holes are subject to rejection. The strength and tightness of the walls and the geometric accuracy of the elements are restored in the body parts. [2]

One of the most technologically complex body parts is the engine cylinder block, which is assembled with the bearings of the main bearings and the clutch housing during manufacturing operations.

This assembly unit is not disassembled during operation and repair. The accuracy of the dimensions, shape and location of the conjugate surfaces and holes affects the durability of the repaired unit, so these surfaces must be accurately made. For example, the accuracy of the elements that determine the reliability of the crankshaft and camshaft bearings have the following values. Tolerances on the sizes of apertures correspond to the 5th or 6th quality of accuracy, total tolerance of roundness and a profile of longitudinal section of apertures - the 6th or 7th degree, parallelism of axes of apertures of bearings of a camshaft and apertures in radical support - 8th or 9th. -th degree, the coaxiality of the middle root support relative to the extreme - 5th or 6th degree. The roughness of the treated holes Ra = 0.63 μm.

The scheme of technological process of restoration of case details is the following: preliminary mechanical processing of the damaged elements of a detail; production of DRD; welding (including those related to the consolidation of DRD) and surfacing; annealing to relieve internal stresses after welding; surface spraying; machining of welds; application of plastic coatings; installation of DRD, which are fixed by elastic forces, glue and pins; rough machining of joints and holes; cutting of threads of the nominal and repair sizes and installation of spiral threaded inserts; finishing of surfaces; surface treatment, cleaning; recovery control.

Machining at the beginning of the technological process is used to remove damaged elements, giving the restored surfaces the correct geometric shape, treatment of cracks, execution of stops and joints for the installation of DRD. Cracks are processed, for example, using a hand grinder IP-2002. A reinforced abrasive wheel is used as a tool. At the end of the cracks drill holes with a diameter of 3 mm. Cracks in cast iron walls are welded with PANCH-11 or -12 wire, or with artificial electrodes TsCH-ZA. The weld is applied in sections 20-25 mm long, which are forged. Welding work on parts made of aluminum alloy is performed using an installation for argon arc welding.

Welding and surfacing work is associated with the investment of heat in the material of the part and cause high internal stresses and associated deformations. Deformations of cast iron workpieces can be reduced by heating them before welding, holding at a temperature of 600 ° C during welding and cooling together with the furnace. In place of broken tides of body parts made of aluminum alloy, weld DRD. Housing parts made of aluminum alloy, made by die casting, after welding must be heated and aged at a temperature of 180 ° C for 10 hours.

In the next part of the technological process is coated by spraying. Cracks and holes in the non-force walls of the part are sealed with pads using epoxy compositions based on resins ED16 or ED20. The main renewable elements of the body part are the guide elements and holes for bearings. The bearings of the main bearings in the cylinder block of the engine are a precise intermittent hole along the length, made both in the cylinder block and in the screw caps. The following methods of creating allowances on renewable surfaces have been tested in repair production: DRD installation; application of epoxy compositions; cold iron; gas-flame surfacing of brass; electric arc and plasma spraying.

Worn threads are restored by cutting threads of repair size, or welding holes with their subsequent drilling and cutting threads of nominal size, or screwing threaded inserts into a pre-cut thread of larger diameter.

Worn holes for pins are unfolded to the repair size. Root supports and holes in the camshaft bushings are drilled in one place on a special machine. Then the root supports are honing. The lower plane of the cylinder block and two technological openings on it are used as technological bases. The cylinder block at the end of the recovery is assembled with the clutch housing. The hole for the gearbox with the allowance for processing is drilled based on the 171 assembly unit on the finished root supports and one of the ends.

Control operations at the end of the restoration process consist of checking the purity of the part, its tightness, geometric dimensions of the elements and their relative position, surface roughness. The size of the holes is controlled by indicator gauges, and the roughness - by profilometers. The relative position of the surfaces is measured by indicator means. Particular attention is paid to the cleanliness and tightness of oil channels. The tightness of the walls of the assembly unit is checked on the stand.

This method is used when restoring the seats of body parts on the installation.

Characteristics of the restoration part

The sockets of the main bearings of the crank mechanism of the internal combustion engine are included in the general complex casting of gray cast iron MF 18 and MF 21, with high casting and mechanical qualities. They belong to the fixed elements of the mechanism creating the engine case and providing rigid fastening of radical bearings of sliding, thereby, forming steady work to all crank mechanism. The element of a radical support of the engine is a demountable cover of the radical bearing.

All surfaces of seats of radical supports of the engine are connected with basic necks of a cranked shaft through sliding bearings - radical inserts. The sockets under the liners have a surface roughness and must correspond to Ra = 1.25 mKm.

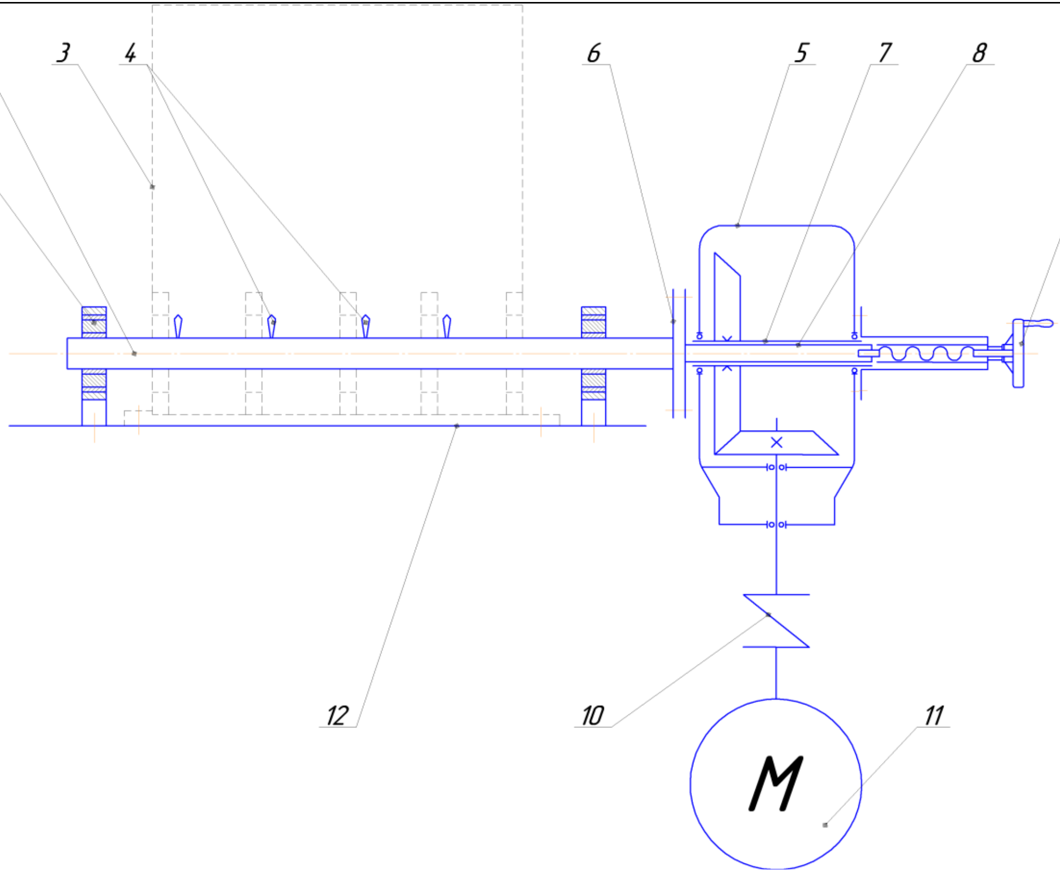
The main components of the projected device.

The device for restoring the bearings of the internal combustion engine bearings (shown on sheet 6 of the graphic part) consists of a boring shaft 1 (Figure 3.2). On the boring shaft 1 are installed basic elements: the housing 2 with internal antifriction sleeves, which is based on the inner surfaces of the support housings through the gaskets in the form of inserts.

A conical reducer 5 is fixed to the coupling 6. The boring shaft 1 is rotated through the reducer 5 from the electric motor 11. The electric motor 11 is connected to the reducer 5 by means of a coupling 10. The whole structure of the device is mounted on the frame 12 cylinders 3.

The principle of operation of the design device

When boring seats, cutting tools 4 (Fig. 2) are fed (extended) to the required value. The operation of the boring device is carried out in the following order: the electric drive 11 through the coupling 10 and the reducer 5 rotates the boring shaft 1 based on the inserts in the support housings 2. In addition to rotation due to the feed mechanism 9 the gear shaft 7 of the gearbox 5. The boring shaft 1 moves along the bushings with built-in cutting tools 4. The cutting tools 4 (cutters), rotating in accordance with the shaft 1, bore the seats 3.



1 - The working shaft; 2 - the basic case; 3 - cylinder block; 4 - cutter;
5 - bevel reducer; 6 - coupling; 7 - a shaft of a gear wheel; 8 - internal splined shaft; 9 - feed mechanism;
10 - safety coupling; 11 - electric motor; 12 - bed.
Figure 2 is a kinematic diagram of the device

After boring, it is necessary to remove the device from the bored unit and measure the diameters of the seats with an indicator gauge. Before and after boring of all places it is necessary to check up their alignment.

Duration of boring of one block of cylinders taking into account preparatory - finishing time no more than 1,5 ... 2 hours.

The proposed device for restoring the bearings of the main bearings meets the technical requirements of manufacturers in terms of machining accuracy (ovality, taper, coaxiality and surface roughness), so it can be used for boring. The scope of the proposed device is wide: large repair companies, repair shops, small service stations and even individual garages. The wide scope of the proposed device is due to high productivity (2 times higher than the productivity of specialized machines of the horizontal boring group) and low cost (60 times lower than the cost of specialized machines).

Conclusions

The cost of restoration of parts in the conditions of modern car repair enterprises is, depending on the design and technological features of parts and the nature of their defects 10 - 50% of the cost of new parts. The economic efficiency of the restoration of parts in comparison with their manufacture is determined by many factors. When restoring parts, material costs are significantly reduced. If the cost of materials and production of blanks in the manufacture of cars is 70 - 75% of their value, then when restoring parts - 1 - 12% depending on the method of restoration. The costs associated with the processing of parts are significantly reduced, as only surfaces with wear or mechanical damage are treated. Restoration of parts allows to reduce the need for the production of spare parts and reduce the cost of their purchase, which is 40-60% of the cost of overhauling cars. Thus, the restoration of parts achieves significant savings in raw materials, energy and labor resources.

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THE EFFICIENCY OF COW'S ELECTROTHERAPY

Аннотация.
Приведена методика электростимуляции маточных сокращений у коров с целью диагностирования и терапевтического лечения послеродовых патологий у коров.
Abstract.
The technique of electrical stimulation of uterine contractions in cows is presented for the purpose of diagnosing and therapeutic treatment of postpartum pathologies in cows.

Ключевые слова*: миометрий, электрофизиотерапия, маточные сокращения у коров*
Keywords: *myometrium, electrophysiotherapy, uterine contractions in cows*

При лечении послеродовых патологий коров с применением электровоздействий [1] выявлено, что при увеличении амплитуды импульсов до 40 В характер нарастания индекса маточных сокращений приобретает выраженную экспоненциальную зависимость в функции продолжительности сеанса. Так, при времени воздействия 5...10 мин он увеличивается в 15,1 раза; 10...15 мин — в 17,1 раза; 15...25 мин — в 21,5 раза, практически достигая уровня, присущего животным с нормальным течением родов. Электровоздействие напряжением 40...55 В при времени 5...10 мин повышает индекс маточных сокращений в 28,7 раз, при 10...15 мин, 15...25 мин, 0...40 мин— соответственно в 64, 69 и 65 раз (рисунок 1). При увеличении амплитуды физиотерапевтических импульсов выше 55 В, наряду с ростом индекса маточных сокращений и усилением моторики матки, отмечено проявление бурных болезненных схваток и потуг [2].

У животных с острой субинволюцией половой сферы до начала лечения наблюдалось понижение нервной возбудимости, снижение молочной продуктивности, замедление жвачки. Температура тела составляла 39.5...39.7 °С, пульс — 78...82 ударов в минуту. Уже спустя 2...4 суток после начала курса лечения температура тела, пульс и дыхание