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The Performance of Machine Parts by the Mechanic Method

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ABSTRACT

Machine parts that have passed their duty and have defects on their working surfaces are restored by various methods. When choosing a restoration method, it is necessary to take into account the amount of spread, surface characteristics, and hardness of the detail material, detail dimensions, and wear values. To restore the geometric shape and dimensions of the details, the method of covering a new layer instead of the spread material layer, the method of elastic deformation (changing the shape of the detail due to the redistribution of the existing volume of metal), the method of replacing the spread part of the detail with a new one, mechanical processing of the spread surface, removing the defective layer and giving the detail the correct geometric shape is used.

Introduction: The physico-mechanical properties of the detailed material are restored by refining (thermal treatment, chemical-thermal, deformation, electrophysical, etc.).

Forming a new coating instead of the spread surface layer of the detail is carried out by such methods as welding, liquid bonding, plastic deformation in the formation of galvanic, polymer and gasometric coatings.

The technological processes of welding and liquid coating take the leading place in the restoration of details, with the help of which almost 60-70 percent of all details are restored. The advantage of welding and thin coating is that the thin layer adheres well to the base metal. However, the intense heat effect of the arc discharge causes serious internal changes in the main material of the part, as a result of which its physical and mechanical properties also change. As a result of this, internal stresses occur in the part, which increase the risk of deformation and collapse.

The surface layer of details by the galvanic method creates problems related to the complexity of technological processes, environmental and energetic and energy consumption.

Due to the introduction of the gasometric correction method of detail restoration, a wide range of possibilities opens up, there are gas flame, electric arc, plasma and detonation types of the gasometric correction method. The use of metal powders with different compositions as a modified material also creates the possibility of using brittle metals and alloys with excellent properties . Therefore, the use of this method is more complicated, it requires a lot of energy consumption, the impact of noise and light is strong, and volatile harmful compounds are formed.

A different group of methods of restoration of parts includes cutting, pressure processing, electric current processing. Each of these methods can be used separately or in combination with the coating method as the final step in detail restoration. In some cases, the cutting method is used as a pre-coating step.

The main technological methods of restoring machine parts are presented in the table.

Recovery and repair methods	Technological methods of recovery
Welding and metal Coating Welding Galvanic(chrome plating, steel plating) cover get Processing under pressure (sinking, stretching, straightening) Methods of correction Cutting processing Electrophysical processing Grinding Chemical-thermal treatment Use of polymers	With a handle arc under a flux layer, with an electric arc in an atmosphere of shielding gases, with electroslag, with a powder wire arc, with a vibrobeam, with an argon arc, with an induction method, in a gas flame, with a plasma method, with the help of a laser. In a gas flame, with an electric arc, with a plasma method, with a detonation method, with the help of a laser, with a plasma method. Chrome plating, steel plating, nickel plating, zinc plating , copper plating Expanding, shrinking, straightening, compression, stretching, smoothing with rollers and balls, smoothing with a pitra, cutting. Grinding, grinding, polishing, milling, drilling, reaming, planing, toothing and grooving, repair dimensions, etc. Electric spark, magnetic pulse Antifriction. Nitriding, cementation, cyanide, coating with chalk Bonding, forming a coating on a forged thin layer and fixing with a gas flame.

of parts by the method of locksmith -mechanical processing

Restoration of parts with mechanical processing includes repair dimensions, additional repair elements, methods of replacement of parts of parts.

Repair dimensions (TO') method. The meaning of the restoration of parts according to TO' is that one of the connecting parts is mechanically treated according to the size of the repair, and the second part of the joint is replaced with a new one or with a restored one according to the size of the repair . Given that the number and cost of repair dimensions are predetermined, two interlocking parts -can be made independently. Let's see how to determine the value and number of repair sizes for shaft necks and detail holes.

Determining the values and number of repair dimensions for shaft necks. Before use , the nominal diameter of the shaft should be equal to d_n . Due to the uneven wear of the shaft, let the maximum value of the wear be d_{max} , and the minimum value d_{min} . In order to restore the shaft neck according to TO', it should be mechanically processed to the diameter d_{t} with a deposit x.

Detail value of repair size:

$d_t = d_н - 2(\delta_{мах} + X)$

the maximum wear value (d $_{max}$) in the expression can be determined by installing the shaft in the centers and measuring its radial deflection with an indicator. But there are certain difficulties to implement this method and it takes a lot of time. For practical purposes, the value of is determined analytically based on the minimum and maximum values of the shaft length.

Total consumption of shaft length:$d_н - d_в = \delta_{мах} + \delta_{мин}$

To be eaten we introduce the concept of unevenness coefficient, its value is $\rho = \delta_{мах}/\delta_y$.

If we put the value of $d_t = d_н - 2(\rho\delta_y + X)$in the expression$\delta_{мах}$

The following two corrosion processes can occur according to the limit values of the corrosion unevenness coefficient: flat corrosion and one-sided corrosion. In flat eating, the total amount of eating is determined as follows:

$$d_t = d_н - d_в = 2\delta_{мах} = 2\delta_{мин}$$

$$\text{He is alone}\rho = \frac{\delta_{мах}}{\delta_y} = \frac{\delta_{мах}}{2\delta_{мах}} = 0{,}5$$

In one-sided eating, the total amount of eating is determined as follows: $\delta_y = \delta_{мах}$

$$\text{In that case}\rho = \frac{\delta_{мах}}{\delta_y} = \frac{\delta_{мах}}{\delta_{мах}} = 1$$

So , the limit of change of the coefficient of unevenness in eating:

$0.5 \leq r \leq 1$

To define the possible values and numbers of repair dimensions, $\gamma = 2(\rho\delta_x + x)$we define as in the expression and call it the repair interval. Let's say the repair interval is the same for all repair sizes. Then the value of one repair size is determined as follows.

For the first TO:	$d_{T1} = d_N - g$
For the second TO':	$d_{T2} = d_N - 2g$
N -TO':	$d_{Tn} = d_N - n\,g$

The strength condition of details is used to determine the number of possible repair sizes. The number of repair sizes is determined by the following formula:

$$N = \frac{d_н - d_{min}}{\gamma}$$

where: - $d_{min}$the minimum permissible diameter of the shaft, which ensures the condition of strength and normal operation of the part.

Determining the value and number of repair dimensions of details holes. Assume that the nominal diameter of the shaft before use is equal to D $_{n}$. -The diameter of the hole where the shaft is located due to corrosion. Let D grow to $_{e}$ -. Let be the maximum amount of consumption and the minimum amount of consumption due to uneven consumption. To restore according to TO', the hole should be machined to a diameter of Д $_{t}$ with an amount of x. In this case, the repair size of the hole is determined as follows:

$$D_т = D_н + 2(\delta_{мах} + x)$$

To determine the size of the repair of the shaft, we introduce the concept of the coefficient of unevenness in wear:

$$\rho = \frac{\delta_{\text{мах}}}{\delta_y}$$

She is with $D_t = D_n + 2(\rho\delta_y + x)$,

where $0.5 \leq \rho \leq 1$

as before, we consider $2(\rho\delta_y + X) = \gamma$ and call it the repair interval, when its value remains constant, the dimensions of the hole are determined as follows.

First repair size:	$Д_T = Д_N + g$
Second repair size:	$D_{T2} = D_N + 2g$
n -repair size:	$D_{Tp} + n\,g$

To determine the number of possible repair sizes, it is necessary to take into account the strength of the part and the operating conditions.

The number of repair dimensions of the hole:

$$N = \frac{D_{max} - D_{н}}{\gamma}$$

In this case, the maximum allowable diameter of the eaten part, which ensures the strength and performance of the D-detail.

The size of the repair is based on the method, mainly the parts of the machine with a complex structure and a relatively high price (sleeves of the cylinder block, engine elbows and distribution shafts) are restored. The main condition of this method is to restore all crankshaft necks and cylinder liners to the same repair size only. Given that the number and value of repair dimensions are predetermined, the first of two interlocking parts can be made independently of the second. Such features of the repair of parts in terms of the size of the repair make it possible to use the technology of industrial production in the repair, the cost of repair is reduced and its quality is improved. Disadvantages of the method of repair sizes include the narrowing of the interchangeability of details (interchangeability is possible only within the limits of repair sizes).

Method of additional repair elements. In the practice of repair enterprises, parts that are eaten in large quantities -are often encountered, and it is necessary to restore them according to the nominal size. In such cases, these details can be restored by casting an additional element. In the repair of parts by the method of additional elements, the worn shaft neck (or the hole of the part) is machined to the appropriate size, and then the previously prepared bushing is pressed and the shaft neck (or hole) is pressed into it. processed according to the nominal size.

The method of additional elements is mainly used to restore holes or shafts by casting sleeves or bushings. This method is simple and one of the most common methods.

When repairing by the method of additional elements, the following conditions must be observed:

- the detail must be repaired with the help of additional elements in such a way that the performance of such repaired detail does not deteriorate compared to that of the new detail;
- the additional element must be pressed (with tension) to the shaft or hole;
- the material of the additional element must match the material of the main detail (except for cast iron details, in which the bushing can be made of cast iron or steel);
- the hardness of the working surface of the additional element must be the same as the

hardness of the surface of the main detail;

- the connection strength of the additional element with the main detail should be such that it does not move during operation;
- when pressing the bushing, it is necessary to avoid bending and deformation of the details.

If the parts are used under load and high temperature, the additional element mounting tension should be higher. Therefore, in such cases, it is necessary to heat the part covering the bush or cool the part to be covered and press it.

The method of repair with additional elements has the following advantages: it is possible to restore the holes of the shafts and details with a large amount of spread according to the nominal sizes; high quality of restored details.

Disadvantages of this method include the dependence of the repair on the detail construction, the reduction of the strength of the main part, the need to re-check the strength of the attachment of the additional element, the fabrication of the additional element and the finishing treatment to the nominal size.

Method of replacement of the detail part. In addition to the above-mentioned methods, restoration of parts by mechanical processing also includes the method of repair by replacing parts of parts. The meaning of this method is that the spread part of the detail is cut and this part of it is prepared again. Then the prepared part is combined with the main part of the part and, if necessary, it is heat treated. Thus, the technology of detail repair in this way consists of the following operations:

1. Scraping the defective part of the part and preparing the surface for joining
2. Making a replacement part of the part from the same material as the main part
3. Combining the replacement part with the main part
4. Joint quality control
5. Final machining of detail

Summary.

The method of completely removing the spread part of the part and installing an additional part beforehand is used only in cases where the part has several working surfaces and one or two of its working surfaces are spread by a large amount. In this case, the replacement part of the part is connected to the main part by threading or after pressing at individual points along the joint line or by welding along the entire perimeter. The disadvantage of this method is the relative complexity of the restoration technology and the decrease in the mechanical strength of the main part.

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