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Techniques for reconditioning an industrial part

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Abstract. The paper wants to show that by means of new techniques any piece can be reconditioned, the costs being much reduced. Among the advantages can be recalled: allows the reconditioning of parts that have a lot of workmanship; material economy; low cost; repairs are performed that cannot be done by other procedures; the equipment used for welding is simple, cheap, with great possibility of diversification; welding is easily suitable for machining and automation.

Keywords. Reconditioning, welding technique, Wear, Technologies for reconditioning.

1. About reconditioning

After a certain number of hours of operation of an assembly, some parts, more difficult to request, have an advanced state of wear, which makes it impossible to continue operating the assembly. In addition to wear and tear due to a certain period of operation, the parts of machines and appliances may become out of order due to accidental causes: bumps, overloads, incorrect mounting, material defects, etc.

In order to put the respective assembly back into operation, it is subject to repairs. During the repair process, the disassembled parts are carefully analyzed, it is impossible to continue the operation of the respective assembly, establishing the nature and size of wear (degree of wear). In order for used parts to be able to fulfill their initial role in good conditions, they undergo a reconditioning process. However, not all used parts are reconditioned.

When establishing the application of reconditioning, the degree of wear of the part is taken into account, first of all, which directly influences the cost of reconditioning.[1]
The cost of a reconditioning, Crec can be determined with the relation:

$$Crec = Cop + Cman + Cmat + Cr \quad (1)$$

In which:

- ✓ Cop is the cost of preparatory operations;
- ✓ Cman is how do labor costs;
- ✓ Cmat the cost of materials needed for reconditioning
- ✓ Cr the expenses with the direction.[2]

If the cost of reconditioning is lower than the price of a new Cpn part, ie:

$$Crec < Cpn \quad (2)$$

it is preferred to recondition the used part, provided that a quality of the reconditioned part is obtained substantially equal to that of the initial part.[4]

But if the cost of reconditioning is higher than that of a new part, ie:

$$Crec > Cpn \quad (3)$$

reconditioning the part is not preferred.

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However, most of the time, the reconditioning ensures significant savings compared to the situation in which used parts would be replaced with new spare parts. These E savings result from the difference:

$$E=Cpn-Crec \quad (4)$$

Reconditioning of used parts can be done by several procedures, which are chosen based on:

- ✓ the shape and dimensions of the piece;
- ✓ the nature of the part material;
- ✓ type and size of wear
- ✓ equipment and materials in the technical endowment of the enterprise.[5]

Among the most widespread reconditioning procedures are:

- ✓ conditioning by welding
- ✓ reconditioning by metallization
- ✓ reconditioning by plastic deformation
- ✓ reconditioning by galvanic coatings
- ✓ reconditioning by applying additional parts;
- ✓ reconditioning by mechanical processing operations

Regardless of the procedure used, the reconditioning comprises a series of preliminary preparation operations, the actual reconditioning operation and some final operations.

Currently, welding is one of the most widely used reconditioning processes. This is due to the fact that numerous welding processes have been developed, made with modern equipment and very varied materials, such as: electrodes, powders, goodbye metal rods.[6]

2. Technology sheet for reconditioning an axle

The table shows the scheme, the steps taken to remove wear from a shaft. Wear was identified on the surfa

Table 1. Technological sheet of reconditioning an axis

Product	Ax			
Part name				
STAS 2517-04.01				
Valid for series 1	pieces 1			
	Prepared technologist	Verified	Normated	Verified norm
Name: Stefanescu E				
Date: 13.02.2020				

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Table 2. Data on the materials used

Basic material STAS	**Weight (kg)**	**Nature and cause of wear**	**Working conditions**				
OLC 45/STAS 880-80	100	friction	dust				
reconditioning technique	manual loading welding						
welding equipment	Parkside welding machine						
Addition material STAS	Quality (condition)	UM					
EH1 STAS 1125/6-82	Φ4/600	Kg					
Chemical composition of the material							
	C%	S%	Mn%	Cr%	Ni%	Cu%	hardness
Basic	0.45	0.03					207-235HB
Of additions	0.3		2	0.25	2.5		200HB

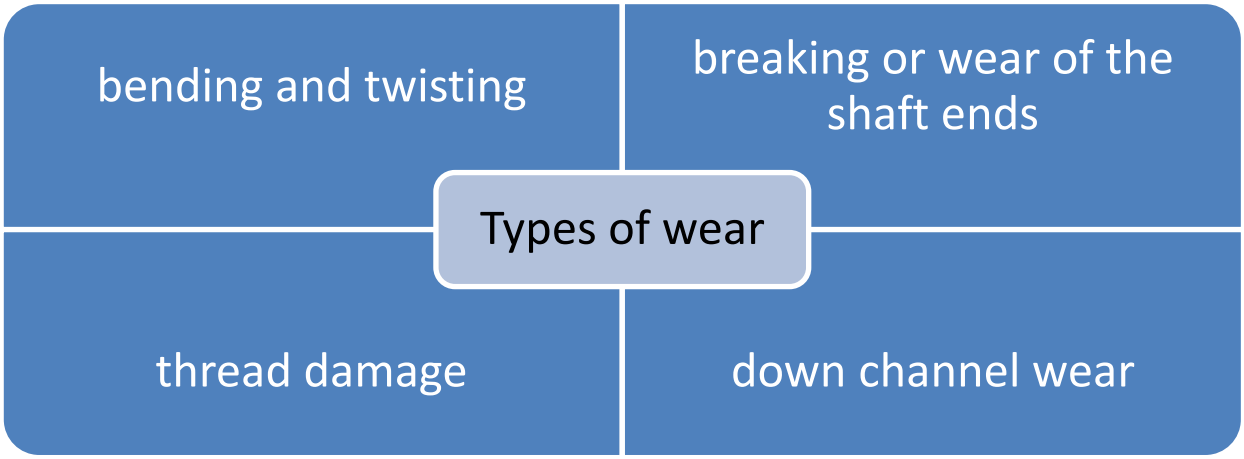

Table 3. Steps performed for shaft reconditioning

	Operation		
Nr	Steps	tools checking devices	technological indications
1	Job and part preparation, cleaned of impurities and oxides with a wire brush, degreased in alkaline solution(NaOH=50g/l, Na_2CO_3 anh 70g/l, Na_3PO_4 12 H_2O=12g/l si Na_2SiO_3 5 H_2O= 5g/l)	electrochemical degreasing bath	current density=5A/dm^3 t=5min T=80°C P=4atm
2	Visual inspection of pores, cracks, fissures		
3	Checking the dimensions in order to establish the degree of wear at the dimensions ϕ60-0,046 and ϕ70-0,054	Measuring STAS1373-73	
4	Preheating to 180◦C	in oven	
5	heating with welding on the hearth of the oven up to the dimensions of ϕ64- ϕ74		Is=180A UA=21V VS=0,15m/min
6	scratch	wire brush	
7	shape and size control	Measuring STAS1373-73	
8	resizing annealing heat treatment	oven treatment	T=600◦C t=70min
9	roughing turning at the elbows ϕ60, 6x75mm - ϕ70,6x470mm	roughing knife STAS6376-80	v=24m/min t=1,5mm s=0,50mm/rot
10	finishing turning at the dimensions ϕ60,0,046x75mm; ϕ70,0,054x408mm; ϕ70,0,054x470mm	finishing knife STAS6378-80	v=140m/min t=0,2mm s=0,20mm/rot
11	milled feather channel -0,02 Φ=18-0,075x55x63 mm for spindle with ϕ60-0,046 and wedge channel Φ=20-0,075x6x80mm for spindle with ϕ70-0,054		
12	Protection of greased surfaces RUL100 and packed with wax paper and storage		t=55mm Df=60mm Hs=46rot/min S=0,25mm/rot

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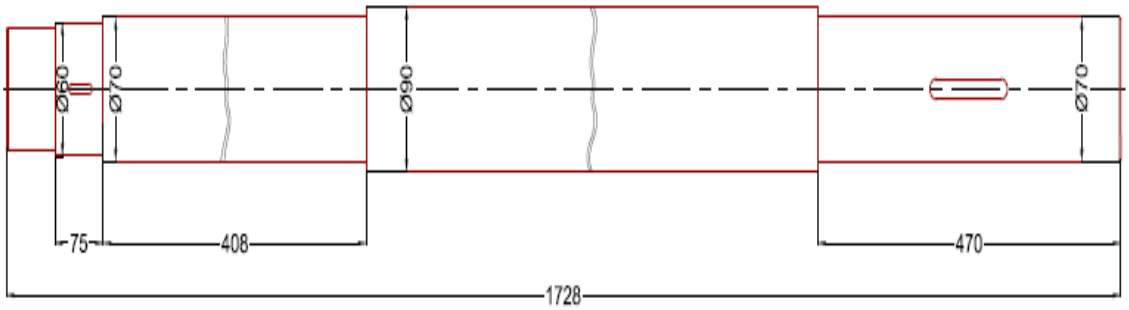


Figure 2. Diagram an axis

The technological process of repairing used parts is:[7]

Preparation of the part surface	•degreasing and cleaning of parts; • pre-processing the surface of the worn part in order to give it a correct geometric shape; • creating roughness.
Deposition of the metal layer by spraying	•melting temperature of the electrodes (wire); • quality of the filler material; • electrode advance speed (forming speed of liquid metal droplets); • the air jet pressure that conditions the size and speed of metal particles.
Mechanical processing.	•mechanical processing of smoothing by cutting the surfaces of the part

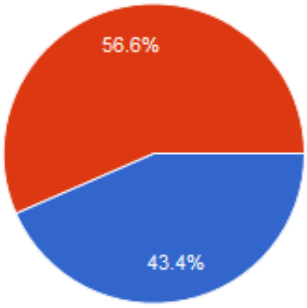
3. Conclusions

The refurbishment operation involves several things and should be mandatory during life. The phenomenon of reconditioning is absolutely necessary to protect the environment.

Although it can be shown that reconditioning is a much more useful, fast and useful operation to protect nature, people still prefer to throw away instead of reusing.

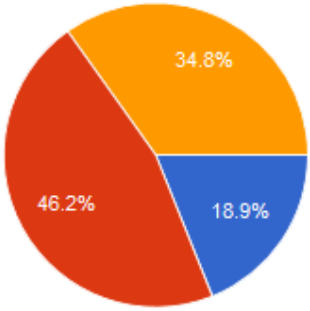
In this paper I wanted to show how we can calculate the costs of a reconditioning, which are the steps and at the same time I gave an example for a shaft, a simple worn and remade part.

The study conducted on 240 people shows us that we are not ready yet and we do not realize the importance of reconditioning anything in our lives.



✓ recondition
✓ throw

Figure 3. Graph with the study of the use of used materials



The reasons for not reconditioning are:
✓ **high cost**
✓ lack of time
✓ lack of materials needed for reconditioning

Figure 4. The graph with the study of the reasons why it is not reconditioned

According to the study conducted on 240 people, I can conclude that society is still thinking about protecting the environment and that's about it .(56%)

Being in the century of speed, everything unfolds quickly and motivating the lack of time, we prefer to throw instead of recondition.

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