SELECTION METHOD FOR AUTOMOTIVE PARTS RECONDITIONING

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Abstract *Paper presents technological methods for metal deposition, costs calculation and clasification for the main process that helps in automotive technologies to repair or to increase pieces properties. Paper was constructed based on many technological experiments that starts from practicans and returns to them. The main aim is to help young engineers or practicians engineers to choose the proper reconditioning process with the best information in repairing pieces from automotive industry.*

Keywords: reconditioning, metal, deposition, automotive, parts

1. INTRODUCTION

The spray plating surface consists of loading (coverage) new or used surfaces with a filler using different metallization technologies. The method has the following advantages:
- provides the ability to cover parts made of any material, including wood, glass, since operating temperatures are very low;
- allows loading large surfaces which practically can have any geometric configuration;
- Can be deposited layers with thicknesses of 6.0 mm and 0.01 ... more;
- Deposited stratum by coating has a high resistance to attrition and / or corrosion and good lubrication properties;
- Does not affect the structure of the base material of which is made of reconditioned piece, since the heating temperatures do not exceed 100 ° C;
- Enables the deposition of stratum of any metal (including aluminum, copper, lead, etc.) and the formation of pseudo who can not get liquid (eg, lead and aluminum);
- Has high productivity and low cost price.[12}.

The method presents some disadvantages:
- Adhesion layer deposited by metallization the material of the piece is poor (to increase, it is necessary to execute special operations training) and due to spray some of the material contribution (about 5%) is wasted;
- Between the adhesion material and the support material must be a compatibility order to achieve the adhesion between them;
- Requires a surface preparation loading to achieve a mechanical anchoring of the layer deposited;
- the heat treatment sometimes requires post-load;
- Metallic parts can not be processed by plastic deformation;
- surfaces covered do not support dynamic loads and the dry frictions and they can not execute threadlocker or channels.

2. RECONDITIONING METHODES

Conditions of deposition of the coating by spraying to cause adhesion of the particles, the density of the charge and thus also of the structure and mechanical properties. Classification metallization coating processes of metals or non-metals and terminology of the main terms used in this field are regulated by STAS 11684 / 1-83, correlated with DIN 32 530.
The diagram in figure 1 presented a classification of the main processes used by reconditioner charge after the energy carrier and technological procedure used.[9,10]

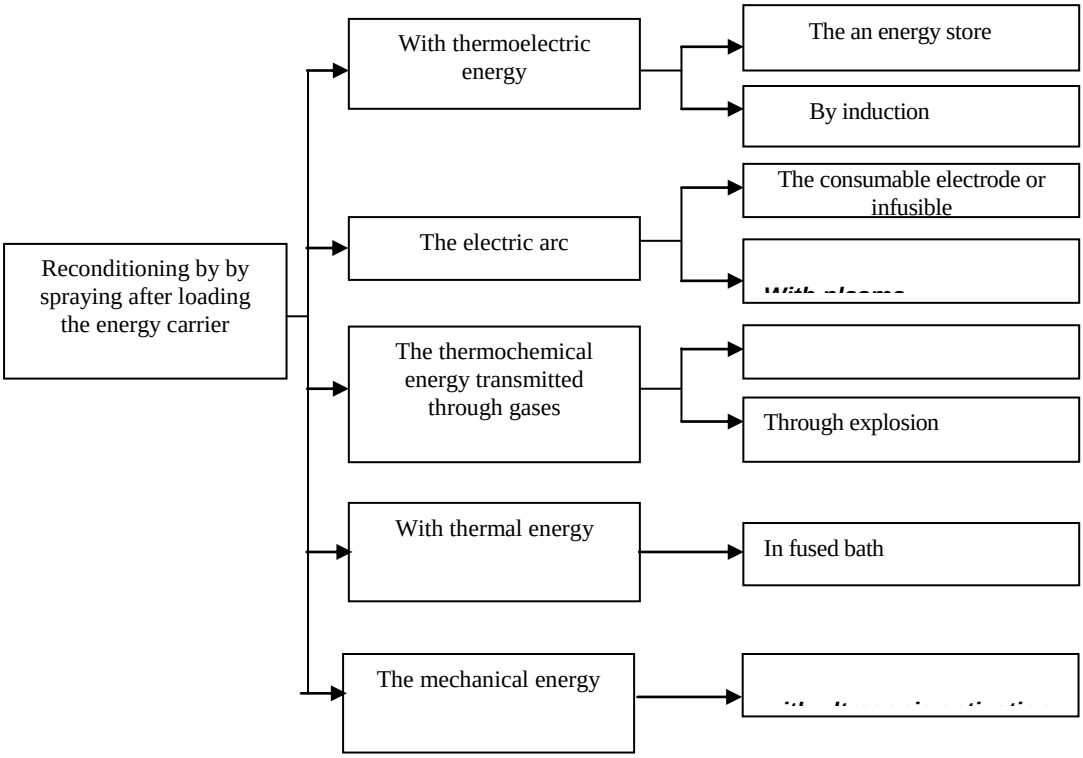

Fig.1. Classification by loading major for reconditioning processes by thermal spraying

The quality of reconditioned autocamion parts depends primarily of the loading method selected material to be the addition and technological process actual load.[14].
Selecting the charging is done taking into account the following factors:

- the degree of wear and wear size;
- nature of the defect and geometry;
- technological and structural characteristics of worn parts;
- functional features required operating conditions;
- reliability design;
- expenditure required by the loading method.

Appropriate choice of the material loading for a given piece of autocamion is a

problem that takes into account primarily the functional characteristics of the couple resulting from the process of reconditioning the load. Appropriate choice of the material loading for a given piece of autocamion is a problem that takes into account primarily the functional characteristics of the couple resulting from the process of reconditioning the load. [5,6].There are many companies producing charge materials and a wide variety of materials used in manufacturing different auto parts truck composition, filler, first choice of loading should be considered the compatibility of the base material (support) and loaded materials (addition), which depends heavily on adhesion between them. For a given chemical composition of the of loading, the characteristics of the deposited layer depends essentially on the loading method used by the thickness of the layer is possible.[8]. Experimentally it has been found that there is a specific minimum thickness of each charging process, as, for example, in the case of loading by welding to obtain the thickness of the deposited layers of material much larger than the load by metal spraying or other methods. For comparison, and for correct charging process are shown in table 1, the minimum thickness of the filler layer can be deposited effectively on a worn out surface.[1,2]

Table 1. Possible the minimum values deposited layer by different procedures by loading reconditioning

No. Crt.	Reconditioning process by loading	Minimum thickness of the deposited layer of added material [mm]
1	Charging by electric arc welding and coated electrodes	3,0
2	Charging by oxyacetylene flame welding	1,5
3	Încărcarea prin sudare în mediu de gaze protectoare MIG/MAG	2,0
4	Charging by welding in protective gas environment WIG	1,5
5	Charging by welding submerged	3,0
6	Charging by welding slag bath	4,0
7	Charging by plasma arc welding	1,5
8	Charging by plasma arc welding	2,0
9	Charging by oxyfuel flame metal spraying	0,25
10	Charging by metallization electric arc metal spraying	0,20
11	Charging by metallization spraying HVOF	0,15
12	Charging by plasma metallization spraying	0,15
13	Charging by metallization spraying by detonation	0,10
14	Charging by metallization spraying with electron beam	0,0005
14	Charging by sprayed metallization of photons beam	0,010

Very important in the selection process and cost of reconditioning is remanufactured parts.

3. RECONDITIONING COSTS

In the general, the cost of remanufactured parts C_{pr} it is calculated with a formula of the form:

$$C_{pr} = C_M + R_m\left(1+\frac{r_s + r_i}{100}\right) + C_{pu} \quad (1)$$

in which: C_M is the cost of materials consumed in the reconditioning piece; R_M - direct productive the personnel the remuneration operator; r_s - indirect costs of section; r_i -indirect enterprise costs of; C_{pu} - cost worn parts [11].

The cost reconditioning piece C_{rp} a relation is calculated as:

$$Crp = C_M + R_m\left(1+\frac{r_s + r_i}{100}\right) + C_{rs} \quad (2)$$

and the cost reconditioning a subassembly C_{rs}, the new parts are used and calculated by the relationship:

$$C_{rs} = C_M + R_m\left(1+\frac{r_s + r_i}{100}\right) + C_{ps} \quad (3)$$

in which: C_{ps} is the cost of new replacement parts:

The cost of reconditioned by charging hard materials truck repair industry is decided by the loaded costs of materials used, the cost of loading process, salary expenses operators participating in the process and overheads. [7] . Relative costs based on unit mass of hard alloy deposited by different procedures by loading reconditioning presented in figure 2.

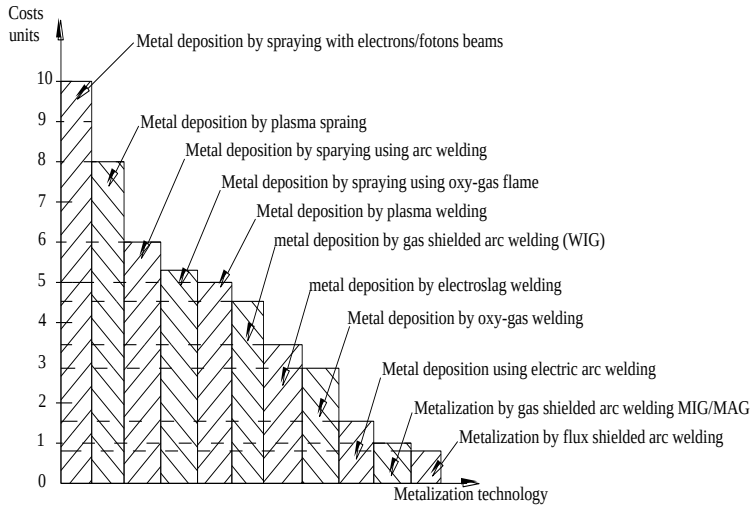

Fig.2. Relative costs based on unit mass of hard alloy charge deposited by different procedures

Cost and productivity are significantly influenced reconditioning operation and deposition rates and deposition yield. A comparison between the values of the deposition rate performed by different a loading methods presents in table 2.[3,4].

Table 2. The values of average speed of deposition made by different procedures of loading

No. Crt.	The process for loading	The average speed deposition [kg/h]
1	Charging by oxygas weldingflame	0,8 ... 1,0
2	Încărcarea prin sudare cu arc electric şi electrozi înveliţi	1,0 4,0
3	Charging by protective gas welding (WIG)	1,0 2,0
4	Încărcarea prin sudare în mediu de gaz protector (MIG/MAG)	3,0 6,0
5	Charging by welding under flow bed	10,0 ... 30,0
6	Charging by plasma welding	5,0 ... 10,0
7	Charging by welding slag bath	15,0 ... 35,0
8	Charging by of photons beam welding	0,5 ... 1,0
9	Charging by electric arc metal spraying and the wire electrode	12,0 ... 16,0
10	Charging by oxygas flame metal spraying and powder	2,0 ... 9,0
11	Charging by oxygas flame metal spraying and the wire electrode	5,0 ... 12,0
12	Charging by metal spraying HVOF	2,0 ... 14,0
13	Charging by plasma metal spraying	4,0 ... 9,0
14	Charging by metal spraying electron beam / photons	0,1 ... 0,5

When choosing reconditioning process must consider and functional characteristics of the resulting the couple, characteristics that depend on the defects which may occur during the process.[13].

Experimental it was found that the principal nonconformities that may occur during charging are fissures, cracks, porosity, inclusions and inhomogeneous structure

4. CONCLUSIONS

1. Repair the reconditioning in loading car parts is one of the most effective methods for both the offeror and beneficiaries;
2. reconditioning repair by welding by loading presents a number of advantages, most importamnte being: significant economy in energy and materials; economy from workmanship and equipment, reduce environmental impacts and pollution;
3. The election process for repairing various parts reconditioning is done taking into account:

the thickness to be deposited on the support material (area of use); Basic material nature; filler material nature; surface geometry and dimensions of used; functional characteristics required the couple resulting from reconditioning; reliability design and costs required by the loading method;
Four comparative analysis of several methods of repair by reconditioning the loading is done taking into account the minimum thickness of the layer of filler material deposited; the relative costs based on unit mass of hard alloy deposited; average speed application; porosity values; The relative relationship between kinetic energy and thermal energy performed in the process; thermal field and state of stress and strain results in the process.

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