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RECONDITIONING OF THE USED COMPONENTS FROM TRANSPORTATION DEVICES USING MECHANISED MIG/MAG WELDING PROCEDURE

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ABSTRACT

The approached thematics intent to increase the resistance to wear of the component parts from transportation devices, for fiability increases and used parts reconditioning for life cycle extension.

Welding reconditioning of the used components allows reducing the exploatation costs for transportation devices.

In this paper is presented a modular instalation which works in manual and automatic duty cycle, and is destinated for reconditioning parts with circular configuration (such as axles, cam brake shafts,drum brakes, tightenings, trams wheelband, etc.)

Changing of the used parts means highest financial and material costs, especially for the imported transportation devices, so that reconditioning is preffered, with exploatation safety guarantee conditions.

KEYWORDS:
reconditioning MIG/MAG welding procedure,
used components, transportation devices

1. INTRODUCTION

The effects of the friction processes between the contact surfaces of the metallic parts are energy losted, which is manifested by heat produced and physical usage, results of the breaking out material and of initially state modification of these surfaces. The lost of the material generate modifying of the dimensions and geometrical shapes for the contact surfaces. In any temperature conditions can be appear structural modifications of the superficially layers. All these have a influence, directly or indirectly, for the portant capacity, work precision, functional cinematics, etc., and generate the unfit dynamical forces and a inadequately function of the mechanisms.

The usage of the metallic surfaces is one complex phenomena which is determined by many factors and conditions (chemical composition or type of material, mechanical properties, surfaces quality, functional parameters such as load, speed, temperatures, etc.).

The increase of the usage resistance for the increase fiability parts is a base problem in conditions of the limitated material resources.

The arc surfacing technology is important for increase the usage resistance.

The highest performances of the arc surfacing technology are determined by harmonisation between metallurgy, physics, tribology, material resistance, electrotechnics, chemistry knowledge, for realisation of the new filler materials, new manually and mechanised equipments, and the automatisation procedures.

The mechanised and the automatised welding systems have the following effects:

- high and constant quality during of whole fabrication,
- possibility for processing of technologies with great deposition rate and welding technological speed by two- or threefold relative to manual procedures, with significant increase of the productivity and capitalisation of fabrication.

The reconditioning by mechanised welding is used on the restricted scale, on national plan, as there is a lack of the specialised equipment.

An important field for rehabilitation is urban transportation, semi-coupling, axles, wheel hubs, brake drums, pivot bearing assembly, coupling, etc.

2. EQUIPMENT DESCRIPTION

The equipment for the mechanised reconditioning by MIG/MAG welding of the used components from the transportation devices, type ISMU-0, consist of the following main subassemblies:

- driving bloc (pos. 2) – which performs the rotation movements end ensures the established welding speed , for the reconditioning by welding of the tram runway tyres;
- welding source MIG/MAG (pos.3), with wire feeding gear and welding handle, semi-automatic, with quality high level, and is recommended to be used for industrial application.
- welding head (pos.4) for external reconditioning of the revolve parts, water cooled, in closed circuit;
- welding head for internal reconditioning of the revolve parts, allows reconditioning of the internal circular surfaces with minimum diameter 120 mm (fig.3);
- hand driven/automatic slides (pos.5) - which realised the positioning movement and the necessary step (horizontal and vertical);
- adjusting devices for work position of the welding head (pos. 6) – including the head leaning at different angles in 2 perpendicularly planes;

- universal welding carriage (pos.7) – ensure the manual or automated movement of the welding head and the control panel to the welding posts; ensure the technological welding speed for the realisation of the long linear welding joints;
- electrical instalation –driving module (pos.1) and control panel (pos.8);
- supporting beam (pos. 9) - which supports and translates the universal welding carriage;
- positioning and fixing devices for the welding parts (pos. 10, 11, 12, 13, 14):
- rotating assembly (pos.10 and fig.4) – for positioning, fixing and meshing, with recommendation welding speed for the revolve parts (differently by the tram runway tires); consist of:
  - manipulator (pos.11) – ensure the necessary welding speed for welding procedure at prescribed parameters.
  - support (pos.12) - a metallic construction, sustain the manipulator and realise the rotating movement of these in vertical plane, with fixing possibilities in work position, in $0 - 90^0$ interval (with 15^0 steps);
  - longitudinal beam (pos.13) – welded metallic construction, is the support for the whole work assembly, and permitted the liniar movement in horizontal plane of the manipulator (adjusting the positioning), working operation c = max. 300 mm.
  - holding devices for the circular parts (pos. 14), lathe chuck type, which ensure clamping and good alignment (between the axis part and worm reducer) for the parts which will be reconditioning, through special clamps.
- Adjustable support for the revolution parts (pos.15) -axle type, which sustain the long parts.

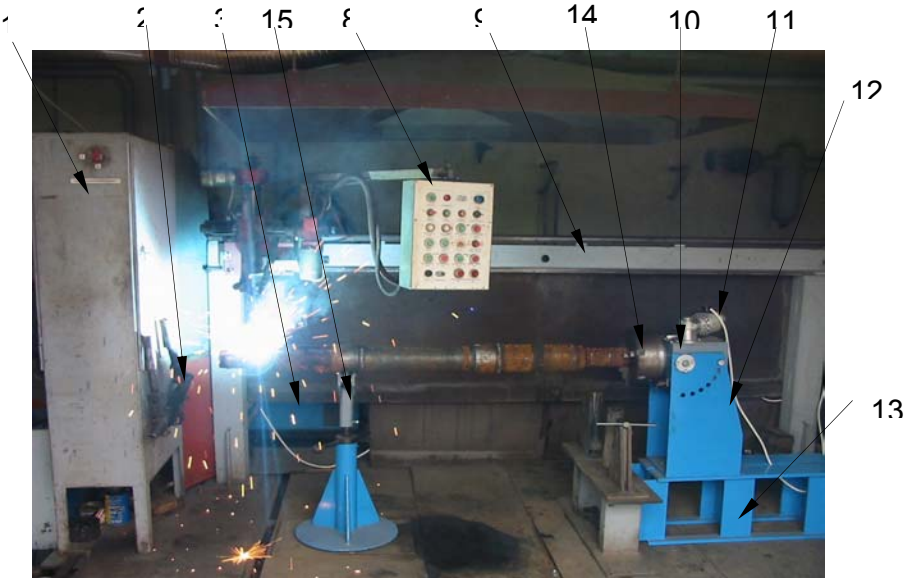

Fig. 1 Instalation for the mechanised MIG/MAG reconditioning of the used components from the transportation devices (reconditioning of the tram axle)

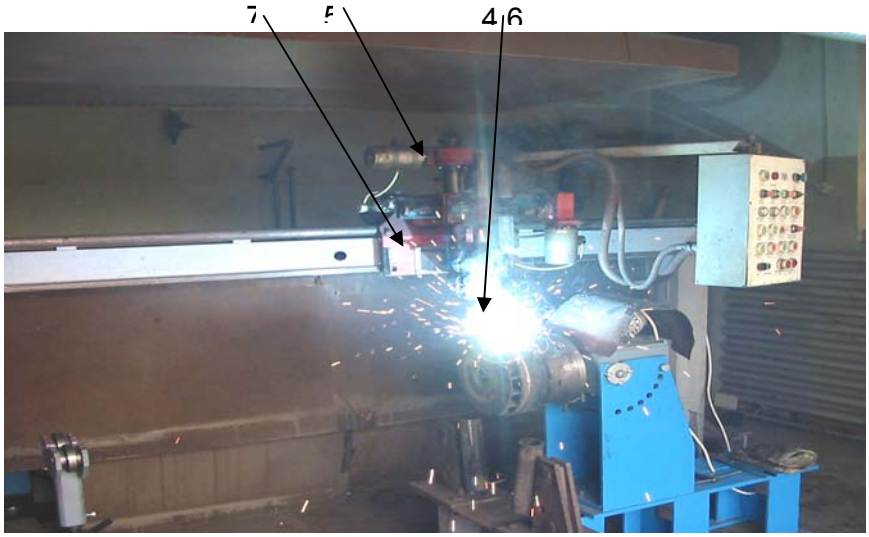

Fig.2 Instalation for the mechanised MIG/MAG reconditioning of the used components from the transportation devices (brake drums reconditioning)

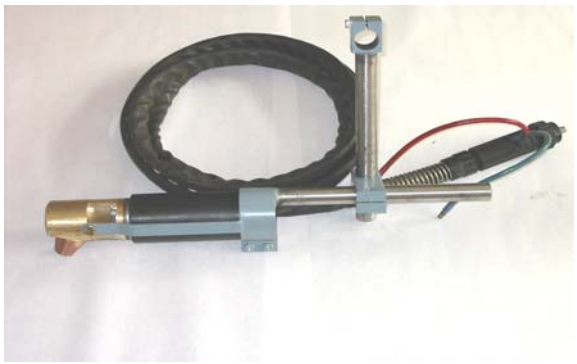

Fig.3 Welding head for interior circular surfaces, with positioning and fixing device

Fig.4 Rotating assembly

Technical characteristics of the welding equipment are:

- welding procedure: mechanised MIG/MAG;
- welding current: 160 ... 230 A;
- maximum welding current: 400 A;
- welding current at DA 60 % 300 A;
- arc voltage: 18 ... 35 V;
- wire feed rate:1,8 ... 18 m/min.;
- horizontal/vertical steps of the welding head….3-20 mm
- welding speed:
  - axle: 13 – 130 cm/min.;
  - cam brake shafts: 7 – 110 cm/min.;
  - brake drums: 36 – 360 cm/min.;
  - tightenings: 24,5 – 245 cm/min.;
- gas-flow: 12 ... 20 l/min;
- overall dimensions 3250×2100×1800mm (with trams wheelband welding equipments)

3. PRODUCTS UTILITY

The regular maintenance and periodical rehabilitation of the transportation devices, ensure:

- increase the function security ;
- lifetime increases;
- reduction of the derangement in service;
- increase the comfort of transportation.

Besides the technical problems, a important problem is represented by noises and vibrations pollution, which is one of the harmful factors for life and human activities. This is produced by circulation of the road transportation devices, in general, and of the trams, especially, and is caused by over limits rate of wear for metallic components in contact/movement.

A study about noises level produced by trams which are used in urban transportation was realised by a team research from Timisoara Polytechnic University. It was measured the total levels for the accoustic pressure (table 1), for 30-50km/h speed of the trams, at a distance by 7-10m from the microphone.

Table 1

Transportation devices	Total level of the accoustic pressure (dB)		
	Minim	Medium	Maximum
Trams	79	88	93

The noise level (maximum and minimum) was measured inside the trams, at start, during the movement among the stations and at stop time in station.

The global noise level in station was measured for arrival and for getaway trams and at 2m distance from the buildings.

The measurements shows that the high noise level is caused mostly by the next factors: runway conditions, ruggedness and wearing of these, high wearing of the metallic parts, at the changing the speed and the movement directions of trams at intersection lines.

Noises and vibrations produced by trams are interesting for two aspects: the influence on the tram-driver and the passengers, as well as ambient medium (buildings, schools, hospitals, etc.).

Making a comparison between noises values, measured at 2m distance from the buildings,and the standard admisible values (50 dB, in conformity with STAS 10009-88), it observe that real values are with $20 \div 30$ dB highest for all protected zone categories. The great values was recordered for romanian trams relative to importated trams.

Conclusions which are resultated from this study, shows necesity the maintenance of the transportation devices, and the importance of the welding reconditioning for the metallic parts with wearing rate over admisible limits.

Changing the used components imply highest material and financial costs, so that is prefferable reconditioning with safety guarantee conditions.

4. APLICABILITY

The equipment for the mechanised reconditioning by MIG/MAG welding of the used components from the transportation devices is complex, with wide range utilisations :

- welding reconditioning (WR) of inside/outside surfaces for parts with circular geometric shapes (semicouples, wheel hubs, axles, etc.);
- circular welding of the cylindrical parts ($\varnothing_{max}$ = 700 mm);
- longitudinal welding (l = max. 1800 mm).

Fig. 3…7 shows representative constructive solutions, which are reconditioned using the "Equipment for the mechanised reconditioning by MIG/MAG welding of the used components from the transportation devices", with marking significant wearing-sensitive zones (I-IV).

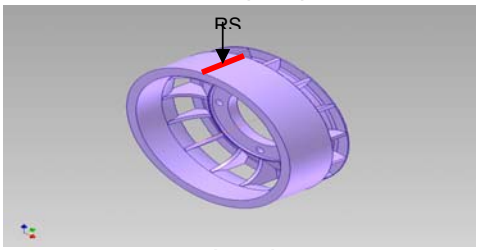

Fig. 3. Brake drum

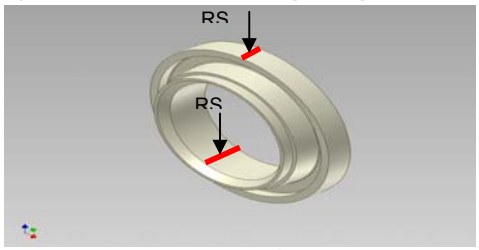

Fig. 4. Tightening

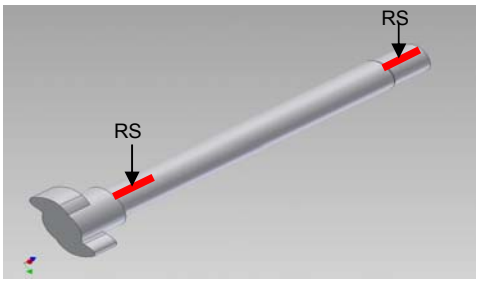

Fig. 5. Cam brake shafts

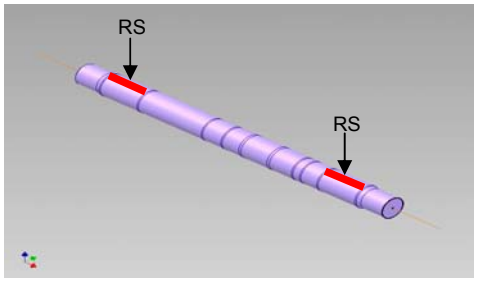

Fig. 6. Motor bogie axle

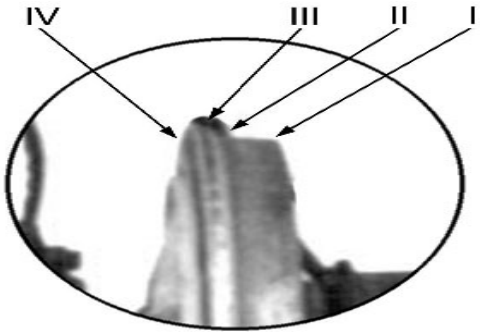

Fig.7 Trams wheelband

5. CONCLUSIONS

Using the mechanised reconditioning, sure enough obtain:

- significant increases of the exploatation safety conditions for mechanised relative to manual reconditioning;
- decrease as much 50% of the costs for reconditioning, in that:
  - auxilliary times decreases for postwelding machine works operations, caused by uniform depositions;
  - auxilliary times decreases for wheelbands or axles dismounting;
- decrease with 20% of the electrical energy consumption and welding materials;
- decrease (about 70%) of the new components importation for outside provenance transportation devices.

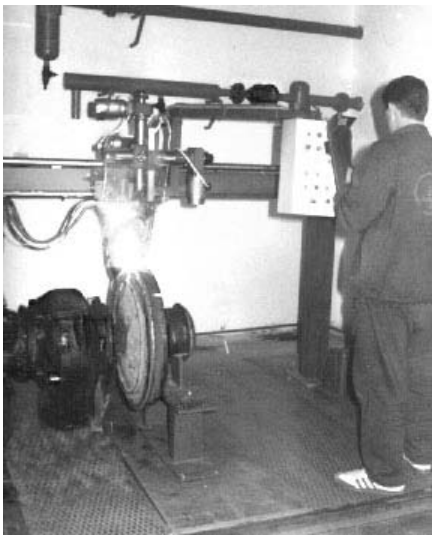

Fig.8 – Continuous
cvcle automated

- The main reasons to maintain of the tansportation devices: increased reliability; noise reduction; increase of the life time; reduction of the running derangement; reduction in the runway tyres and railways wear; improved transport comfort.
- Rehabilitation by welding of the used components allows the decrease of the exploitation costs for the transportation devices.
- The equipment, which is realised in modular system, allows the reconditioning of tram wheels without dismounting them out of the axles and without overheating the rubber made damper devices.
- The equipment works both in manual and automated regime, so the welders qualification can be medium. The role of the operator is to supervise the process, the quality of the welds is not dependent on the professional training and the psychical state of the welder (fig.8).
- Compared with the existing equipment abroad the price is smaller for the same technical performances.

- If reconditioning of the used parts shapes is very good realised, is possible a important working life extension. The reconditioning it must be used after a good knowledge of the benefit and the limits. If reconditioning is corectly applicated, it is an important tool for degradations control, and for decrease of the total transportation devices maintenance costs.

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