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INCREASING THE WEAR RESISTANCE OF SUPERFICIAL LAYERS BY LASER ALLOYING

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Abstract: *It is important for the machine components to have a good wear resistance for the material surfaces In order to improve wear resistance for these elements can be used laser techniques. In the paper are presented laser techniques using powders. It is possible to make a heat treatment with laser to improve the wear resistance or it is possible to use a laser alloying techniques. In the paper are presented both methods. Are analyzed the heat treatment with laser on the metallic material C50 and laser alloying techniques using carbide powders, both methods in order to obtain a laser processed layers with high wear resistance of the superficial layers. The effect parameter variation of the laser beam is investigated in the papers using optic microscope, electronic microscope (SEM) and wear resistant test with Timken tribometer. On the superficial layers are measured also the layers thickness and microhardness.*
Key words: *laser, wear resistance, heat treatment, superficial layers, microhardness*

1. INTRODUCTION

Using high power laser with continuous emission give the possibility to use some heat treatment technology and the results is the improvement of the mechanical and anticorrosive properties of metallic materials. (Steen 1991).

The attitude of the carbon steel at wear and friction is influenced by the structure and chemical composition. The wear is smaller when the steel has a martensitic structure.

After the experimental researches, the martensitic structure of the hardened steels by quenching has a high wear resistance.

To improve wear resistance of the machine components can be use laser technology. Can be use laser technology in order to obtain alloyed layers. The alloyed layer gives to the machine component another mechanical property, in order the hardness has an increase values. The alloyed layer is obtained using metallic powder. (Barton et. al., 1988).

In the future research will be extended on different types of steels with the scope to increase the wear resistance. The increase of the wear resistance will be made by the different kind a thin layers deposition with new physical- chemical techniques as PVD and CVD.

2. MATERIALS AND METHODS

In the first case, the samples are a cylinder Ø23 mm and a block with the dimension 17x15x12mm.

The cylinder sample (2 C50 – EURONORM 10083-1) is superficial hardened with high power CO_2 laser in continuous wave. Figure 1 illustrate the microstructure of the hardened layer

Superficial heat treatment with laser was made using a displacement of the sample in the field of the laser radiation.

The results are surface in ring or spiral form with a width approximately equal with diameter of the laser beam 2,4 mm .

To obtain a hardened zone in ring form the sample was rotate with 5mm/s linear speed or 10mm/s. to obtain a hardened zone in helical form, the sample must make a rotation and translation motion.

3. RESULTS AND DISCUSSIONS

After the laser beam passing the microstructure of the base material is changing. The new martensitic microstructure can be seen in fig.1 and fig. 2 (Demian & Demian, 2005).

In the fig. 1 and fig. 2, can be measured the thickness of the heat treated layer and the microhardness.

The results of the tests, show, that the gravimetric wear corresponding to the first stage of the working friction couples and the average friction factors (fig.3). (Demian et.al., 2008).

Figure 3 show the diagrams concerning the progressive wears of each friction couple.

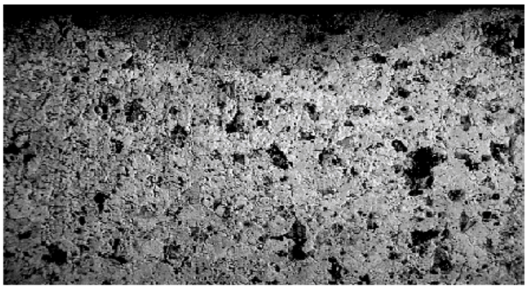

Fig. 1. Macrostructure of the sample 1

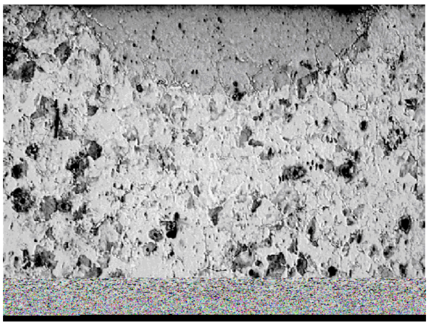

Fig. 2. Macrostructure of the sample 2

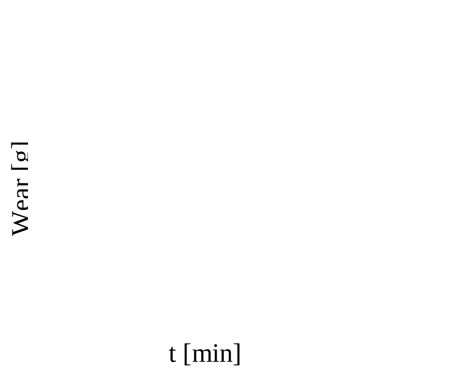

Fig. 3. Progressive wear of couple shoe-roll

In the figure 4 can be seen the zone that support the microhardeness measurements.