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RESEARCH ON OBTAINING WEAR-RESISTANT SINTERED PARTS FROM METAL POWDERS RECOVERED.

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Abstract: *The paper presents the results of experimental research regarding the microstructure of sintered samples from high speed steels obtained from recovery powders. Research conducted in this direction prove the technical possibilities of recovery of high speed steel (HSS) chips resulted from the finishing processing of cutting tools in mechanical processing enterprises. From the recovered chips from chipping tools grinding made of high-speed steel were elaborated fine powders by ball mill pulverizer with different milling times.The samples from recovered powders were obtained by unilateral compacting in die using 600 and 800 MPa pressures and sintered in argon at a different temperature followed by a heat treatment .*
Key words: *powder metallurgy, high speed steels recovered, mechanical alloying*

1. INTRODUCTION

Global trends can be grouped as: recycling, development of new technologies to reduce consumption of powder metallurgy and metal (Sinha et. al.,1992).

Obtaining metal powders from wastes of production has many implications for both the higher capitalization of waste and the finished product.

Processing chips from classic pieces of iron or steel is in a mechanical workshop, a small value for remelting scrap or reuse them and can be turned into dust by grinding, forming and sintering (for parts with medium quality).

The performed researches have proposed to obtain some basic material with similar qualities as the classical ones, but for a lower price (Cesar et. al., 2003), (Hong al., 2000).

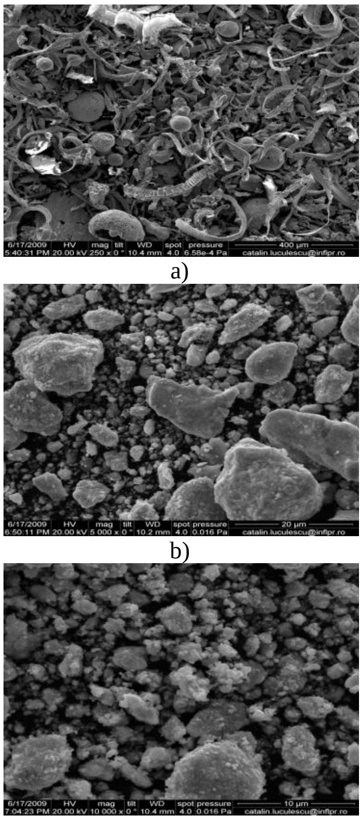
2. EXPERIMENTAL RESEARCH

We present the results of experimental research regarding wear behaviour of sintered samples obtained from HSS (high speed steel) collected during the process of recovery and grinding of high speed steel chips during the rectification operation.

The chips were grinded inside a Fritsch planetary mill type Pulverisette 4 with grinding balls in conditions of variable rotation of the drum and of the grinding bowl, making possible in this way to determine the optimal grinding times for the obtaining micrometric powders with different granulation of HSS.

It was analyzed the time influence of MA on the morphology of the particles of micrometer powders by electron microscopy SEM. To determine the grain shape it has been used the SEM at JEOL 5600 LV microscope, fig.1.

The chemical composition of the high speed steel (HSS) powder was studied using the EDAX analysis, fig.2.



a)

b)

c)

Fig. 1. SEM images of the powders :a) initial powder; b) after 10 hours of milling; c) after 20 hours of milling

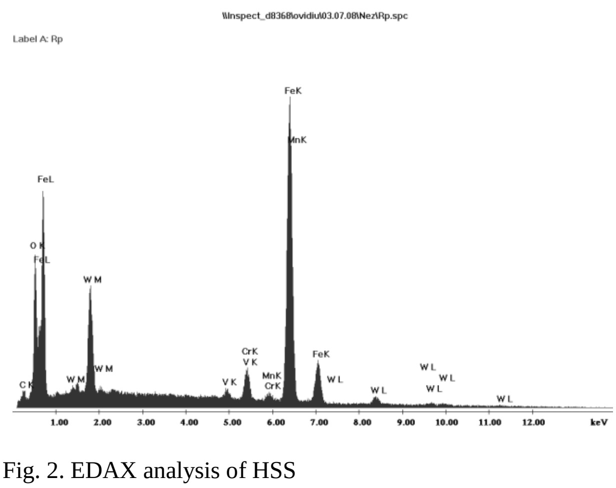


Fig. 2. EDAX analysis of HSS

The recovered samples were obtained through unilateral compacting techniques at pressures of 600 and 800 MPa The green densities evolution function the milling time and the pressing forces are presented in the figure 3.

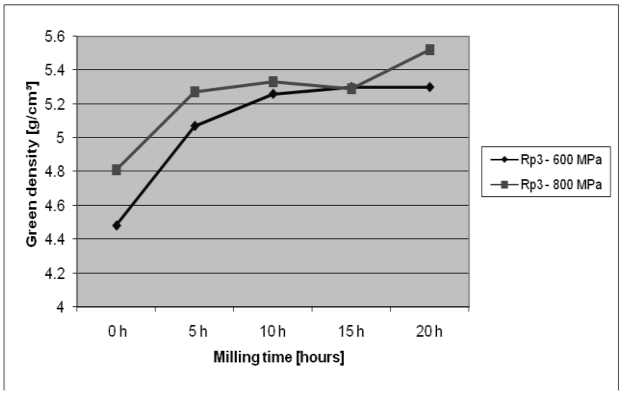


Fig. 3. Green densities evolution

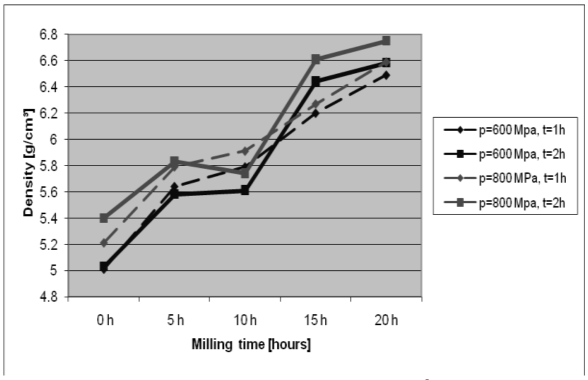


Fig. 4. The densities of sintered parts at 1250 °C

The samples were sintered in an electrical owen using Argon atmosphere at 1150 °C, 1200 °C 1250 °C, 1 hour and 2 hour. After sintering, the box was cooled in furnace into the protective argon atmosphere. Figure 4 present the densities of the samples sintered at 1250 °C with dwell time at the sintering temperature of 1 and 2 hours. The hardness of the samples was studied and is it was presented in figure 5.

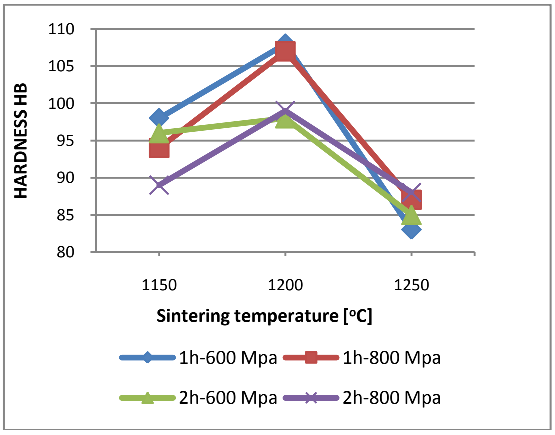


Fig. 5. Evolution of hardness function the sintering parameters

The samples were submitted to wear forces on a tribometer type TRB-01-02541 and a profilometer type TRB-0-WM-0000. As a result of the experimental research conducted we obtained important correlations between wear resistance and the morphology of the high speed steel recovered powder, compacting pressure and sintering temperatures.

In Fig.6 and Fig. 7., can be see the evolution of the friction coefficient versus sintering temperature and pressing force.

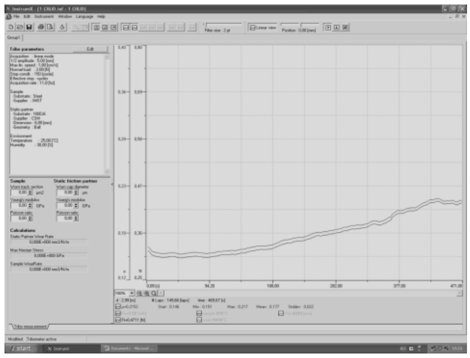


Fig. 6. Friction coefficient of the sample pressed at 800 MPa and sintered at 1250 °C with dwell time of 2 hours

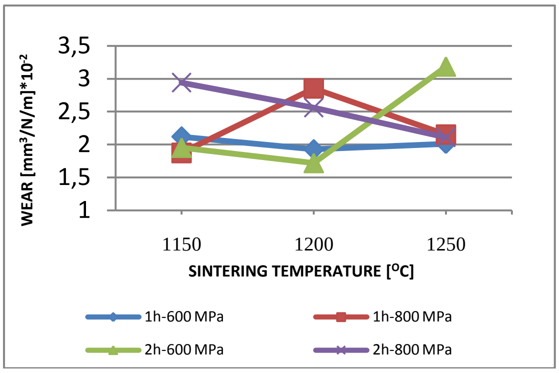


Fig. 7. Evolution of wear function the sintering and compaction parameters

3. CONCLUSION

The experimental work lead to the following conclusions:
Recycled steel powder can be produced using steel scrap in the planetary milling process;
During the milling, the scrap is laminated, micro-forged, cracked continuously, and then finally formed into a spherical shape powder; The size and shape of the spherical powder produced depend on the milling time.
Increasing the milling time will reduce the size of the powder and produce spherical-like powder.
The best values at the coefficient of friction have the HSS produced from recovered chips obtained by milling for 20 hours , pressing for 800 MPa and sintered of 1250°C and dwell time 2 hours.

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