

## THE HEAT TREATMENT OF PUNCHES FROM OSC10 THROUGH ION NITRIDING

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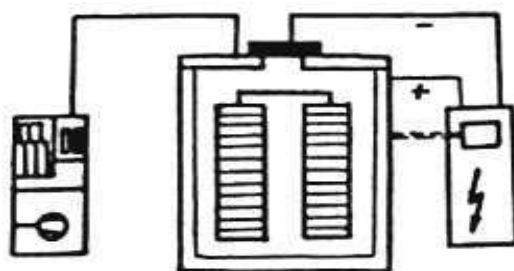
**ABSTRACT:** Ion nitriding is a modern method of nitriding, through the nitrogen is incorporated superficially using the luminescence discharge concentrated energy from plasma jet type. The electrical particles charged concentrated of ions and electrons level constitutes the activation medium.

**KEY WORDS:** ion nitriding, punch, structure.

### 1. INTRODUCTION

It use the adequate installations, like in fig.1, composed of a electrically heated vacuum furnace, the dispenser of gas, electric instalation, a vacuum system at one degree from 10 Torr. The pieces being treated are placed in the furnace and electrically isolated. With the help of

electrical installation is obtained active gas plasma state, applying a constant voltage of 1500 volts between the furnace wall and workpieces. By increasing productivity is necessary that these parameters to be higher, but all of these depend on the quality of processed material.



Instalatia de ionitrare

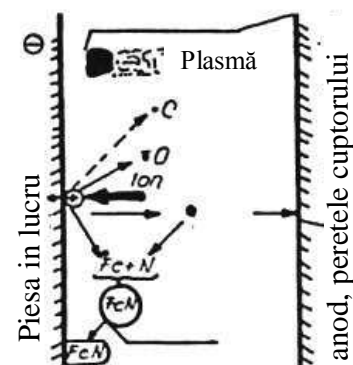


Fig.1 The installation of ion nitriding

The pieces are connected to the negative pole and the furnace wall to the positive pole. The dissociation  $NH_3$  is possible due to power failure, when it comes to the ionization, the atoms with oriented permanent positive ions to the cathode (part treated) and electrons to the anode (the furnace shell). The kinetic energy of the ions who falling on the surface It is converted into heat and energy for diffusion into the interior material from pieces.

The nitrogen forms  $FeN$  the iron nitride, which then decomposes by giving less nitrogen rich phase as  $Fe_2N$ ,  $Fe_3N$ ,  $Fe_4N$ , which diffusing. With this technique is nitriding mportant parts like shaft of rolling mill, laminating cylinders for paper pulp, pumps, compressors, etc. which improve fatigue resistance, wear resistance, hardness etc.

## 2. THE METHOD USED

The hardness reach values between 700-900 daN / mm<sup>2</sup>, with depths

of 0.1 ... 0.2 mm working temperature is between 400-600°C. For punch in OSC10 it improved temperature on which the operation was 520 ° C Figure 2.

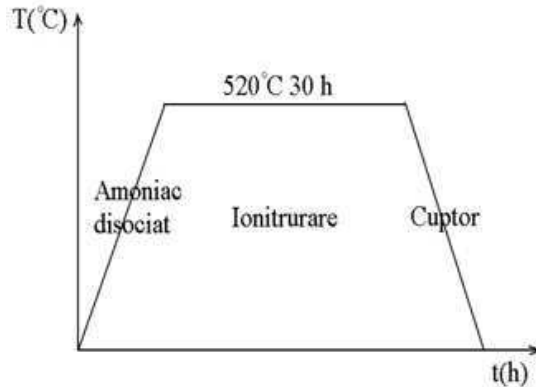


Fig.2 The heat treatment of ion nitriding

The maintaining time was 30 hours and the cooling was performed with the furnace. The resulting nitrided coating depth was 0.2 mm and hardness was obtained by the method HV0,5 640 daN / mm<sup>2</sup>. The microstructure of the nitrided coating is shown in figura.3.



Fig.3. The structure of OSC10 nitrided 100 X

In the figures 4-5 presents the the images are viewed from side and front with enlarged details from 6X for tooling variants researched.

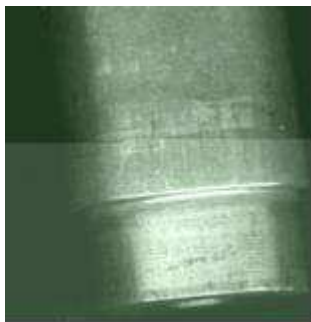


Fig.4. The punch OSC10 nitriding

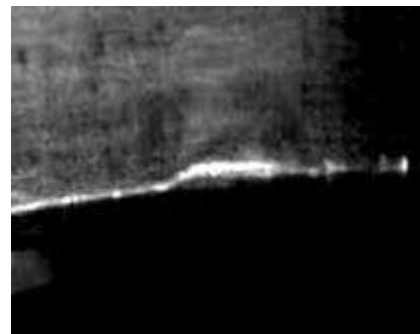


Fig.5. The edge of punch OSC10 nitrided - 6x

## 3. RESULTS:

Plastic deformation structures 15x magnification are obtained by stamping with cutting tools of used by 16000 hits.

The penetration of the punch in semi-finished pieces it was progressive, and at each step the advance was approximately 0,33mm.

The separation of the material is executed with two associates and contains three characteristic phases which are indistinguishable by the appearance that it has in those areas, resulting surface after cutting of the material.

These phases are: phase of solicitations in elastic conditions of the material, this area has appear reflective; phase of solicitations in elastic conditions of the material it looks sleek specifically

sliding separation, fig.6-11; phase breaking, looks grained, fig.12.

Fig.10

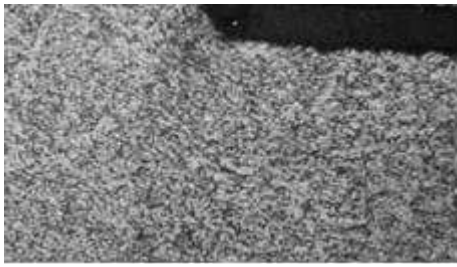


Fig.6

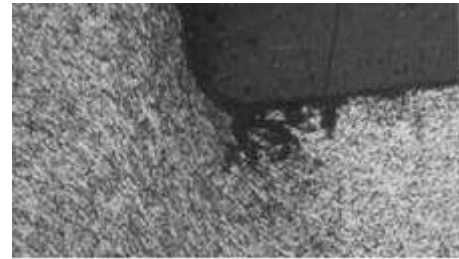


Fig.11



Fig.7



Fig.12

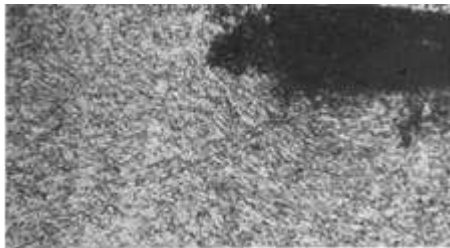


Fig.8

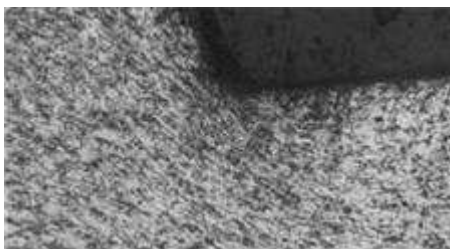
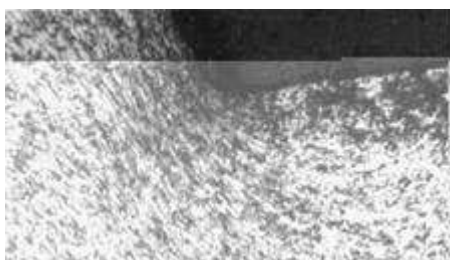


Fig.9



#### 4.CONCLUSIONS:

It is observed both of the forms of wear, front and side fig.4-5. occurring as a result of phenomena adherence (contact), abrasion, superficial weariness. Analyzing the exterior appearance of the cutting edges of used punches it is observed sticking traces, the wear on the lateral surface, plastic deformation, dislocation of material.

After a careful analysis of deformation produced by used punch in semi-finished sheet it detach the following conclusions:

- In the first phase the solicitations produce at the material elastic deformations and plastic partially, this recovering dimensional but not totally. of the material The structure of the material is slightly deformed; in this phase the tensions are small.

- in phases 2-6, fig.6-11, when pressed increase the tensions from the material increase, plastic effects is accentuates and it is producing the deformations of the crystal lattice; it can

be observed distorted fiber, fiber orientation and increase the tensions.  
- in phase 7, fig.12, phase of shearing, it is observed crack propagation in the semi-finished material when it can not take over the efforts.

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