The Influence of Thermal Shock on Zn-Ni Surface in the Automobile Industry

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***Abstract**: The aim of this research is, to investigate the influence of thermal shock on parts surface treated with galvanizing. On the chosen components was performed the method Zn-Ni surface treating on bath line. After the surface treatment the components were embedded in to the thermal shock chamber, where was performed a thermal shock examination. In the upper chamber had been set plus 180 degrees Celsius, in the bottom chamber minus 30 degrees Celsius. The components were disposed 15 minutes in the upper chamber and 15 minutes in the bottom. The transition between the upper warm chamber and the bottom cold chamber is provided by leading spindle system. Therefore the duration of one cycle was 30 minutes, and the duration of complete examination was 300 cycles, i.e. 150 hours. The research showed that the chosen thermal shock has no influence on the surface treatment.*

***Keywords**: surface treatment, thermal shock, galvanizing.*

INTRODUCTION

Rising of technical levels, applied attributes, quality and reliability machine products belong to general directions of economy.

The aim of surface treatment is to reach the desired properties [4,6,7,8,11,15] and to protect the surfaces of components from long-term side effects [12,13,19,20]. The aim of thermal shock test is to check the resistance of surfaces against corrosion or any other defects. Several authors deal with surface treatment. [1,2,3,15,17] With the surface treatment dealt several authors. [9,10,14,16,]

MATERIALS AND METHODS

Zn-Ni surface treatment on galvanizing bath line

The most important processes during the suspension galvanizing are degreasing and rinsing. They are preformed before the application of coating. The galvanizing process takes place twice a week in acid bath and is followed by repeated rinsing.

In our research, we used 5 same components, which are used in vehicles. On the components was performed the suspension galvanizing process. The thickness measurement was carried out with an X-Ray machine, type Fischerscope X-Ray DLB.

During the measurement the value of the thickness was lying in the volume of 9 - 12 microns. The requirement of the thickness value is between 8 and 13 microns.

Fig. 1. The controlled component

Thermal shock test

The spinner thermal shock chambers are the new developments of the manufacturer Angelnatoni. Compact, 130-liter space-and energy-efficient, dual-chamber thermal shock chamber.

Fig. 2. Angelnatoni Spinner thermal shock chamber

The aim of the thermal shock test is to check the resistance against extreme temperature changes. The maximum temperature of the upper chamber can be plus 220 degrees Celsius, and the in the bottom it can be minus 80 degrees Celsius. In our case the upper chamber was heated on plus 180 degrees Celsius, and the bottom chamber was cooled on minus 30 degrees. The transition between the upper warm chamber and the bottom cold chamber is provided by leading spindle system, in less than 10 seconds.

During the test, the components were placed 15 minutes in the warm chamber, after that time the leading spindle moved the components in to the cold chamber, where the components were also 15 minutes. Therefore was the duration of one cycle 30 minutes, and the whole cycle consisted of two phases: the warming and the cooling. The test lasted 300 cycles, i.e. 125 hours.

RESULTS

After the test period we controlled visually the components, looking for the sights of corrosion. The white corrosion means, the surface is getting damaged, by the red corrosion is damaging the raw material.

Figure 3 shows the comparing of the original component with the component after the thermal shock test. As we can see, after the test on the component is appearing slightly white corrosion.

Fig. 3. Comparing the components

For the precise material control we used a focus microscope - manufacturer Alicona, type Infinite Focus. Figure 4 consists 2 pictures, and they was made with the Infinite Focus microscope. Each picture consists of matching 8 scanned pictures. The right picture shows the investigated surface, with slight white corrosion, but without a sign of red corrosion, which can damage the raw material. The left picture shows the height difference on the scanned surface, which is shown in color difference. The yellow color on the figure indicate the highest point on the surface, the pink color indicate the lowest point.

SUMMARY

In this research we investigated the influence of thermal shock on components surface treated with galvanizing. Corrosion is one of the defects due to which we must replace the components on cars. The galvanizing surface treatment has been made to fulfill the customer’s requirement. After the thermal shock test the visual control hasn't showed any sights of red corrosion or other defects. The more detailed microscope control also showed that on the controlled part was no sight after red corrosion. The thermal shock test showed that this kind of material testing is also needed by the surface treatment.

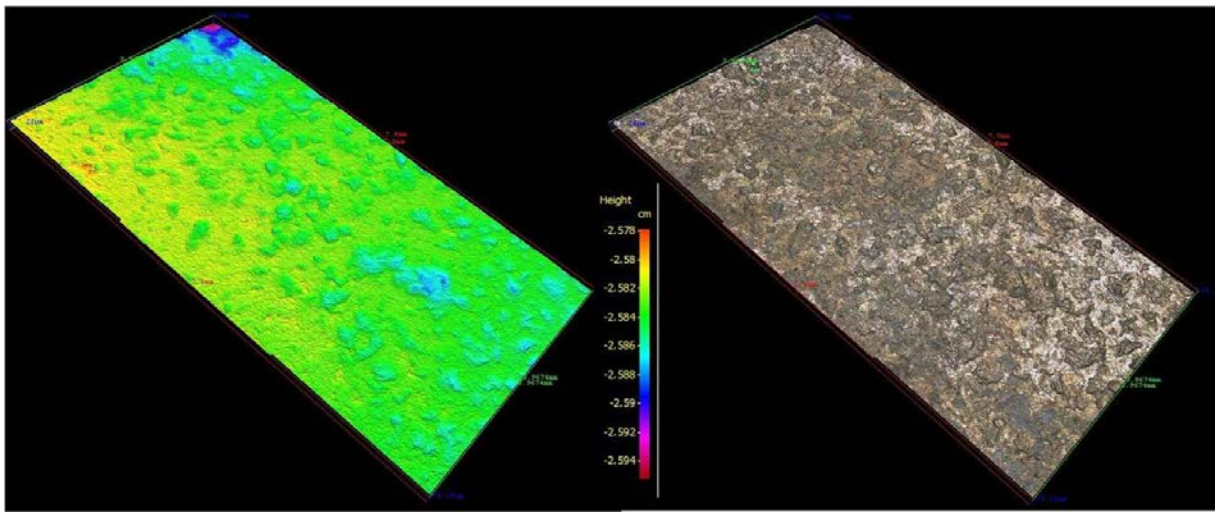

Fig. 4. Surface comparing

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