Controlling and testing methods in the surface treatment

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Abstract: This research contains an investigation of surface treatment and corrosion stability. The surface treatment was performed on the galvanizing bath-line, it was provided the method Zn-Ni. After the surface treatment the controlled components were investigated in the corrosion chamber and thermal shock chamber. After these tests, The thickness measurement was carried out with an X-Ray machine, type Fischerscope X-Ray DLB.the investigation showed that the thermal shock has no influence, but the salt spray test has a big influence on the surface treatment.

Keywords: surface treatment, thermal shock, galvanizing.

Introduction

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

Material and energy- saving more environmental friendly technologies have an increasingly important role in industrial practice. Machining, work load and special requirements have to be related to the product mass at the lowest acceptable volume.

The aim of surface treatment is to reach the desired properties [2, 3] and to protect the surfaces of components from long-term side effects. The aim of thermal shock test is to check the resistance of surfaces against corrosion or any other defects. Several authors deals with surface treatment. [1, 7]. With the surface treatment dealt several authors. [4, 5, 6].

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 weak in acid bath and is followed by repeated rinsing.

In our research, we used components, which are used in vehicles. On the components was performed the suspension galvanizing process, method Zn-Ni.

Salt spray test

The most commonly used salt spray test is the long-term investigation. Generally the long-term investigation consists of several hundred hours continuous testing. The cyclic salt spray test consist not only salt spray test, but also condensation, drying, etc. During the test we put the tested components in the salt spray corrosion chamber, which was made from the manufacturer Liebnisch Labortechnik tip SKB TR-1000 A.



Fig.1. The controlled components



Fig.2. Corrosion chamber

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.3. Angelnatoni Spinner thermal shock chamber

The aim of the thermal shock test to check the resistance against the extreme temperature changes. The maximum temperature of the upper chamber can be plus 260 degrees, and the in the bottom it can be minus 80 degrees.

Thickness control



Fig.4. Fischerscope X-ray and Mikrotest

The thickness measurement was carried out with an X-Ray machine, type Fischerscope X-Ray DLB and Mikrotest G6 (Fig. 4). The X-Ray device measures within 6 second not just the value of layer thickness, but also the composition percentage of the layer. During the measurement, the measured surface must by perpendicular to the X-Ray beam. The device Mikrotest G6 is a hand unit device, which is used for the thickness coating control in production. With the device Mikrotest G6 we can measure in a range up to 100µm.

The surfaces of the parts were observed by Alicona Infinite Focus microscope. Infinite Focus is an optical 3D micro coordinate system for shape and roughness measurement. Measurements achieve a vertical resolution of up to 10nm. This system also operates on large measurement areas and volumes. Its results are traceable and ensure repeatable accuracy. Users benefit from these features, those of a coordinate measurement system and those of a surface measurement instrument.

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.



Fig.5. Controlled sample after the salt spray test

Figure 5 shows the influence of the salt spray on surface treatment. The components were surface treated with the method Zn-Ni, after the treatment they were tested in the salt spray chamber during 460 hours. After this period the surface was damaged.



Fig. 6. Microscope investigation after salt spray test - 133 -

Figure 6 shows the result of the microscope investigation with the Alicona Infinite Microscope. As the figure shows, after the salt spray test the raw material is damaged.



Fig.7. Microscope investigation after cyclic salt spray test

Figure 7 shows the result of the microscope investigation with the Alicona Infinite Microscope. The cyclic salt spray test has no influence on the surface treatment.



Fig.8. Thermal shock investigation

Figure 8 shows the result of a thermal shock investigation. In our case the upper chamber was heated on plus 220 degrees, 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. The duration of the investigation was 300 hours.

Summary

In this research we provided the method surface treatment Zn-Ni on bath line. After the surface treatment was performed a salt spray test, a cyclic salt spray test and thermal shock test. After the tests the surface was investigated with an X-Ray device and Alicona Microscope. As the research shows, the long-time salt spray test has a big influence on the surface treatment. The X-Ray and Microscope investigation shows a detailed analysis.

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