Determination of coating thickness applied by Zn-Ni method

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Abstract: *This research deals with the evaluation of the surface treatment with galvanizing on parts with grinding machining. The aim is to check the coating thickness on the surface, which was machining by grinding. During the research was used 10 pieces of components. On these pieces was performed the grinding machining, and was achieved roughness Ra 0,59 µm on each. After the machining was performed the galvanizing method ZnNi on the bath-line. During the galvanizing process the parts obtained a thickness value from 8,5 µm to 11,1µm. After this research we can conclude, the smoother roughness receives less coating, but the galvanizing process satisfies the company's requirements.*

Keywords: *grinding machining, bath line, surface treatment*

Introduction

Applying coatings has its foundation in a manufacturing sector. In the modern times there are increasing demands on the quality and reliability of the components in the automotive industry. These components are exposed to various stresses during their functionality and life-time. Devaluation, damage and the loss of the function of the components cause the damage of the surface, corrosion and wear.

The aim is to increase the quality by applying layer on material and thus to prolong the service life, increase depreciation resistance in operation and ultimately cost savings. Several authors dealt with the surface treatment [1, 2, 3, 4, 5].

Grinding machining

On the components was performed the grinding machining. With this method we obtained the value of roughness 0, 59 µm on each part. Figure 1 shows the controlled area. The surface roughness was controlled with Mitutoyo Surfacetest 301.

Fig.1. Controlled area

Fig.2 Mitutoyo Surftest 301

Surface treatment ZnNi on suspension galvanizing bath line

The galvanizing process ZnNi is divided into several operations. The most important processes are degreasing and rinsing, which are performed before the application of galvanizing. At the beginning of galvanizing process, the chemical degreasing is performed by 65 degrees -75 ºC and checked visually followed by pickling and cathodic - anodic degreasing in degrees 45 to 65 ºC and at a current of 1000 A. The galvanizing process takes place twice a weak in acid bath and followed by repeated rinsing and thick filmed passivation. At the end are used the conservation and drying processes at 60 to 90 ºC.

During the research we used 10 pieces from the same elements. Each one of these elements had the same value of roughness, which was performed during grinding machining. Before the galvanizing process we measured the roughness with Mitutoyo Surftest 301. After the galvanizing process we measured the thickness coating with an X-Ray device Fischerscope X-Ray XDL-B.

Table 1.
Technological process of galvanizing baht line

Nr.	Operation
1.	Slouch
2.	Chemical degrease I
3.	Chemical degrease II
4.	Cold swill
5.	Bating
6.	Cold swill
7.	Electrolytic degrease
8.	Activation
9.	Cold swill
10.	Dipping
11.	Zinc coating Zi-Ni
12.	Zinc coating Zi-Ni
13.	Cold swill
14.	Activation
15.	Cold swill
16.	Passivation
17.	Cold swill
18.	Gutter + blowing
19.	Sealing - in
20.	Drying – bitter air

Surface treatment measuring

Fig.3. Fischerscope X-Ray XDL-B

Table 2.

Measured data

Nr.	ZnNi (µm)	Ni (%)	Zn (%)
1.	8,3	13,1	86,9
2.	9,2	13,7	86,3
3.	11,7	14,3	85,7
4.	11,1	14,1	85,9
5.	10,8	13,9	86,1
6.	9,4	13,6	86,4
7.	9,7	13,7	86,3
8.	10,2	13,9	86,1
9.	8,5	13,3	86,7
10.	8,5	13,3	86,7

Table 2 describes the measured data of the surface treatment. It also contains the ratio of Nickel and Zinc. the ratio of Nickel can't be higher as 15 %, the ratio of Zinc can't be lower than 85 %.

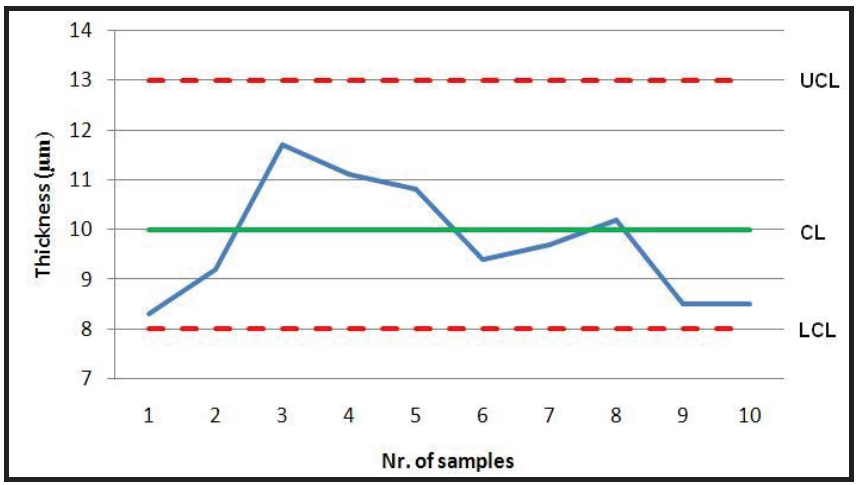

Fig.4. Measured data

The Picture 1 includes the measured data of the thicknesses of the coating in the tolerance space terms. From the measurement requires that the acquired values lying in the required volume. The medium volume of the thicknesses is 10 micro-young, which is marked as the CL and means Central Line. The marking UCL means Upper Control Limits, and the marking LCL means Lower Control Limits.

Ending

In this research we controlled the surface treatment on elements, which surfaces was machined with grinding. After the machining was performed the galvanizing ZnNi bath line method. The highest thickness coating was 11,7 micro-young, and the lowest 8,3. The requirements are between 8 and 13 micro-young. With galvanizing on surface machined with grinding can we obtain thinner layer, as on the surfaces treated with other methods.

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Докладът е рецензиран.