

## Valuation of the technologies of surface treatments for automobile components

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### Abstract

This research deals with the valuation of the process technological modifications. The aim is to select the method of a surface treatment and control the thickness of the deposited material on the surface of the chosen component. The method Zn-Ni was performed in a bath line, which has a standing practice of a technological method. After the dab of the thickness has been practiced a test on a X-ray device FischerScope XRAY XDL-B. The deposited material reach in a five points of measurement thickness from 11 till 13,4 micro-young, reach in a five points of measurement thickness from 11 till 13,4 micro-young. The customer requires, that the measured thickness reach the value in the range 8 till 15 micro-young. From the measurement results, that the acquired values are lying in the required area, and the company satisfy the customer's request.

**Keywords:** surface treatment, coating thickness, bath line

### 1. Introduction

In general surfaces are not perfect. However, in our daily life we communicate with objects mainly through their surfaces. Surface and coating technologies on one hand improve existing materials and products; on the other hand they are indispensable for the realization of innovative products based on particular properties of thin films [2].

Raising of technical levels, applied attributes, quality and reliability machine products belong to general directions of economy. The material and from they produced ware are during all their lifetime treat settings and functional straining, whereby request stability their original attribute and appearance. Abbreviation pot-life and loss reliability be often caused with devaluation surface of the material, primarily corrodible effects and wear.

The aim of the surface treatment is obtain required facilities and surface condition the materials, which be needed for its optimally function. With the surface treatment dealt several authors [2, 3, 4, 5, 6, 7]

### 2. Methodology

#### Continuous adjustments of metals

Convenient surface preparation insure adequate cohesion of the final coat, equable appearance of the consequential adjustments, and her good resistance against the corrosion and wear. Surface treatment is usually two – stage and separates on two primer groups of work operations:

- Mechanical surface treatment,
- Chemical surface treatment.

#### Chemical surface treatments

Chemical or electrochemical surface treatments have they meaning first of all in the removing of the contaminations from the surface of the materials before the following modifications:

- Grease removal,
- Bating,
- Curtailing,
- Polishing.

#### Electrochemical (galvanic) metallization

The technology of the galvanically secreted metals and the alloy is known a long time, and this from the creating coatings on the models with difficult shapes pending thin coatings on the objects with the aim to protect the surface first of all against the corrosion.

The basis for this department creates electrochemical actions, and this changes the electrolysis parallel in the galvanic articles.

The composition of the electroplating solutions is very miscellaneous. However, for all that's a bargain, that the structure of the bath is expected to be most equable, this means that in the bath may not happen a self decomposition of the effective components. that in the bath may not happen a self decomposition of the effective components. The option of the technological progress depends on the types of components, types of baths, depends on the surface conditions of the components and from the technological equipment of the galvanic engines [1].

The devices of the electroplating works we can divide into these groups:

- Baths, airtechnic devices, preparations, preparations,
- Filtering and ancillary devices,
- Mechanization and automation resources,
- Devices for the preliminary treatment or to finishing surface modifications.

The primer scheme of the technological process for the galvanic metallization:

- Chemical grease removal,
- Rinsing,
- Electrochemical degreasing,
- Rinsing,
- Bating,
- Rinsing,
- Metallization,
- Rinsing,
- Drying.

### 3. Surface treatment Zn-Ni on the bath line

The process is divided in to several groups, from those the most important is the process of the grease removing and cleansing away the components. The grease removal takes place on several levels and in several bathtubs, because before the single surface modification is this process very important. After the grease removing in one bathtub the components passing along of a swirl and after that follows another grease removal process. After an ideal grease removal and cleaning the parts passes in to the process to "activate" the surface of the parts, after that the parts can accept the material Zn-Ni. After the activation of the surfaces of the parts follows the coating, concretely the applying the coat Zn-Ni. After this process follows against the swirl and consequently the passivation, which will increase the resistance of the parts against corrosion. The last of the processes is the drying, which runs through in the hot air, over 70 – 100 °C.

Tab. 1 Technological process of surface treatment on a bath line

Nr.	Operation	Time (min)	Temperature (°C)
1.	Slouch		
2.	Chemical degrease I	6,5	60-75
	Chemical degrease II	6,5	60-75
3.	Cold swirl	3 x 0,5	r.t. **
4.	Bating	6,5	r.t. 20-40
5.	Cold swirl	3 x 0,5	r.t.
6.	Electrolytic degrease	1-4	40-60
7.	Cold swirl	2 x 0,5	r.t.

8.	Transport	0,5	r.t.
9.	Activation	0,5 – 1	r.t.
10.	Cold swill	2 x 0,5	r.t.
11.	Dipping	0,5	r.t.
12.	Zinc coating Zi-Ni	48,72	33-37
13.	Zinc coating Zi-Ni	48,72	33-37
14.	Cold swill	4 x 0,5	r.t.
15.	Activation	10-30 sec.	r.t.
16.	Cold swill	0,5	r.t.
17.	Passivation	0,5 – 1,5	35 – 45
18.	Cold swill	3 x 0,5	r.t.
19.	Passivation	0,5 – 1,5	20 – 30
20.	Cold swill	3 x 0,5	r.t.
21.	Gutter + blowing	1 – 3	r.t.
22.	Sealing - in	10 – 60 sec.	15 – 30
23.	Gutter + blowing	1 – 3	r.t.
24.	Sealing - in	10 – 60 sec.	15 – 30
25.	Drying – bitter air	14,5	70 - 100

\*\* room temperature

Table 1. describes a concise technological progress of surface coatings in a bath line. The first column specifies the number of the operations, the second column describes the given operation. Next follows the during times of the operations in minutes and the temperatures in °C.

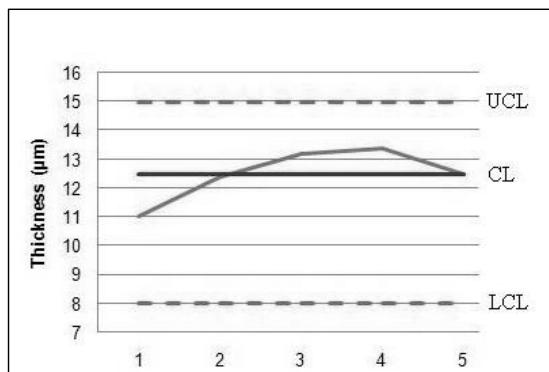
#### Control of the thicknesses the coating deposited materials

After the cool down we randomly picked out a component part, on which we measured by X-ray machine Fischerscope XRAY XDL-B the thickness of the coating. The points, on we maked the measurements, were they ostensible by customer, also the tolerance dounds, in they the measured attributes should to set.

Tab. 2 Measured data

Nr.	NiZn (µm)	Ni (%)	Zn (%)
1.	11,0	13,5	86,5
2.	12,4	14,0	86,0
3.	13,2	13,9	86,1
4.	13,4	14,0	86,0
5.	12,5	14,2	85,8

Following the methodologist, on the components we practiced 5 measurements. During the measurements we gained thicknesses value of the coating from 11 till 13,4 micro-young. The results are visible in the tablet nr. 2.



**Fig. 1 Verified thicknesses of the deposited materials of the coating**

The figure 1. includes the measured data of the thicknesses of the coating in the tolerance space terms. In our case the customer requires, that the thickness coating on the measured place has been in the intervals from 8 till 15 micro-young. From the measurement requires, that the acquired values lying in the required volume. The medium volume of the thicknesses is 12,5 micro-young, which is marked as the CL and means Central Line. The marking UCL means Upper Control Lomits, and the marking LCL means Lower Control Limits.

#### 4. Ending

The company is in the area of surface treatments the most remarkable in Slovakia, it has even abroad a high representation. From this reason is needed, that the worked components gained the quality, which is required from the customer. The surface treatment is important not only for the automobile industry, but everywhere, where the components needed to have a specific visage, protection against external influence and protection against corrosion. After the measured values we can establish, that the process of deposition of coatings used by the company satisfy the customer's request.

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**Докладът е рецензиран.**