

## REPORT CONCERNING THE ANALYSIS OF ZINGA IN COMPARISON WITH HOT-DIP GALVANISATION FOR :

B.V.B.A. ZINGAMETALL

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### 1. Objective of the experiment:

At the request of M. Willemot, Zingametall, Eke, the Laboratory for Technical Chemistry of the University of Gent has compared the protective action of Zinga applied onto a steel surface with the action of galvanised steel. Moreover, research was performed on the influence of the pretreatment of the steel surface on the protective properties of the Zinga coating.

### 2. EXPERIMENTAL

The galvanic action between an unprotected steel surface and a steel surface treated wether by Zinga or by hot dip galvanising is measured by recording the short circuit current flowing between both metals by means of a zero resistance amperemeter. This current is recorded continuously and so is its derivative ( $dI/dT$ ) simplifying the detection of the current inflection point (considered as the end of the reaction).

The enclosed diagram outlines the variation of both, the current and its derivative. The maximum in the derivative is chosen as the point where the protection of the steel electrode by the zinc treated electrodes expires. At this point, the zinc layer on the hot dip galvanised steel has completely disappeared while the available amount of zinc has dissolved on the surface treated with Zinga.

In order to acquire results within acceptable time limits, the tests were carried out in a HCl solution.

The maximum current flowing between the two electrodes is taken into consideration when measuring the quality of the coating protection, while the time spent to reach the

inflection point (maximum on the derivative) gives the real time that the protection will last at the given current.

The surface pretreatment of the steel before applying the paint was as follows:

- Degreasing with alcohol and acetone
- Sandblasting

A first layer ( $\pm 25 \mu\text{m}$ . ) of Zinga was applied immediately after sandblasting. The second layer ( $\pm 25 \mu\text{m}$ .) was applied after polymerisation of the first one.

Whenever the pretreatment is performed in a different way, it will be mentioned in the text.

### 3. Results :

#### 3.1. Comparison between Zinga and galvanized steel.

	Zinga (dry 50 micr.)	Hot-dip (50 micr.)
Max. current	2,5 mA	2,75 mA
Protection time	260 min.	248 min.

The "useful charge" for Zinga is approximately 39 coulombs and 41 coulombs in the case of hot-dip galvanized steel.

Under "useful charge", the charge actually used to achieve cathodic protection of the unprotected steel is ment.

On the other hand a certain part of the available zinc will not be used for cathodic protection because of the auto-corrosion of the layer, as can be deduced from the integral disappearance of the zinc coat in the case of hot-dip galvanization.

Knowing that a layer of  $50 \mu\text{m}$ . of hot dip galvanisation contains approximately 265 coulombs and that only 41 coulombs passed between the galvanised electrode and the unprotected steel indicates that only 15% of the zinc was used for galvanic action.

On the other hand, at the end of the experiment, there was still a substantial amount of zinc present in the Zinga film.

The quantity used for the cathodic protection remained nevertheless the same.

#### 3.2. Comparison between Zinga applied on a dry and a wet steel surface.

In order to estimate the difference in cathodic protection between a Zinga coat applied on dry metal and a coat applied on a wet steel surface, one electrode was sandblasted, dipped in water and covered immediately with a layer of Zinga.

After polymerisation (48 h.) of the first layer, this layer was also wetted and covered with a second layer of Zinga.

The total coating thickness was  $50 \mu\text{m}$ .

The experiment carried out in a H.L. solution gave the following results :

	Zinga (dry; 50 $\mu\text{m}.$ )	Zinga (wet; 50 $\mu\text{m}.$ )
Max. current	2,5 mA	2,75 mA
Protection time	260 min.	416 min.

For an identical coating thickness it appears that the same maximum current is obtained by the Zinga coating applied on a wet surface in comparison to a galvanised steel surface, but the protection period is much longer. This would suggest that the amount of zinc used for cathodic protection has increased considerably.

#### 4. Conclusion:

Under the conditions of the experiment, the Zinga layer appears to have a cathodic protection capacity that is comparable to that of a hot-dip galvanization layer and that applying Zinga on a moist surface has no adverse effects on the protection. On the contrary, it seems that the amount of zinc used is even greater.

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