



LIFE 09 ENV/IT/000185

# MDPATC

NEW ECO-PROCESS OF SUPERFICIAL TREATMENT  
OF THE METALLIC WIRE PRODUCTS

**Dip coating bath:** Functional details and photos

## 1. Functional detail

The main objective of the present action consists in the construction of the hot dip coating bath completely working, able to operate with an optimized ternary alloy Zn-Al-Mg, with which rapidly coat the metallic wire. The system should be able also to treat 1000 Kg/h of metallic wire.

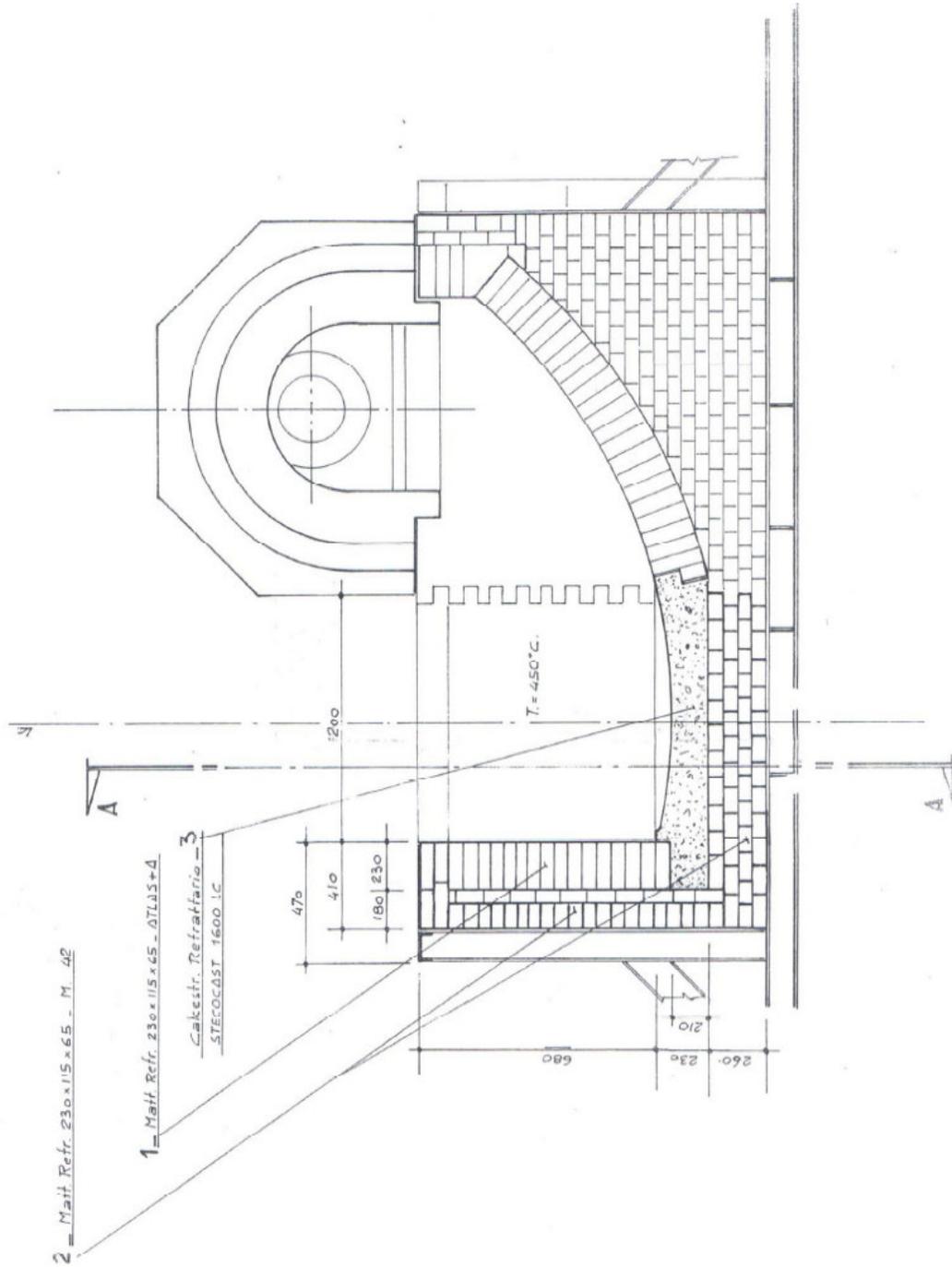
In order to achieve the results mentioned, it was needed the preparation of a bath able to coat the metallic wire with the new coating Zn-Al-Mg. Trafileria e Zincheria Cavatorta has also built all the auxiliary systems necessary to the plant to operate, including the moving system for the wire inside the plant (wrapping and unwrapping systems).

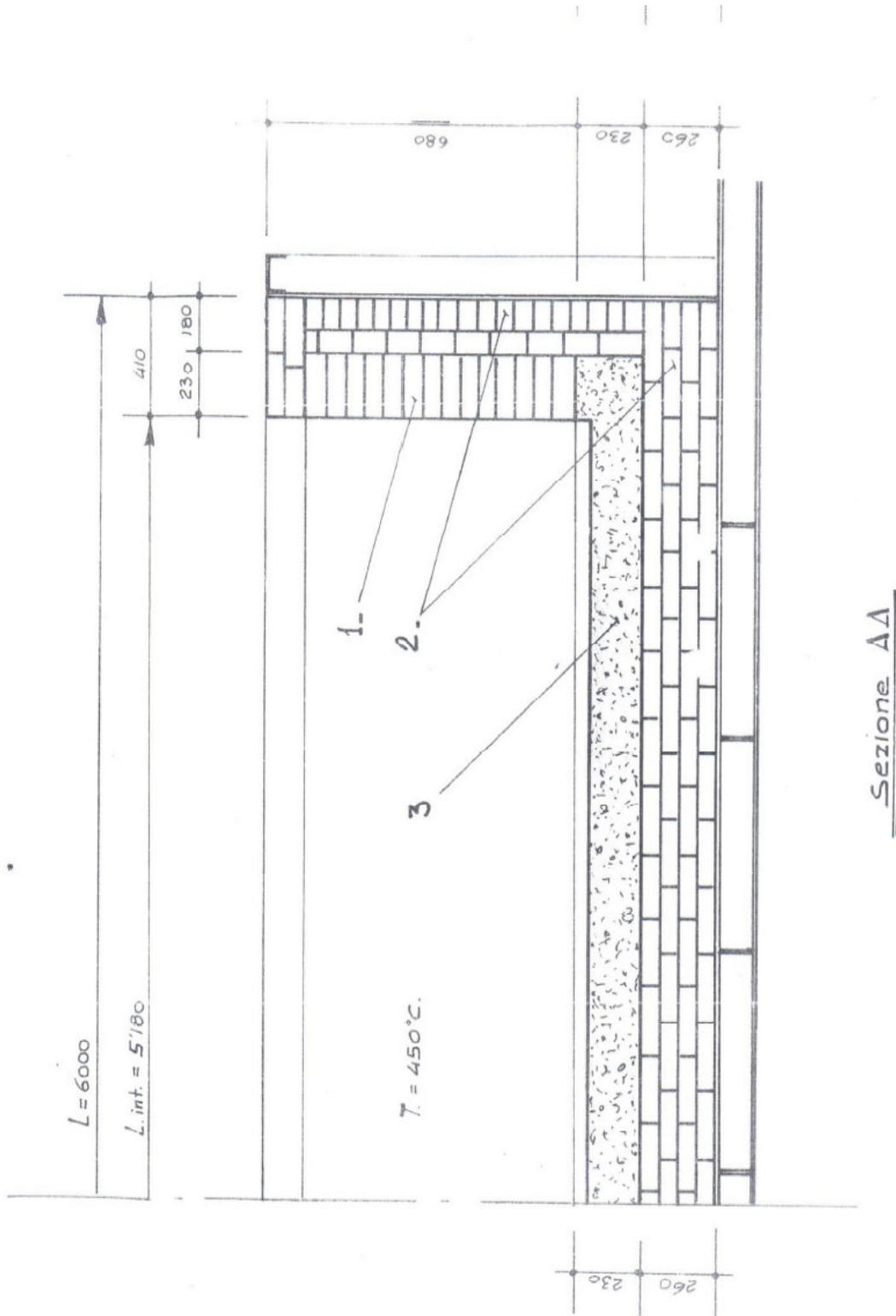
The final system results composed by a complete ceramic pool with metallic structures made of carbon steel. The internal part of the pool is instead made of refractory material, with two different lines composed by refractory bricks, while the external part is composed by insulating bricks, sealed with a particular concrete cement. It has been built and positioned a cover for the pool for bath composed by Zn-Al-Mg in order to contain appropriately the mixture reactions and guarantee the cleanliness of the wire and a better application, not contaminated by external items.

A burning system insures the possibility to reach optimum temperatures.

The burning room is composed by refractory bricks and insulating panels and contains a burning module 30 °-350 °.

## 2. Design of the system





### 3. Composition of the coating bath

The identification of the exact composition of the coating bath was extremely important in order to obtain the results foreseen; at the beginning of the project the coordinator has evaluated different combinations of raw materials able to guarantee satisfactory results from a mechanical and aesthetical point of view. While implementing tests, the staff has implemented experimentations adding also rare earths, able to strengthen the physical properties of the material treated.

Different tests on the composition of the coating bath have shown the futility of such materials since the resulting characteristics of the wire treated with Zn-Al-Mg resulted more than satisfying; a pool has been allocated only for tests on the new alloy in order not to influence the company manufacturing process.

The first tests, before in laboratory and then on field, have shown that the combination of Zn-Al almost allowed to achieve the goals set, in particular, the metallographic observation of the wire shows an intermetallic layer of Fe-Zn-Al alloy between the steel wire and the external layer made of a Zn/Al eutectic alloy. Other tests have shown an improvement in corrosion resistance and improved mechanical characteristics compared to pure Zinc.

The tests carried out have made it possible to increase the percentage of Al compared to Zn. We have in fact already produced anticorrosion coatings with Galvan alloy (Zn: 95% - Al: 5%) for particular products. With the last tests we have achieved an alloy composition made of 85% Zn and 15% Al, increasing the corrosion resistance of the product and consequently its duration, using less raw materials to obtain the same results.

Increasing the percentage of Al in the mixture and adding Mg, even if in a small quantity, the company has been able to achieve the wished results for what it concerns thickness to be applied, wire resistance, homogeneity of the treatment.

The final tests have led, also to the identification of the optimal working temperature and the correct timing of immersion in the bath of the wire.

The treatment temperature of the standard dip coating bath is around 450°C, which determines the production of toxic gasses generated from the evaporation of Zn. The treatment temperature of the baths operating with the new system is around 420°C, therefore less toxic emissions are produced which leads to a better environment.

The coating bath is able to treat 400 Kg/h of product.

The treatment timing in the bath in order to process 1000 Kg of product is around 1 hour and 30 minutes in the case just one wire per time is processed; the coating bath gives the possibility to treat more wires in the same time therefore the working timing can be drastically reduced; in the case 2 wires per time are treated, the resulting time results halved.

The treatment timing depends also on the thickness of the wire; the wire drawing define the thickness of the wire. A small diameter determine shorter timing during coating bath treatment if compared to a wire presenting an higher diameter.

Temperature and application timing in the bath change slightly depending on the composition of the wire, therefore in the final phase of the tests, Trafilera e Zincheria Cavatorta, with the support of the University of Modena e Reggio Emilia has defined the perfect treatment conditions for a variety of different products.

Here below we present some pictured of the coating bath operating with the new bath composition.

## 1. Pictures of the pool

