

## THE STATE OF THE ART

# MODERN CONTINUOUS ZINC WIRE LINE

An adherent zinc layer applied on a steel surface gives the latter a very high resistance to atmospheric corrosion. Thermal Spray, often called Metallized Coatings, is remarkably interesting due to zinc's ductility and ease of applications both in industrial mass-produced processing and handicraft for maintenance and renovation.

**Zinc wire and zinc alloy wire** between 1 and 3 mm is used to apply zinc coatings, via a metal spraying process, by a thermal gun. The wire also finds its application in the electronics industry. SHG (Special High Grade) zinc is of the highest purity (99.995%) and is used in the production process of zinc and zinc alloy wire.

### Therefore the major applications are:

- active cathodic protection for steel structures (e. g. cast iron pipes, steel frames, power distribution pylons, gas cylinders, wind power plants, bridge construction, etc.)
- active cathodic protection of steel reinforced concrete structures
- capacitors (film or paper capacitors)
- air conditioners and heat exchangers
- electrical shielding

Old style technologies for zinc wire are the following:

1. Melt Zn ingot and make Zn billet – Warm up Zn billet and press-extrusion to make rod 8-10 mm and then roll and/or draw rod down to wire – packaging

or

2. Melt Zn ingot and make coils of 12 mm rod by horizontal casting – anneal the 12 mm rod – Draw the rod (2 passes) down to 10.5 mm – roll the 10.5 mm rod down to 3.5 mm – final draw and packaging

In both cases production rate is low and operating cost is high because of the many steps involved, the high scrap percentage, and the intensive energy and labour process.

Properzi instead takes advantage of many

decades of experience in continuous casting of zinc bars and of the excellent capability of rolling the bar to very small dimensions (3.5 mm dia) on a very modern Monobloc mill with 7 to 11 rolling stands designed on the successful 3-rolls technology.

When environmental conditions are more corrosive (such as a marine environment), the ZnAl coating is preferred to pure Zn. One such application is for wind turbine pylons.

However, the two technologies described above are not capable of producing good quality ZnAl Alloys.

Properzi has a strong presence in this market segment both for pure Zn (99.995%) and for the advanced ZnAl 15%.

Each line described in the table on the opposite page is configured in order to permit the production of both zinc and zinc alloy wire with minimum modification and with dedicated furnaces. The furnaces used for zinc alloys cannot be used for pure zinc if not appropriately washed.



*Zinc coating application by spraying method.*

CCR Zinc Rod/Wire Line			
Type	Production (tph)	Yearly production (metric tons)	
		working 5 days/week	working 7 days/week
CCR Zn 1	1	5,100	6,800
CCR Zn 2	2	10,200	13,600
CCR Zn 3	3	15,300	20,400
CCR Zn 5	5	25,500	34,000



The furnaces are very important in order to achieve the lowest melting cost and minimize the loss of material during the melting operation. In particular, Properzi is capable of supplying electrical melting and holding furnaces (induction type) as well as gas-fired melting and holding furnaces. We paid particular attention to the geometry of the burner inside the gas-fired furnace in order to maximize the production rate while minimizing the gas consumption.

A zinc wire manufacturing Plant includes (furnace set, CCR line and wire drawing equipment):

1. **One or two melting/holding furnace(s); they can be tiltable or static, gas-fired or electrical induction type.**
2. **The Properzi casting wheel (horizontal casting).**
3. **The Micro Mill for rod rolling is a monoblock design with nine/thirteen stands. The rolling sequence is round-triangle and the final wire/rod diameter can be approximately 3.5/5.5 mm. The rolling mill is synchronized with the casting machine through a counterweight type bar sensor. The stands are Micro Model and each stand has 3 work rolls with diameter of 170 mm. The high plasticity of zinc, combined with the low working temperatures and the low speeds of the rolling stands, allows a remarkably long life for the work rolls, on the order of years.**
4. **The rod coiler to collect the wire/rod into a basket; the resulting coil will weigh approximately 0.5 to 1.5 tons. The coiler includes a rotary loop-forming pipe driven by a motor which is synchronized to the rolling mill.**
5. **The drawing machine(s), to obtain final wire diameters, and the necessary packaging department.**

The compactness, simplicity, robustness and automation of the Properzi CCR Line, as well as the minimal maintenance requirement which does not need a continuous presence of the operator, allows the entire operation to be carried out by a few operators per shift.

The production of Zn and ZnAl wire can be a very profitable business when considering the wire premium, the ingot premium and an affordable CapEx which permits a very short payback period.

The OpEx of these lines is minimal considering they generally require only 2 persons per shift and incur low maintenance costs.



*Continuus-Properzi zinc line.*