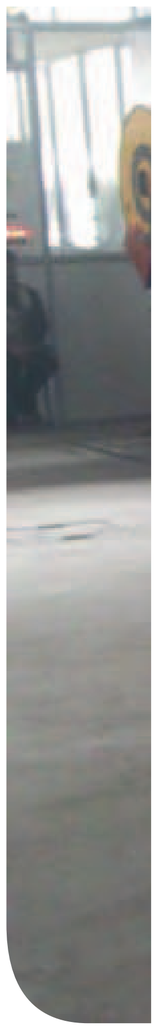
# FROM INGOT TO ZINC WIRE THROUGH PROPERZI TECHNOLOGY





Zinc is a chemical element with symbol Zn and atomic number 30.

Brass, which is an alloy of copper and zinc, has been using since at least the 10th century BC in Judea and China and since the 7th century BC in Ancient Greece and Italy but at that time zinc was only known as a zinc-bearing mineral called calamine.

An Englishman, William Champion, is believed to be the first to have industrially produced metallic zinc. In fact, in 1738, he patented a furnace complete with an external condenser (note that zinc evaporates at 920°C) and equipped a small factory near Bristol where more than 200 tpy of metallic zinc were produced starting in 1760. Also, Andreas Marggraf and Anton Von Siwab are regarded as 'zinc' pioneers of the same period.

Based on its low melting point, 419°C, pure zinc has really modest physical properties and therefore its use is very limited in the engineering field. However, it's largely employed in the preparation of alloys, for roofing sheets and, when combined with small amounts of copper and aluminium, it forms a series of excellent alloys for die casting in different fields. Alloys with higher aluminium percentage content are used for shell castings.

For sure, the most important application of zinc comes from its chemical properties, for instance its high resistance to atmospheric corrosion: an adherent zinc layer applied on a steel surface gives the latter a very high resistance to atmospheric corrosion. This phenomenon is a consequence of the different electro-negativity value of the two components which causes a preferential zinc corrosion in favor of steel protection.

Among the different systems to protect steel by means of the zinc, metal spraying is remarkably interesting due to zinc's ductility and ease of application both in industrial mass-produced processing and in handicraft for maintenance and renovation.

In fact, metal spraying consists in spraying molten zinc on the steel surface to be treated, using special guns which are fed with extremely pure zinc wire. Zinc is melted in these guns with a mixture of oxygen-acetylene, oxygen-propane or through an electric arc and further ejected and melted into very small drops on the surface to be treated.

Typical applications range from simple treatments of handrails up to complete treatments of petrochemical works, bridges and pylons.

Typical application of coating with zinc wire

Typical view of Properzi Zinc Wire Line –
by courtesy of Koshla Engineering – India



Obviously between these two extremes lies an enormous quantity of different components that are subject to corrosion.

If we consider the large variety of applications, the different types and brands of guns and spraying systems, and the necessity of applying different quantities of zinc depending on the final use of the treated materials, then the market must offer ample quantities of either pure zinc or zinc-aluminium (up to 15% Al) alloy wire with precise physical, mechanical and geometrical properties in diameters ranging from 1.2 to 3.2 mm. Additional diameters outside this range are less common, but also need to adhere to the above characteristics. For some applications the zinc-aluminium alloy wire is even more appropriate than the pure metal.

During the year 1947 Ilario Properzi, the founder of the Continuus-Properzi S.p.A., patented the first Continuous Casting & Rolling (CCR) Line producing directly nonferrous wire from ingot. One year later the system was applied to zinc.

Continuus-Properzi S.p.A. is able to produce zinc CCR Lines ranging from 1 tph up to 5 tph, or more, to fulfill our customers' specific needs.

## One zinc wire manufacturing system includes:

**1.** One or two Melting/Holding Tiltable or Static Furnace(s). The furnace(s) can be gas fired or electrical induction type.

**2.** The Properzi Casting Wheel (horizontal casting).

**3.** The Rod Rolling Mill monoblock with nine/thirteen stands Micro model. The rolling sequence is round-triangle and the final wire/rod diameter can be approximately 5.5/3.5 mm. The Rolling Mill is synchronized with the Casting Machine through a Counter Weight type bar sensor. The Stands are Micro model and each one includes 3 work rolls.

The high plasticity of the 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 a few 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.

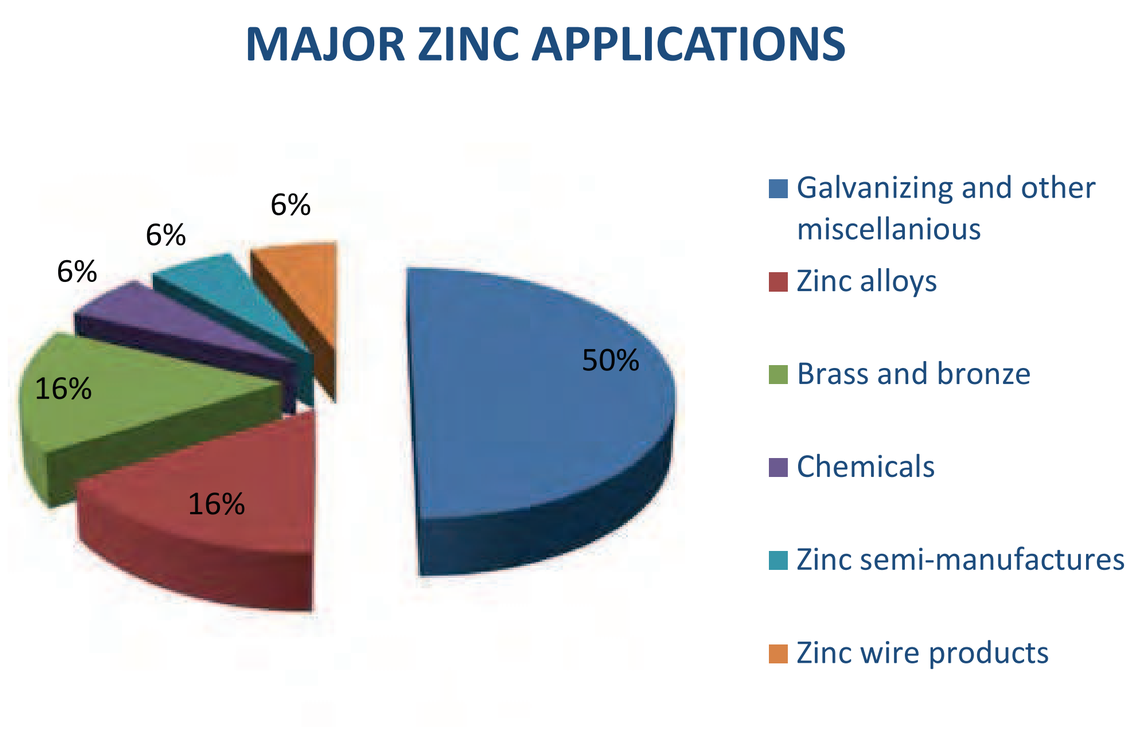
**5.** The manufacturing system is completed with the Drawing Machine(s) to obtain the final required zinc wire diameters and the appropriate packaging department.

This requires a total area in the range of only 800 to 1,000 $m^2$ which also includes the area for stocking the raw material and the final product.

The compactness, simplicity, robustness and automation of the Properzi CCR Line, as well as the minimal maintenance requirement coupled with horizontal pouring which does not require a continuous presence of the operator, allows the entire operation to be carried out by only a few operators per shift (3 to 4 persons).

From the practical experience of our customers, a complete facility may be justified with a production requirement of only 2,500 tpy.

*By M.N.*




Study of major applications of zinc world-wide