

# Achieving premium quality copper rod

The reliability and the performance of Properzi CCR lines remains unparalleled for the production of copper rod, whose quality exceeds the ever more stringent demands for fine wire, ultra-fine wire, as well as magnet wire production in modern industry.



From liquid metal to high quality copper rod through Properzi technology. Photos: Properzi

The brilliant mind of Ilario Properzi invented the Continuous Copper Rod manufacturing system back in the 1960s. All of a sudden, the existing and consolidated wire-bar rolling mills became obsolete, while other companies strived to copy and replicate this original, successful idea.

As the best raw materials unfortunately do not come at the cheapest price, the Properzi advanced technology facilitates mitigation of the adverse effects that more price appealing cathodes may sometimes have on the final rod quality or productivity.

Continuous-Properzi CCR lines were conceived ahead of their time, and still are. Our vast experience, consolidated over many years, from numerous lines spread around the globe, allows the Properzi lines to evolve and improve, enabling the end-users to produce premium quality wire-rod in a flawless, consistent and repeatable manner.

## The source of quality

A state of the art Properzi CCR line includes, among many others, the following features and devices that are most significant for the rod quality:

- Charging equipment designed to optimise the distribution of the cathodes and the permissible scrap inside the melting furnace, to enhance fuel efficiency and extend the refractory lining life, minimising inclusions.
- Vertical melting furnace equipped with the latest high efficiency Automatic Individual-Combustion Control System to provide consistent metal flow while optimising oxygen content and temperature of the molten metal stream.
- Horizontal holding furnace, specially designed for slag separation and removal.
- Fully sealed, atmosphere-controlled transfer launders equipped with slag filtration sections, resulting in cleaner molten copper with controlled consistent oxygen level.
- The tundish design allows fully ceramic metering-pins, thus avoiding inclusion-related wire-breaks due to erosion of the conventional steel metering-pin.
- The original, unique Properzi casting machine design allows perfect vertical casting, for optimal gas evolution thereby minimising cast bar porosity.

Table 1. Properzi CCR line average quality output (8mm rod)

Rod Grade	Suitable for	Wire size	Expected minimum output
A	Ultra-fine, fine and magnet wires. High-speed multiwire machines	< 0.20 mm	65%
B	Fine and magnet wires. Multiwire machines	> 0.20 mm	90%
C	Coarse wire	> 0.40 mm	99%
S	Off-grade, recycle	–	Practically null

- The special Automatic Sooting Control System enables the generation of a consistent soot layer with optimal thickness on the casting mold, both wheel and belt, thereby providing a sound, flawless, crack-free cast bar while extending the operational life of these components.
- The compact Bar Preparation Unit prevents, by design, any damage to the cast bar, thus avoiding the generation of sub-surface oxides which are detrimental for magnet-wire manufacturing.
- The Rolling Mill combines the two-roll and the unique Properzi Three-Roll technology for optimal material stress distribution during the rolling process, thus enhancing the mechanical properties of the rod, while granting it excellent roundness.
- The special high-pressure Descaling System efficiently strips off any residual bar surface oxide, preventing it from being rolled-in and, again, avoiding problems in magnet-wire manufacturing.
- The rolling mill housing design minimises rolling material oxidation, along the advanced lubro-cooling (emulsion) and filtration system.
- The design of the Cleaning and Quenching system provides bright rod with low surface-oxides, while minimising the consumption of the reducing agents.

## An operation under control

It must be underlined that the up-to-date Properzi lines come with the most advanced digital technologies, which allow the line itself to operate in full automatic mode, therefore maintaining the most optimal steady-state operational conditions for extended production runs of consistent rod.

The critical process variables are conveniently stored for future statistical analysis and evaluation, allowing the further fine-tuning of the settings, as well as maintenance planning.

The automatic mode includes rod (coil) grading. The real-time evaluation of the critical production variables of each individual coil assures the rod consistency according to standard laboratory tests, therefore significantly increasing the drawing predictability factor.

As far as ultrafine or magnet wire applications are concerned, every detail of the Properzi line is designed and manufactured with extreme precision and attention. Nonetheless, the line must operate following maximum attention to details and repeatability of the operative procedures and settings. For this purpose, the highly experienced Continuous-Properzi staff support the CCR end-user in proper operation of the line, by selecting raw materials, critical components and consumables, by preparing Standard Operative Procedures and by training the supervisors and operators ([consultancy@properzi.it](mailto:consultancy@properzi.it)).

Through the combination of advanced Properzi technology, process experience, and customer support, it is possible to minimise or avoid rod defects like inclusions, porosities, rolled-in-oxides, as well as all those issues which may affect the rod performance in the most advanced multi-wire, high-speed drawing shops for fine wire or magnet wire.

Providing ordinary A-Grade raw material, a state of the art Properzi CCR line can provide the average quality output (8mm rod) shown in Table 1.

Furthermore, if compared to competition, the design of a Properzi CCR line remains compact and simple. It is easy to operate and even easier to maintain, yet the Properzi design grants extended smooth runs of premium quality rod on an efficient, consistent and repeatable basis.

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