

# Achieving consistent copper rod quality

With ever more stringent quality demand from the wire drawing industry, a standardised approach with the latest upgrades and automation is essential, writes Andrea Peviani of Properzi

Today's drawing shops are mostly equipped with advanced high-speed, multi-wires machines, sometimes exceeding 40 wires. Should a single wire break occur, the process to clear and re-thread the machine would undoubtedly be extremely time-consuming and expensive. Consequently, it is essential that the incoming copper rods comply with the highest quality standards. More importantly, their quality must be consistent for the entire coil length, coil after coil of each truckload. Rod quality consistency is probably the most stressful issue for the CCR plant manager. The saying goes, "Yesterday rod quality was so good and now it's so poor with no apparent reason".

## Variables affecting performance

A reliable lab-testing structure to grade the rods would certainly help in selecting and grouping the coils and assigning them to a certain drawing procedure. However, even the most well-equipped lab cannot guarantee that a metre long specimen reflects whether the entire coil maintains the same properties, except for the Eddy-Current tester, which too often finds inconsistency. Drawing performance can be compromised by:

- Surface issues such as flakes, high-oxides, seams, poor geometry
- Internal defects like micro- or macro-porosity, inclusions by foreign particles or oxides, poor mechanical properties, and so on.

The invention of the CCR process (1) by Ilario Properzi's brilliant mind boosted not only copper rod volumes, but quality as well. Nonetheless, the technology hides an enormous number of variables interacting with each other in a very complex manner. Should even a minor parameter drift off range, quality might easily suffer.

To match the more and more stringent quality demand from the wire drawing industry, we strongly encourage the copper rod manufacturer to consider the following three topics.

## Standard Operating Procedures

Introducing Standard Operating Procedures (SOP). A set of written instructions, clear and simple step-by-step guidance, to enable the shift operators and staff to execute the process set-ups and operations in an equal, consistent and repeatable manner. Doing so, it will be possible to establish the best practices and values by comparing the results and amending the SOPs themselves for the better. Unscheduled downtimes due to inaccurate or wrong doings will be dramatically reduced. The steadier conditions will remarkably extend the life of such expensive components and consumables like casting rings, bands, refractories, rolls, etc., while highlighting the best performing ones. Moreover, SOPs are becoming mandatory by any international quality certification institute, like ISO (2), etc.

## Upgrades

Keep the CCR line up to date. At Properzi, we are relentlessly working to improve the performance of our CCR lines by fine-tuning the design with the best available technologies, crucial to accurately carry out the many tasks required in the manufacturing of



1 Properzi Casting Machine. Photo: Properzi

consistent quality rods. The newer lines already come equipped with most of these state of the art features. Nonetheless, we'd like to recommend evaluating the following technical packages designed to bring the more seasoned lines up to the current technology, capable to be fully competitive on the present-day markets. Upgrades are available from the charging section to the packaging units. Here's a few of the most significant ones:

- Mega-Blocks impact section
- Individual Burner Combustion Control
- Oxy-Fuel Secondary Burners System
- Burner Remote Visual Inspection
- Molten Metal Filtration (3)
- Automatic Casting Level Control
- Oxygen-Acetylene Sooting System
- Optical Synchro Control
- Automatic Bar Temperature Control
- Casting Water Treatment Plant
- Improved Bar-Preparation Unit
- Descaling System
- Vacuum Emulsion Filtration Unit
- Improved Waxing Unit
- Enhanced consumables: metering pins, casting rings, belts, rolls/ guide rollers, etc.

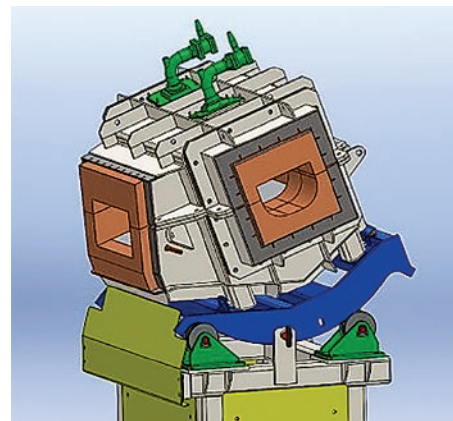
## Automation advantages

Enhancing the line automation (4). The above-mentioned upgrades mostly operate in fully automatic mode, granting the many variables to remain within narrow, pre-set ranges. This facilitates fewer operator interventions, thereby contributing to smoother more extended runs. In general, the implementation of automated functions assures higher rod quality and consistency standards, to a degree directly related to the sophistication of the automation itself. The ultimate development in the CCR automation is represented by the Integrated Line Automation & Supervision System, whose most important features include:

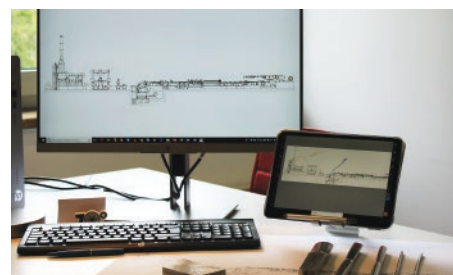
- Fully integrated supervision and control of the critical production and operational parameters and sequences
- Repeatable production condition by consistent control of variables settings
- Data and alarm tracking and storage for the statistical analysis, process fine-tuning and training
- Automatic coil (rod) grading
- Minimised downtimes, increased productivity and line efficiency
- Advanced rod grading and drawing predictability
- Maintenance planning
- Data sharable online.



2 ISO Certification. Photo: Properzi



3 Tiltable metal-filtration box. Photo: Properzi



4 Integrated CCR automation. Photo: Properzi

In conclusion, the goal is to ensure that rods remain consistent in quality for the entire coil lengths, free from defects affecting the subsequent drawing procedures. Repeatability is the key word. It allows the process to operate in optimal conditions, avoiding or minimising both surface and structural rod flaws, thus granting the proper drawability.

We intentionally did not mention the raw materials, which are indeed predominant in rod manufacturing. However, because of the gained repeatability, the CCR line could be more forgiving with some cathode brands of questionable nature, by simply avoiding any further process issues.

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