

Innovative Self-Annealing Microrolling: Copper Rod Breakdown Greener Solution

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A revolutionary patented process that takes advantage of the Law of Conservation of Energy.

Today, there is a global push throughout industry to increase efforts towards a greener planet as everyone strives to save even a small percentage of their energy consumption. Rightfully so, everyone is looking to be 'greener', to use less energy and to reduce their carbon footprint, in order to achieve net zero emission within their operations.

Continuus-Properzi has provided innovative technology for more than 75 years that has allowed the end-users of our equipment to be 'greener', in order to reduce their CO₂ emission, well before being 'green' was in fashion. This began with Properzi's disruptive technology for continuous casting and direct rolling of nonferrous metals, which completely changed the production method for nonferrous rod by making it safer, more economical, and above all less energy intensive thereby reducing CO₂ emission.

One of Continuus-Properzi's latest revolutionary patented processes, that takes advantage of the Law of Conservation of Energy, is known as the **Self-Annealing Microrolling®** process, or SAM for short (**Figure 1**). This process incorporates Properzi's Microrolling® technology, which utilizes a 3-roll configuration per rolling stand and harnesses the heat that is generated in the rolling process in order to systematically increase the temperature of the copper wire as it is being reduced from the 8 mm inlet size to the outlet size in the range of 1.8 to 2.6 mm. The energy of the rolling process is transformed into heat thereby increasing the wire temperature to a level that provides the desired characteristics of an annealed wire without using the conventional drawing/annealing process thereby providing tremendous energy savings.

The copper wire from the SAM process is ready for subsequent processing in downstream drawing applications such

as in multiwire drawing machines, while avoiding the costly and energy intensive, resistance annealing process.

Energy savings, and those processes that promote it, is a must for every industry because of two reasons: energy is expensive and the resulting emission is potentially harmful to the environment.

From the environmental perspective, the innovative SAM process greatly reduces the consumption of electrical energy, which is necessary for the area reduction of the Cu rod and the recrystallization of the Cu wire when compared to the conventional process, which uses a rod breakdown drawing machine and in-line resistance annealer. The use of the SAM completely eliminates the annealer, and its intense electrical energy requirement. It also utilizes considerably less energy compared to that required by a breakdown drawing machine to go from the 8 mm copper inlet to an outlet range of 1.8 to 2.6 mm due to the elevated temperature of the copper during the SAM process. This revolutionary technology provides energy savings of approximately 50% (in the range of from 90 to 110 kWh/t) compared to the traditional rod-breakdown drawing/annealing operation. The Properzi SAM process provides a savings of 75 Kg CO₂-eq per ton when producing 1.8 to 2.6 mm wire starting from 8 mm Cu rod.

In addition to the greener aspects of the SAM process compared to the conventional rod drawing and annealing process, the SAM process also provides several advantages from both economic and operational perspectives:

- Tremendous energy savings: provides wire (**Figure 2**) with elongation greater than 30% without in-line annealer thereby avoiding annealer energy and maintenance costs.
- Smaller power transformer and associated cables, lower installation costs, smaller overall footprint.
- User-friendly/added operator safety: does not require rod/wire pointing or die threading; the rod is automatically captured and fed through the rolling process thereby eliminating the potential pinch points common with wire drawing machines - the operator simply, and safely, feeds the rod into the rolling mill and in seconds the wire is ready to be threaded onto the coiler (**Figure 3**).



Fig. 1 — SAM at Properzi Headquarters.



Fig. 2 — Soft Cu wire using the Properzi Self-Annealing Microrolling (SAM) process.

EMPHASIS: Rolling

- Reduces the cross section of the 8 mm rod to the 2 mm range using only eight rolling stands; this equates to a total area reduction of approximately 95%.
- Does not use drawing dies: elimination of drawing dies (polycrystalline) translates into virtually no copper dust generation in the area reduced via the rolling process.

Like any innovation or new process, it must be accepted in the market in order to realize its fullest potential and success.

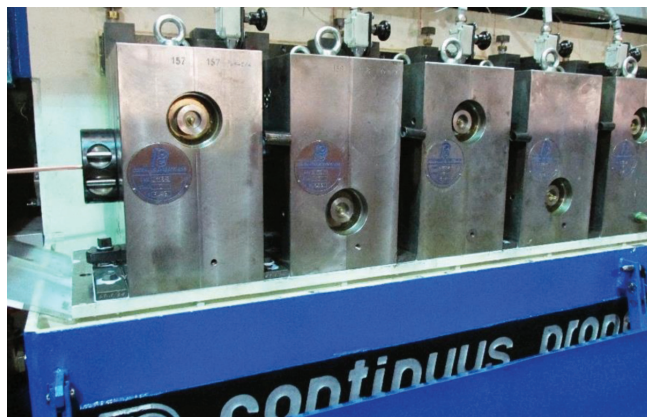


Fig. 3—Passage of Cu Rod in the Properzi Microrolling® Mill. The Continuous-Properzi organization understands this concept very well as this is not our first ‘innovative technology rodeo’. SAM is a new process that utilizes innovative technol-

ogy in order to provide the end-user with the attributes and advantages illustrated in this article. The conundrum with any innovative process is that everyone requires the absolute latest technology while also requiring it to be well-proven. Therefore, any new concept or innovation, such as the SAM process, must be demonstrated to the market.

In the past Properzi has done this with all of its innovative processes and equipment including, but not limited to, the Continuous Cast Rod (CCR) process, the Continuous Cast Wire (CCW) process and the Cu Refining processes and equipment. Now has come the time to demonstrate the SAM process, which has been tested and confirmed to be an advantageous alternative to the traditional rod breakdown drawing process for Cu wire.

So Continuous-Properzi has installed a complete SAM Line in its factory in Italy, and it is available for customer trials to showcase the well-proven characteristics of this patented, innovative process in action! www.properzi.com **WCTI**

Company Profile:

Properzi offers its customers technical solutions of absolute excellence in quality and innovation as Microrolling®, Track & Belt caster and Vert-Ref Furnaces among others. Properzi now drives customers in Industry 4.0, which translates into having newly developed features for new plants and upgrading options for existing ones in response to specific needs. www.properzi.com