

A rosy future for wire and Tube

After several postponements, it's finally here. Wire / Tube 2022 in Duesseldorf promises much, not least a kickstart to many businesses' fortunes



APR 7 - Nexans announces the appointment of Jean-Christophe Juillard as Deputy Chief Executive Officer effective 4th April 2022. Jean-Christophe will support Christopher Guérin, Chief Executive Officer, in the deployment of Nexans' 2022-2024 strategic roadmap.



Nexans's Active Light® cable is illuminated along its entire length, making it clearly visible. The solution uses LED technology and it is self-powered.

www.nexans.com

MAY 4 - The Prysmian Group plans to invest some EUR 1 billion by 2024, mainly targeted at developing businesses that support the energy transition. The investment plan seeks to consolidate the company's approximately 35-40% share in the high voltage submarine and underground cable market, which per 2025 forecasts is projected to top EUR 8 bn a year in terms of projects awarded. In 2021, Prysmian acquired projects worth EUR 4.8 bn. The Group plans to build the first HV submarine cable facility in Massachusetts, USA with an investment of EUR 200 million.

www.prysmiangroup.com

PROPERZI REFINING TECHNOLOGY



Loading of scrap into the refining furnace.

Photo: Properzi

11G40 - Continuus-Properti's nature is to increase the efficiency of its equipment, to reduce the consumption of utilities and to decrease waste by inventing new technological solutions for recycling copper scrap. It is possible to convert 100% low quality copper scrap directly into high quality copper rod. The goal of the global community is to make the Copper Supply Chain "greener" and Continuus-Properti continues to make a significant contribution in this field. Significant results already reached:
Properti Cu Refining Technology: savings up to 7,000 Kg CO₂-eq per ton of FRHC copper rod products processing 100% copper scrap
Cu Green Wire: savings up to 50% of electrical energy per ton of 1.8-2.6 mm wire produced starting from 8mm rod. (see page 11)

www.properzi.com

Wire / Tube 2022 - Copper Exhibitors

06A01 / 09C06 - ASMAG

Austrian manufacturer of individual machines and fully interlinked production systems for the steel and non-ferrous metal industry.

11G26 - BWE

British engineering company specialising in continuous rotary extrusion (CRE) machines for many different applications and cold pressure welding machines.

06G17 - Combilift

Ireland-based firm revolutionising the way companies handle and store goods. Global manufacturer of multi-directional forklifts and leader in long load handling solutions.

09C38 - Confex Technology

Continuous rotary extrusion tooling wheels, dies, upgrades and consultancy.

11G40 - Continuus-Properti

Copper ETP rod lines and FRHC rod lines. Reveratory-refining and Vert-Ref furnaces for Cu scrap. Shaft + Holding furnaces for Cu cathodes.

10C42-07 - EBNER

HICON/H2 bell annealers for bar, coinage blanks, strip, tube and wire; HICON/H2 bright annealing lines for strip; HICON roller hearth furnaces for tube and bar.

10C59 - ER-BAKIR

A 200,000 tonnes per year wire rod producer from Turkey.

06I26 - Fraunhofer Institute

The Fraunhofer-Gesellschaft based in Germany is a leading applied research organisation prioritising key future-relevant technologies and commercialising its findings.

06F27 - GIA Clecim

One of the leading companies to provide engineering solutions to extruders and complete extrusion plants for all kinds of copper alloys. Based in Albacete, Spain.

06C21 - Inductotherm Group / 09A50 - Inductotherm H&W

Development and manufacture of advanced technologies, products and systems for the heat-driven transformation of metals.

12D33 - La Farga

Manufactures semi-finished copper products and their alloys for the electrical, metal packaging, railway, tubes, automotive, billets and special conductors markets.

10A47 - Lamifil

Global manufacturer of innovative transport and electrical sector cable and wire products in copper, aluminium and copper and aluminium alloys based in Belgium, and more.

11D68 - NDC Technologies

A leading global provider of intelligent, connected measurement and control solutions for manufacturing organisations.

09B49 - Presezzi Extrusion

Supply of machinery for the extrusion industry. Design and construction of various types of presses for aluminum, hard alloy, copper and brass.

10B56 - Rautomead

Continuous casting machines for Copper Wire and Copper Cable, Alloy Wire, Engineering Alloys, Precious Metals, Copper Magnesium and Copper Chrome Zirconium Rod.

10C38 - REDEX

Advanced solutions for high-precision industries including machine-tool drives and precision strip and wire processing equipment.

14E52 - Saint Gobain

Design, development and production of engineered ceramics and refractory products for harsh operating conditions in industry.

10H77 - Sarkuysan

Fire refining, Electrolysis, Continuous casting on multiple line technologies, Wire drawing, and Copper tube and busbar production. Based in Turkey.

06J11 - Secopta

Laser-based analysis solutions for tasks in industrial process control as well as in the production of primary and secondary raw material.

07aB04 - SMS group

Plant supplier to the metallurgical industry for steel, aluminium, copper and metals.

10F56 - Tecnofil

Copper wire / copper alloy wire (such as brass wire or bronze wire). Based in Peru.

06A01 / 09C06 - Upcast

The UPCAST process is a technology developed to produce top quality rod and tube for various applications.

A much greener copper wire production

The Self-Annealing Microrolling (SAM) process was born of a need to improve energy efficiency, writes Eng. Michele Moretti of Properzi.

The energy used for the mechanical deformation in a metal working process is transformed into a higher temperature of the material which is being deformed. This also applies to traditional copper rod breakdown machines which use dies to reduce the diameter, but in this case the process requires that the copper must be cooled before entering the next die to avoid wire breaks. This leads to hard wire and to the subsequent need for annealing, which consumes a great amount of electrical energy. The question is if there is a more efficient way to work, to avoid the dissipation of energy by cooling down the copper and then reheating it in the annealer.

3-roll mill

Properzi's idea was to use a Microrolling® mill, a typical Properzi 3-roll mill for small diameters, with the capability to process hot materials, thereby allowing the energy of the rolling process to be transformed into heat, increasing the wire temperature step by step to a level that lets the copper be deformed in a less severe hardening condition, almost as if it were hot-worked, and letting it reach a temperature in which a partial recrystallisation process can begin. At the end of the rolling process, it is only necessary to maintain the wire at the recrystallisation temperature for a short time in an inert atmosphere and then cool the wire to facilitate coiling.

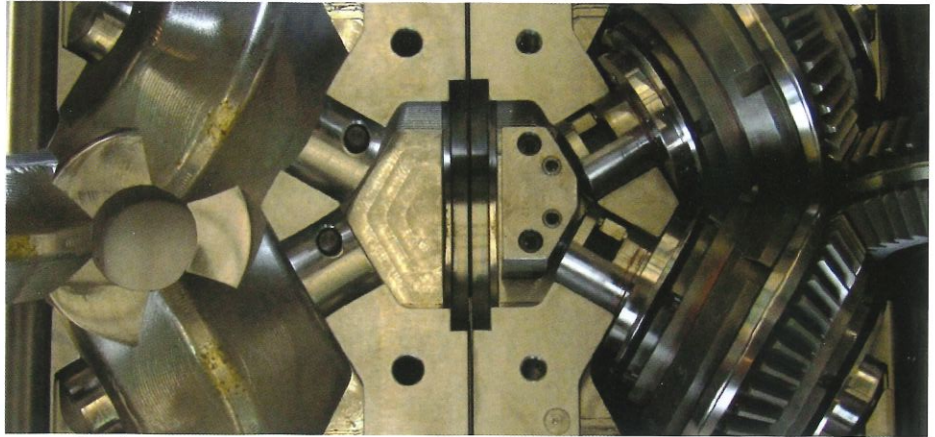
This process heats the copper and gives it time to recrystallise, thereby providing the desired characteristics of an annealed copper wire with elongation A% > 25%, while avoiding the energy intensive resistance annealing process. From there, the "Self-Annealing Microrolling", or "SAM", process was born.

To reach this result, a new Microrolling® line has been developed. This new line provides the appropriate, easily adjustable, amount of cooling for the rolling stands so that the majority of the motor's electric power is transformed into heat within the copper wire that is being deformed under the rolls, thereby enabling an elevated temperature of the exit wire and, at the same time, guaranteeing the reliability of the line. Concurrently, an inert gas insulated pulley box, with very low consumption of nitrogen and without electrical power, has been designed and developed to guarantee the correct recrystallisation time for the wire before it is cooled through a compact and highly efficient cooling unit.

The SAM process can be seen as a small, compact rolling plant with a total length of about 25 m. It consists of a rod pay off, a Microrolling® Mill with its auxiliaries, an inert atmosphere (N₂) pulley box, a high-pressure cooling system, and a wire coiler.

Proving the process

A rigorous testing campaign was carried out with different materials and different outlet diameters, to study and develop the process to achieve the best wire quality in terms of elongation, dimensions, and shape.



Empty semi-shell and complete semi-shell. Photo: Properzi

We can say that, after several tests processing ETP-Cu rod from different producers and in different quality grades, the wire has a minimum elongation of 27%, with shape and dimension tolerances which make it ideal for subsequent processing in multiwire drawing applications. The most interesting result is the electrical energy savings that are possible with the SAM process. Comparing the total energy consumption per ton of produced wire, we have the following results:

- For 2.6 mm ETP-Cu wire, at a production rate of 5.1 tons per hour with exit speed of 27 m/s, the energy consumption is 70 kWh/Mt with SAM versus 110 kWh/Mt with a traditional rod breakdown drawing machine. This equates to 35% less energy consumption.
- For 1.8 mm ETP-Cu wire, at production rate of 2.4 tons per hour with exit speed of 27 m/s, the energy consumption is 120 kWh/Mt with SAM versus 220 kWh/Mt with a traditional rod breakdown drawing machine. This equates to 45% less energy consumption.

In addition, FRHC-Cu rod has been successfully tested to obtain a very good 1.8 mm wire at a production rate of 1.8 tons per hour, with energy consumption of 150 kWh/Mt. In this case, as expected, FRHC requires more deformation power that translates into an increased wire temperature at the end of the rolling process. More deformation power is also required in rod breakdown drawing machines with FRHC-Cu rod due to microstructural impurities but, unlike the SAM process, this increased power is also dissipated by the cooling system and therefore even more electrical power is required in the annealer. For this kind of Cu rod, the energy savings in the SAM process are even greater.

A green decision

The SAM process has been tested and confirmed to be a good choice and a great alternative to the traditional rod breakdown drawing process for Cu wire that has to be further processed in intermediate or multi-wire drawing machines to obtain wires below 0.25 mm. The SAM process can guarantee a constant and high elongation value for both 'subprime quality' ETP and FRHC copper rod.



SAM at Properzi headquarters. Photo: Properzi



Passage of the rod in the Properzi Microrolling® Mill. Photo: Properzi



Copper wire obtained with Properzi SAM. Photo: Properzi

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. The Properzi Self Annealing Microrolling Machine is a revolutionary, greener option that decreases the required energy consumption to produce annealed redraw wire by 40 to 45%.

www.properzi.com

Author: Eng. Michele Moretti, Project Engineer, Continuum-Properzi S.p.A., Italy

CONTINUUS-PROPERZI: ITALIAN ENGINEERING



*Continuus
Properzi*



Example of a Casting Machine for the production of copper wire.



Properzi Continuous Casting & Rolling Line for ETP and FRHC wire production.

**INDUSTRY 4.0 APPLICABLE TO
NEW AND OLD PROPERZI PLANTS**

**TAILOR MADE DESIGN
OF CONTINUOUS CASTING
AND ROLLING PLANTS
OF NON-FERROUS METALS**

**SPARE PARTS PRODUCED
INTERNALLY AND TOTALLY
MADE IN ITALY**



Stand produced in the operational headquarters of Milan.



Properzi Vert-Ref Furnace loaded with scrap with a minimum copper content around 93%.

TECHNICAL CONSULTANCY:

- ▶ **Written**
Consultancy via e-mail
information exchange
- ▶ **Remote**
Assistance via internet connection
- ▶ **Training courses**
at Properzi headquarters
- ▶ **On-site**
Technical Audit

www.properzi.com

