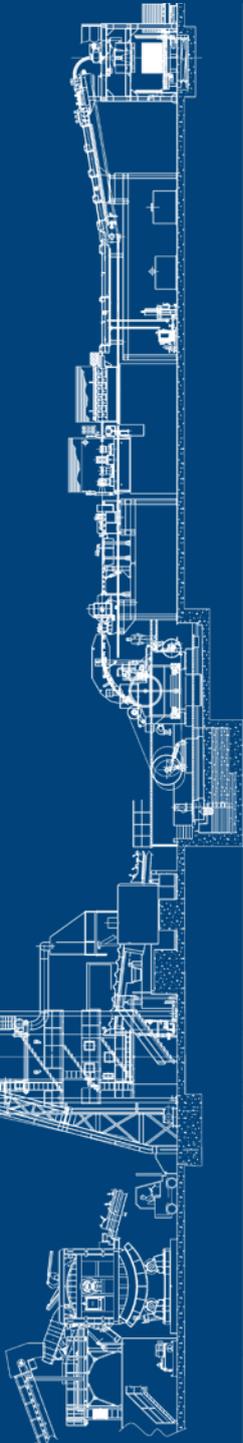




Continuus
Properzi

PROPERZI COPPER SCRAP RECYCLING



Properzi





NOTE

For publication purposes, the normal safety guards may not be present on the equipment pictured.

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A VALUABLE RESOURCE

Recycling of copper scrap is one of the best examples of a circular economy. Melting, refining and casting the desired final product according to Properzi know-how, accumulated during 30+ years of experience, allows great energy savings and avoids additional spoiling of the mines.

Here is a clear comparison:

PROPERZI TECHNOLOGY FROM SCRAP

- Scrap melting and total refining
- Casting into desired product

VS.

TRADITIONAL PROCESS

- From mineral to Blister
- Blister melting with some refining
- Anodes casting
- From anode to cathode via electrolysis
- Cathode melting
- Final casting into product

Copper products produced from mines requires 2.5 times the energy used when starting from scrap and creates 750 times (!) the SO₂ Pollution.

Copper scrap availability is constantly increasing. The so-called "new scrap" is a percentage of the total production of new products that is increasing year by year and the "old scrap" (30-50 years old) from dismantled wire, cable, tubes and so on, is also increasing through the years.

For instance, the number of cables installed during the seventies was less than those of the eighties and so on.

FROM INNOVATION TO INNOVATION

Yesterday, today and tomorrow

"It's no secret that copper wire and cable makers are chasing around to come up with cost-cutting method that would give them an edge in the highly competitive fields... It's a tool that will provide a means to a manufacturer to operate in the black in a highly competitive market". It is a very banal and uninteresting incipit describing Continuous Casting of Redraw Copper! But it changes color and significance if you know that it is from Mr. Ilario Properzi's interview with American Metal

more) and drawability (down to diameters of 0.10 – 0.05 mm and smaller processed by high speed multiwire drawing machines!).

We are proud of our founder, the inventor of the **CCR process for nonferrous rod**, so we added his name to Continuus, renaming the company Continuus-Properzi Co. We are equally confident of the inventiveness and strong leadership shown by Giulio Properzi, our President, and in the commitment



Both Ilario Properzi and Giulio Properzi receive Mordica Awards, Ilario in 1973 and Giulio in 2003



Market on May 16, 1963, just one month after **the first ever continuous copper rod was produced by a brand new Properzi System in the USA. It was the beginning of a new era thanks to Ilario Properzi and his ingenuity!**

Since then, dozens of prominent individuals and companies have contributed to the development and optimization of ETP copper rod production plants up to the current astonishing production rates (40 tph and

and capabilities of the entire Continuus-Properzi team.

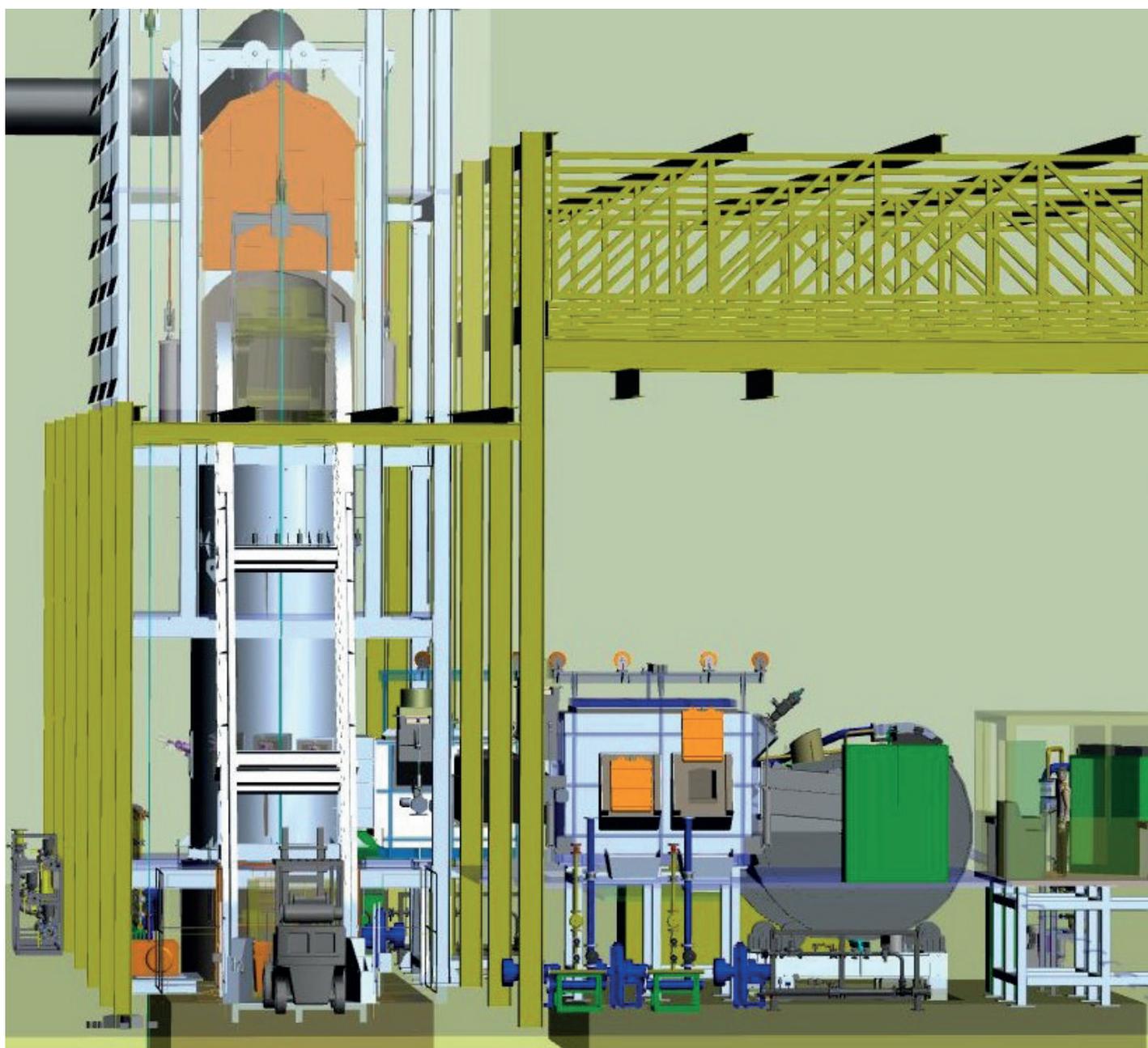
Step by step, our company, despite some unfair competition and baseless gossip, has developed into a true EPC supplier that has accumulated the longest worldwide experience and relevant know-how regarding complete **ETP or, in particular, FRHC Lines**, from furnaces to the derived final production.

Our commitment is to continue and surpass our company's 70+ years of success based on continuous attentiveness to our customers and to the future requirements of the global market.

Our latest innovations include the Micro-rolling® Mill process for self-annealed copper wire, a promising revolutionization of the drawing shop, and the new Vert-Ref process to recycle copper scrap into FRHC products.

As a true engineering company, we feel confident in providing full packages from finished foundation to plant in operation. Always looking forward and always a step ahead is our mantra as we march towards our centennial anniversary!

Properzi Furnace Set 3D layout for scrap refining



HOW TO START YOUR BUSINESS

PLAN WITH COPPER SCRAP

FRHC copper rod, ingot, billet or other products

What we are talking about encompasses all types of scrap from bright copper from the drawing shop (near to cathode purity) to old scrap with a minimum copper content around 93%.

Naturally, it is possible to mix many kinds of copper scrap thereby saving hundreds of dollars per ton for the raw material and this is a promising start towards satisfactory profit on your produced semis.

A new Recycling Project must consider the quality and the quantity of the available scrap.



Typical CU scrap

THERE ARE THREE TYPES OF CONTINUOUS-PROPERZI PROCESSES FOR THE PRODUCTION OF FRHC COPPER:

| No. 1 | No. 2 | No. 3 |
|--|--|--|
| Batch Process with maximum refining ↓ REVERBERATORY FURNACE | Continuous Process with limited refining ↓ VERT-REF FURNACE | Batch Process with limited refining ↓ REVERBERATORY FURNACE |
| Copper scrap mix $\geq 93\%$ 40 - 250 tons per day 8 hours/day casting | Copper scrap $\geq 97\%$ 10,000 - 100,000 tons per year 24 hours/day casting | Copper scrap $\geq 97\% - 99\%$ 40 - 80 tons per day 8 hours/day casting |

No. 1 - PROCESS

Is based on one reverberatory furnace usually feeding a rod line or a slab caster during approximately one shift per day.

No. 2 - PROCESS

Is based on a Vert-Ref (shaft) furnace followed by two holding/refining furnaces and two holding furnaces feeding a rod line 24 hours/day.

No. 3 - PROCESS

Can be based on a reverberatory furnace dedicated to ingot casting during one shift. Ingots are then diluted with cathodes in a shaft furnace for ETP rod production. The No. 2 Process may be preferable in certain cases also for this purpose.

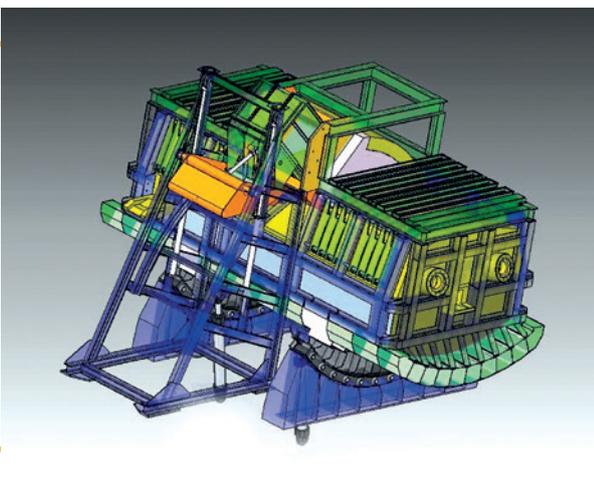
For more than 30 years Continuus-Propenzi has delivered and put into operation several dozen refining furnaces for the No. 1 Process, mainly feeding copper rod lines, around the world including Italy, USA, Korea, Iran, Mexico, Brazil, China, India, Ukraine, Russia, Cuba and others.

In 2012, Giulio Propenzi patented a new design where the reverberatory furnace is loaded from the top; the first one, with a capacity of 250 tons/day, has been in production since that same year. Several top-loading furnaces with capacity of 100 tons/day have been installed since then.

This configuration is several steps ahead compared to the lateral charging system.

When the charging door is on the top of the furnace body the scrap can be conveyed by a belt through a small door thereby minimizing heat and the escape of pollutant fumes. In just one minute the belt conveyor can bring about two times the tonnage of scrap into the furnace when compared to prior charging systems. This allows minimum heat loss with a much shorter charging cycle, less shock to refractories, and less pollutant fumes.

The initial consideration, as previously mentioned, is the kind of scrap that is available, then the possible annual quantity, and finally the identification of the final FRHC product or products (rod, ingot, billet, etc.) that could have interesting high market demand in the area.



Presently our top-load furnace patent is extended throughout Europe and in many other countries and is the unsurpassed tool for melting and refining copper scrap. It can be loaded by a belt conveyor or a skip hoist machine similar to the one used to charge cathodes in a shaft furnace.

Refined Copper Ingots:

This is a product that has a good potential market. It is sold below but near the LME quotation. Metal purity can vary the price.

Copper Billet/Slab:

These are usually captive markets limited to sheet or tube producers.

Copper Rod:

FRHC rod is very similar to standard ETP rod but with some limitation. However, it is perfect for power cables and building wire especially if it is used internally.

PROPERZI'S FRHC CU ROD CHARACTERISTICS:

| Parameter | Reference | Value |
|--------------------------------|--------------------|---------------|
| Chemical composition | Cu+Ag % | >99.90 |
| Oxygen | Ppm | 150 ÷ 250 |
| Elongation | A ₂₀₀ % | 38 ÷ 43 |
| Tensile strength | Kg/mm ² | 22.8 ÷ 23.5 |
| Conductivity | IACS % | 100.5 ÷ 101.3 |
| Twist test to failure | Number | 43 ÷ 50 |
| Best drawability | mm | 0.25 |
| POPS test – surface oxides | Ångstrom | 100 – 200 |
| Re-crystallization temperature | °C | 280 |

In any case, everything will be justified by the price level of the local Cu scrap! Price will fluctuate year by year and from one location to another. **In any case, even recycling only 8,000 - 10,000 tpy should be considered, as it is usually economically justified and profitable.**

The Properzi Technology is a mix of excellent engineering, vast experience and updated refining know-how transferred to the client by a strong and dedicated team of engineers.

THE PROPERZI COPPER INGOT:

A winning alternative to

open top casting system

The old open top system looks simple and economical but several drawbacks are hidden until the production starts. The intermittent pouring, mould by mould, is imprecise and subject to spout clogging; the thickness of the ingot is not stable and can create stacking problems; the ingot may present holes and cracks in the upper surface causing water explosions; the iron moulds have a very limited life while the copper moulds are very expensive; the number of moulds required is nearly 200.

The Properzi wheel and belt casting machine has a totally automatic continuous pouring system and produces a sound bar that is cut into 20 - 25 kg ingots having a very precise geometry. The only mould required, the casting ring, can last for years.

The second Properzi ingot line will be in production in 2021 with a 20 tph casting rate and a business plan which foresees a return of the investment in less than 3 years.



CU ingots produced with Properzi technology and equipment

Ingot stacking robot in operation



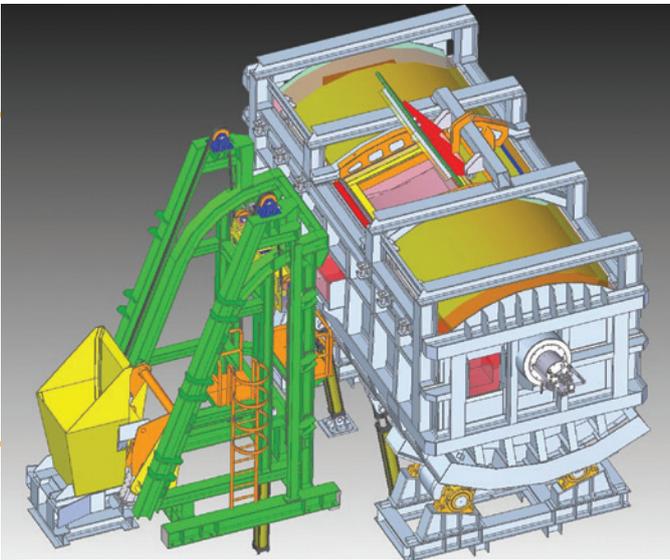
NEW COPPER

REFINING

FURNACES

Several sizes: 50 Ton – 80 Ton – 120 Ton – 150 Ton – 250 Ton and larger

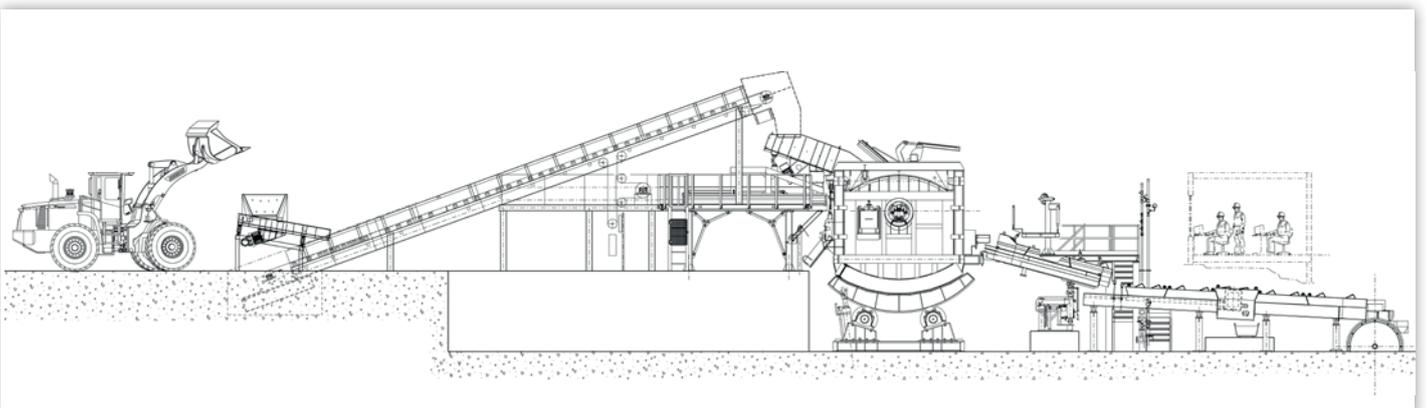
VARIOUS CHARGING SYSTEMS AVAILABLE



- OXY-AIR BURNERS
- DE-SLAGGING MACHINE
- EASY SLAG EVACUATION

REFINING FURNACE

≥ 10 TON SCRAP CHARGING OPERATION IN LESS THAN 2 MINUTES



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A Family Passion!



And much more...



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