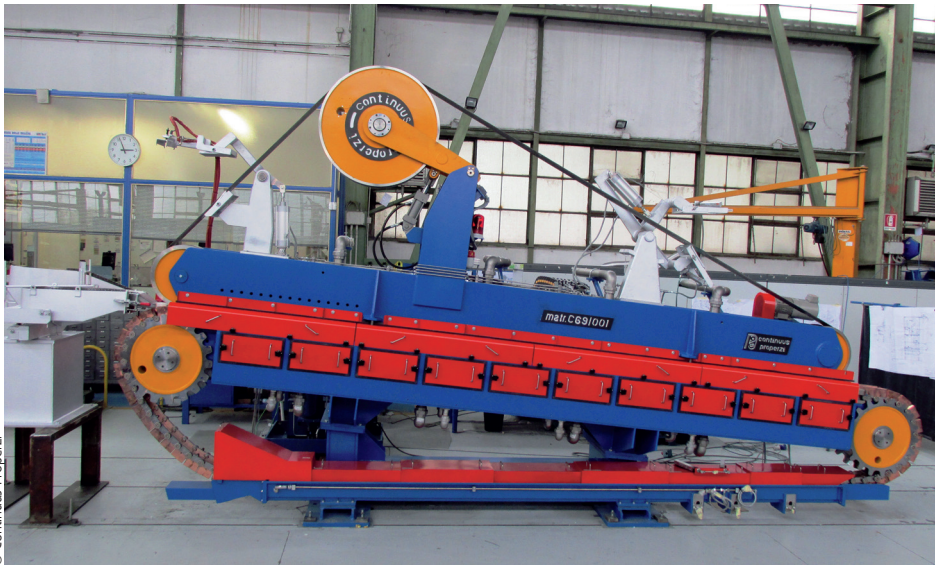


## Properzi continuous casting equipment – a leading world process technology



Continuous-Properzi track and belt ingot casting machine – leading industry technology

**Engineer Ilario Properzi (1897-1976), Italian inventor and promoter of continuous casting and direct rolling for non-ferrous metals, founded his company, Continuous-Properzi SpA in 1947. Guided by his son, Giulio Properzi, Continuous developments in new melting and rolling technology have completely revolutionized world non-ferrous wire and rod production – from molten metal to product in a matter of minutes. And, the company remains a leader in supplying associated equipment and machinery. Here, Properzi details the machinery, process technology, and all related engineering, in appraising the current CO<sub>2</sub>ntinuous Green Ingot, as produced for example by Emirates Global Aluminium.**

In 1992, an awareness that the wire market represented a niche market in the world consumption of aluminium, spurred Properzi to identify new and diverse end-products of the metal, in addition to rod production. A rigorous analysis of the market highlighted the importance of the aluminium ingots in the industry, for both primary and secondary production. Ingots represent one of the most commonly used products from primary smelters – this re-melt form finds application in various industry sectors including automotive as the most important. More than a third of global aluminium consumption is delivered in the form of ingots.

For many years ingots have been produced

using the traditional mould chain – ‘Open Top Ingots’. Although many improvements have been made over the years, several problems related to the general design concept remain unresolved.

The patented Properzi ingot casting machine, from molten metal, produces continuously cast straight bar of trapezoidal shape with total repeatability. The cast bar is cut into ingots of precise length by a rotary shear. The ingots are subsequently cooled in line to a temperature of 70-80 °C for palletization and strapping operations with plastic or steel binding.

The process technology is gaining wide acceptance in many countries, including Italy,

The data and information included in this article have been evaluated through a scientific approach, and all the related references to the technical literature and the detailed explanation of the calculations are included in a technical report issued by Continuous-Properzi and validated by BSI Group (British Standards Institution).

Continuous-Properzi is available to provide more information regarding the above data and report to anyone in the aluminium industry interested in producing Properzi ingots. During the coming weeks, the company will inform its customers, already producing Properzi Ingots, about the results demonstrated by the process in order to allow them to also certify these sav-

Mexico, India, Bahrain, Poland, United Arab Emirates, Russia and PR China.

Properzi ingot casting lines can work either in continuous operation with an Overall Equipment Efficiency (OEE) exceeding 90%, or on a batch basis as requested by most refineries of aluminium scrap.

The advantages are clear: constant and very compact ingot shape – thereby improving ingot stacking; closed uniform surfaces without water infiltration, and reduced formation of slag in the subsequent re-melting operation. The benefits delivered by this method are:

- Repeatable shape and dimensions and, therefore, consistent weight
- Consistent dimensions and shape of the ingot bundles
- Skimming is not required
- The cast bar is solidified in a closed continuous mould and therefore there are no off-size dimensions: the only tolerance is in the length of each ingot (720 mm ± 0.5%).
- Traceability data engraved on the top ingot
- No de-moulding problems
- Two straps are generally sufficient to secure each bundle; some customers use a maximum of three straps.

All these advantages readily translate into economic advantages.

Various plant configurations can provide ingot production rates ranging from 10 tph (or higher) for secondary alloys, and up to 28 tph for pure aluminium.

The Properzi ingots currently produced are

ings in their production chain, including with their customers, stakeholders and banks.

Commercially, on the London Metal Exchange deliverable ingot shapes for LME Aluminium include standard mould cast ingots as well as continuously cast ingots. The latter greatly support increased efficiency in both storage operations (warehousing) and in transport activities. Continuous-Properzi is fully confident that the CO<sub>2</sub>ntinuous Green Ingots are the most eco-friendly and best available technology for the production of primary and secondary aluminium ingots.

Together with a considerable reduction in operating costs, producing Properzi Ingots does reduce CO<sub>2</sub> emissions.

called CO<sub>2</sub>ntinuous Green Ingots as they greatly reduce CO<sub>2</sub> emissions compared with traditional ingots from an open top mould.

The most important ‘green’ aspect of Properzi technology is that the liquid aluminium solidifies inside the casting machine – a copper mould is closed by a steel belt thereby eliminating any contact with air. No dross is created and zero aluminium is lost.

It should be noted that the entire production process from the bauxite mine to an aluminium ingot requires 17,000 kWh/tonne and generates 3.5 tonnes of direct CO<sub>2</sub> emissions. The total average global emissions are reported to be between 12 and 17 tonnes of CO<sub>2</sub>-equivalent per tonne of aluminium. Comparing the Properzi ingot casting technology with the others available highlights a conservative average value of 11.5 tonnes of CO<sub>2</sub>/tonne of aluminium.

The Properzi process generates zero loss of aluminium while the dross generated from the production of open top mould ingots must be removed from each ingot, either manually or automatically. This equates to hundreds of tonnes of aluminium being converted and removed in the form of dross every year! The management and further processing of the dross produces additional CO<sub>2</sub>. Using alternative technologies, ingots are produced by sawing operations, which generate aluminium waste in the form of chips, wasting aluminium (and the related CO<sub>2</sub>) and creating a significant environmental impact due to the management of wet lubricants.

In the Properzi process, the continuous cast bar is cut with a rotary shear without any chips. The result is clear: zero aluminium is lost in the production of the CO<sub>2</sub>ntinuous Green Ingots. All this can be translated into an environmental advantage and, also into a key economic benefit that cannot be underrated!

Further, the dross formed upon contact of liquid aluminium with air, cannot be completely removed from the ingots produced with the open top mould. These oxides (mainly Al<sub>2</sub>O<sub>3</sub> and MgO), degraded by other materials during the casting process, such as fragments of refractory from the casting channels, result in much higher melting points. So, among further operational problems, a higher energy consumption is required and an increased amount of slag is again generated, with a direct effect in producing additional CO<sub>2</sub>-equivalents.

The Properzi ingot bundles are more compact and stable than with traditional open top mould ingots. This reduces the PET and/or steel strapping material required by about 40%, which represents a further CO<sub>2</sub> saving in the production process.

Following a comprehensive study of all the advantages, Continuous-Properzi has issued a detailed technical report that elaborates the advantages, which directly affect the reduction of CO<sub>2</sub> emissions. Properzi summarizes the main features as:

- Higher metallic yield
- Higher quality



**EGA supplies Properzi ingots primarily to customers in the automotive industry supply chain**

- Higher packing density
- Lower consumption of straps, and
- Preheating is not required.

This report provides clear evidence that CO<sub>2</sub>ntinuous Green Ingots are greener, compared to other ingot forms available on the market, with a reduction of operating costs and CO<sub>2</sub> emissions conservatively calculated to be above 280 kg of CO<sub>2</sub> per each tonne of primary aluminium converted into Properzi Ingots.

**Industry view**

Emirates Global Aluminium is a key customer of Continuous Properzi. Throughout their collaboration, both companies have focused on improving their products, and implementing low carbon considerations.

Our Journal took the opportunity to pre-

sent some questions to EGA’s vice-president of Casthouse, Mr Fadi Awadhalla, who kindly responded from a leading ingot producer’s viewpoint:

**IAJ: Which industrial sectors purchase EGA’s Properzi ingots by choice?**

FA: EGA supplies Properzi ingots primarily to customers in the automotive industry supply chain. Our company is one of the largest suppliers of foundry alloys for the automotive sector. These products are used to produce wheel rims, sub-frames and suspension parts, cross members, engine blocks, cylinder heads and engine cradles amongst other component applications.

**IAJ: In brief, what would you say are the technical and commercial strengths of the Properzi ingot?**

FA: Properzi offers quality, productivity and safe handling. Properzi casting stations are semi-closed and relatively automated, from batching to finishing.

**IAJ: Your company has greatly contributed to the industrialisation and economy of your country. How has this been combined with sustainability?**

FA: In the UAE, EGA is the heart of a broader aluminium sector which generates over USD5 billion annually in the economy. We recognise that making products that help meet social and environmental challenges is not enough. It also matters how responsibly those products are made. EGA is the first company in the world to produce aluminium commercially using the power of the sun. This metal is marketed

under the product name CelestiAL. The use of solar power significantly reduces the emissions associated with aluminium smelting. Additionally, EGA has launched an initiative to manufacture its products using post-consumer scrap to reduce our carbon footprint and have fitted our machines with an environment monitoring systems to detect and record all emissions for traceability and improvement.

**IAJ: Could you share some more details about Guinea Alumina Corporation, and its future prospects?**

FA: GAC has been delivering strong operational performance and the team there is well positioned to continue this substantially over the coming months.

**IAJ: Many thanks Mr Awadhalla for your time and for sharing your input and views.**