



Photos: Continuous-Properti

The track & belt machine for the production of CO₂ntinuous Green Ingots.

CO₂ntinuous Green Al Ingots and Vert-Melt

Continuous-Properti's significant contribution to reduce the carbon footprint in the aluminium industry.

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Aluminium can be defined as the most circular material being infinitely and 100% recyclable, and it can be transformed reusing all the material in the production cycle. Through all the phases of the aluminium chain it is of paramount importance not to waste even one sole gram since the production of primary aluminium is energy-intensive. In the electrolysis process, direct CO₂ emissions occur due to the reaction between oxygen and carbon anodes and the number of anode effects results in PFC emissions. Direct emissions strongly vary with the kind of electrolysis cell used, and up to 17 kWh/kg Al can be required, depending on cell technology.

Properti ingot casting technology has several advantages. This article focuses on the 'green' aspects of the ingot.

The vision of greener aluminium starts at the beginning of the chain, where primary aluminium is produced and then solidified in semi-finished products to be re-melted or processed for different types of product. In fact, many primary producers are already reducing their consumption of electricity and CO₂ emissions by using renewable energy in aluminium production. Continuous-Properti's commitment to the green industry is not to dissipate the savings made by the smelters, but rather to improve them. For this purpose, the company has designed processes that do not waste liquid aluminium and the energy bank inside it, which is equivalent to a huge reduction of CO₂ emissions. ▶

This article will emphasise and illustrate Continuus-Properti's significant contribution to reducing the CO₂ emissions in solidification of liquid aluminium into ingots and also in the following phase to remelt the Al ingots for the production of the downstream products.

CO₂ntinuus Green Ingots help reduce CO₂ emissions

Continuus-Properti began developing a new process for the production of aluminium ingots almost 30 years ago in order to overcome the limitations of traditional ingots produced in open moulds. Eng. Giulio Properti, current president and chief executive, had the brilliant idea to apply the Properti continuous casting method, patented by his father Eng. Ilario Properti in the 1940s, for the production of ingots.

Properti ingot casting technology has several advantages in terms of ingot quality, operational costs, procedures, and several other characteristics. However, this article focuses on the 'green' aspects of our ingot. We have named the Properti ingots 'CO₂ntinuus Green Ingots' as they greatly reduce CO₂ emissions compared to traditional ingots solidified in an open top mould, that is conservatively calculated to be above 280 kg CO₂/t of primary aluminium converted into Properti ingots.

The most important aspect of the Properti technology is that the liquid aluminium solidifies inside the casting machine copper ring closed by a steel belt, thereby eliminating any contact with the air. Thanks to this key aspect, no (!) dross is created and consequently zero loss of aluminium. Remember, aluminium requires 17,000 kWh/t and generates direct 11.5 t CO₂ emissions into the atmosphere. On the contrary, the dross generated during production of open top mould ingots must be removed from each ingot, usually done manually by the operators. 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 CO₂.

In other processes ingots are made by saw cutting which creates aluminium waste in the form of chips, thereby wasting aluminium (and emitting CO₂) and creating a significant environmental impact linked

to the management of wet lubricants. In the Properti process the continuous cast bar is cut with a rotary shear that does not generate any chips. The result is evident: zero aluminium is lost by producing the CO₂ntinuus Green Ingots.

Furthermore, the Properti ingot bundles are more compact and stable than bundles of traditional open top mould ingots. This reduces the PET and/or steel strapping material required to deliver a tonne of ingots by about 40%, which represents an equivalent savings of CO₂ generated to produce it.

A detailed study of all the savings, including other benefits of our ingot casting technology, including the elimination of 'out-of-dimension' ingots and transport of the same, has provided evidence that 'CO₂ntinuus Green Ingots' are greener compared with other ingot types available on the market with a savings of 280 kg CO₂. Continuus-Properti is also working to support our customers in certifying such CO₂ savings. During the last 30 years several Properti Ingot Casting Lines have been supplied to various secondary and primary aluminium smelters, including Alba, EGA, Yunnan and Rusal.

Properti ingots are the most eco-friendly and best available technology for the production of primary and secondary aluminium ingots.

Vert-Melt furnace: further savings in terms of CO₂ emissions

After solidification into ingots, the next step required by aluminium producers is to melt the aluminium ingots. Properti has over 40 years of experience with shaft melting furnace technology, which has led to the development of the Vert-Melt family of furnaces with continuous melting speeds of up to over 10 t/hr. Compared with the traditional melting furnaces, there are several advantages of the Vert-Melt such as, to mention few of them, easier operability, lower maintenance, lower operational costs, and more constant melting rate.

In this article, the evaluation is limited to the sole environmental point of view. It can be asserted that the melting phase has three key aspects: energy consumption, dross generation and fume quality.



Ingots produced with Properti technology.



The Vert-Melt furnace.

The Vert-Melt furnace compared with the traditional melting furnaces has the following advantages on the three key green aspects indicated above:

- Energy efficiency: higher than any kind of reverberatory furnace with an energy consumption up to 40% lower, and no need for sophisticated, energy-wasting stirring systems.
- Dross generated: metal losses are three or more times less.
- Emissions: significantly reduced since the melting chamber is smaller and fumes temperature is lower.

Let's focus only on the first two key aspects, higher energy efficiency and lower dross generated, in equivalent savings of CO₂ generated. As said, aluminium requires up to 17 kWh/kg Al and generates direct emissions of up to 11,5 t CO₂, and since metal losses are three times less, the saving is up to 3% of aluminium with the associated CO₂ emis-

sions to produce it. Adding the advantage of an energy consumption up to 40% lower, since the consumption of 1 Nm³ of natural gas generates 1.8 kg CO₂, the result of the two above savings is conservatively above 420 kg of CO₂/t Al ingots or sows melted. The management and further processing of the dross produces additional CO₂ but, since it is difficult to represent in a formula, it is not considered here.


Conclusion

A visit at Continuous-Properti's headquarters shows the company's commitment to not only being an inventor of new technologies that have changed the traditional industrial practices in the non-ferrous sector, but also a strong commitment to the environment and sustainability. The headquarters has 20,000 m² of greenery and hundreds of trees which existed when the company relocated to its current location; now these same trees are more than 70 years old.

The nature of the company is to increase the efficiency of the equipment, to reduce the consumption of utilities and to reduce waste by inventing new technological solutions and recycling processes. Continuous-Properti has spent tremendous effort to realise these goals and the company continues to work to improve the significant results already achieved:

- CO₂ Continuous Green Al Ingots: 280 kg CO_{2e}/t of Al ingots produced
- Vert-Melt Furnace: 420 kg CO_{2e}/t of Al ingots melted.

The goal of the global community is to make the aluminium chain 'greener', and Continuous-Properti continues to make a significant contribution in this field. ■

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