

PRIMARY AND SECONDARY ALUMINIUM INGOTS BY THE NEW PROPERZI TRACK & BELT SYSTEM

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Year after year aluminium is replacing steel, copper and plastic in many engineering sectors. As a consequence, the per capita consumption of aluminium is among those economic indicators which defines the degree of development of each country.

Aluminium is produced either at a primary smelter, starting from alumina (Al_2O_3), or in a refinery where the raw material used is aluminium scrap such as motor casters, UBC (used beverage cans) or other types of shredded scraps duly refined. Several technical papers have underlined the huge savings in transformation costs when the aluminium scrap is used as raw material, being likewise a bank of energy, and therefore we will not cover this subject in this document. Our main focus is that regardless of the starting material (alumina or scrap), the usual re-melt forms standardized worldwide are ingots, tee-ingots or tee-bars and sows.

The production of re-melt forms worldwide represents approximately 1/3 of the aluminium produced by primary smelters and 2/3 of the aluminium scrap “resurrected” by aluminium refineries with ingots being the most preferred. In fact, the ingots give the users the flexibility of loading into the furnace bundles of a nominal weight of 500 kg or 1,000 kg or one or two ingots at a time in the case of die casting operations. The automotive industry is one of the largest consumers of aluminium ingots as the current average quantity of aluminium used is in the range of 150-160 kg per car while the number of cars manufactured worldwide has already surpassed 90 million units per year.

For many years ingots have been produced with the traditional open top chain mould and such ingots are referred to as “Open Top Ingots” in the market. Their shape is represented in one of the pictures of this document. The suppliers of such ingot casting machines have spent remarkable efforts



Conventional open top ingots; ...apparently, not very stable...

to develop and modernize this technology by improving those details meant to increase efficiency. Although many improvements have been made over the years, several problems related to the general concept design remain unresolved.

Therefore, while the car industry looks more and more for repeatability and traceability of the process and raw materials used, the traditional open top ingots are still affected by the following major limitations:

- >> Inconsistent geometric dimensions of the ingots and, therefore, inconsistent weight
- >> Inconsistent dimensions and shape of the ingot bundles
- >> Loss of metal due to skimming
- >> High rate of rejection due to off-size
- >> Critical de-moulding operations
- >> Necessity of using at least three straps for securing each bundle; the use of five straps is also quite common



Properzi Track & Belt Ingot Caster

The Properzi Ingots
By courtesy of Dubai (UAE)



**Perfectly square, perfectly stable, perfectly shaped –
By courtesy of Dubal (UAE)**

The solution to the problems mentioned above has concerned the ingot producers and users for many years.

Well, sometime consolidated technology becomes obsolete when something disruptive appears in the market using a completely different concept design.

This is certainly what happened when, in the 90s, Properzi introduced a new method to produce ingots with Properzi's well-proven continuous casting process based on solidification in a continuous closed mould.

The recently patented Track & Belt Ingot Casting Machine Model 2 supersedes the limitation of the Properzi wheel diameter and the straightening of cast bar made of hard alloys. It transforms the molten metal into a continuous cast, straight bar of trapezoidal shape with very consistent repeatability. This cast bar is cut into ingots of repeatable length by a Properzi rotary shear. The ingots are then cooled to a temperature of 70-80 °C in order to allow the palletization and strapping operations.

The ingots produced with the Properzi Track & Belt system are characterized by:

- >> 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 the concept of off-size dimensions is not applicable. The only tolerance is in the length of each ingot (720 mm ±0.5%)
- >> Traceability data engraved on the top surface of each ingot
- >> No de-molding problems
- >> Two straps are, in general, sufficient to secure each bundle. Some customers use a maximum of three straps

Thanks to the advantages listed above, the Properzi system boasts one of the lowest OpEx (Operational Expenditures) available in the market to produce ingots either for primary smelters or for scrap reclamation. In particular, the non-necessity of skimming, either manual or robotized, saves 30,000 kg of metal for every 10,000 tons of aluminium processed; a very big number!

The Track & Belt process is gaining wide acceptance in many countries from Italy to Mexico, from Poland to Russia and China. We have also enjoyed several repeated orders by Raffmetal (Italy).

The Properzi T&B Ingot Casting Lines can work either in continuous operation reaching an OEE of 85% and above or on a batch basis as requested by the refineries of aluminium scrap.

The standard ingots have the following weights:

- >> 8.5 kg
- >> 10.0 kg
- >> 13.6 kg
- >> 15.0 kg

By installing a very simple retrofit kit, it is also possible to produce two ingot lengths, 720 mm and 600 mm, from the same line. Each bundle has a nominal weight of 1,000 kg approximately. There are different plant configurations for different outputs: from 10 tph up to 30 tph and more.

We are glad to study and supply special machinery to produce ingots of special size and weight tailored to customer need.

Properzi is also available to supply such plants on EPC (Engineering, Procurement, Construction) basis so that the buyer is only minimally involved with the installation of the plant.

By C.M.B.