



ALUMINIUM BILLET MANUFACTURING PLANTS



Automatic plant for aluminium billet manufacturing



MELTING FURNACE

HOLDING FURNACE

CASTING MACHINE



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HOLDING FURNACE



CASTING MACHINE

Our wide experience in design and manufacturing of furnaces and auxiliary equipments, together with continuous contact and information exchange with our customers has allowed GHI to supply complete turn-key plants that include all or part of the equipments described in this paper.

MELTING SHOP

MELTING AND HOLDING

Melting furnaces must fulfill following requirements:

- Obtain high specific outputs.
- Provide maximum energetic efficiency with a low atmospheric contamination level.
- Easy charging and skimming/dedrossing.
- Allow complete automation.

Melting furnace may be round or rectangular shaped and tilting or fix (non tilting).

As a first choice for melting furnace, we have the top charged round furnace that is charged through the roof. Roof lifting and swinging mechanism reduces opening time and energy loss.

Low NOX regenerative type burners make this kind of furnace reach un-

beatable bulk scrap specific melting ratios.

When we want to remelt ingots and/or medium size scrap, dry hearth melting tower is an ideal choice to get very low specific gas consumption and metal loss.

Finally, rectangular shaped reverberatory furnaces with wide doors are designed for easy charging and cleaning of furnace chamber.

Reverberatory type furnaces are specially recommended to remelt long rejected extruded profiles that can be charged into the furnace without any need of cut-

ting or baling by means of a charging machine.

When wet scrap is wanted to be melted, it must be dried either in a pre-heating oven or in the dry hearth ramp avoiding explosions or metal splashes.

Once scrap is molten, metal is transferred to the holding and casting furnace where it is raised to the desired casting temperature and alloying materials can be added.

If bath chemical homogeneity wants to be improved, porous plugs or electromagnetic stirring devices are used.



HOMOGENIZING FURNACE

COOLING CHAMBER

SHEARING



CASTING

From holding and casting furnace, molten aluminium is transferred to

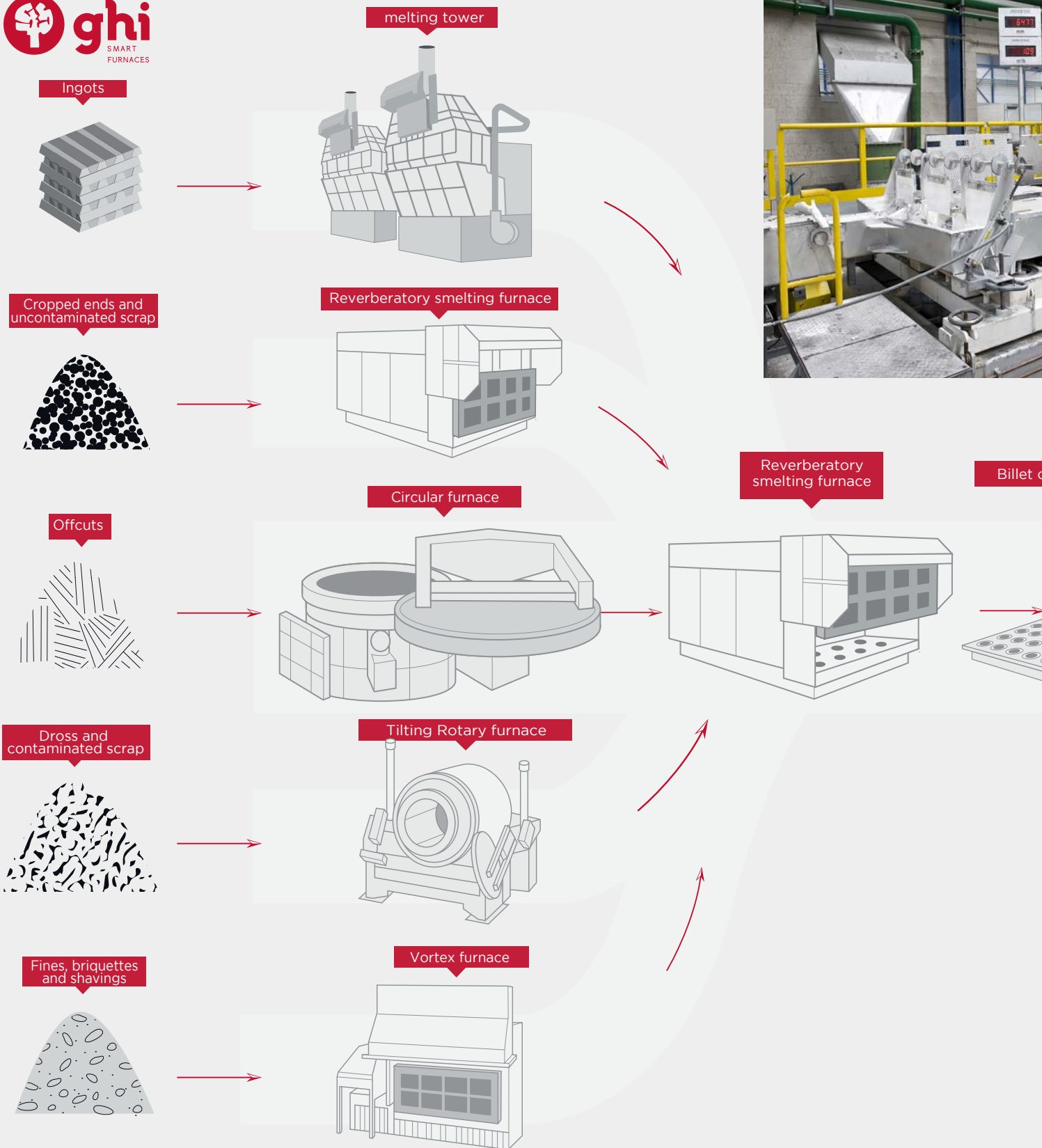
the vertical casting machine.

Furnace tilting is controlled by means of laser detectors that maintain metal level in the laun-

der, degassifier and ceramic foam filter.

In order to obtain the best quality in casted aluminium log, a continuous rod feeder is installed

in the pouring spout of casting furnace for grain refining. Metal then goes first through an in-line degasser where hydrogen content is reduced and after through a ce-



ramic foam filter where inclusions are removed.

Among different kinds of vertical casting machines, hydraulically operated ones with self-guiding cylinders allow close control of lowering speed and practically eliminate vertical vibrations, what means that

high quality casting and tight dimensional tolerances are reached.

INSPECTION TABLE

Once billets are cast, they are lifted out of the casting pit and set down on the inspection table with the help of a specially designed device hanged to



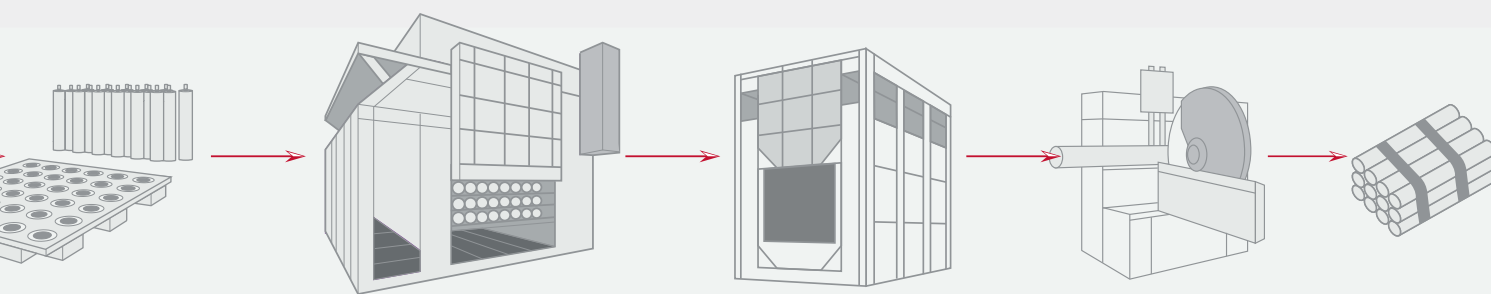
Casting machine

Heat treating furnace

Cooling chamber

Cutting and strapping

Strapped billets



the overhead crane. In the inspection table, dimensional tolerances and also casting defects are checked.

If log is defective, it is automatically rejected and stored in a particular table until it will be remelted later on. Otherwise, log is stored in the exit table until it is heat treated.

AUXILIARY EQUIPMENTS

GHI develops both general and detail engineering of the melting shop integrating auxiliary equipment designed and manufactured by ourselves such as scrap charging machines, ladder tilting devices, launders, furnace tending

machines... together with other equipment supplied by other manufacturers like degasser, filters, spectrometers.

Aluminium logs casted in vertical chill casting machines must be homogenized in order to improve both mechanical and metallurgical properties.

Stress generated inside logs during water cooling often gives rise to cracks when they are cut to achieve the size required by extrusion presses.

These stresses disappear when ingot is heated to the relatively high temperatures of homogenization.

From a mechanical point of view, during homogenization, transforma-

tions that increase hot plasticity of material occur, mechanical characteristics improve as does malleability in general.

This leads to a lower resistance to deformation and thus extrusion process is favoured.

Metallurgic modifications are complex. Eutectic elements are dissolved on the grain limits so that solid state temperatures can be raised.

Some constituents segregate while others are dissolved.



Inspection table



**Billet
homogenizing
plant**

Differences in concentration disappear so that not only the above mentioned advantages are achieved but also the behaviour of the metal improves substantially in the heat treatments and manufacturing processes coming after the extrusion it self.

Homogenization heat treatment has undergone great changes from a user specification point of view.

Traditional treatment were long lasting and basically considered the

time metal was maintained at the desired temperature with a specified precision.

Actually, homogenization goal is to heat logs as quickly as possible up to the set point temperature avoiding temperature differences between logs of a single lot.

Temperature precision during maintenance period continues to be important and must be achieved in the least amount of time, although its duration depends on the al-

loy being heat treated.

After homogenization, controlled cooling is applied, and it's a point of highest importance to achieve a top quality homogenized billet.

Furnaces described following have been developed in collaboration with aluminium producers in order to achieve maximum efficiency in the cycles currently employed.

HOMOGENIZATION FURNACE

It is a loading machine furnace. The introduction and extraction of

loads is performed by an external machine so that furnace itself does not have moving elements for this purpose.

The main advantage of this kind of furnace is that only load itself absorbs heat inside the furnace as there are no supports or cars that are heated or cooled at least partially with the load, avoiding energy losses and delays and more expenses in the treatment.

Inside part of furnace is basically divided in two

STANDARD PLANTS

NAME	ANNUAL BILLET PROD. (TON/YEAR)	EXPANDABLE TO (TON/YEAR)
PRA - 10	10.000	20.000
PRA - 20	20.000	40.000
PRA - 30	40.000	80.000



**Furnaces charging
machine.**



parts:

The lower one where the load to be treated is stored and the upper one which contains recirculation fans and heating elements.

Furnace design allows wide chamber volumes on each side of the load. They create a plenum chamber that maintains pressure uniform throughout the useful height, creating a uniform gas flow through the billets.

COOLING CHAMBER

Billet, after homogenization cycle has been completed, are introduced via the charging machine in a temperature controlled chamber.

There is a wide variety of procedures used to cool a load, ranging from simply blowing cold air through it, either in one direction or two using

reversible fans or couples of fans to sophisticated cooling chambers which are similar to heating furnaces.

In the latter case, the cooling chamber has a series of fans, located on the roof that blow the air through the load horizontally as is done in homogenizing furnace.

In fan suction zones, they are controlled cool air inlet where the flow can be regulated to a greater or lesser amount depending on the desired cooling rate.

These chambers can include water spray cooling systems, in which case the internal casing must be stainless steel.

Lay-out of an homogenization plant includes one or more furnaces, cooling chamber(s) as well as loading and unloading tables where loads to be treated are placed and treated ones are taken out.

Plant is operated automatically through the charging machine that receives commands from the PLC system and general line computer.

Throughout the cycle, system records all necessary data and statistics and also manages alarms.

SAW

Once billets are destacked after they

come out from the cooling chamber they are fed into the loading table of the saw.

Depending on customer requirements head or tail of the billet is sawn off or billet is cut into shorter pieces for specific extrusion press.

Saws can include a chip collection system and billet weighing and packaging devices.





AUTOMATIZATION AND SAT

A management and control system which permits process variables to be monitored, thus offering possibilities for control and continuous improvement.

Corrective, preventive and predictive maintenance; SAT and Services 4.0.

HOMOLOGATIONS

SERVICES



Engineering 4.0



Automation



Technical Assistance
Service 4.0



SOLUTIONS



Turnkey
plants



Industrial
furnaces



Auxiliary
equipment



Revamping



QI-9 CERTIFIED

APPLICATIONS



Melting and
holding



Casting



Heating



Heat
treating



METALS



Aluminum



Iron and steel



Zinc



Other materials



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