UK Aluminium Industry Fact Sheet 7

Aluminium Wrought Remelt

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Introduction

The UK aluminium industry includes companies who remelt recovered aluminium alloy materials, usually in-house wrought alloy scrap arisings, and convert them into wrought alloy products such as extrusion billet and rolling slab.

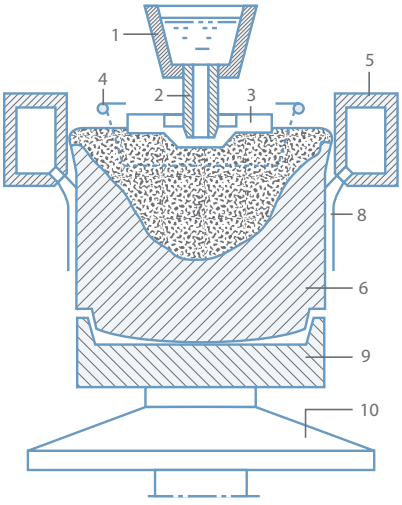
The Process

A significant proportion of the remelters' melting capacity is devoted to in-house recycled metal from rolled products and extrusion plants. This can include a customer toll-conversion service to enable customers to maximise their material usage by the remelting and re-constituting of their own wrought alloy scrap arisings.

Strict quality control must be exercised at all stages of production from the receipt of raw material through to the dispatch of the finished product. To ensure that the alloys conform to their specifications, compositional control is maintained using spectrographic analysis. During the melting and casting operation the metal is degassed and cleaned using inert gas and filtration to remove hydrogen and other impurities from the metal.

The casting process to produce extrusion billet or rolling slab is the vertical Direct Chill (DC) process.

Schematic representation of a vertical DC caster.



1. feed trough 2. nozzle 3. float-valve
4. distributor 5. mould 6. solidifying ingot 7. sump
8. water-cooling spray 9. stool-cap 10. stool.

The diagram shows only one billet or rolling slab being cast, but in practice it is possible to cast simultaneously many extrusion billets, up to 100, and several rolling slabs, 8 is not uncommon. In the DC process a fixed water-cooled mould is situated above a deep casting pit. The bottom of the mould is filled with a stool cap. Molten aluminium is bought to the top of the mould by a launder and a floating valve controls the flow of molten aluminium. At the start of the 'drop', when the molten aluminium surface in the mould reaches the required level a hydraulic ram takes the stool-cap down, taking with it the solidifying billet. Water sprays directly play on the outer skin of the billet, removing the latent heat of solidification. Below the level of the mould the cast billet consists of a solidified outer shell with a centre that still contains molten aluminium. This central molten aluminium will solidify well below the mould level, particularly for large cross-section castings. The final length of the cast billet or rolling slab is dependent only on the depth of the pit and the sufficient supply of molten aluminium.

The close proximity of large volumes of water and of liquid aluminium means that accurate control of the process is paramount to ensure safety and also to ensure the quality of the billet. The cast billets and rolling slabs must be free of harmful impurities such as dross inclusions and with a minimum gas content. Grain size control is also required so that an optimum casting speed can be achieved without risk of cracking.

As environmental awareness standards have increased, the industry has endeavoured to minimise and, if possible, eliminate the pollutants escaping into the atmosphere from the melting and casting process. Modern fume arrestment equipment virtually eliminates dust emissions from the melting and holding furnaces and dross treatment apparatus keeps the generation of fumes to a minimum.

The Product

Aluminium extrusion billet is generally in 6000 series alloys. Some 2000 and 7000 alloys are also produced in the wrought remelts. Billet for forging stock is available in 2000, 5000, 6000 and 7000 series alloys. Rolling slab is available in 1000, 3000, 5000, 6000 and 7000 series alloys.

The Structure of the UK Industry

Each UK centre for aluminium rolling has its own associated remelt facility to recycle the in-house arisings of aluminium scrap from the rolling process. Such scrap would include scalpings from cast rolling slab, edge trim, and front and back end discards.

Similarly the larger aluminium extruders in the UK have an associated remelt facility. In this case the scrap arisings will include crops from the top and bottom of extrusion logs, the back end discard from the extrusion press and the extrusion lengths cut off following stretching.

In both cases the rolling slabs and extrusion billets will be fabricated within the company operating the remelt. Facilities also exist on a tolling basis so that a small independent extruder, without a remelt facility, can send in-house scrap arisings to be remelted and cast into more extrusion billet. In this case the metal remains within the ownership of the original fabricating company who pay a tolling fee to convert scrap back into extrusion billet of the same chemical composition.

Further information about aluminium and aluminium alloys, their production, fabrication and end use can be obtained from:

(1) European Aluminium Association in Brussels
www.eaa.net

(2) International Aluminium Institute in London
www.world-aluminium.org

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