



Magnesium Elektron

SERVICE & INNOVATION IN MAGNESIUM

Recycling Economics

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DEMAND FOR HIGH PURITY ALLOYS

Magnesium is a highly recyclable material, consuming only 5% of the energy required to manufacture the primary metal. Consequently, the recycling of high quality magnesium scrap from the die casting process is a key element in determining the costs competitiveness of using this material for automotive applications. Furthermore, as magnesium becomes specified for an increasing number of applications, the recycling of second-generation components from the recovery of End of Life Vehicles (ELVs) is likely to play an increasingly important role in the supply of magnesium in the long term.

The demand by designers and end users for high purity magnesium alloys for the majority of new applications suggests that, unlike for other materials, a two-tier system of alloys, i.e. primary and secondary, is unlikely to evolve. In today's marketplace, recycled alloy ingot is required to meet the same stringent quality criteria as primary metal in terms of chemical composition and oxide content. While oxides and certain impurity elements can be removed when recycling die casting scrap, it is not possible to remove elements such as nickel and copper. If present in excessive amounts, these elements can have a detrimental impact on alloy performance, particularly corrosion resistance.

MATERIAL VOLUMES AND POTENTIAL OUTLETS

During the manufacture of a diecasting, inherent within the process is the production of a high percentage of process scrap metal, typically 40% -60% of the total cast (shot) weight. This is in the form of runners, which feed the die cavity as it is injected with magnesium. For a die casting foundry, the relationship between the quantity of process scrap produced and recycled, and the volume of primary metal purchased, is a complex one that is dependent upon one or more of the following factors:

- Scrap to component ratio for a single shot.
- Metal losses during the melting cycle.
- Number of different components cast.
- Production efficiencies in terms of the percentage of reject parts cast.
- Quality of process scrap.
- Efficiencies within the recycling operation.

In a typical system whereby the scrap to component ratio is 40% : 60%, the volume of recycled metal entering into the system accounts for 35% of the total magnesium required by the die caster. For a scrap to component ratio of 50% : 50%, this figure increases to 44% of the total magnesium required. Both scenarios highlight that the efficient utilization of this material is critical to the overall cost effectiveness of the die casting operation.

The die casting foundry has 3 options in terms of managing this quantity of process scrap:

1. Sell the material onto the open market
2. Recycle the material internally.
3. Recycle the material externally.

Some die casting foundries may choose to sell process scrap onto the open market. The disadvantage of this approach is that material is usually downgraded for use

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in alternative markets such as alloys for the production of anodes, or powders used in the desulphurisation of steel. The prices paid for such material is heavily dependent on the supply of alternative materials and can vary considerably over time. In the main, the adoption of such a route to manage process arisings will have a detrimental impact on cost effectiveness of the die casting operation. At today's European prices, selling scrap on the open market will cost the diecasting foundry an additional DM0.50-DM1.0/Kg of scrap generated in comparison with recycling the metal either internally or externally. In addition, the alternative markets using magnesium scrap have a finite requirement and are not expected to grow in line with the growth of magnesium for die casting applications.

In Europe, the vast majority of die casters today choose to recycle their process scrap arisings, either internally or externally. As well as being the most cost effective solution, this method of management gives the die casting foundry a guaranteed source of supply at a relatively stable price and keeps their overall operating system in equilibrium, i.e. the process scrap the system generates is utilized within a closed loop. The impact of external factors is minimised and the demand by the die casting foundry for primary metal is reduced by up to 50% depending upon the scrap to component ratio.



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