Magnesium Elektron

SERVICE & INNOVATION IN MAGNESIUM

ELEKTRON REFINING TECHNOLOGIES

REMOVAL OF MAGNESIUM OXIDES

Scrap magnesium from the die casting operation tends to be high grade clean scrap, Type 1 under the scrap classification index developed by Magnesium Elektron. However, prior to being reintroduced into the die casting operation as feedstock material, there is a requirement to refine the metal of dissolved gases and oxides and ensure it is free from impurity contaminants, which can have a detrimental impact on material properties, particularly corrosion resistance. It is this refining process which forms the basis of a recycling operation. The process is carried out either internally by the die casting foundry or externally by companies specializing in the recycling and recovery of magnesium.

Melting of the scrap is usually carried out on a batch or semi-continuous basis using a flux or suitable protective atmosphere to ensure the molten magnesium does not react with air. Once molten, the oxides produced in the die casting process can be removed. The techniques for removing oxides are based on either flux refining or argon sparging. With the former, a refining flux is introduced into the melt and stirred. The flux absorbs the oxide particles to form a conglomerate, which is significantly denser than the molten magnesium. During a settling period, the conglomerate sinks to the bottom of the melt. The technique of argon sparging involves dispersing fine argon gas bubbles through the melt. These attach to the oxide particles and float to the top of the melt where they can be removed. The magnesium recycling industry both in Europe and North America favour the use of flux refining systems.

Using its extensive knowledge in the processing of molten magnesium, Magnesium Elektron developed its own proprietary flux based refining technology (ELEKTRON® Refining Technology). Although the technique restricts manufacturing to a batch or semi-continuous process, very high levels of metal cleanliness can be achieved, equal to that of primary metal. In addition, melt losses are minimised. The latter is the biggest cost driver in any magnesium recycling system.

REMOVAL OF IRON

Iron pick up occurs during the die casting process and this is usually removed by the addition of manganese. Manganese is already present in magnesium alloys as an alloying addition between 0.17 - 0.50%. Further additions form dense intermetallic particles with the iron, which then precipitate out of the melt thereby lowering the iron content. Although this technique is successful in removing iron, the residual manganese content of the alloy can become variable, potentially leading to excessive 'sludging' in the die casting furnace, particularly where lower holding temperatures are used as is the case for hot chamber die casting. To overcome this problem, Magnesium Elektron developed a proprietary technique based upon small additions of zirconium. Using the technique, manganese is only added when it is below the minimum specified level. Compositional adjustments are made and dissolved gasses removed prior to the molten alloy being cast into high purity alloy ingot.

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THE PROBLEM ELEMENTS

To date, no technology exists to refine molten magnesium of copper or nickel. If these elements are present at levels greater than the maximum allowable under the ASTM specification, then corrosion rates can significantly increase. Today, Magnesium Elektron uses statistical process control & ELEKTRON® Feedback Analysis to monitor all incoming scrap materials. The technique enables contamination issues to be quickly identified and eliminated at source.

† The information contained within is meant as a guideline only

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