



IN-CELL RE-CYCLING FACTS

In today's economic uncertainty along with diminishing profits, and ever changing prices for magnesium and uncertainty in the supply chain more and more companies are closing their door. Fortunately there is a way to counter this effect and remain competitive and that is to re-cycle magnesium scrap in house.

Only a few years ago major ingot manufacturers would tell us that it was not possible to re-cycle in house due to lack of know how and equipment, but now that they are all disappearing so is the pressure against re-cycle in house. Now that most new ingot suppliers do not offer re-cycling themselves they advocate in house re-cycling. Therefore, a magnesium die caster that does not re-cycle will be fighting an uphill battle to remain competitive.

There are a few different methods of re-cycling in house. The first method is to purchase a full re-cycling system with equipment to alloy and clean the metal which will require an ingot mold line. This is cost effective if there is more than 5 million lbs per year of scrap. Total capacity can be increased by purchasing other die casters scrap if there is some availability at a reasonable cost. Doing this will require more controls than doing internal material only. The full re-cycling allows for stored scrap to be processed but does need constant attention to alloying and impurity removal. This system is expensive and harder to operate and requires trained personnel.

There is a much simpler way to do this and it is **In-Cell Re-Cycling**. This can be done efficiently with the right equipment and process. The advantage of doing In-Cell Re-Cycling is that there is no need to alloy the scrap that goes back in. Read further to see how it is done.

Single Furnace VS Double Furnace

What Happens to Oxide Inclusions in a Magnesium Scrap Melt?

Oxides will rise to the top 8 inches of the melt fairly rapidly when first melted. This is due to hydrogen formation from burning the film formation on the scrap surface. The hydrogen gas bubbles attach themselves to the surface film oxides which helps float them to the surface.

The design of a system to In-cell Re-Melt must allow the natural separation to take place. There needs to be enough dwell time built into the process for the oxides to rise - this is why a two-furnace approach is preferred. The cast or pumping furnace does not go through a phase transformation from solid to liquid so it is easier to keep the clean alloy separate.

Melting and holding are two different processes with two different requirements, so they should be kept separate.

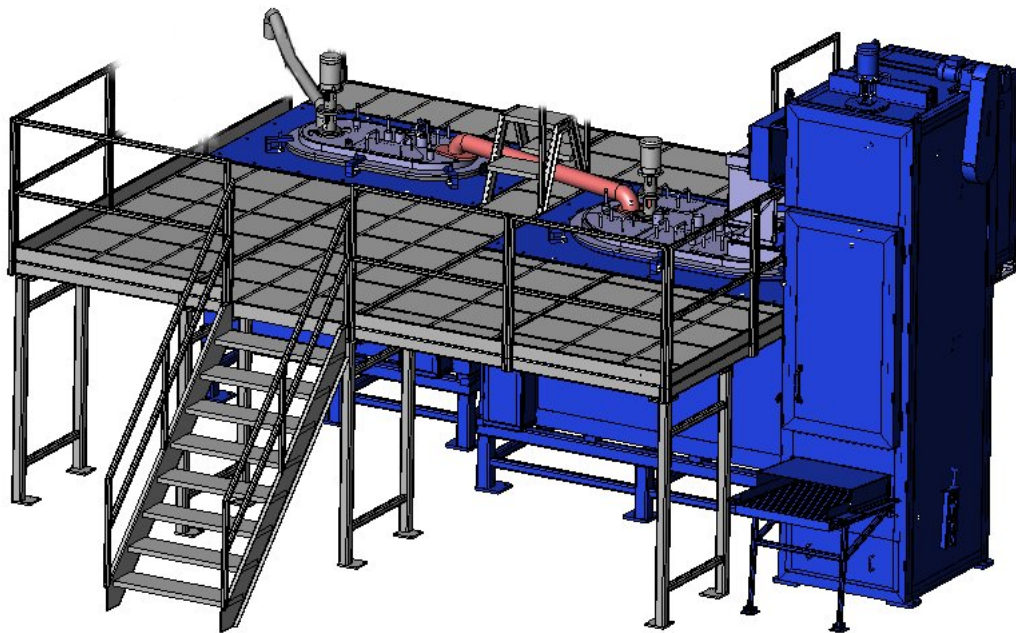
Keeping the Right Composition

In order for In-Cell Re-Cycling to be successful, the alloy composition must remain within the prescribed specifications and must still meet the ASTM B94 specification for die cast ingot. If done properly the scrap to virgin ingot ratio should be 50/50. Depending on the tooling design the casted part can be up to 60% of the total shot weight; this makes it easy to keep the ratio equal. In a real time process, the scrap gets put back into the melt within minutes of being casted. This is especially good in preventing a thick oxide skin of the scrap.

Addition of Circulation Pump

The addition of Circulation Pump is more efficient in any re-melt furnace system. The Circulation Pump is located in the Melt Furnace, where it will assist the scrap to pass from solid to a liquid much faster thus minimizing inter-metallic separation. The stirring action resulting from the Circulation Pump also helps the lighter magnesium oxide to float to the surface.

The melting and holding process require two different operating temperatures, this is impossible to do in a single furnace. There are some instances where In-Cell Re-Melting is done in a single furnace but the crucible size has to be more than double the normal size required. In a single furnace the cast temperature will be compromised in order to satisfy the required melting temperature needed to melt scrap.



TWO FURNACE SYSTEM