

The furnace

The furnace used for zinc cannot reach the required temperature for AM-lite®. Magnesium alloys, including AM-lite, require a furnace that can operate at 600-660°C. The crucible should be changed from the cast iron or mehanite crucible normally used for zinc to a steel crucible. Ceramic bricks inside the furnace must not contain any silica as magnesium reacts violently with silica. This is important in case of molten metal leaks from the crucible.

The top of the crucible should be sealed by a well fitting cover, which is normally bolted to the crucible, to minimise ingress of air. The cover is usually made of low carbon steel and comprises a main cover, at least one hinged lid to allow ingots to be fed to the furnace and also to allow for cleaning, and a slide-on cover that goes behind the goose neck.

Gooseneck and nozzle

Steels in contact with magnesium alloys need to have a low Ni content to prevent contamination. Usually 1.2888 steel is specified for the gooseneck and nozzle. The following items should be manufactured from this steel:

- gooseneck
- plunger
- plunger rings
- plunger rod
- nozzle

The nozzle and gooseneck are heated to approximately 600-650°C for AM-lite. It is recommended that the nozzle is electrically heated and a thermocouple should be inserted into a hole drilled into the nozzle to sense the temperature. Accurate control of the nozzle temperature controls sprue freeze-off and assists operation of the machine in automatic mode. The sprue bush and sprue post can be cooled by either water or oil.

The dies

Dies used for zinc can often be used for AM-lite. The runner systems are often similar. AM-lite usually requires a warmer die than zinc. Therefore, it is normal to heat the dies with oil via an oil heater system to allow for a quick start-up as well providing good temperature control of the die.

Cover gas

All magnesium alloys require cover gas protection to reduce oxidation and risk of fire. AM-lite is less prone to oxidation than other magnesium die casting alloys but a cover gas is still required. It is usual to have a number of inlet points into the furnace especially near the hinged cover at the front of the furnace and near the back of the furnace where the gooseneck enters the crucible. Most die casting machines also have an inlet near the plunger rod to inhibit reaction above the plunger.

AMT recommends the use of AM-cover™ but other cover gas mixtures utilising SF₆ and SO₂ will also work with AM-lite. Carrier gases can be either nitrogen or dry air.

Care of the metal

Molten AM-lite requires a lot less maintenance than other magnesium alloys. After initial melting or re-melting, the molten alloy should be thoroughly stirred (puddled) in a vertical direction before commencement of casting. The surface of the metal should be skimmed at the end of every shift using a slotted spoon.

As with all molten metals any tools used for cleaning the furnace must be heated to at least 200°C before putting them into the melt. Every third day a slotted spoon should be used to clean the bottom of the melt to remove any sludge that may have formed. AM-lite produces much less sludge than other magnesium alloys so the amount of sludge should be small. The skimmings should be stored in an air-tight steel container. Ammonia may be evolved during storage.

Any ingots that are added to the furnace must be heated to 200-300°C. This evaporates any water that may be either on the ingots or chemically bonded to surface oxide.

Safety

Safety in the diecasting shop is the responsibility of the diecaster.

Magnesium alloys are considerably more reactive than zinc alloys. In converting from diecasting with zinc to diecasting with AM-lite it is very important that both management and shop floor personnel are aware of possible dangers and that appropriate safety procedures are put in place.

Important safety precautions are broadly outlined in AMT's Technical Information Sheet "Safe Handling of Magnesium". Diecasters should seek detailed and comprehensive information that is applicable to their own requirements and should rely and act upon their own evaluation of that information.

In case of fire

One of the biggest differences between AM-lite and zinc is that, like other magnesium alloys, molten AM-lite is reactive with air and if it is not protected by cover gas it may start to burn and be difficult to extinguish. Water definitely must not be allowed to come into contact with molten metal, especially magnesium. Specially made fluxes and fire extinguishers are available for extinguishing magnesium fires.

Around the machine

The area around the hot chamber die casting machine should be kept clean. If any flashing outside of the die occurs then these thin sections can easily burn. Dies should be made so that no metal is ejected from the die during normal operation.

Some die casting companies raise the level of the machine so that the areas under the machine can be easily cleaned using a broom. Others use steel plate around the machine to assist in cleaning and to stop any spills of molten metal from reacting with the concrete.

Regular cleaning of the area should be carried out to stop any accumulation of magnesium.

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