DIE CAST SYSTEM COOLING

Die casting is the process where molten metal, typically zinc or aluminum are poured into a die where it is cooled to a solid form. The heat load is the combination of the following:

1. Sensible heat from the molten state when poured to the melt point of the metal
2. Latent heat that is required for the metal to change state to a solid
3. Sensible heat from the melt point to the final product extraction temperature

Below are typical temperatures and metal properties used in die casting aluminum and zinc. Use these values as reference with a customer as individual processes may vary.

	Aluminum	Zinc
Specific Heat of liquid metal	0.26 Btu per Lb.	0.96 Btu per Lb.
Specific Heat of solid metal	0.27 Btu per Lb.	0.97 Btu per Lb.
Latent Heat	172 Btu per Lb.	43.5 Btu per Lb.
Die Casting Temperature	1250°F	810°F
Melt Temperature	1112°F	790°F
Extraction Temperature	800°F	220°F

Calculating Die Casting Heat Loads

There are three steps to calculate the total heat load from the dies. To this amount is added the heat load from the hydraulics that drive the machinery. Furnaces are typically used to melt the metal and have their own cooling source.

Step 1 - Sensible Heat from pour temperature to melt temperature - Aluminum as an example

Q = Lbs per hour x Specific Heat x Delta-T

Q = Lbs per hour x 0.26 x (1250° - 1112°)

Step 2 - Latent Heat during phase change - Aluminum as an example

Q = Lbs per hour x Latent Heat

Q = Lbs per hour x 172 Btu per Lb.

Step 3 - Sensible Heat from cooling of solid metal - Aluminum as an example

Q = Lbs per hour x Specific Heat x Delta-T

Q = Lbs per hour x0.27 x (1112° - 800°)

All three heat loads must be added to derive the total die cooling heat load