Dr. Die Cast

Overflows, Vents and Simulation

I have observed that in some places the approach is - "If a little bit is good, more is better." - when it comes to overflows. After all, we can always remelt them so they don't cost anything to add... WRONG! If you were paying attention when Mike Evans from Gibbs Die Casting presented his study on melt loss at a recent NADCA Conference, remelt isn't free and melt loss is often much more than your standard estimates. What do you expect or want the overflow to do for the casting? Is there an engineering approach to sizing and placing overflows? This is where simulation comes in handy.

Rule #1: Overflows should be located at or near "the last to fill". If the intent is to "purge" oil laden melt from the casting, it's already too late. You need to reduce the left over die lube and/or tip lube from your process. Having said that, overflows are similar to real estate. It's all about location, location, location! The overflow does provide a connection to the vents. Perhaps a well-designed vent could be sufficient.

Rule #2: Size: The overflow(s) should only address specific areas or features of the casting. Don't try to do too much with one overflow. Several small overflows can be more effective than one large one especially when the large overflow connects over a long parting line. A large overflow can create a "back-filling" defect when metal returns from the overflow and reintroduces cold and gas-ladened metal back in to the casting. I have also observed this phenomena from vacuum runners that are connected to a group of overflows.

Rule #3: Is the purpose to only provide "Outboard" ejection? If you are trying to avoid ejector pin marks within the casting, then outboard ejection can sometimes accomplish this. Don't enlarge the ejector boss just because it is attached to an ejector pin. Simulation can verify if there is a need to purge material.

Rule #4: Control the die temperature. In some cases overflows are added to compensate for poor temperature on the die. Be sure that the die is up to operating temperature before deciding that the only solution is adding more or larger overflows.

Rule #5: What percentage of the problem feature can be improved by adding or enlarging an overflow? In fact, calculate how much of the metal through the gate goes to the overflows. I have seen large castings that had as little as 7% overflows and smaller castings that had 150% overflows. Intricate miniature castings usually have zero overflows while chrome plated casting will nearly always have a high percentage of overflows. Location is a major consideration.

Rule #6: Similar to #2 above, when using several overflows, avoid tying them together. This is a common practice when one or more overflows are prone to sticking or falling off and landing on a slide. The problem it creates is "recirculation" or "back-filling" into the cavity when metal has race-tracked through the bridge and mixing back in to the casting. This can cause flow defects, leakers and weak castings just to name a few.

To summarize:

- Overflows are not free.
- Challenge your assumptions that overflows, the size (volume) and locations are always needed.
- Calculate the percentage of overflows you use. Compare the % to the intended benefit.
- Locate overflows (and vents) where indicated by "last to fill".

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