A Milacron Company
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The Need for Heater Dry Out

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Hot runner systems use electrical heaters for providing molten plastic to the point of delivery. An unfortunate problem with these heaters is that they are hygroscopic, meaning that they absorb moisture. Attempts to make these heaters air tight have not been very successful because temperature cycling from startups and cool down cause seals to expand and contract, eventually causing the seals to fail.

Most hot runner heaters run at 240 volts, AC. Therefore, the presence of moisture can cause short circuits between power leads and from power to ground. Further yet, failure of heaters with internal thermocouples can lead to damage to the temperature control system if electrical power begins to flow from the power leads into the thermocouple leads.

To prevent damage to heaters, thermocouples and the control system, it is imperative that the control system provides a heater dryout routine. DME Company's SmartSeries controls refer to this as *SmartStart.* This is also generically referred to as soft start.

Most reputable control systems provide some sort of heater dryout routine. Some of these are strictly time based. Others are more intelligent and can actually detect the presence of moisture in a heater and will maintain the dryout routine until such time that moisture is safely driven off. DME's CSS module has a patented, intelligent dryout routine.

Dryout Methods

Heater dryout can be provided in one of two different ways, time proportioned and phase angle fired. Phase angle firing is more effective because it actually lowers the voltage that is provided to the heater. It works like a light dimmer. DME's DSS and CSS modules employ phase angle firing.

The time proportioning applies full voltage to the heater for a very short period of time, typically 8.33 thousands of a second at 60 Hz (North America) or 10 thousands of a second at 50 Hz. The idea here is to apply power for such a short period of time that it causes a gentle rise in temperature to drive off moisture yet prevents arcing (creation of a short circuit) inside the heater. This is the way DME's SSM module works. This is the preferred method of operation in some countries in Europe.

The newest designs in hot runner components have also increased efficiency to such a degree that the large tubular heaters in the manifold of the hot runner system can actually raise the temperature of the nozzles significantly, even before power to the nozzles is turned on. If nozzle temperature is well in excess of 100 degrees C (212 degrees F) when nozzle power is turned on, it is entirely possible that the nozzle heaters will already be dried out. Therefore, by sequencing startup so that manifolds are heated first, nozzle heater failures (the most common) may be entirely avoided.

Don't get excited, let the control system do its job!

Most reputable controllers have a built in dryout override. When they are turned on, they detect process temperature. If temperature is well in excess of 100 degrees C, the dryout routine will automatically be bypassed.

However, some controls also have a way to manually bypass dryout. Do not use this feature! Some controllers even have a "switch" that allows for continuous bypassing of the dryout routine. It is our understanding from our customer base that in the rush to get the process up and making parts, personnel may occasionally elect to bypass soft start. The consequence could be a blown out heater, which can either lead to lower production capability or no production at all.

Idle Heat, Anyone?

Some molders are located in areas of such high humidity that they should consider the use of idle heat. A good way to prevent heaters from failing from moisture is to prevent them from absorbing it to begin with. DME's present SmartSeries modules all have an option for idle heat control. When used in conjunction with the TAS-0512, the user can order all modules to an idle heat setting. This temperature is either 100 degrees C (SSM) or 93 degrees C (DSS and CSS). This temperature is high enough to prevent moisture from being absorbed in the heaters. It is also low enough that it will not cause degradation of most materials. When you are ready to start production, merely shutoff the idle heat setting and the controllers go back to their normal operating setpoint.

Summary

The reliability of hot runner systems is affected by the temperature control system. Not all controls are the same. However, it is imperative that controls used with hot runner systems have a dryout function to help protect against potential problems with moisture.

Proper training of setup personnel is essential. The need for speed can lead to unnecessary failure of heaters. Setup personnel must be trained to know that attempts to speed up the startup of a hot runner system can lead to system failure and even more downtime than if they allowed the controls to do the job they were intended for.