



Cycletime Tips - General

Volume 19: Air Drafts Across the Die

By Tim Chernock

Processors are always looking for consistency. If a profile can be extruded consistently, then operators are free to attend to other matters, profile rejects are decreased and profit share increased. There would be no argument that die flow consistency is crucial to profitable extrusion. Everyone would agree that material viscosity should be consistent. Yet how many people take precautions to guarantee consistent die temperatures throughout an extrusion run?

An extruder is hot. We rely on both conductive and shear heating to plasticize the raw material and force it through the die. In the summer months, ambient air temperature can soar to 110°F plus. It is extremely refreshing to open doors or direct fans to the operators' station at the die. A cool breeze provides a good deal of comfort for the operator. It also can wreak havoc on die flow!

Under production conditions, and at production rates, a die should always be balanced on the extruder. An effort is made to control the viscosity of the material under production conditions to assure an even flow of material through the die. Temperature is usually a variable of the viscosity of a thermoplastic. The die is usually balanced at a specific temperature. So if the temperature of the die changes, so should the viscosity of the material flowing through the die.

A heater band can and should provide even heating to the die (within an acceptable margin). The temperature controller monitors the temperature of the thermocouple centrally located in the die. Typically the outside of the die is slightly cooler than the center of the die. This temperature difference is usually compensated for by balancing the die. An air current blowing across the die will cool the die, increasing the temperature gradient across the die and change the viscosity of the material flowing through the die. This leads to profile dimensional variations and surface imperfections.

In an isolated climate-controlled environment, die drafts are not usually an issue. However, in an open shop where the daytime temperature at the extruder can reach 110°F and the night air drops to 60°F, an open shop door can create a situation where constant adjustments are needed to maintain product consistency.

Not only are drafts created by open doors and by spot fans for the operator's comfort, but also by air streams directed at cooling the extrudate, whether by fans or air jets. Many custom profile extruders use a jet of air directed on a die to correct the material flow through a poorly balanced die. An inadvertent air flow can create problems that many times are falsely attributed to material inconsistency or "night-shift gremlins." The most

sophisticated instruments cannot compensate efficiently enough for die cooling due to unwanted air currents.

Insulating blankets and custom-fit die jackets are available that will prevent air currents from affecting die flow. Blankets are the most versatile. Custom-fit jackets are generally more expensive but are more efficient. Closing shop doors and removing fans are not the answer.

Safety - Insulating dies will help prevent burns. The protruding hot die is covered. Your employees will be less likely to be burned. This does not eliminate the need for proper safety practices, but it does help prevent burns resulting from accidentally brushing against a hot die.

Caution: Dies are hot! Do not use an insulating blanket that will ignite. Make sure the blanket you use is designed for plastics processing and compatible with your particular application at your processing temperatures!

Energy Conservation - There is an obvious energy cost savings anytime anything is insulated. The blanket/jacket manufacturer can quote specific cost savings to you.

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