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Blown Film Troubleshooting

A Case Study of HDPE

Control of melt temperature is one of the secrets to success in the blown film industry. Unfortunately, many extruders do not have operating melt temperature indicators. You may assume that the temperature in the last barrel zone is the melt temperature. This works only if the melt temperature is under control.

Consider the following scenario. Two lines are producing 300 lb/hr. of HDPE film. One has a 2-½" and the other a 3-½" grooved feed throat extruder. Back pressures and die diameters are similar for both lines.

The 3-½" line operates at a lower screw speed and has a less sever screw design that the 2-½" line. The 3-½" line exhibits overheating in the last tow barrel zones; a much higher melt temperature; poorer mixing; and more gels than the 2-½" line.

Some common causes for these problems are:

1. The resin may be overheating in the feed zone due to insufficient cooling. An outlet water temperature between 70 and 90ºF is normal. Increase the water flow rate if the exit temperature is above 100ºF. Excessive wear in the feed section increases melt leakage flow and residence time. Compare the screw and grooved feed section to original specifications.
2. Most groove feed throat extruders have air-cooled barrels. Barrel heater without fins, or poorly designed shrouds, will cause the barrel to bend toward to cold side over time. Screw wear after the feed section and galled barrel lines are the result.
3. Excessive leakage flow occurs along the longer barrel side. Symptoms include: vibration directly proportional to screw speed, poor dispersion of additives, excessive gels. Check the screw and barrel for excessive wear.
4. Huge variations in the melt temperature can result if temperature controllers are not tuned properly. Broken or loose thermocouples will cause similar symptoms. Look for zones that are mostly cooling or heating and surging.
5. Some adjustments can be made for screw wear in the last tow zones. Increase the temperature in the feed section by reducing the water cooling rate. The resin will melt sooner. It may improve dispersion; reduce surging and melt temperature sings. This technique will work only if the screw is not severely worn and overheating has not occurred in the feed zone.