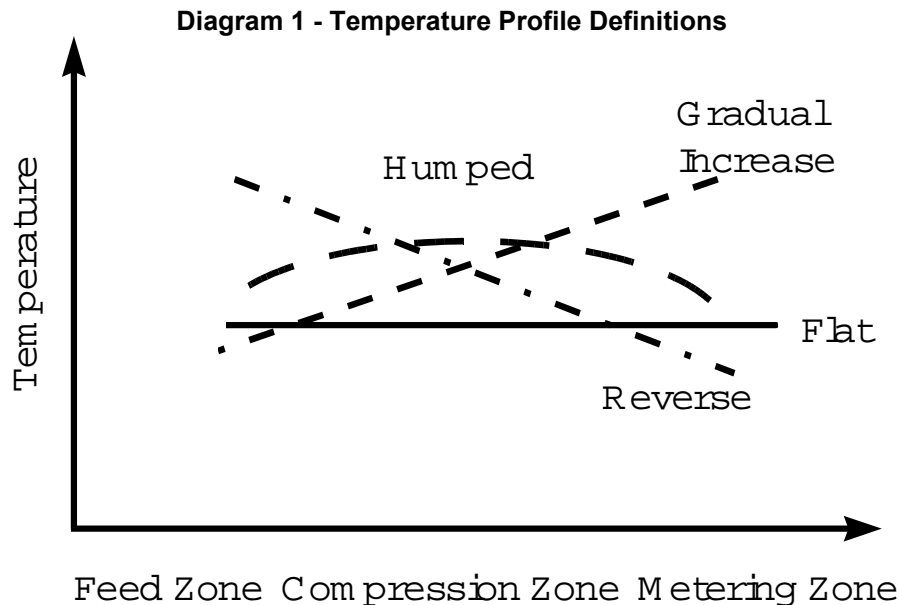


Troubleshooting

Which Way is Up? - Extruder Temperature Profiles

Most twin screw extruders have screws that can be modified to meet specific processing requirements. Single screw extruders usually use general purpose screws that are rarely changed. As a result, these screws are almost never optimized for the material that is being processed. Even if the screw is designed for the exact grade being processed, adjustments must be made for screw and barrel wear as well as ambient conditions.

The most popular strategy is to compensate by adjusting temperatures zones along the extruder barrel. This article explains how temperature profiles affect output for smooth bore and grooved feed throat extruders. Four temperature profiles are commonly employed: gradual increase, reverse, humped and flat. All four are illustrated in Diagram 1.



Smooth Bore Extruders

The Gradual Increase Profile is the most popular strategy. Common symptoms of screw wear are increased screw Rpm's to maintain output and rising melt temperature. Excessive screw wear will result in surging. A common countermeasure is to employ a Reverse Profile. This will more quickly soften resin in the feed zone and/or extract heat in metering zone. Bridging or surging can result if the feed zone temperature is too high. The Humped Profile is a modification of the Reverse Profile strategy. It helps compensate for starve feeding in the feed zone due to low coefficient of friction against the barrel wall or insufficient shear in the compression zone. The Flat Profile is employed when aggressive cooling along the entire screw length is required.

Grooved Feed Extruders

As in Smooth Bore extruders, the Gradual Increase Profile is standard. Resin temperature in the grooved feed section must be kept low to prevent plugged grooves. The Reverse Profile is rarely used due to the risk of plugged grooves. The Humped Profile is often employed to reduce excessive shear heating in the metering zone. The Flat Profile is often used for "hard", high melting temperature resins or to compensate for short barrels. Care must be taken to avoid plugging grooves in feed section.

Another alternative is to attach screw cooling to the extruder. Screw cooling allows for more rapid melting without sticking to the screw in the feed zone. Extruder capacity can be increased from 4 to 20% without causing surging. The key limitation is screw torque capacity in the feed section. For this reason, screws of less than 3-½" or 175 mm diameter rarely have screw cooling.

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