

EXTRUSION PROCESSING GUIDE- RIGID PVC COMPOUND

GENERAL INFORMATION

This processing guide is meant to provide general information for the extrusion of rigid PVC pellet compounds when using a single screw extruder. Westlake rigid PVC compounds can be tinted on-line with color concentrates; however, it is recommended that the concentrates use PVC as a carrier resin.

EQUIPMENT

Screws

Screws used for rigid PVC compounds should have a length/diameter (L/D) ratio of 20:1 to 24:1 with a compression ratio of 1.8:1 to 2.5:1 and should be composed of feed, compression, and metering zones. Longer barrels tend to over-heat the compounds due to excessive shear. Having the correct screw for your extrusion process cannot be over-emphasized. If you have an incorrectly designed screw you will see lower output rates, poor physical properties, excessive melt temperatures, and poor surface quality.

Screw cooling is not required in most cases but can be obtained using air or oil. Cooling of the screw tip can be very beneficial in controlling burning or flow problems. It is suggested that all screws are chrome-plated and the flights should be hardened.

Breaker Plate

A breaker plate is not always required; however, a standard breaker plate or inverted style can be utilized. Inverted breaker plates are very useful in resolving “pinking” in profile extrusions. Breaker plates should be made of hardened and polished stainless steel suitable for contact with PVC.

Screens

Screens are normally added in conjunction with a breaker plate to fine tune the flow and remove contamination and are made from stainless steel. A 20/40 screen pack is recommended with the coarser 20 screen next to the breaker plate and the finer 40 screen near the screw for most rigid extrusion PVC compounds. The finer mesh screens have more resistance to flow and will result in more shear imparted by the screw.

Barrels

Bi-metallic barrels are recommended. A chrome-plated or surface treatment is recommended.

Dies

Dies should have a streamlined design to maximize flow and avoid any “dead spots” where material can stagnate and burning will occur. The vast majority of dies are constructed of 4340 or 420 stainless steel; aluminum is sometimes used for small plate dies. Quenched and tempered steels are used to prevent dimensional changes and distortion in larger dies. Any steel material should be chrome or nickel coated/plated due to potential corrosion when extruding PVC.

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The land length should be 10-15 times the land clearance. Excessive draw down ratios can cause high residual stresses and brittleness. Depending on die swell, drawdown should be 4-10%; with 5% being the standard but this is dependent on processing conditions.

Start-Up

Once the extruder has reached the correct operating temperatures along the barrel, adaptor, and die, begin by slowly rotating the screw and feed compound into the throat of the extruder. Increase the speed of the screw until normal running speed is obtained and the melt from the die is smooth. Monitor the load and pressures along the barrel and die assembly.

Clean-down/ Maintenance

The use of a PVC purge compound is recommended when shutting down and cleaning equipment. Once all of the PVC has been removed from the feed throat, the purge compound should be introduced into the feed throat and run through the extruder until the purge compound is the only material exiting the die. The extruder can be cooled and screw speed lowered and stopped. The screw should be restarted and all of the purge material removed from the extruder. The die and all associated components should be “neutralized” to remove any residual hydrochloric acid and then treated with a high-quality mold preservative or rust inhibitor.

TEMPERATURE PROFILE

Melt Temperature

355°F – 380°F should be obtained using a combination of screw shear heat and barrel heat. It is recommended to measure the actual melt stock temperature with a hand-held pyrometer as material is coming out of the die (within 1/4 to 1/8” of the die face).

Barrel Temperature

Barrel temperature should be set with a graduating profile from low, at the hopper zone, to a higher value at the metering zone nearest the adapter.

Zone 1 (°F)	Zone 2 (°F)	Zone 3 (°F)	Zone 4 (°F)	Adapter (°F)	Die (°F)
330-340	330-350	340-360	340-350	350-360	350-360

ADDITIONAL INFORMATION

Rigid extrusion PVC compounds do not typically need to be dried before use; however, if necessary the compound can be dried at 120°F for approximately 4 hours. Proper sizing of the drier is based on throughput; the hopper is sized to hold the lbs. /hr. multiplied by the suggested drying time (normally 4 hours). Example: if the extrusion rate is 100 lbs/hr. then the drier capacity should be 400 lbs.

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