



Converting an Injection Press From Thermoplastic to Thermoset Molding

There are major differences in the injection unit of a press designed to process thermoset materials and one designed to process thermoplastic materials. The reasons for this are that thermoset materials are shear sensitive, have a fairly low melting point and their chemical reaction must be carefully controlled to prevent their curing in the barrel and/or nozzle. The following table outlines the differences:

<u>Item</u>	<u>Thermoplastic</u>	<u>Thermoset</u>
Barrel	22:1 to 25:1 L/D	13:1 L/D
Barrel Heating	Electric band heaters	Water jackets
Screw	Variable pitch 1.5 – 3.8:1 Compression Check ring	Square pitch No compression Only BMC materials requires a check ring.
Screw Tip	60° included angle	40° included angle
End cap	Match tip angle Not available	Match tip angle 1/16" - 1/8" axial clearance

Obviously the ideal press for injection molding thermoset materials is one that was specifically designed for thermosets. However, for many reasons that option may not be available and one has to consider whether a thermoplastic press can be converted to process thermoset materials. Despite the differences noted above, some customers of Plastics Engineering Company have been successful in making this type of conversion by do the following things:

Barrel

There are two choices on how to get the shorter L/D needed for processing thermoset materials:

1. Build a new thermoset barrel with a 13:1 L/D. **NOTE:** Bed of injection unit must be able to move forward far enough to allow a standard nozzle to properly seat in sprue bushing.
2. Use the thermoplastic barrel but saddle mount the hopper so there is a 13:1 L/D.

Barrel Heating

Regardless of which barrel option is chosen, two water jackets will have to be made and installed on the barrel. The front jacket (The one located on the nozzle end of the barrel.) will cover $\frac{1}{3}$ of the L/D and the rear jacket will cover the remaining $\frac{2}{3}$ of the L/D.

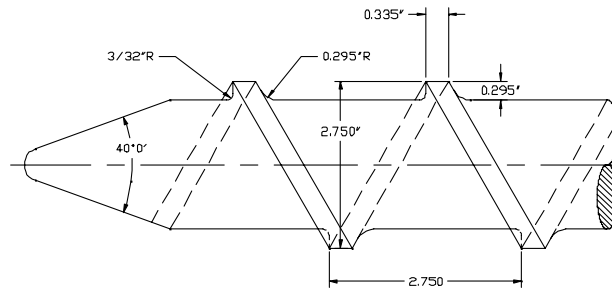
Screw

Regardless of which barrel option is chosen, it will require a new screw with the following design features:

- The length of the screw flight will be equal to the screw diameter when measured from leading edge to leading edge or in other words the screw will have a square pitch.
- It will not have a check ring unless it will be used for processing BMC.
- Screws 50.8 mm (2.0") diameter and larger, will have a flight depth equal to 10% - 11% of the screw diameter, while screws under 50.8 mm (2.0") in diameter will have a flight depth equal to 15% of the screw diameter.
- The base of the screw flight's trailing edge will have a radius equal to the flight depth, while the base of the screw flight's leading edge will have a radius of 2.38 mm ($\frac{3}{32}$ " or 0.093").
- The flight width will be 1 mm (0.039") more than the screw flight depth.
- There will be 0.025 - 0.051 mm (0.001" - 0.002") per side of barrel clearance.

If the thermoplastic barrel is retained and the hopper saddle mounted, then the screw will have no flight between the hopper and the spline. That area of the screw will also be relieved 0.010" per side to prevent the possibility of scraping on the barrel.

The drawing below shows a 70 mm (2.75") screw designed with these specifications.



Screw Tip

As showed in the above drawing, the screw tip will taper down to a 40° included angle with a rounded tip and the screw flight will taper down and end at the transition to that 40° included angle.

End Cap

The end cap must match the screw tip profile and will have 1.59 - 3.175 mm ($\frac{1}{16}$ " - $\frac{1}{8}$ " or 0.0625" - 0.125") axial clearance between it and the screw tip when the screw is in the fully forward position.

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This information is suggested as a guide to those interested in processing Plenco Thermoset molding materials. The information presented is for your evaluation and may or may not be compatible for all mold designs, runner systems, press configurations, and material rheology. Please feel free to call Plenco with any questions about PLENCO molding materials or processing and a Technical Service Representative will assist you.