Section #3
Fluoroplastics

made from TFE stock which had been exposed to temperatures below 74° F. within a 48-hour period prior to machining would probably have a marked change in dimensions when brought up to room temperature. Therefore, TFE stock shapes should be stored at temperatures 74° F. or above for a period of at least 48 hours before and during the machining operation. If the part is to be used at temperatures below the critical range (preferably below 54° F.) measurements should be made at the temperature at which the part will be used.

General Machining Factors

Because TFE is flexible, provisions must be made to support the work to prevent deflection of the stock away from the force of the cutting tool.

Due to the softness of TFE, dull tools deform the material, causing it to flow away from the cutting edge. Cutting tools should be kept sharp at all times and generous tool clearances should be provided so that only the cutting edge of the tool contacts the material for maximum free cutting. Also, any rubbing action is detrimental to finish and tolerances.

Cutting fluids are generally not necessary. However, if tolerances are critical, copious amounts of coolant or a coolant mist should be used to keep the work cool to avoid excessive thermal expansion. The use of correct coolants permits higher cutting speeds and prolongs tool life. Since water has a higher heat removal rate than oil, water-base fluids perform best as a coolant for Teflon®. A weak solution of rust inhibitor and/or water-soluble oil is the most practical fluid for the purpose.

Turning

Turning TFE on engine lathes, turret lathes and automatic screw machine equipment is the most common machining operation. In general, techniques recommended for turning apply to most of the other TFE machining operations.

As mentioned previously, cutting tools must be kept sharp and coolants are recommended. Roughing cuts are not generally required to turn Teflon. This saves considerable time and contributes greatly to realizing low unit cost for machining.

Tools must be centered accurately. A tool that is not centered will cause a concave or convex surface at cutoff and unnecessary burrs may result. Teflon®, being relatively soft and flexible, will deflect from its center and follow the misalignment of the more rigid tool, causing inaccuracies in the finish and dimensions, torn threads, tapered holes, etc.

Forming and skiving tools are used advantageously in turning operations. Where practical, skiving tools are recommended because very little pressure is required to remove large cross sections and a smooth finish is readily achieved on heavy as well as light cuts. However, on some complex forms and when tolerances are critical it is sometimes more advantageous to rough machine the piece a few thousandths oversize and finish form to size.

The most generally used cutting tools are high speed steels. However, on long production runs, especially on automatic screw machine equipment, carbide tipped tools are recommended because of their high productivity and longer life. Grades used are usually A.I.S.I. Carbide Designation C2. Carbide tools should be lapped carefully to a keen edge on a fine grit diamond wheel (grits between 400 and 600 are recommended) for maximum sharpness.

Clearance angles are important in tool geometry to provide maximum relief to the cutting edge to minimize frictional heat. Recommended tool geometry is presented in Table I.

TABLE I

TOOL GEOMETRY FOR CARBIDE & HSS TOOLS

Back rake angle	0°
Side rake angle	0°
Side clearance angle	2°-5°
End clearance angle	15°-20°
End cutting edge angle	2°-5°
Side cutting edge angle	0°
Nose radius	Optional

The recommended tool geometry is for general practice. Physical characteristics of specific jobs may require slight modifications to the recommended angles.