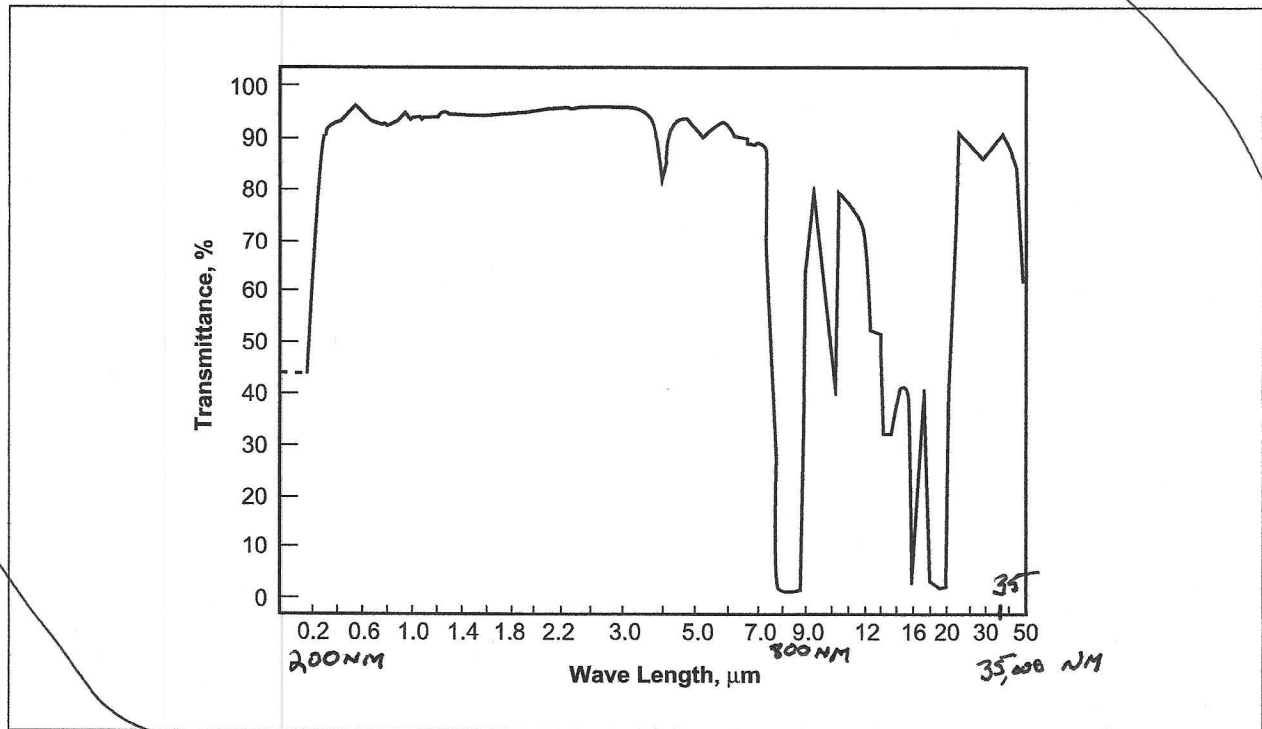


Figure 25. Transmission Spectrum for Teflon® FEP Fluoropolymer Film



onto wire as a primary insulation or for jacketing purposes. Teflon FEP 160 is usually the preferred material for transfer molding of liners, tubing, etc., where a high degree of stress crack resistance is required. However, the very high melt viscosity of this product results in considerably slower production rates and limits its use for some types of processing. Teflon FEP 100, being of lower viscosity and hence more easily processible, is the preferred resin for injection molding and general extrusion applications. Teflon FEP 140 is of intermediate viscosity and usually used where a modest improvement in stress crack resistance is required but where some degree of production rate reduction can be tolerated.

The specific techniques are discussed in DuPont guides for injection molding, extrusion, and transfer molding that are available from the nearest DuPont Fluoro-products office.

Forming and Fabrication

When extreme tolerance must be specified, when product shapes are very complex, or when just one or two prototypes are required, the machining of Teflon FEP basic shapes becomes a logical means of fabrication.

All standard operations—turning, facing, boring, drilling, threading, tapping, reaming, grinding, etc.—are applicable to Teflon FEP resins. Special machinery is not necessary.

When machining parts from Teflon FEP resin, either manually or automatically, the basic rule to remember is that this fluoropolymer resin possesses physical properties unlike those of most other commonly machined materials. It is soft, yet springy. It is waxy, yet tough. It has the cutting “feel” of brass, yet the tool-wear effect of stainless steel. Nevertheless, any trained machinist can readily shape Teflon FEP to tolerances of ± 0.001 in and, with special care, to ± 0.0005 in.

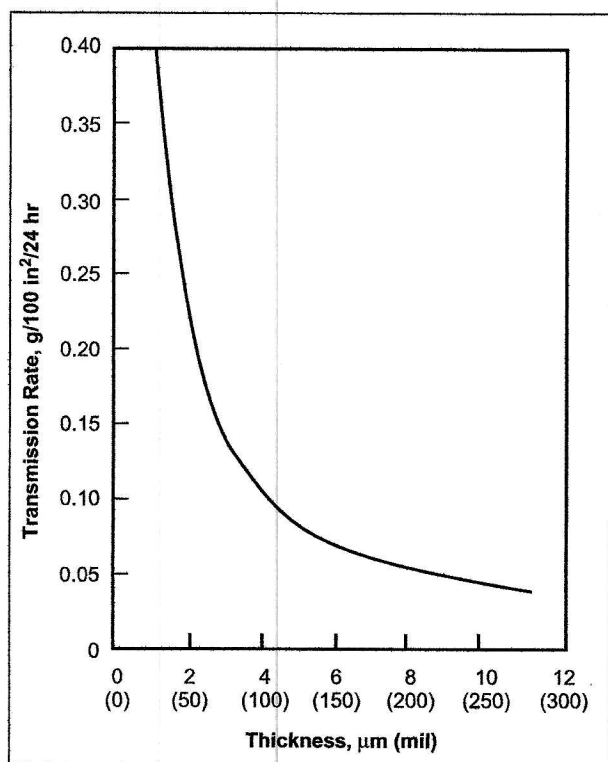
Choose Correct Working Speeds

One property of Teflon FEP resin is the exceptionally low thermal conductivity. It does not rapidly absorb and dissipate heat generated at a cutting edge. If too much generated heat is retained in the cutting zone, it will tend to dull the tool and overheat the resin. Coolants, then, are desirable during machining operations, particularly above a surface speed of 150 m/min (500 fpm).

Table 8
Typical Vapor Transmission Rates, Teflon® FEP 100 Fluoropolymer Resin
(1 mil film, ASTM E96 modified test)

Vapor	Temperature		Vapor Transmission Rate	
	°C	°F	g/m ² ·d	g/100 in ² ·d
Acetic acid	35	95	6.3	0.41
Acetone	35	95	14.7	0.95
Benzene	35	95	9.9	0.64
Carbon tetrachloride	35	95	4.8	0.31
Ethyl acetate	35	95	11.7	0.76
Ethyl alcohol	35	95	10.7	0.69
Freon® F-12	23	73	372	24
Hexane	35	95	8.7	0.56
Hydrochloric acid	25	77	<0.2	<0.01
Nitric acid (red fuming)	25	77	160	10.5
Sodium hydroxide, 50%	25	77	<0.2	<0.01
Sulfuric acid, 98%	25	77	2 × 10 ⁻⁴	1 × 10 ⁻⁵
Water	39.5	103	7.0	0.40

Figure 24. Water Vapor Transmission Rate of Teflon FEP Film at 40°C (104°F) per ASTM E96 (Modified)



Note: Values are averages only and not for specification purposes. To convert the permeation values for 100 in² to those for 1 m², multiply by 15.5.

FDA Compliance

Teflon FEP may be used as articles or components of articles intended to contact food in compliance with FDA regulation 21 CFR 177.1550.

Optical Properties

In thin sections or films, Teflon FEP transmits a high percentage of ultraviolet and visible light. The solar transmission of Teflon FEP in thin-film form is approximately 96%. Teflon FEP is much more transparent in the infrared region of the spectrum than is glass. The infrared transmission spectrum for Teflon FEP in thin films is shown in Figure 25.

Fabrication Techniques

Teflon FEP, as a thermoplastic polymer, can be processed by most techniques applicable to the type of resin. Depending upon the grade, and hence the melt viscosity (melt flow number), Teflon FEP can be processed by injection, compression, transfer, or rotational molding. It can be extruded into a variety of complex shapes including rod, tubing, and film and can be coated