

the tov viscometer focus

Melt Viscosity vs. Temperature

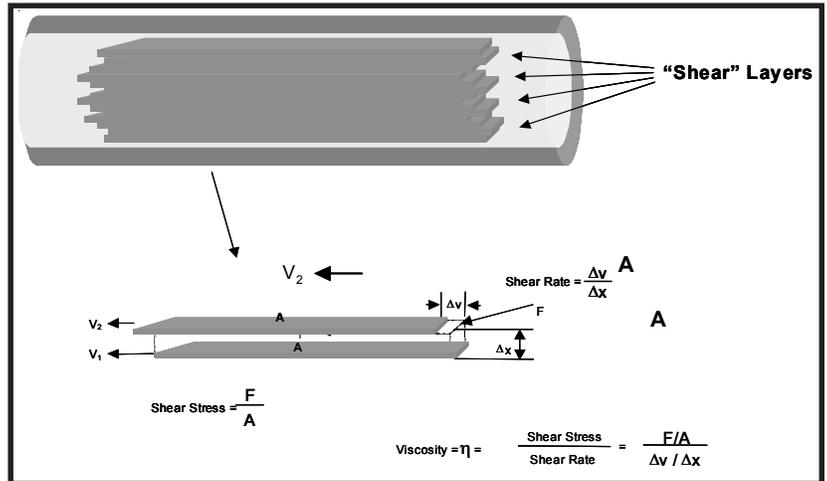
Viscosity

All fluids have a resistance to changing form or flow. This property, an internal friction, is called viscosity and is expressed most typically as poise.*

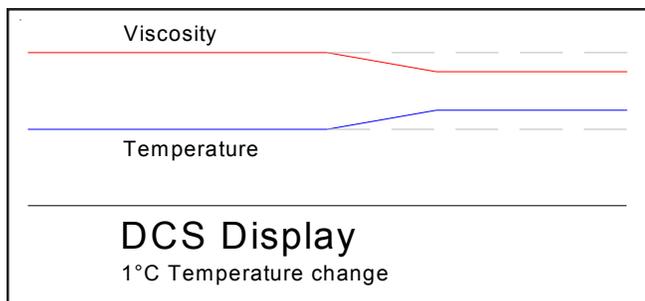
There are several types of viscosity measurements. Most commonly used is the Apparent Viscosity, which is the shear stress divided by the shear rate (sometimes called the shear viscosity).

In most plants and applications, lab tests are performed on samples to determine the viscosity. The most common lab tests include:

1. Relative Viscosity (RV): the ratio of time to elute a process sample in solution compared to the pure solvent.
2. Intrinsic Viscosity (IV): Extrapolates the ratio of RV to zero concentration.



Apparent Viscosity Changes



Effect of a 1°C Temperature Change on Polyester

Temperature is an important factor when determining viscosity. As shown at left, as the temperature increases, the apparent viscosity decreases. This characteristic is typical for most polymer applications.

In these instances, the temperature change causes an “apparent” viscosity change and not a change in the molecular structure or weight (“Real” viscosity change).

Providing good, tight temperature control and compensating the viscosity signal to remove “apparent” viscosity changes are very important in controlling the product quality. In the TOV System, temperature compensation removes the influence of temperature so that only the “real” viscosity changes are measured.

Melt Viscosity versus Temperature

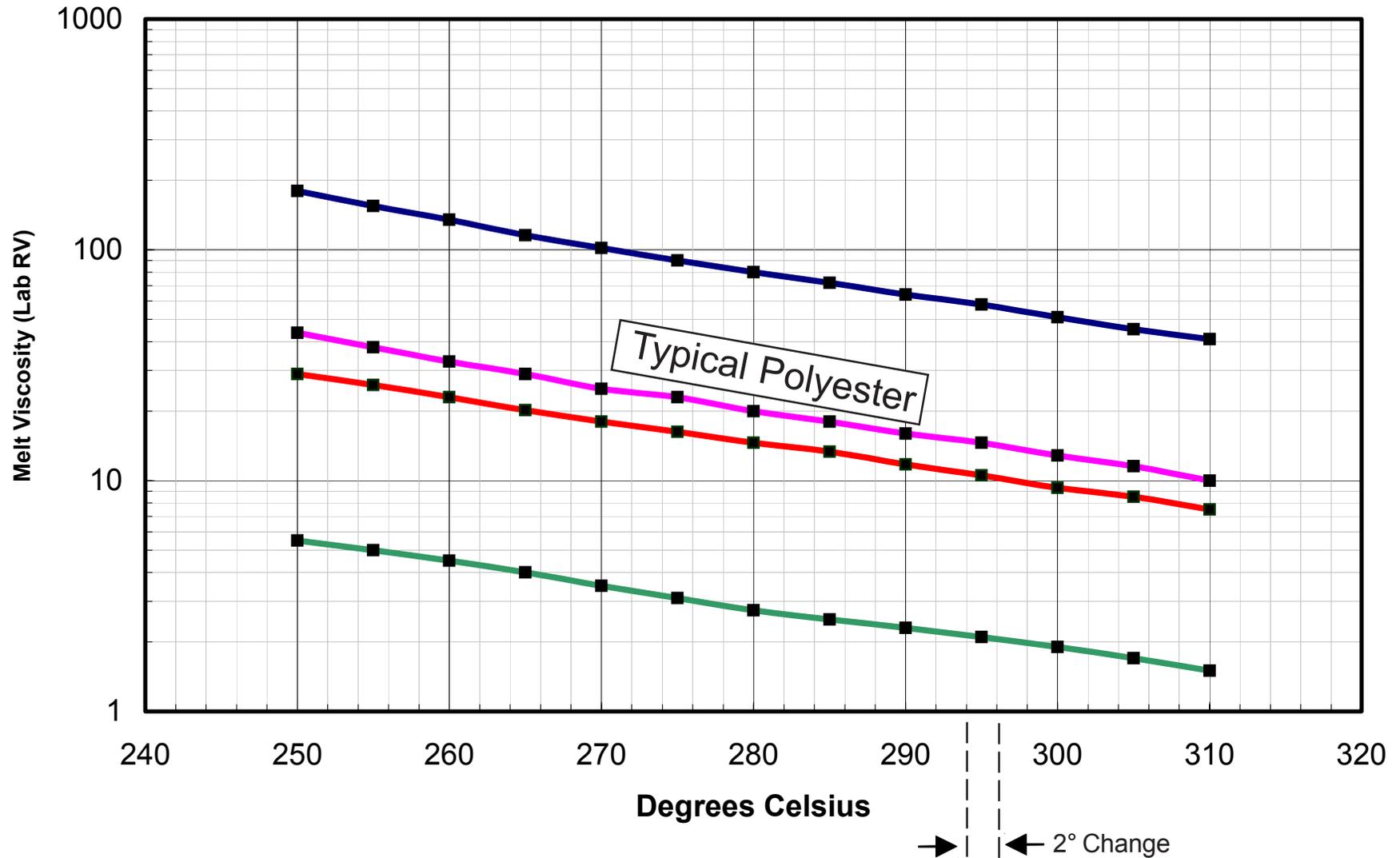
The following chart shows the relationship of Melt Viscosity to Temperature of 4 different PET products.

Notice:

1. As the temperature moves 2°C, the viscosity moves 3 to 4%.
2. As the temperature increases, the viscosity decreases.

Melt Viscosity (RV) vs. Temperature

Four (4) Products Shown



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Effects of Temperature on Viscosity
Example: Change of temperature from 294°C to 296°C results in an
apparent viscosity decrease of approximately 4% in Lab RV.