SABIC
Innovative
Plastics™

Thermal conductivity

Thermal conductivity:

- Measures the ability of a material to conduct heat.
- Defines thermal insulation characteristics.
- Basic data for heat transfer calculations.
- Important in any design that must function in a thermal environment.
- Controls the rate of cooling in injection and blowmolding tools.
- Controls the rate at which a plastic "sets up" during extrusion.
- Thermal input for moldfilling programs.

Thermal conductivity (k)

The rate of heat transfer by conduction. As an example, frying pans and kettles are made of high thermal conductivity materials such as copper, aluminum, or iron; the insulating handles are constructed of low thermal conductivity materials such as wood or plastic.

The standard unit, W/m°K, is read as Watt/per meter degrees Kelvin.

1 W/m°K	= 6.93 BTU in/hr ft² °F
	= 0.576 BTU/hr ft °F
	= 0.0024 Cal/sec cm °C
	= 0.859 Kcal/hr m°c
	= 10 mW/cm °K

Units of thermal conductivity

R-Value

A term commonly used in the building and construction industry that indicates the insulation value of a structure (i.e. wall or window).

The RR-value is related to the thermal conductivity by:

- RR-value = thickness/thermal conductivity
- Low thermal conductivity = high RR-value
- High thermal conductivity = low RR-value
- The type of polymer. Different polymers have different thermal conductivities. This affects their cooling rates. Crystalline polymers cool faster than amorphous polymers (see figure 1)

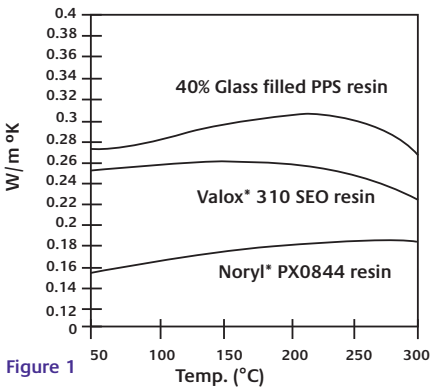

Figure 1

The effect of density

Heat transfer decreases as density decreases. This is illustrated by this foamed Noryl* resin example.

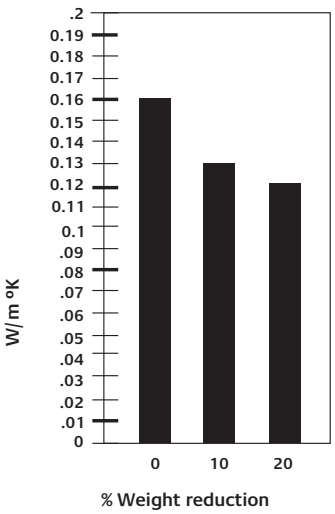

Figure 2
Thermal conductivity* of Noryl* FN215X resin

Based on SABIC Innovative Plastics test data.

The effect of fillers

Thermal conductivity increases with glass content. This is because glass has a higher thermal conductivity than plastic.

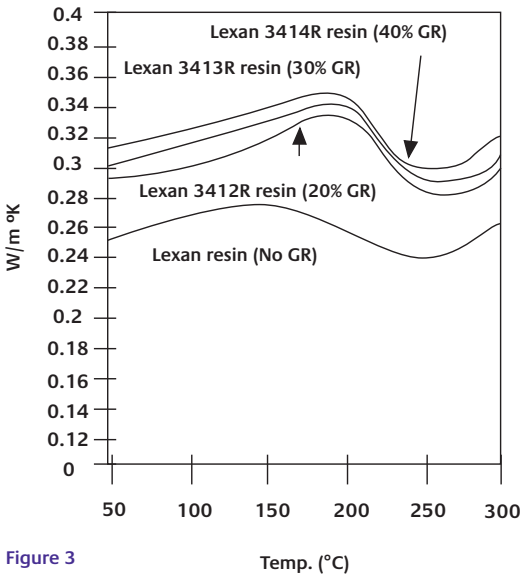

Figure 3

The effect of temperature

For heat transfer calculations at processing conditions, thermal conductivity should be measured in the melt state.

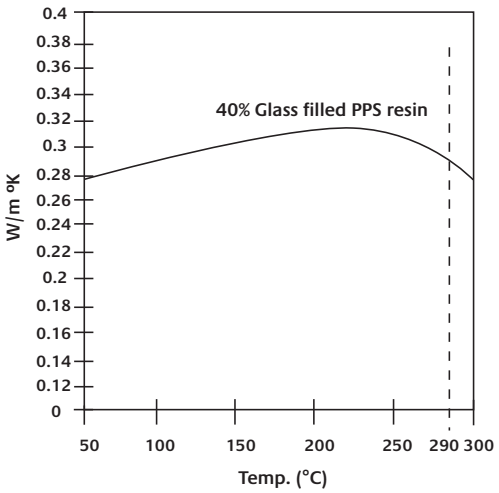

Figure 4

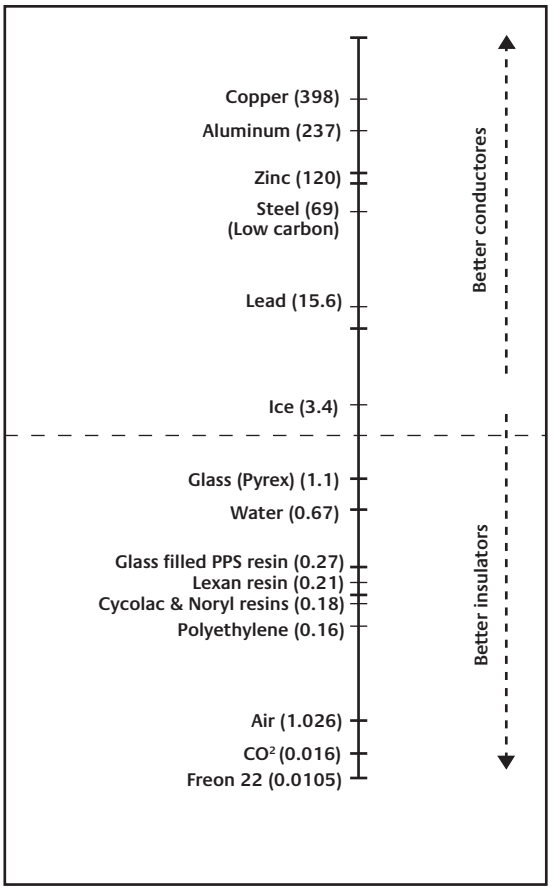

Figure 5
Relative thermal conductivity (at 25°C)