ANNEALING (STRESS) RELIEF FOR PLASTICS STOCK SHAPES

The following guidelines are presented for those machinists not familiar with the machining annealing (stress relief) for high-performance plastics. They are intended as guidelines only, and may not represent the most optimum conditions for all parts.

Most quality stock shape materials are stress-relieved by the manufacturer after molding to ensure the highest degree of machinability and dimensional stability. However, some components may benefit from post-machining annealing or stress-relieving using the instructions below.

Post-Machining Annealing (Stress-Relief)
When should parts be annealed after machining to ensure optimum part performance?

Experience has shown us that very few machined plastic parts require annealing after machining to meet dimensional or performance requirements.

Generally speaking, most stock shapes are annealed after molding using a proprietary stress relieving cycle to minimize any internal stresses that may result from the manufacturing process. This assures you that the material will remain dimensionally stable during and after machining

Machined-in stress can reduce part performance and lead to premature part failure. To prevent machined-in stress, it is important to identify the causes. Machine-in stress is created by:

- Using dull or improperly designed tooling
- Excessive heat -- generated from inappropriate speeds and feed rates
- Machining away large volumes of material -- usually from one side of the stock shape

To reduce the potential for the machined-in stress, review the fabrication guidelines for the specific material. Recognize that guidelines change as the material type changes.

BENEFITS OF POST-MACHINING ANNEALING

- **Improved Chemical Resistance** Polycarbonate, Polysulfone, and Ultem® PEI. like many amorphous (transparent) plastics may be annealed to minimize stress crazing. Torlon® PAI also benefits from post machining annealing. Annealing finished parts becomes more important as machining volume increases. Annealing after machining reduces "machined-in" stresses that can contribute to premature failure.
- **Better Flatness & Tighter Tolerance Capability** Extremely close-tolerance parts requiring precision flatness and non-symmetrical contour sometimes require intermediate annealing between machining operation. Improved flatness can be attained by rough machining, annealing and finish machining with a very light cut. Balanced machining on both sides of the shape centerline can also help prevent warpage.
- **Improved Wear Resistance** Extruded or injection molded Torlon® PAI parts that require high PV's or the lowest possible wear factor benefit from an additional cure after machining. This curing process optimizes the wear properties. Only PAI benefits from such a cycle.