



## **Cycletime Tips - Automotive**

### **Volume 34: Annealing of Thermoplastic Components**

All part fabrication techniques for thermoplastics result in some degree of stress. These stresses can depend on the processing strategy, assembly technique, material selected, part and tool design, as well as the selected fabrication type. There is no substitute for effective part design, tool design, processing, and material selection, but it is important to know the alternatives when you are in a pinch. A highly stressed part can result in premature failure (stress cracking) due to the thermal, chemical, or mechanical rigors experienced in application. Annealing is often done to combat this issue and has been found to be very effective in doing so.

These stresses can be created due to molecular compression and/or tension created by fabrication method or assembly. The annealing process is a secondary process. Typically, the part is exposed to elevated temperatures via a forced air oven, infrared (IR) heaters, or in a heated liquid media (for semicrystalline polymers). The method used depends upon the resin utilized. Individuals who use this process typically experience a dimensional change in the component as the stresses are relieved. They tend to allow for this change by controlling the process and designing the mold to provide for the reduction in size.

Where applicable, infrared annealing is preferred due to the rate at which the function can be performed and the symmetry of applied heat. This can also be done in minutes as opposed to hot air alternatives which can take as long as two hours. IR processes are applied in-line and parts should be exposed within 30 seconds of molding.

The key is to know the root cause of the stress cracking. Stress cracking agents have been used to determine if the part has elevated levels of stress. Simply select the agent and expose the part at a given concentration and time and observe for failure. In the case of thermal and chemical attack, it is important to discuss the application with your supplier before selecting a resin.

Different resins will require different parameters and produce differing results. The mechanism for change may also vary depending upon the thermoplastic confronted. Please do not hesitate to contact us if you require more specific detail.

Bill Fierens  
Ashland Distribution Co.  
General Polymers - Automotive  
[wjfierens@ashland.com](mailto:wjfierens@ashland.com)

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