Bayer Polymers
Americas

# Annealing Molded Polycarbonate Parts

**Annealing** or heating a molded polycarbonate part to just below it's glass transition temperature is done to reduce inherent stresses introduced in a molded part by the molding and cooling processes. Stress reduction can provide an extra measure of safety from aggressive chemical environments that may come in contact with the molded part. High stress levels generally make molded polycarbonate parts more susceptible to stress cracking. Applications such as medical devices, automotive lenses, and institutional / commercial foodware are areas where stress-cracking failures can be critical.

Batch, "Conveyorized Forced Hot Air", and conveyorized Infrared annealing are three common methods used in the plastics industry.

**Batch Annealing** consists of placing parts, usually on racks, in a hot air convection oven that is set at a certain temperature for a specific time period. This is a fairly simple annealing method that has been used for many years. However, it does have its drawbacks.

Annealing cycles lasting from thirty minutes to as long as 2 hours or more at temperatures ranging from 230°F to 270°F are not uncommon. These long cycles are sometimes necessary due to restricted airflow caused by parts being packed on top of or placed very close to one another. Parts closest to the airflow see hotter temperatures for a longer period of time. This can lead to inconsistent annealing throughout the population of parts in the oven

**"CFHA" Annealing** uses forced hot air set at a certain velocity and temperature as the heat source. Unlike the batch process, this process is conveyorized and is well suited for implementation as an in-line annealing process. Parts can be set on the conveyor belt immediately after molding which works especially well with robotic part pickers.

This method allows for each part to be heated identically, which yields consistent annealing results. Typical annealing times using CFHA can range from as little as four minutes to as long as fifteen minutes with temperatures ranging from 250°F to 275°F, depending on part design, size, and thickness. This process can also be implemented as an off-line process where parts could be annealed some time after molding if necessary.

**"IR" Infrared annealing** is a process that is best suited for in-line implementation. It is a continuous annealing process much like CFHA. However, unlike CFHA, heat is generated in the molded part by absorption of electromagnetic energy transmitted from IR emitters. Direct energy absorption by the molded part generates the required heat for annealing. This method is a very fast and efficient way of generating heat. Comparatively, the hot air annealing methods generate part heat by first heating the surrounding air which in turn heats the molded part.

Typical in-line IR annealing cycles range from about 60 seconds to as long as six minutes, depending on the size and wall thickness of the part. Although IR annealing is generally the fastest of the three methods, it also has a few drawbacks. Off-line implementation is possible, but not generally recommended. Also, part orientation sometimes is critical for successful IR annealing.

Please contact the local Bayer representative in your area for further information as to which annealing method may best fit your requirements.