

# Thermal shock (thermal cycling)

For automotive parts, a specification related to the thermal cycling (thermal shock) is usually required with a minimum number of cycles before getting a failure/crack and a temperature range (typically  $-40^{\circ}\text{C}$  to  $+160^{\circ}\text{C}$ ). When an insert (metal, glass, plastic...) is overmolded by a plastic, the thermal strain (shrinkage) of the plastic when the assembly is cooled down out of the mold is constrained somehow by the metal leading to (mainly tensile) **residual stresses** in the plastic. Since we often have stress concentrations (sharp edges of the metal insert), a failure (in fatigue) in these areas is expected after a given number of thermal cycles. Some internal molding tools have been developed to compare the grades, the designs, the processing conditions. From all these measurements, we extracted the data ( [link](#) ) that are considered as reliable and are comparable between themselves with one single tool (Fuji's mold) . These data can be used to illustrate the performances of our grades, even though the design of the Fuji'mold is harsh.

The influence of the other parameters (weld line, insert temperature, design...) is described in the following document (under construction).

The [prediction of failure](#) (and some designs tricks) when such a structure is submitted to a thermal cycling is more than challenging and is discussed [here](#)

