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Importance of fatigue data to the designer

Fatigue data

Flex fatigue (or tensile fatigue) refers to the cyclical stressing to either a constant load (stress) or a constant deformation (strain) of a material for the purpose of identifying the material's "fatigue endurance limit." The fatigue endurance limit represents the maximum allowable design stress for a material to be used in a repetitive loading (i.e., fatigue mode) application. Fatigue data are necessary for designing a part such as a chair that will be required to support a load intermittently without fracture.

As always in designing with plastics, sharp corners or abrupt changes in cross-sectional geometry or wall thickness should be avoided as they produce weakened, high-stress areas. Areas of high loading (where fatigue requirements are high) need more generous radii combined with optimal material distribution. Radii of 10 to 20 times the initial sheet gauge thickness for extrusion or one-fourth to one-half the wall thickness for molding may be necessary to distribute stress more uniformly over a large area.

Figure 1 presents a fatigue curve for general purpose Cycolac* brand ABS resin .

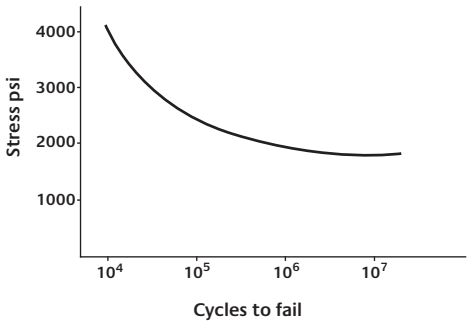

Figure 1.
Flexural fatigue data; general purpose Cycolac ASTM D-671 73° C; 1700 cycles/minute

The example presents a suggested procedure for using fatigue data to calculate the working stress limit for general purpose Cycolac resin. As the example below shows, the limit falls within general purpose Cycolac range of 0.50% to 0.75% tensile strain.

Working stress limit for general purpose Cycolac using flex fatigue at 73°F
- Working stress = fatigue endurance limit minus 10% safety factor
- For example, for general purpose Cycolac at 73° F
- In terms of strain, 0.5% strain limit for most Cycolac products