

Cracking and Crazing

The versatile, lightweight and cost-effective nature of plastics makes them an attractive build option for many manufacturers. That said, these features come with tradeoffs that should be kept in mind when determining final design and implementation. One of these tradeoffs is environmental stress cracking or crazing, which can cause plastic component failure in service. Simply put, environmental stress cracking or crazing refers to internal (crazing) or external (cracking) fractures of the plastic material.

This can occur in all plastics, and the extent of the fracturing will vary with stiffness and composition of the plastic, environmental conditions, and more. This is why manufacturers must be careful when choosing how to attach these plastics in their design and process. For simplicity, attachment methods can be broken into two categories:

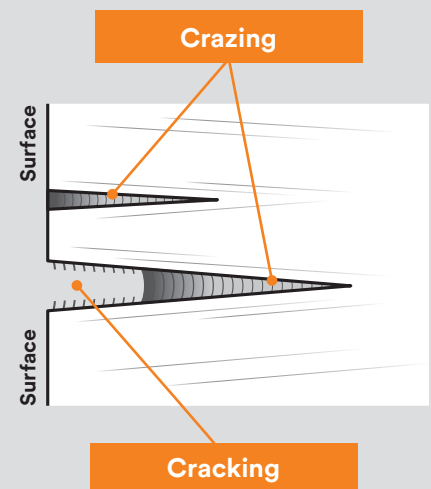
- 1. Mechanical attachments:** fasteners, ultrasonic welding, etc.
- 2. Adhesives:** 1-part and 2-part liquid adhesives, tapes, etc.

Mechanical attachment methods are typically well-known and versatile solutions for manufacturers. However, attaching plastics have the drawback of inherently focusing stress on the point of attachment. For example, as a screw punctures the material it's attaching to, the puncture area becomes weaker than the material surrounding it. Plastics have weaker internal forces holding them together than metals, and over the lifetime of the product, this area may be a starting point of a fracture.

This may make it seem like adhesives are automatically a better attachment method, but they can also have drawbacks. Plastics are more susceptible to cracking and crazing when exposed to liquid chemicals and solvents. Some tapes and adhesives can require a solvent primer or adhesion promoter to adhere to certain plastics, and liquid adhesives, by their nature, expose the plastic to uncured chemicals.

Therefore, using a tape or fully-cured adhesive that does not require a chemical primer may be the best option to inherently avoid cracking and crazing of plastics. Some bonding applications do require greater strengths than tapes are designed for, so liquid adhesives that are designed for plastic use may be a good attachment option.

Crazing: internal fracturing without a change of the surface texture. It might be seen when light transmits through transparent or translucent material and it can also exist in opaque plastics. Crazing can be a precursor to cracking if it extends to the surface, but even if it stops short of the surface, crazing still decreases the strength of the material.



Cracking: is more familiar and occurs on the outside surface of the material and can propagate into the interior. Cracking is easily identified by the observer visually and through physical touch. It's also easy to understand that the material has been weakened when cracks are present.



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