The Difference Between Thermoplastic and Thermosetting Plastic

Have you ever wondered what the difference between thermoplastic and thermosetting plastic is? Although both sound similar, they have very different properties and applications. Below we discuss the differences between thermoplastics vs. thermosetting plastic, their curing process, and the pros and cons to each. Comprehending the performance differences can help you improve your product designs!

THERMOPLASTIC VS THERMOSETTING PLASTIC

Thermoplastics and thermosetting plastics are two separate classes of polymers, which are differentiated based on their behavior in the presence of heat. The material difference between the two is that thermoplastics can be remelted, while thermoset plastics remain in a permanent solid state once hardened. As a result of these physical qualities, thermoplastic materials have low melting points while thermoset plastic products can withstand high temperatures without losing austerity.

THERMOPLASTICS CURING PROCESS

Thermoplastics pellets soften when heated and become more fluid as more heat is administered. The curing process is 100% reversible as no chemical bonding takes place. This characteristic allows thermoplastics to be remolded and recycled without negatively affecting the material's physical properties. There are a variety of thermoplastic resins that offer various performance benefits, but the majority of materials commonly offer high strength, shrink-resistance and easy flexibility. Depending on the resin, thermoplastics can serve low-stress applications such as plastic bags or high-stress mechanical parts. Examples of thermoplastic polymers include polyethylene, PVC, and nylon.

Thermoplastic Advantages:
- Highly recyclable
- High-Impact resistance
- Reshaping capabilities
- Chemical resistant
- Aesthetically superior finishes
- Hard crystalline or rubbery surface options

Thermoplastic Disadvantages:
- Expensive
- Can melt if heated
THERMOSET CURING PROCESS (THERMOSETTING PLASTIC)
Thermoset plastics, typically processed by reaction injection molding, contain polymers that combine together during the curing process to form a permanent chemical bond. This process forms weak bonds between the monomer chains within these materials and eliminates the risk of the product remelting when heat is applied, making thermosets ideal for high-heat applications like appliances and electronics. Thermoset plastics greatly improve the material’s mechanical properties, providing enhanced chemical resistance, heat resistance and structural integrity. Thermoset plastics are frequently used for sealed products due to their resistance to deformation and are also among some of the most impact resistant plastics available. Examples of thermoset plastic polymers include epoxies, phenolics, silicones, and polyesters.

Thermosetting Plastic Advantages:
- More resistant to high temperatures
- Highly flexible design
- Thick to thin wall capabilities
- High levels of dimensional stability
- Cost-effective

Thermosetting Plastics Disadvantages:
- Can’t be recycled
- More difficult to surface finish
- Can’t be remolded or reshaped

For addition information on the innovative thermosetting plastics, contact Osborne today. Requests for sample material will be accommodated whenever possible.