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Rotational Molding Resins

There are two primary requirements for a material for rotational molding. First, it must flow adequately to coat the cavity evenly as the mold is rotated. Second, it must be thermally stable at the oven temperature at which it is processed and for the oven cycle time required.

Most plastic materials for rotational molding are special formulations which were developed to have high flow and superior thermal stability. Most resins are supplied in a fine powder (35 mesh) which melts more quickly and uniformly than pellets, although, for some resins, small pellets, which can sometimes cost less than powder, are adequate.

Common Rotationally Moldable Materials

The following list is comprised of the more commonly used plastic materials for rotational molding and their general characteristics.

Polyethylene

LLDPE - Flexible to medium stiffness, tough, easy to process, excellent chemical and environmental stress crack resistance. Available in powder form with UV stabilized and FDA approved grades. Applications include tanks, toys, containers, and industrial parts.


HDPE - Stiffest of the polyethylene's. Like the other types, it, too, has excellent chemical resistance, easy processability and low cost. Applications include barrier-coated tanks, toys and furniture.

Cross-Linked - Contains a cross-linking agent which reacts with the material during the molding cycle, forming a cross-linked molecule similar to a thermoset. This reaction improves the toughness, environmental stress-crack resistance, and tear resistance. Applications include chemical and sewage tanks, trash containers, seats and other products where stress cracking and tear resistance are important. Good for filling fine detail on parts.

EVA Copolymer - Excellent low temperature flexibility. Available in UV stabilized and FDA approved grades. Applications include soft toys and blending with other materials to improve impact strength.

Polyvinylchloride

PVC compounds can be molded in either liquid or powdered form. The liquid plastisols are fluid suspensions of fine particle size resins in plasticizing liquid.

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PVC compounds are moderate in cost and are easily processed. They can be formulated to produce parts ranging from flexible to semi-rigid with durometer hardness ranges of 60 Shore A to 65 Shore D. Applications include balls, doll heads, teething rings, planters, novelty items and flexible bellows.

Nylon

Type 6 - Excellent tensile strength, stiffness and impact strength. High heat resistance, so properties are maintained at elevated temperatures. Excellent chemical resistance. Moderate in cost. Applications include military fuel tanks, hydraulic oil and solvent tanks, grain buckets and air ducts.


Type 12 - Moisture absorption, melting point and mechanical properties lower than Nylon 6 but more easily processed. Applications include heating and air conditioning ducts, gasoline tanks and chemical tanks.

Polycarbonate

Excellent mechanical properties including stiffness, tensile strength and creep resistance. Highest impact strength of all rigid plastics. High heat resistance. Can be molded clear. Applications include light fixture globes, snowmobile engine hoods, shipping containers and other applications where high heat resistance and toughness are required.

Polypropylene

Stiffer than polyethylene's with higher heat distortion temperature, autoclavable, excellent chemical and environmental stress crack resistance. Very low impact properties at this point. Manufacturers are working on getting the impact properties up to ASTM specifications.

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Special Plastic Materials and Composites

At one time or another, virtually all thermoplastics and most thermosetting plastic materials have been rotationally molded, at least experimentally. In most of these special cases, markets have not grown large enough to justify the development of the specially compounded plastics that would be suitable for the rotational molding process. The following list of plastic materials are used occasionally for the rotational molding of specialty products:

1. Polybutylene
2. Acetal
3. Acrylic
4. Cellulosics
5. Epoxy
6. Fluorocarbon
7. Phenolic
8. Other Grade of Nylon
9. Polyurethane

The physical properties of the plastics referred to in this paper are summarized in the Modern Plastics Encyclopedia and the Cordura Company's Desktop Data Bank.

Applications which require these or other special plastic materials can be considered if the magnitude of the project justifies the cost of the necessary preproduction development work required.