



Cycletime Tips - General

Volume 28: Which Polyethylene is Best for Your Application? Part Two

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As was discussed in last month's installment, the differences in simple-old polyethylene are vast and require a greater understanding. Let's review the various advantages of the several polymerization methods and what property benefits they will bring to your molded parts.

LDPE has both long and short chain branched molecules. Because the long chain, branched molecules are compact, the material will flow easily. The material is tough but suffers from creep; a 5% strain is used for design purposes. It is very permeable to gases and vapors, when compared to LLDPE or HDPE. The permeability decreases (improves) as density is reduced within this group. Keeping the melt index low will improve environmental stress crack resistance (ESCR) and impact resistance. Linear low density PE is produced with the butene, hexene, or octene comonomer and display a narrower molecular weight distribution when compared to LDPE. The butene produced materials are slightly less expensive than the octene. The octene-based PE has better mechanical properties. Overall, LLDPE has better ESCR and mechanical properties than LDPE. Increasing the comonomer content will continue to yield improvements in these categories, also.

Exciting new technology is allowing for very low densities and narrow molecular weight distribution. This, often times, transforms the material into an elastomeric resin with very high viscosity. Cross-linking is often done to improve thermal stability and mechanical properties.

Often times, PE of medium density is rolled into the same category as HDPE. MDPE is a product of a second monomer used while polymerizing which increases the side chain branching and decreases the density slightly. The blow molding industry uses the majority of these resins. These materials have been fluorinated and sulfated in order to make them less permeable to fuels.

High density resins display a molecule that is free from branching. It is a product of the monomer technology and its ability to grow a chain in a very ordered way. The comonomer content controls the density. These materials have a higher level of crystallinity, compared to LDPE. Because of its crystallinity, they perform better at high temperatures. This unique characteristic also allows the material to display higher stiffness, tensile strength, hardness, and improved ESCR.

Injection molding grades utilize narrow molecular weight materials in contrast to extrusion and blow molding grades. HDPE occupies the application niche that requires low temperature impact strength and a stiffness, often times, similar to polypropylene. It will also resist deformation when exposed to boiling water. But make no mistake, HDPE cannot resist high temperature requirements like polypropylene.

All products are available in pellet or powder form and antioxidants, UV stabilizers, antislip, antistatic, antiblock agents and even glass fillers are often added. Your General Polymers Technical Service Representative can assist in guiding you through this seemingly endless maze of opportunity. As always, let us know if we can help.

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