



## Cycletime Tips - General

### Volume 27: Which Polyethylene is Best for Your Application? Part One

By Bill Fierens

Polyethylene can be a very complex thermoplastic when it comes to a specific material selection. The following information is meant to eliminate the “shotgun” approach of specifying a polyolefin in this group. I think you’ll be surprised that it isn’t as easy as simply picking Dow, Equistar, Nova, or Paxon.

The most obvious and well-known characteristic that draws most molders, extruders, and formers to polyethylene (PE) is its outstanding resistance to organic solvents and chemicals. If there was an “Achilles heel” for this material, it would be its resistance to high temperatures; polypropylene typically rules this habitat. PE is grouped according to density. The following chart breaks it down.

Description	Density (g.cm3)
Type 1-low density PE (LDPE)	.910 to .925
Type 2-medium density PE (MDPE)	.926 to .940
Type 3-high density PE (HDPE)	.940 to .967

To make matters more complicated, our suppliers developed a product termed “linear” PE, which describes the molecules’ absence of long-chain branching. This is, in fact, a copolymer, where the ethylene is polymerized with a small percentage of a higher olefin. Densities range from .905 to .945 with this type of technology.

Polyethylene product properties are known to change as the density, melt index, and the breadth of the molecular weight distribution are altered. The following chart demonstrates this:

	Melt Flow Rate Increase	Density Increase	Molecular Weight Increase
Tens. Str. @ Yd	–	d	-
Tens. Str. @ Bk	f	d	-
Elong. @ Bk	f	f	-
Impact Str.	f	f	f

Modulus	-	d	-
Transparency	-	f	-
Creep Res	-	d	-
ESCR	f	f	-
Softening Pt	-	d	-
Melt Strength	f	-	d
Melt Elasticity	f	-	d
Melt Fracture	f	-	f
Gloss	-	-	f
Viscosity	-	-	f

These types of materials are polymerized using a process which utilizes ethylene, a comonomer a olefin, and a catalyst. The comonomer type and the production process will affect the resin's mechanical properties. The common comonomers are 1-butene, 1-hexene, and 1-octene.

Part Two will encompass the advantages and disadvantages of the various polymerization processes.

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