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Difference Between MDPE and HDPE

Contrary to popular belief, there are relatively few high-density polyethylene homopolymers produced these days. Most HDPE "homopolymer" grades consist of small amounts of a comonomer (usually butene, hexene, or octene) to help control crystallinity while maintaining density at 0.941 or higher.

Also, while some MDPEs in the late '60s and early '70s were produced by melt compounding LDPE with HDPE, nearly all MDPE manufactured today is produced via copolymerization --- by far the least expensive and most easily controllable route to crystalline polyethylenes in the 0.926-0.940 density range. I say nearly all, because I expect that there are a few compounding houses that may still market an LDPE/HDPE blend as MDPE, but beware, these compounds are not the MDPE that one would get from any of the major polyolefin suppliers (and these compounded versions are certainly not pipe grade MDPE). All MDPE pipe grades marketed since the mid '70s have all been copolymers of ethylene and higher alpha-olefin comonomers. All others, including many of the early true homopolymers, have not exhibited good long-term resistance to creep rupture, and produced early failures.

The inclusion of a small amount of a comonomer allows higher molecular weight resins to be used, which enhances the long-term creep rupture properties, while still being able to achieve fairly good extrusion throughput.

Furthermore, a density gradient column would not be capable of determining if an MDPE resin was melt compounded or a copolymer. However, a simple DSC thermogram, would indicate two separate melting points for the LDPE/HDPE compound (basically because they separate and crystallize among themselves, i.e., they are incompatible) while a copolymer will exhibit only one melting point.

Regarding the difference between PE 100 and PE 80, these are different hydrostatic rating values issued by ISO, and PPI. Originally, both the HDPE and MDPE pipe grade resins could only achieve a PE 80 rating using the ISO method. In the late '80s, Solvay produced a bimodal variety of their high-density resin which yielded extremely good resistance to creep rupture and little to no indication of a propensity to exhibit a ductile-to-brittle transition, even at very long times, which allowed them to be the first to achieve a PE 100 rating using the ISO method. Since that time, most of the major pipe resin suppliers have attempted to produce their own bimodal molecular weight versions with many achieving a PE 100 rating.

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