

LDPE/LLDPE (94/95-1)

In this time of rapidly advancing developments and the availability of many technologies for license, the choice between a low pressure LLDPE process or a high pressure LDPE process is becoming less obvious. The development of the low pressure gas phase LLDPE process in the late 1970s was claimed, by many, to be the beginning of the end for LDPE and its technology. Nearly two decades later, the LDPE business is generally the most profitable segment of the polyolefin business (globally) and the LLDPE share of the total LDPE/LLDPE business has reached only about 35 percent on a global average.

The second generation advances are targeted at companies wanting a competitive advantage through product/revenue enhancement and/or cost reduction. Although many companies have been involved with these developments, only a few have emerged as Leaders due to the degree of investment in time and resources, and their commercial status. Overall, it is believed that nearly \$3 billion have already been expended globally since the mid 1980s in the development and commercialization of second generation polyethylene technologies. There are two distinct areas of developments:

- Metallocene based catalysts for the production of LLDPE resins with precisely tailored product properties
- Bimodal polymers to improve the processability of conventional LLDPE resins

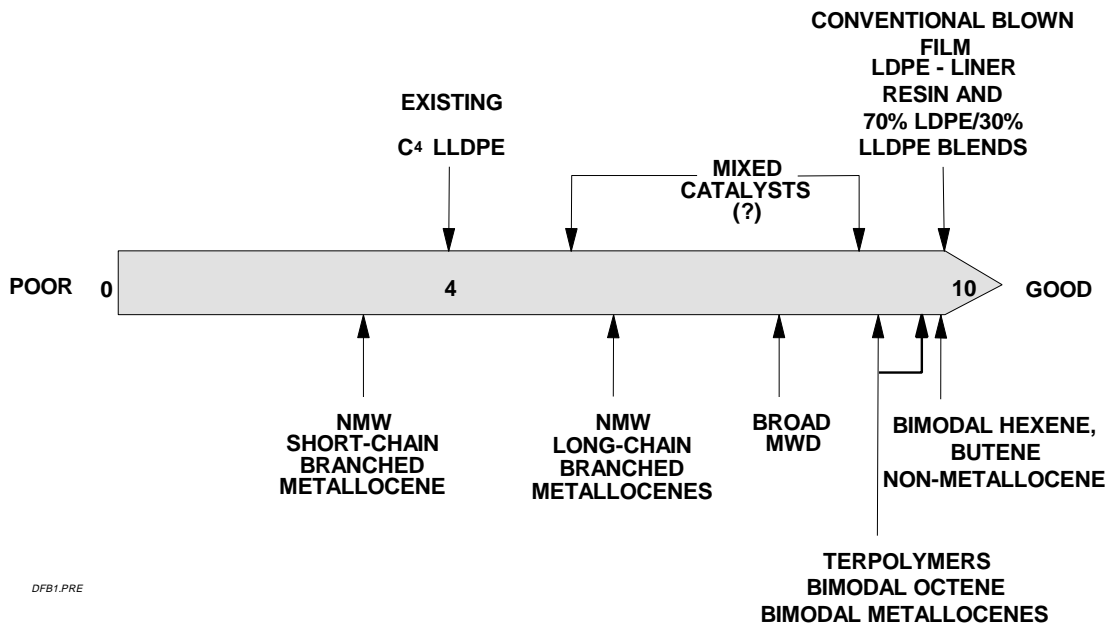
The latest specific developments have been a combination of these, that is, bimodal metallocene resins, which are targeted at overcoming one of the significant disadvantages of metallocene based resins, inferior processability.

The ability to produce easy processable bimodal, broad molecular weight distribution (MWD), and terpolymer based LLDPE in a low pressure process could give an LLDPE resin that processes and performs like a conventional high pressure LDPE resin. At current price differentials, this could offer cost savings to fabricators. This will have a significant impact on the LDPE business, if there is real ability to extend LLDPE's penetration into LDPE applications previously unattainable due to performance deficiencies (e.g. clarity, melt strength, etc.) A polymer containing the desired properties, characteristic of high molecular weight resins (toughness, strength, etc.) but with the processability of LDPE, is the ultimate goal of these "easy processing" LLDPE resins. The development of these non-metallocene resins is second in terms of dollars spent on R&D (following metallocene catalyst development).

Because LDPE is an easier resin to process relative to LLDPE (e.g. requires less power, more narrow die gaps, and has greater melt strength), the benchmark for improved

processability of LLDPE is the ability to fabricate blown film in existing LDPE extrusion equipment without modifying the LDPE based equipment. The figure below illustrates the relative processability of various types of resins.

RELATIVE PROCESSABILITY OF BLOWN LINER GRADE FILMS



This report updates the economics of both LDPE and LLDPE and examines the technological issues and economic implications of the various approaches to enhancing the processability of LLDPE. In addition, global strategic issues and supply/demand outlooks are presented.