

PERP Program

May 2001

Chem Systems' Process Evaluation/Research Planning program has published a new report, **LDPE (00/01-5)**.

In spite of the maturity of polyolefins technology, the industry continues to be dynamic. Technology developments are now redefining state-of-the-art products and processes in the polyolefins industry. In 2000, cost reductions and the continued commercialization of second generation LLDPE resins (metallocene/single-site and easy processing) represented the common themes of the polyolefins industry, and the greatest challenges for the LDPE industry. For technology licensors, cost reduction and product enhancement of their technologies are important in this competitive field with many polyethylene processes available for license.

At the company level, initiatives to improve competitiveness and profitability continue. Cost reduction is achieved through economy of scale, improved operating efficiencies, and streamlined process configurations. One driver for cost competitiveness is the availability of third party (licensed) technology. Increasing reactor capacity has reduced unit operating costs. Most of the licensors are now offering single-line annual capacities of at least 300 thousand metric tons (661 million pounds) per year. In addition to building grassroots plants, retrofit technology has also advanced significantly. LDPE tubular capacity has been scaled up to approximately double the previous levels. The current technical limitation of polyethylene capacity is governed by the limits of extrusion and pelletizing equipment, which continues to expand. In addition, existing processes are being streamlined with respect to lowering the number of pieces of equipment and the amount of "steel" per annual ton of capacity in the plant, regardless of the plant size.

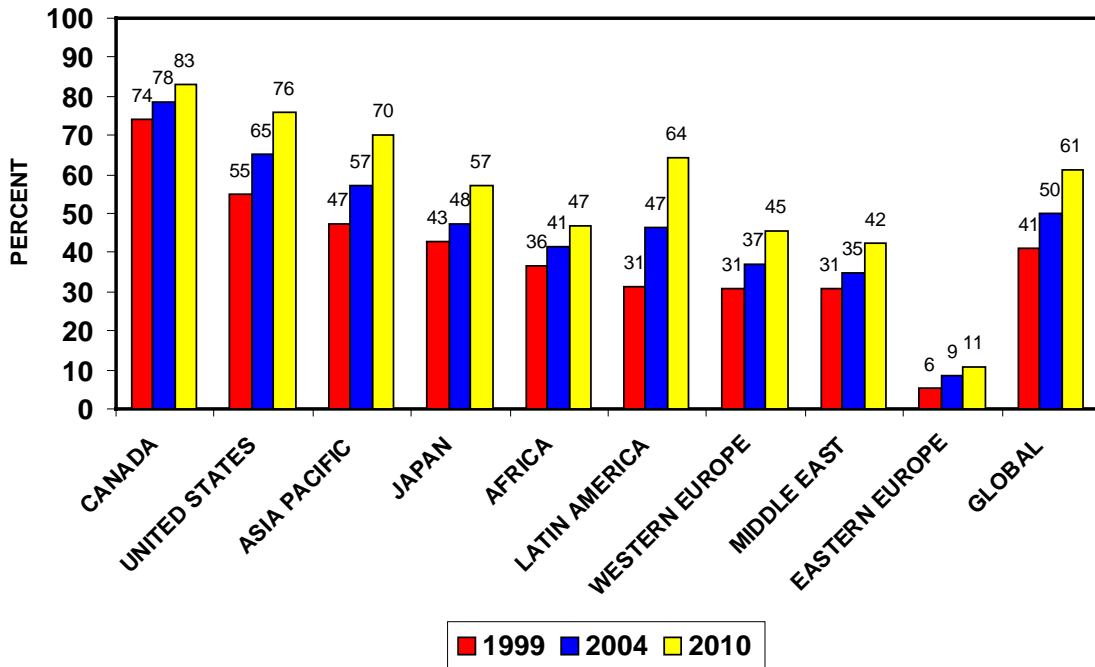
As the threat of substitution by LLDPE continues, LDPE manufacturers and licensors are continually improving their processes to reduce investment and operating costs. When considering overall economic performance of a plant/technology, the cost side of the "operations equation" must be considered in conjunction with the revenues of the plant (i.e., profitability). What first appears to be a high cost plant may actually be more profitable if the technology produces grades that command a premium price or that can be easily marketed, or if the license fee is low.

Although cost of production is a principal factor in evaluating a technology, several other factors must be considered in a full evaluation, such as product capability, ease of operation, licensor experience and costs, post-plant costs, etc. Licensing fees/royalties vary depending on the specific technology type. These fees are reported to have a

significant impact on the final plant investment and operating costs. However, licensing fees are extremely proprietary and subject to negotiation, and thus are not included in the economics in this report. Because they can be significant, these full costs must be considered when carrying out a full technology comparison.

Historically, when LLDPE was first introduced commercially in 1981, it was advertised as a "complete replacement of LDPE." However, because of the property and performance limitations of LLDPE (e.g., clarity, hot melt strength, processability, etc.), far less than complete penetration has been achieved, as shown in the figure below. In 2000, LDPE still commands almost 58 percent of the combined LDPE/LLDPE market on a global basis. LLDPE penetration varies from a low of 6 percent in Eastern Europe to a high of 75 percent in Canada. However, it is expected that with the enhanced performance of second-generation LLDPE (including improved processability), further substitution of LDPE will occur. By 2010, LDPE's share of the total LDPE/LLDPE market is forecast to be less than 40 percent.

LLDPE PENETRATION INTO TOTAL LDPE/LLDPE MARKET
(percent)



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