PERP Program - LDPE

New Report Alert

July 2005

Nexant's *ChemSystems* Process Evaluation/Research Planning program has published a new report, ***LDPE (04/05-1)***. To view the table of contents or order this report, please click on the link below: http://www.nexant.com/products/csreports/index.asp?body=http://www.chemsystems.com/reports/show_cat.cfm?catID=2

Introduction

Technology developments continue to redefine state-of-the-art products and processes in the polyolefins industry. The continued development and commercialization of second generation LLDPE resins represent the greatest challenge for the LDPE industry. Companies are focused on cost reduction and commercialization of new technologies and products.

Increasing reactor capacity has reduced unit-operating costs. Most licensors now offer single-line grassroots capacities of at least 300 thousand tons (661 million pounds) per year for tubular reactors, and retrofit technology has also advanced significantly.

The second generation resins that will impact the LDPE business are those referred to as "more processable" LLDPE resins. These are LLDPE polymers that have extrusion processability approaching LDPE, while imparting superior mechanical properties. The implication is that these LLDPE resins can replace conventional LDPE resins in several end-use markets, if the LLDPE resin could be run in existing LDPE blown film equipment.

When LLDPE was first introduced, it was advertised as a complete replacement of LDPE. Due to the property and performance limitations of LLDPE (e.g., clarity, hot melt strength, processability, etc.), penetration has been far less complete than originally forecast. However, LLDPE continues to gain market share in the combined LDPE/LLDPE market. In 2004, LDPE held a 52 percent market share on a global basis. Japan falls about 5 percentage points below the global figure. While the United States is about 10 percentage points below the global figure, Western Europe is conversely about 10 percentage points above the global figure.

Technology

For this report, Nexant *ChemSystems* has reviewed many state-of-the-art LDPE processes that are available for license. The evaluation provides:

- Highlights of key developments relating to the process technology.

- Background information on the technology including general product capabilities and a list of licensees, where applicable.

- Process description with simplified flowsheets. Technologies covered include:

  - Tubular Processes: Basell, Equistar, ExxonMobil, SABIC (DSM)
  - Autoclave Processes: EniChem, Equistar, ExxonMobil, ICI/Simon Carves, Voridian/Eastman

Also, a comparison is made between LDPE and LLDPE technology.

Economics

Investment and cost of production estimates are provided for generic grassroots LDPE facilities constructed by a third party. It is generally believed that a licensor can build its own plant for a lower capital cost relative to a third party company.

An economic comparison with LLDPE technology is also included, since there has been the question of which process is less expensive, ever since the inception of the gas phase LLDPE process.

Cost of production economics were developed on a first quarter 2005, U.S. Gulf Coast basis. For LDPE, the various technologies are considered very competitive, so cost of production estimates were developed for generic state-of-the-art plants. For autoclave processes, a single line 120 thousand ton (265 million pound) per year plant for both an 18 percent EVA material and a homopolymer material were analyzed, along with a 3-line, 300 thousand ton (661 million pound) per year plant. For tubular processes, the plants analyzed were a small 120 thousand ton (265 million pound) per year plant for comparison with the autoclave plant, a 300 thousand ton (661 million pound) per year plant, representative of the larger plants operating, and a speculative 400 thousand ton (882 million pound) per year plant, representative of the largest plant a licensor will offer for license.

While variable costs represent the majority of the total cash cost, the 300 thousand ton (661 million pound) per year three-line autoclave plant shows a small fixed cost advantage over the smaller single line homopolymer plant, but is at a cost disadvantage versus the same size tubular plant. However, it should be kept in mind that autoclave reactors are often used to produce specialty-type grades (extrusion coating, EVA, etc.), while tubular reactors are often used for larger-scale commodity grades, such as film. The largest scale tubular plant shows a slight fixed cost advantage over the large tubular plant and a modest fixed cost advantage over the smallest tubular plant.

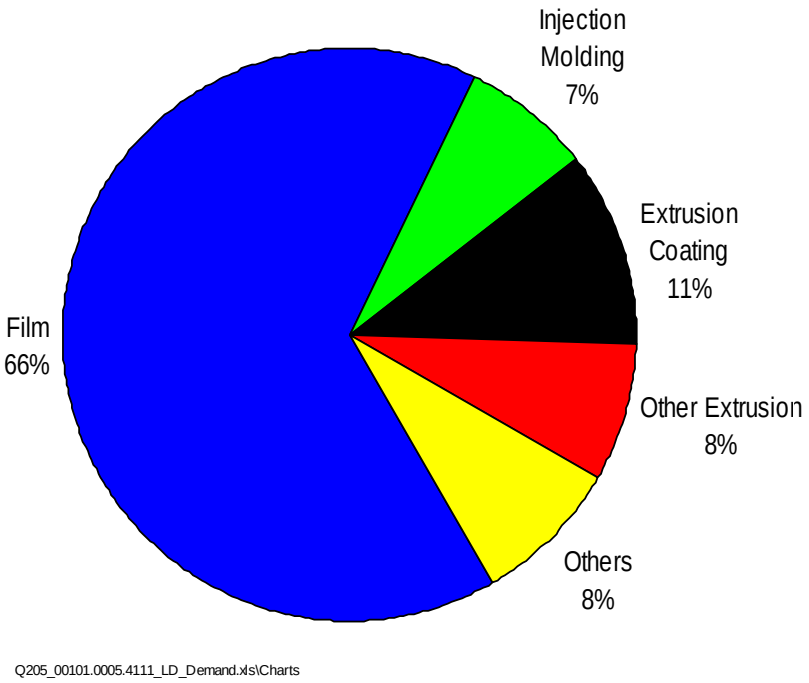
Commercial

Commercial data is shown on a global basis along with a more in-depth analysis for the United States, Western Europe, Japan, and the Asia Pacific region.

Global demand for LDPE in 2004 was 17.8 million tons and is projected to reach 18.3 million tons in 2005. Growth is expected to average 1.8 percent per year through 2010. This low growth rate is due to replacement by LLDPE. High-growth areas for LDPE demand (3.8 percent to 4.0 percent per year) are Asia Pacific, Eastern/Central Europe, Middle East, and Africa, in order of estimated 2005 base demand.

LDPE demand by end use for 2004 is presented in Figure 1. Film is by far the largest end use, accounting for 66 percent of total demand in 2004. Extrusion coating represents the next largest segment with 11 percent market share. Other significant end uses are other extrusion (8 percent) and injection molding (7 percent). This pattern is not expected to change significantly through 2010.

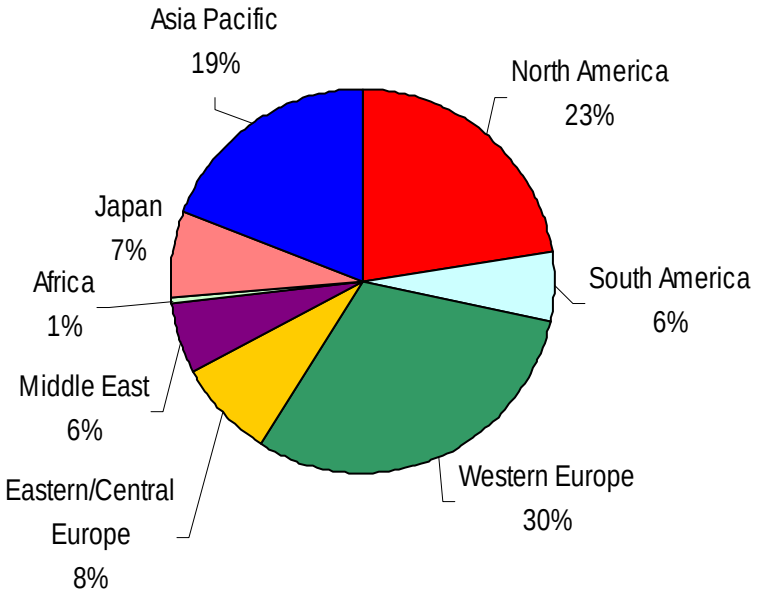
Figure 1
Global LDPE Demand by End Use, 2004
(percent)



LDPE global capacity is forecast to grow at an average rate of 3.1 percent per year through 2010.

The LDPE regional capacity profile will change over the forecast period. Figure 2 shows the regional capacity split for 2004. North America, Western Europe, and Japan are forecast to lose share in the global market, while Asia Pacific and the Middle East will increase their shares in the period through 2010.

Figure 2
Global LDPE Capacity by Region, 2004
(annualized, thousand tons per year)

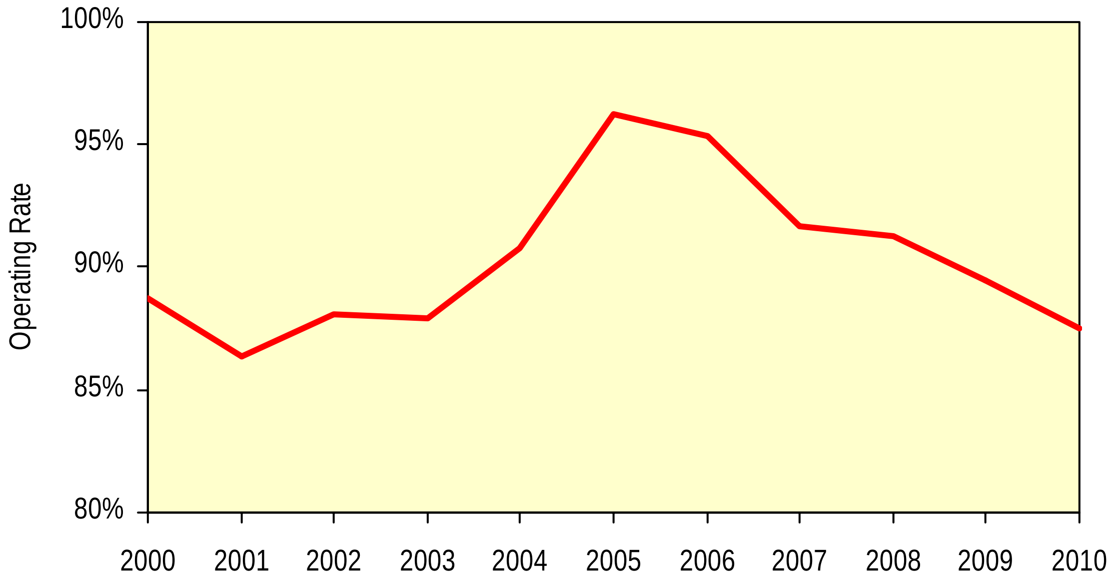


Total Capacity = 18,819

North America will remain a major net exporter, but will be surpassed by the Middle East as the global leader by 2010. Asia Pacific will remain the largest net importing region. Trade patterns are estimated for 2004, 2010, and 2015.

Historical and projected LDPE operating rates through 2010 are shown in Figure 3. High historical operating rates have allowed a high price premium compared with LLDPE. While this has caused some fabricators to modify equipment to allow greater LLDPE blend ratios, growth in LDPE performance markets (extrusion coating, high clarity film, etc.) has been offsetting this. This tight supply and the high price premium have prompted some producers to add LDPE expansion capacity.

Figure 3
Global LDPE Operating Rate
(thousand tons)



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