



PROCESS ECONOMICS PROGRAM

SRI INTERNATIONAL
Menlo Park, California
94025

Abstract

Process Economics Program Report No. 36B

LOW DENSITY POLYETHYLENE

(August 1980)

Low density polyethylene continues to be the largest volume commodity plastic. Before 1977 it was made almost exclusively by free radical polymerization at extremely high pressures, typically 1000 to 3500 atmospheres. In 1977 however, Union Carbide announced a new low pressure route to LDPE having substantially lower investment and energy costs. Since this announcement, a great many companies have been active in developing similar low pressure routes, some with success. Three processes have currently reached full commercialization, namely, the gas phase process of Union Carbide and the solution processes of Dow and Du Pont.

The resins produced by these low pressure processes have a linear molecular structure similar to that of HDPE (hence the name linear LDPE) but with some relatively short chain branching. Branching is achieved by copolymerizing ethylene with an alpha olefin such as butene-1, hexene-1, or octene-1. The combination of a linear backbone structure and branching results in resins with outstanding physical properties. These resins will compete effectively with conventional LDPE in many applications and will probably also find some new applications.

This report gives detailed evaluations of the Union Carbide fluid bed process, the low pressure solution processes of Dow and Du Pont, and the Mitsui Toatsu process, which produces polymer as a slurry in an inert diluent. The economics of these processes are compared with updated economics for the high pressure tubular and autoclave reactor processes, and with the Stamicarbon solution process (for HDPE), for which LDPE capability is claimed.

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Report No. 36B

LOW DENSITY POLYETHYLENE

SUPPLEMENT B

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For detailed marketing data and information, the reader is referred to one of the SRI programs specializing in marketing research. The CHEMICAL ECONOMICS HANDBOOK Program covers most major chemicals and chemical products produced in the United States and the WORLD PETROCHEMICALS Program covers major hydrocarbons and their derivatives on a worldwide basis. In addition, the SRI DIRECTORY OF CHEMICAL PRODUCERS services provide detailed lists of chemical producers by company, product, and plant for the United States and Western Europe.

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