

## Abstract

### Process Economics Program Report 45B POLYOLS FOR POLYURETHANES (November 1995)

This report, Supplement B to PEP Report 45, reviews the technology for producing polyether polyols (PETP), polyester polyols (PESP), polymeric polyols, and poly(tetramethyleneether)glycol (PTMEG). We also present the economics for producing polyols for rigid polyurethane foams, polyols for flexible or semirigid polyurethane foams, and PTMEG for spandex or nonfiber polyurethanes.

Rigid polyurethane foams require a tightly crosslinked structure. Therefore, highly functional PETP with low molecular weight are often used. Sucrose and other high-functionality initiators, such as sorbitol and methyl glucoside, are used to produce PETP by alkoxylation with propylene oxide and ethylene oxide. A majority of the rigid foam laminates produced today are based on low-cost PESP. PETP may be used alone or in combination with PESP in polyurethane foam systems for pour-in-place or spray applications. In general, pour-in-place foam systems tend to use greater amounts of PETP than do spray foam systems. This is because PETP typically provide better flow properties and greater dimensional stability to the final foam products. PESP however, provide the rigid foams with reduced flammability.

PETP are used primarily for cushioning applications, such as furniture and automotive seating. PESP are used in producing specialty foams for textile laminates and packaging, and in reticulated foams for automobile air filters and gaskets. Polymeric polyols are typically used in blends with other highly reactive polyols to produce high-resilience, flexible foams or reaction injection molding applications. The solid content of a polymeric polyol (amount of dispersed polymer in it) depends on the end-use market. Those having high solid content are used in carpet underlay, while those having low solid content are used for molding applications such as automobile seating and furniture.

Worldwide consumption of PETP in 1994 is estimated at 6.2 billion lb (2.8 million t), and those of PESP and PTMEG are 784 million and 254 million lb (356,000 and 115,000 t), respectively. The 1994 worldwide overall consumption of polyols for polyurethanes is estimated at 7.3 billion lb (3.3 million t) with about 31% consumption accounted for by the United States, 32% by Western Europe, and 10% by Japan. The 1997 world consumption of polyols is forecast at 7.9 billion lb (3.6 million t).

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