

Xylenes (92-8)

Xylenes are commercially produced from two main sources: reformat and pyrolysis gasoline. The predominant feedstock, reformat from the catalytic reforming of naphtha, is largely used as a high-octane component of gasoline. Pyrolysis gasoline is formed as a by-product of ethylene production by steam cracking of mixed hydrocarbons.

Although there is a market for mixed xylenes, most demand is for the isomers, primarily *para*-xylene and *ortho*-xylene. The demand for these isomers corresponds to the composition of neither the feedstock nor an equilibrium mixture. As a result, a xylenes complex consists of a combination of processing units for isomer production.

Separation of the *para*-xylene is done in one of two ways: crystallization or adsorption. The relatively high freezing point permits *para*-xylene to be separated from the other C₈ aromatics by crystallization. In this operation, between 60 and 65 percent of the contained *para*-xylene can be recovered per pass and still meet the 99+ percent purity specification for *para*-xylene. Increased recovery of *para*-xylene is prevented by the formation of xylene eutectics. UOP has developed a molecular sieve adsorption (Parex[®]) process for the continuous liquid-phase adsorption of *para*-xylene from either mixed xylenes or nonextracted reformat. The economics of these two technologies are compared in the body of the report.

The separation units previously described are usually employed in conjunction with an isomerization unit in order to maximize *para*-xylene production. The raffinate from the separation step has been depleted of *para*-xylene, and possibly *ortho*-xylene, and is then fed to an isomerization unit. About 95 percent of the *para*-xylene plants use isomerization. The three major commercial isomerization processes are offered by Mobil (MLPI, MHAI, and MHTI), Engelhard (Octafining[®]), and UOP (Isomar[®]).

UOP has developed two new xylenes equilibration catalysts for use in its Isomar[®] process. The variable production costs of UOP's new catalysts (I-100 and I-200) are compared with the older technology in the body of the report. Another mixed xylenes feed source is toluene disproportionation. Several companies, namely Lyondell, UOP (Tatoray[®]), and Mobil (STDP), have had processes available for licensing since the early 1970s.

Virtually all *para*-xylene is used to produce either terephthalic acid or dimethyl terephthalate. These in turn are feedstocks for the production of polyester: polyethylene terephthalate and polybutylene terephthalate. *ortho*-Xylene is used almost exclusively to

make phthalic anhydride whose main outlet is plasticizers, which are primarily used in polyvinyl chloride production as well as in the production of alkyd resins and unsaturated polyester resins. *ortho*-Xylene is a feedstock in the manufacture of 2,6-naphthalene dicarboxylic acid. *meta*-Xylene, the smallest market of the three isomers, is used to prepare isophthalic acid (for the manufacture of specialty unsaturated polyester resins) and isophthalonitrile (for fungicide production).

In 1992 U.S. domestic mixed xylenes demand amounted to nearly 1.12 billion gallons. By 2000 it is expected to decrease to about 1.04 billion gallons, reflecting compound annual growth rate of -0.9 percent. In Western Europe a demand growth rate of only 1.1 percent per year is forecast (2.24 million metric tons in 1992 to 2.44 million metric tons in 2000) largely due to continuing pressure of imported polyester fiber clothing. East Asian xylenes demand is dominated by *para*-xylene, which accounts for approximately 80 percent of the total. Japan is a net exporter of *para*-xylenes at present, and is expected to remain so through 2000.