The most commonly known oxygenate additive used in fuel is methyl tertiary butyl ether (MTBE). It has become the largest volume fuel ether because of the growing availability of low cost feedstocks (methanol and by-product isobutylene) and its environmental effects in gasoline. However, the preferred status of MTBE in meeting U.S. oxygenate needs during the 1990s is by no means causing diminished interest in other oxygenates. Other ethers under consideration or already commercialized include ethyl tertiary butyl ether (ETBE), diisopropyl ether (DIPE), and tertiary amyl methyl ether (TAME). MTBE, ETBE, and DIPE have been reviewed in previous PERP reports. This report covers the process technology and economics of TAME and the global supply/demand situation for TAME/MTBE.

Since TAME can be made fairly easily by etherification of the isoamylene produced by refiner catalytic cracking units, it can be produced like MTBE in part from feedstocks already available within refineries. At present, most isoamylene is blended directly into gasoline. Their etherification removes some of the highest vapor pressure olefins from gasoline, thus helping to meet some of the U.S. Clean Air Act (CAA) gasoline requirements, irrespective of oxygen content.

The blending octane of TAME is slightly lower than that of MTBE or ETBE, but the Reid vapor pressure (RVP) blending value is significantly lower than MTBE's and half of ETBE's. Thus, there is some advantage in using TAME as a fuel oxygenate over MTBE or ETBE. In addition, the blending octane and RVP are significantly better for TAME than for most C₅ components (e.g. 2-methyl-1-butene). Like MTBE, it is an ether that is essentially insoluble in water. Thus, it has none of the cold weather, moisture, or phase separation difficulties of some other oxygenates such as methanol or ethanol.

Isomerization of normal C₅ olefins to isoolesfins can significantly improve the reformulated gasoline production economics. The C₅ olefins have a high vapor pressure and a high ozone formation potential. Converting these to the isoamylene and then to TAME decreases the vapor pressure and ozone potential of the C₅ olefins. In addition, the production of TAME increases. Thus, the bad actors are removed from the gasoline pool and replaced with the oxygenate, TAME.

There are numerous licensors of TAME technology including CDTECH, UOP, IFP, ARCO, Snamprogetti, and Phillips. Two stages of etherification are commonly used. Process configurations and reactor designs differ somewhat from one licensor to another. Basically, there are two types - those employing a fixed bed reactor for the second stage and those employing a catalytic distillation system for the second stage. Combined MTBE and TAME production is also possible, either in combined or separate reactors. At
least two MTBE manufacturers in the United States (ARCO and Citgo) produce a mixture of MTBE and TAME by feeding both isobutylene and C\textsubscript{5} olefins to the same reactor vessel. Combined production has also been undertaken by three refineries in Western Europe.

Development of TAME supply, demand, and pricing is set against the same uncertainties affecting MTBE and other oxygenates. The most important factors are likely to be legislative developments; gasoline demand and composition trends; technological developments; and economic growth and crude oil prices. The U.S. TAME capacity in 1994 is 635,000 metric tons per year with another 770,000 planned. West European TAME capacity will reach 616,000 metric tons per year by 1995. The planned TAME capacity in East Asia and Latin America is estimated to be 410,000 and 500,000 metric tons per year, respectively. It is expected that TAME and MTBE will be used interchangeably with the choice involving mainly a supply issue.