PERP Program

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Options for Refinery C_5's (98/99S4)

About 58 million tons per year of C_5s are produced in 113 million BPSD of FCCU capacity world-wide. About 40 percent of this is found in the United States. At the moment the fate of the C_5 stream is in gasoline blending and as a steam cracking feedstock. Very little of the refinery C_5 pool is used for TAME production. Even less is used for chemical upgrading. However, there are a few companies, e.g. Exxon, that make use of the C_5 stream for chemical applications.

The RVP and olefin content of the FCCU C_5 stream may, in time, make this stream unattractive as a gasoline blending component as gasoline specifications tighten in the light of EPA legislation and the Auto Oil Programme in Europe. As a consequence refiners may have to look for new outlets for this stream and examine new upgrading options.

Subject to potential legislative developments regarding MTBE and other fuel oxygenates, TAME remains the most likely candidate for upgrading C_5s in the refinery, although alkylation and polygasoline offer lower value alternatives. By using skeletal isomerization in a TAME process scheme it is possible to convert virtually all the contained C_5 olefins into TAME, but at significant extra cost.

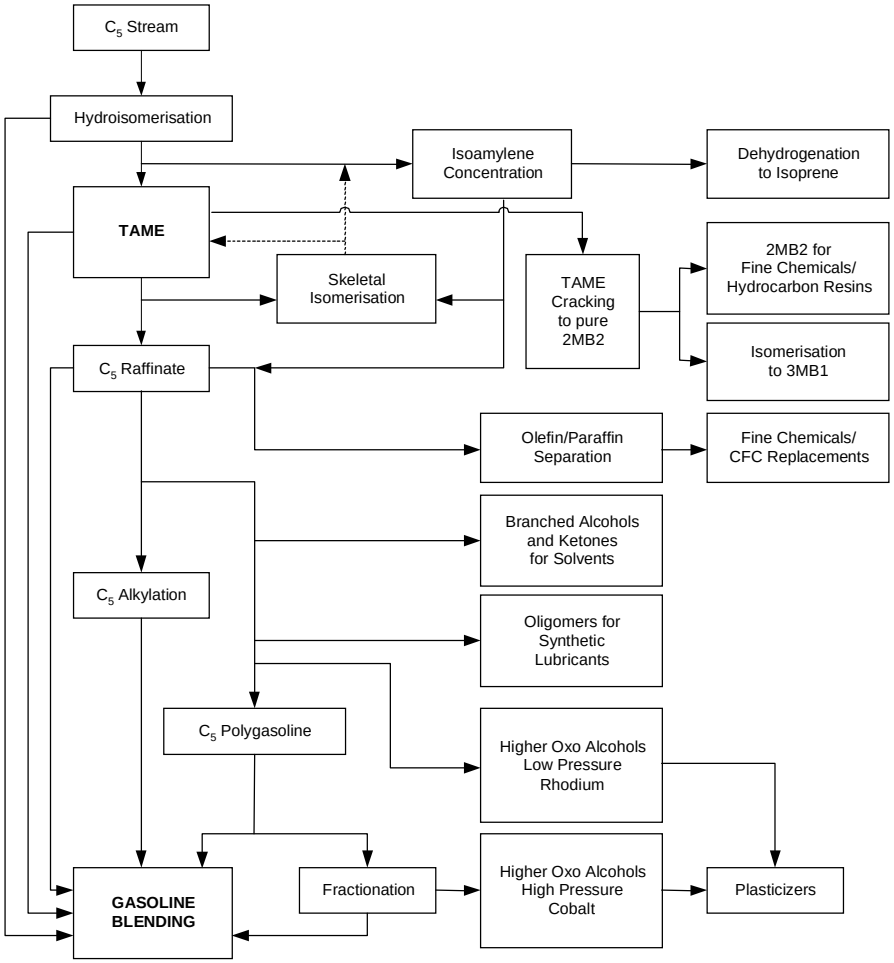
Various routes to upgrading refinery C_5s through chemical conversion have been proposed, e.g. new oxo alcohols, lubricant basestocks, solvents and propylene monomer. A theoretic process for enhancing the yield of 3MB1 has been proposed and its extraction in high purity for the manufacture of new homopolymers, copolymers and elastomers.

On the basis that the refinery C_5 stream has a blend value of 85 percent of premium unleaded gasoline, then TAME production boosts this value (based on breakeven economics) to about 94 percent. The conversion of refinery C_5 olefins into propylene through new catalytic technology could increase this value to about 115 percent. Novel chemical options such as a new oxo alcohol could have the potential to increase this value significantly to over 200 percent. However, this value will only be accessible to a few producers.

The overall aim of this study, it to provide a resource for R&D groups and engineering teams within the refinery and petrochemical businesses to explore some new chemistry for potential products derived from refinery C_5s, provide preliminary cost of production estimates and some idea of potential value-added.

The figure below illustrates some of the options looked at in this report.

POTENTIAL OPTIONS FOR THE REFINERY C_5 STREAM



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