PERP Program
December 2001

Chem Systems' Process Evaluation/Research Planning program has published a new report, ***Developments in Propylene Oxide Technology (00/01S12)***.

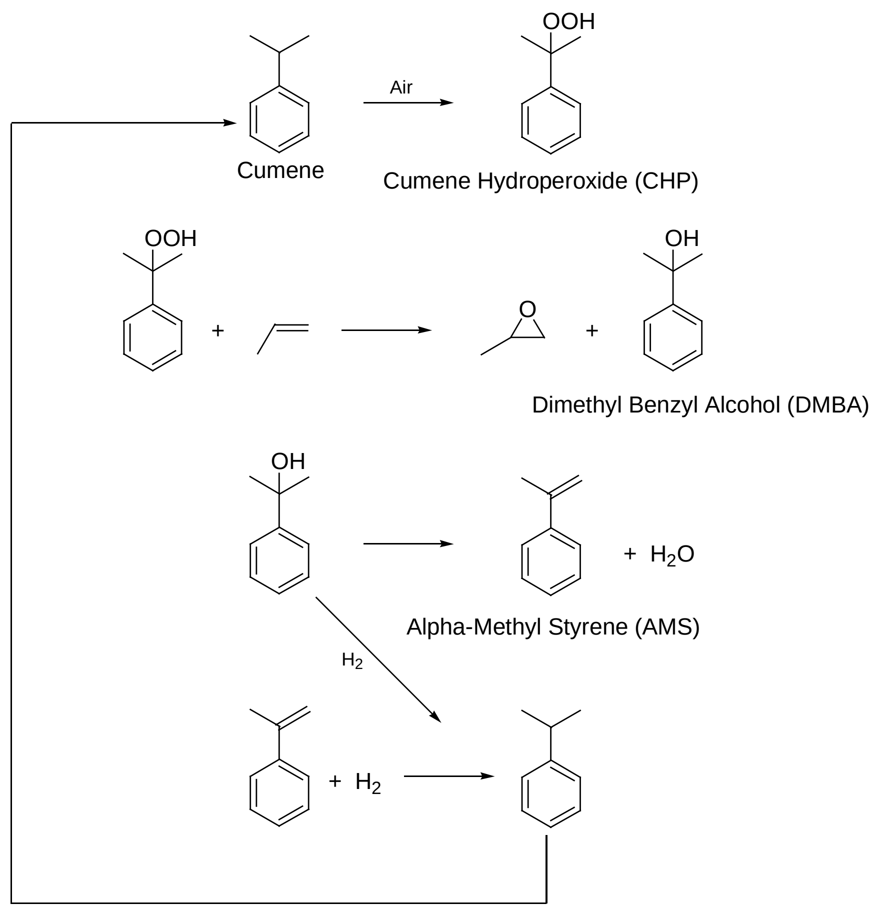
Sumitomo Chemical announced in September of 2000 that they had plans to commercialize a new route to PO that did not involve making any co-product. In a very recent announcement (October 19, 2001), Sumitomo has revealed that they have broken ground on a 200,000 metric ton per year co-product-free PO plant in Chiba, Japan. Sumitomo and Lyondell have also recently signed a preliminary agreement for global cooperation in the commercialization of the Sumitomo PO-only process. Sumitomo has not released much detail about their new process other than it does not make co-products, uses a proprietary titanium-based catalyst and the capital cost is expected to be about $100-$200 million for a 200,000 metric ton per year plant.

Based on this limited information and an examination of recent patents awarded to Sumitomo Chemical, Chem Systems has put together a speculative assessment of the Sumitomo Chemical PO process.

Sumitomo has patented the use of cumene hydroperoxide (CHP) for the epoxidation of propylene. The CHP is obtained by oxidation of cumene (isopropyl benzene) with air. On giving up oxygen to propylene, the CHP is converted to cumyl alcohol (also referred to as dimethylbenzyl alcohol or DMBA). The cumyl alcohol can be dehydrated to alphamethyl styrene (AMS) which can be, in turn, hydrogenated back to cumene for recycle. According to the Sumitomo patent, the dehydration and hydrogenation steps can be combined into a single hydrogenolysis step. The chemistry for such an approach is shown on the next page.

One can question what is so unique about the Sumitomo cumene-based approach shown previously. Operators of the POSM process always have the option, at least in concept, of hydrogenating co-product styrene back to ethylbenzene. Of course, downgrading styrene to EB does not make economic sense. Then what makes the hydrogenation of alpha-methyl styrene back to cumene attractive?

The use of cumene hydroperoxide (CHP) to epoxidize propylene has potential advantages over the analogous use of ethylbenzene hydroperoxide (EBHP). Cumene hydroperoxidation is more facile, selective, and stable than EB hydroperoxidation. The stability of CHP allows safe concentration to levels of 75-85 percent. This is in contrast to EBHP, which is typically handled in concentrations of about 10-15 percent.



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Substrate conversion per pass is about two times higher for CHP. Likewise, selectivity to hydroperoxide is 95-98 percent for CHP versus 72-77 percent for EBHP. All three factors translate into smaller and simpler equipment, with attendant capital cost reductions.

Further impetus is given to the use of CHP by the commercially-proven status of the cumene oxidation step and the AMS hydrogenation step, both of which are practiced commercially in the phenol/acetone process. This new report compares the economics of the speculative Sumitomo co-product free PO process to conventional PDSM economics over a ten-year period.