Abstract

Process Economics Program Report 262

PROPYLENE GLYCOL FROM GLYCERIN

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A variety of economic, environmental and technical factors have encouraged industry attention on producing industrial chemicals from bio-feedstocks, rather than from crude oil derivatives. One such example is producing propylene glycol (PG) from glycerine (GLY), rather than the conventional routes starting with propylene monomer.

Propylene glycol has historically been produced in commercial quantities either via the chlorohydrin process or by peroxidation, both using propylene monomer as the starting material. Both routes produce propylene oxide (PO) as an intermediate chemical, which is then hydrated to propylene glycol. The peroxidation routes have evolved from those processes (Arco Chem/Lyondell, Repsol, Shell, BASF) producing a significant amount of by-product (PO/styrene monomer, PO/tertiary butyl alcohol, PO/ methyl tertiary butyl ether), to more recent processes developed by Solvay, Dow and BASF that eliminate the by-product by using hydrogen peroxide as the oxidizing agent.

As of 2007, Degussa has announced the design and construction of a commercial scale PG plant using glycerine as its feedstock. Other companies have announced processes to use glycerine to produce polyols and epichlorohydrin.

The combination of high crude oil prices and governmental subsidies to produce biofuels (bio-ethanol, bio-diesel) have resulted in an enormous increase in bio-diesel production, resulting in a glut of by-product glycerine (which represents 10% of biodiesel mass). As a result, glycerine market prices have fallen from $US 2/kg down to fuel value ($US 200/mt), or less.

The low cost of glycerine combined with the high price of PG offers an opportunity to develop industrial scale processes converting glycerine to propylene glycol. This report presents preliminary process engineering design information and the corresponding production economics for converting GLY to PG using the Davy process and a process developed at the University of Missouri by Galen Suppes. In addition to these two processes this report also provides a detailed design of the glycerin purification section that is needed to allow these processes to take advantage of lower cost crude glycerin which is readily available form may bio-diesel production facilities.

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