Abstract

Process Economics Program Report 283

BIO-BASED 1,4-BUTANEDIOL

(August 2012)

1,4-Butanediol (BDO) is an important compound that is used as a starting material for the production of important polymers such as polyesters, polyurethanes, and polyethers. The major uses are in the production of tetrahydrofuran (THF) (an intermediate for spandex and other performance polymers) and polybutylene terephthalate (PBT) resins for engineering plastics.

With the price volatility of conventional fossil fuel-based raw materials and an increased focus on technologies that reduce carbon footprint, there is an opportunity to deploy renewable bio-based technologies for the production of products like BDO. Currently, the majority of BDO installed capacity is based on the conventional acetylene-based process. Many companies are considering bio-based technologies for the production of chemicals with hopes of being able to use cheap sugars as a feedstock, thereby eliminating the need for fossil fuel-based feedstocks. Companies such as Genomatica, BioAmber, and Myriant have announced plans to develop processes to produce BDO from sugars or cellulosic feedstocks. The technologies either produce BDO by direct fermentation of sugars or by indirect routes involving bio-based intermediate (e.g., bio-succinic acid).

In this PEP report, we present process designs and associated cost estimates for producing BDO using both bio-based and conventional process technologies. The designs presented in this report are for a base case capacity of 30 kTA or 66 million lb/yr of BDO. The conventional technology presented is based on acetylene which is still the dominant method of producing BDO in the industry. Additionally, two competing bio-based technologies are presented in terms of process designs and the associated economics—BDO by direct fermentation of glucose and BDO by hydrogenation of bio-succinic acid which is obtained by fermentation of glucose. Process economics presented for these technologies include both capital costs as well as production costs, thereby enabling a direct comparison of the economics of these technologies.

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BIO-BASED 1,4-BUTANEDIOL

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