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Styrene by CB&I/UOP SMART Technology

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Abstract

Styrene consumption in the United States in 2016 was roughly 3.3 million metric tons/year.

Styrene is expected to grow at an average annual consumption rate of 0.8% during between 2014 and 2019. In this review, we look at the production of styrene by the CB&I/UOP (previously Lummus/UOP) SMARTSM styrene monomer (SM) technology. The SMART process is based on the use of selective oxidative reheat step, which offers advantages over “Class” styrene technology. The SMART styrene process is uniquely used for increasing plant capacity at the lowest capital expense (CAPEX). The commercialized process scheme for SMART revamped for large capacity increases involves the innovative use of the “EB bypass” concept, where additional ethylbenzene (EB) is fed directly to the third position SMART reactor. The combination of higher EB conversion, interstage reheat, and EB bypass provided by the oxidative reheat step results in debottlenecking of the constraining equipment to provide more than a 50% capacity increase.

This review updates the process of Lummus Crest/Monsanto/UOP SMART technology that was presented in PEP Report 33C, *Styrene* (March 1993).

The focus of this review includes capital and production costs for two process schemes that are revamps from the base case capacity of 500,000 metric tons/year of styrene by conventional CB&I Classic styrene technology, presented in PEP Review 2017-09, *Styrene by CB&I/UOP Classic Technology* (June 2017). The process schemes presented in this review are:

- Case I—Low capacity, an increase of 20% from the base case to produce 600,000 metric tons/year of styrene.
- Case II—High capacity, an increase of 50% from the base case to produce 750,000 metric tons/year of styrene.

An interactive module is included with the electronic version of this review, the iPEP Navigator for styrene, which provides a snapshot of the process economics and allows the user to select the units and global region of interest.

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