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Review 2013-07

Acetic Acid, Update of the BP Cativa Process

By P D Pavlechko, PhD

June 2013

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Abstract

Monsanto began the changeover from oxidation routes via acetaldehyde to homogeneous rhodium-catalyzed methanol carbonylation with their "high water" process. Since then, Celanese has developed a homogeneous rhodium-catalyzed "low water" process called AO Plus, Chiyoda devised a heterogeneous rhodium-catalyzed "low water" process called Acetica, and BP created a homogeneous iridium-catalyzed "low water" process named Cativa. SABIC and Showa Denko have both devised oxidation routes that attempt to make oxidation economical again. PEP has previously evaluated each of these routes in a PEP Report [PEP037C] and a PEP Review [PEP97-12], and more recently updated all but the BP route in a series of PEP Reviews [PEP201201, PEP201202, PEP201301]. Hence, this review updates the BP route, incorporating new technology patented (or applied for) since the last evaluation, and updates the economy of scale to the new world scale of 600 thousand metric tons per year (kta).

The technology comparison would actually be academic assuming 600 kta, because none of the plants that BP has built appear to be at that scale, as noted in the CEH Report on acetic acid [CEH602.5000], the production capacity by company database [CMAI120418], and world acetyls report [CMAI2011WAA]. BP plants seem to be limited to 500 kta instead, which we initially assumed was because of equipment size limitations in the refining section, which proved to be false. Since BP actually designs for 500 kta, we evaluate the technology at the 600 kta capacity with a 300 kta and 1,200 kta scale range, but we add a second base case at 500 kta. The 600 kta base case and the 300–1,200 kta range are presented to compare technology against the Celanese and Chiyoda designs, while the 500 kta alternate base case allows actual plant comparisons.

While the process is labeled as being attributed to BP, it is actually our own independent interpretation of the BP patent literature and may not reflect in whole or in part the actual BP plant configuration. We do believe that it is sufficiently representative of the process to estimate the plant economics however, within the range of accuracy for economic evaluations of conceptual process designs.

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