**Abstract**

**Process Economics Program Report 21E**

**OXO ALCOHOLS**

**(September 2010)**

This report reviews research work and development activities in the field of oxo alcohols production since our last report on the subject was published in December 1999. It also describes and presents techno-economic appraisals of the following three propylene-based technologies:

- Dow-Davy's Low-Pressure Oxo$^{SM}$ SELECTOR$^{SM}$ technology for n-butyraldehyde
- 2-Ethylhexanol technology (based upon the recent patents of Mitsubishi Chemical)
- n-Butanol technology (based upon the recent patents of BASF)

The above-named oxo chemicals were selected for analysis because they are the largest-volume oxo products. Production of 2-ethylhexanol (2-EH) and n-butanol (NBA) together accounts for nearly 90% of the total n-butyraldehyde consumption.

Some other commercially important oxo alcohols are:

- 2-Propylheptanol
- Isononyl alcohol
- Isodecyl alcohol
- Amyl alcohol

These oxo alcohols are not derived from propylene, so they might be a subject for analysis in our next report on oxo alcohols.

Dow-Davy's Low-Pressure Oxo$^{SM}$ SELECTOR$^{SM}$ technology for n-butyraldehyde (NBAL) production (an intermediate for most oxo alcohols) employs a proprietary rhodium catalyst modified with a bisphosphite ligand for propylene hydroformylation. This technology, now employed for about two-thirds of the global production of NBAL, is an improved version of the older triphenylphosphine-based technology. The Low-Pressure Oxo$^{SM}$ SELECTOR$^{SM}$ technology can produce up to 30 times more NBAL than iso-butyraldehyde at moderate process conditions [194–212°F (90–100°C) and less than 20-bar pressure].

2-Ethylhexanol is produced by a successive condensation and hydrogenation process of NBAL using aqueous NaOH and proprietary Cu-Cr (or Cu-Ni) catalysts for these two steps. n-Butanol is produced by the hydrogenation of NBAL employing Cu-Cr or Cu-Ni catalysts.

Our report evaluates the oxo alcohols chain costs for n-butyraldehyde, 2-ethylhexanol and n-butanol production. For a ~209 thousand metric-ton/yr 2-ethylhexanol case, the net production cost is about 58¢/lb; the same for a 242 thousand metric-ton/yr n-butanol plant is equivalent to 51¢/lb. n-Butraldehyde feed to both plants was identical, i.e., ~239 thousand metric-ton/yr.

*A private report by the*

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