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TECHNO-ECONOMIC ANALYSIS OF A BUTANOL RECOVERY PROCESS BASED ON GAS STRIPPING TECHNIQUE

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Abstract

Acetone-Butanol-Ethanol (ABE) industrial production by fermentation is strongly affected by the low concentration of solvent (<25 g/L) that affects the cost of the recovery process. To decrease the overall cost of the butanol production, alternative routes for the recovery have proposed in literature.
This paper presents a techno-economic analysis of an innovative butanol recovery process from ABE fermentation broth based on gas stripping technique. The comparison with a recovery process based on conventional distillation is also presented. The investigated recovery line included gas stripping, absorption of butanol in a selected solvent, and distillation to separate the butanol from the selected liquid. The proposed and the conventional processes were modelled by means of the commercial software Aspen Plus to assess energy and material balances. The estimation of the investment cost was carried out by using Aspen Icarus and approximated methodologies typical of the process engineering.
Gas stripping flow rate, solvent flow rate, and feed preheating temperature were explored as design variables. The effect of the butanol concentration in the typical fermentation broth was also presented and discussed. From the economic point of view, the proposed process was the most convenient to recover butanol from fermentation broth. The incidence of the recovered section on the assessed butanol production cost by fermentation ranged between 0.33 and 0.92 $/kg, when butanol concentration in the fermentation broth changed in the interval 5 - 18 g/L.

Key words: ABE fermentation, butanol recovery, gas stripping, techno-economic analysis

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