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Jet fuel production in eucalyptus pulp mills: economics and carbon footprint of ethanol vs. butanol pathway

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Abstract

This work assessed the economics and carbon footprint of alcohol (ethanol vs. n-butanol)-to-jet fuel production using eucalyptus for feedstock. Considering a risk-mitigating strategy of investing first in the alcohol plant (organosolv pretreatment, enzymatic hydrolysis, fermentation) and waiting five years until the second investment (alcohol-to-jet plant), the minimum jet fuel selling price was similar in both ethanol and butanol cases (2.10 and 2.08 US\$/l for 20% Internal Rate of Return, IRR). In contrast, according to a stochastic decision-making framework that had carbon footprint as one of the criteria, the ethanol pathway is more promising. Nevertheless, even optimistic assumptions (regarding e.g. lignin price, and the interval between project phases) were ineffective to prevent eucalyptus jet fuel from depending on price premium (>1.00 US\$/l), which is needed for better returns than those from eucalyptus ethanol plants. Therefore, the feasibility of alcohol-to-jet fuel production in eucalyptus pulp mills depends on long-term, stable premium and subsidy.

Keywords: Eucalyptus jet fuel; Organosolv; Fermentation; Phased investment; Multi-criteria analysis

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