

Sustainable Process Design of Biofuels: Bioethanol Production from Cassava rhizome - DTU Orbit (09/11/2017)

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This study is focused on the sustainable process design of bioethanol production from cassava rhizome. The study includes: process simulation, sustainability analysis, economic evaluation and life cycle assessment (LCA). A steady state process simulation is performed to generate a base case design of the bioethanol conversion process using cassava rhizome as a feedstock. The sustainability analysis is performed to analyze the relevant indicators in sustainability metrics, to

define design/retrofit targets for process improvements. Economic analysis is performed to evaluate the profitability of the process. Also, simultaneously with sustainability analysis, the life cycle impact on environment associated with bioethanol production is performed. Finally, candidate alternative designs are generated and compared with the base case design in terms of LCA, economics, waste, energy usage and environmental impact in order to identify the most sustainable design for the production of ethanol. The capacity for ethanol production from cassava rhizome is set to 150,000 liters/day, which is about 1.3 % of the total demand of ethanol in Thailand. LCA on the base case design pointed to large amounts of CO₂ and CO emissions (related to combustion engine from transportation), biowaste and waste water that are released from the distillation columns, which affect the terrestrial ecotoxicity. Sustainability analysis on the base case pointed to a large waste of the water and lignin, which were then targeted for potential improvement.

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