



Production of Hemicellulosic Sugars from Residual Lignocellulosic Biomass in an Integrated Small-Scale Biorefinery: Techno-Economic and Life Cycle Assessments

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Abstract

Biorefineries design, as for other industries, usually target the economy of scale approach, maximizing processing capacities to achieve economic viability. However, the installation of large-scale biorefineries has some drawbacks, namely their high capital costs and the difficulty to assure a proper supply of biomass at regional level. Small-scale, self-sustainable, biorefineries can solve several of the challenges of their larger competitors and are also reported to expand environmental and social benefits, but several hurdles for their deployment still exist.

This chapter describes a methodology for the implementation of an integrated small-scale self-sustainable biorefinery in a rural area, based on a design that takes advantage of the synergies of processing two types of feedstock (corn stover and swine manure). A detailed explanation for the process selection by performing a heuristic analysis, process simulation, mass and energy balances alongside with the techno-economic assessment of the biorefinery is provided. The full life cycle assessment (LCA) of producing xylo-oligosaccharides (XOS) and ethanol from lignocellulosic residues, i.e. corn stover, under a biorefinery concept to be located in Portugal is also assessed.

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