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Techno-Economic Analysis of Different Pretreatment Processes for Lignocellulosic-based Bioethanol Production

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Abstract

In this work, a method based on process synthesis, simulation and evaluation has been used to setup and study the industrial scale lignocellulosic bioethanol productions processes. Scenarios for pretreatment processes of diluted acid, liquid hot water and ammonia fiber explosion were studied. Pretreatment reactor temperature, catalyst loading and water content as well as solids loading in the hydrolysis reactor were evaluated regarding its effects on the process energy consumption and bioethanol concentration. The best scenarios for maximizing ethanol concentration and minimizing total annual costs (TAC) were selected and their minimum ethanol selling price was calculated. Ethanol concentration in the range of 2% to 8% (wt.) was investigated after the pretreatment. The best scenarios maximizing the ethanol concentration and minimizing TAC obtained a reduction of 19.6% and 30.2% respectively in the final ethanol selling price with respect to the initial base case.

Keywords: Lignocellulosic biomass, bioethanol, pretreatment, techno-economic analysis

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