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Black liquor fractionation for biofuels production- A techno-economic assessment

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Abstract

The hemicelluloses fraction of black liquor is an underutilized resource in many chemical pulp mills. It is possible to extract and separate the lignin and hemicelluloses from the black liquor and use the hemicelluloses for biochemical conversion into biofuels and chemicals. Precipitation of the lignin from the black liquor would consequently decrease the thermal load on the recovery boiler, which is often referred to as a bottleneck for increased pulp production. The objective of this work is to techno-economically evaluate the production of sodium-free lignin as a solid fuel and butanol to be used as fossil gasoline replacement by fractionating black liquor. The hydrolysis and fermentation processes are modeled in Aspen Plus to analyze energy and material balances as well as to evaluate the plant economics. A mathematical model of an existing pulp and paper mill is used to analyze the effects on the energy performance of the mill subprocesses.

KEYWORDS: Techno-economic analysis, black liquor fractionation, butanol fermentation, process integration, pulp and paper mill

1. Introduction

The sulphate or Kraft process is the dominant production method of chemical pulping and accounted for approximately 75% of the global pulp production in 2012 (FAOSTAT 2014).

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