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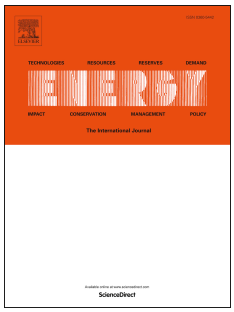

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Integrated production of biodiesel in a soybean biorefinery: modelling, simulation and economical assessment

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Abstract

Soybean is currently recognized as a high value crop, allowing the manufacture of a broad range of products. This contribution investigates the synergies resulting from coupling the production of biodiesel with soybean processing facilities, defining the core structure of a soy-based biorefinery. Simulations in Aspen Plus® were performed, employing a detailed modeling framework. A base case scenario was established, allowing a detailed economic assessment of the process, a profitability and risk analysis, as well as the identification of plant integration opportunities.

Increased process integration leads to a 18 % decrease of the biodiesel production costs, corresponding to a 9 % reduction of the break-even price (from 875 to 798 \$/t of biodiesel). This is accompanied by an overall decrease of hot and cold utilities consumption of 20 %, with a heat exchanger network that performs closely to the energy recovery targets determined through pinch technology.

The need for fresh water in biodiesel production is also completely eliminated and the generation of wastewater is mitigated by 9 %. The risk analysis, carried out through Monte Carlo simulations, shows that the new plant configuration becomes more robust to variations in the key economic factors considered.

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