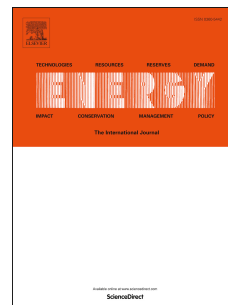


Accepted Manuscript

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

José F.O. Granjo, Belmiro P.M. Duarte, Nuno M.C. Oliveira



PII: S0360-5442(17)30524-8

DOI: [10.1016/j.energy.2017.03.167](https://doi.org/10.1016/j.energy.2017.03.167)

Reference: EGY 10644

To appear in: *Energy*

Received Date: 2 June 2016

Revised Date: 25 March 2017

Accepted Date: 27 March 2017

Please cite this article as: Granjo JoséFO, Duarte BPM, Oliveira NMC, Integrated production of biodiesel in a soybean biorefinery: Modelling, simulation and economical assessment, *Energy* (2017), doi: 10.1016/j.energy.2017.03.167.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

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

José F.O. Granjo^{a,*}, Belmiro P.M. Duarte^{b,a}, Nuno M.C. Oliveira^a

^a*CIEPQPF, Department of Chemical Engineering, University of Coimbra, Rua Sílvio Lima Polo II, 3030-790 Coimbra, Portugal*

^b*Department of Chemical and Biological Engineering, ISEC, Polytechnic Institute of Coimbra, Portugal.*

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.

*Corresponding author. Tel.: +351 239 798 793. Fax: +351 239 798 703.

Email addresses: josegranjo@eq.uc.pt (José F.O. Granjo), bduarte@isec.pt (Belmiro P.M. Duarte), nuno@eq.uc.pt (Nuno M.C. Oliveira)

Download English Version:

<https://daneshyari.com/en/article/5475929>

Download Persian Version:

<https://daneshyari.com/article/5475929>

[Daneshyari.com](https://daneshyari.com)