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A TECHNO-ECONOMIC ANALYSIS OF BIODIESEL PRODUCTION FROM MICROALGAE

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Abstract

The preliminary assessment of a cost-effective flow-sheet for the production of biodiesel from microalgae lipid fraction was carried out. The study was based on approximated cost-estimation methods integrated with the simulation software Aspen Plus[®]. Several scenarios were investigated to compare costs regarding the main steps of the biodiesel production process. Ranges of input variables from downstream literature and experimental data were used to simulate the sections that define concrete process routes for production of algal biofuels: the extraction of the lipid fraction from aqueous solution, the lipid transesterification, and the methyl esters (FAMES) and glycerol recover. The design variables were selected so as to correspond to the main degrees of freedom of the process: number of equilibrium stages, solvent recycle flow rate, transesterification time, methanol to triacylglycerols ratio, plate number and reflux ratio of the distillation unit for methanol recovery. The cost estimation for the conceptual design of the flowsheet dedicated to the FAMES production from microalgae was carried out according to Happel's method. Data were worked out to assess the venture profit and the selling price (s) for mass unit of FAMES. The minimization of *s* was adopted as the objective function. A preliminary determination of plausible values of the cost for unit of mass of biodiesel was attempted as a function of operating conditions.

Key words: biodiesel, cost estimation, microalgae, simulation

Received: March 2013; Revised final: July, 2013; Accepted: July 2013

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