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BIOREFINERY FOR THE PRODUCTION OF BIOGAS AND BIODIESEL BASED ON THE USE OF PLANTS AND MICROALGAE TREATING WASTEWATER

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Abstract

Biorefineries are an emergent field of research, since they offer an opportunity to improve the economic feasibility of biofuels production. In this work, a Biorefinery is envisaged as a complex in which integration of various unit operations allows the treatment of polluted river's water, municipal or agro industrial wastewater with a simultaneous production of biomass (plants or microalgae) and its transformation into fuels and/or chemicals. Several recent Life Cycle Analysis studies have indicated that the cost-benefit of biodiesel production from microalgae may increase if produced utilizing wastewater within a Biorefinery. The aim of the present work is to discuss the design and operation of a Biorefinery combining the treatment of wastewater with aquatic plants, the production of biogas from harvested biomass and the use of treated water for cultivation of microalgae with potential for production of biodiesel. Wastewater of various sources such as municipal and agro industrial is discussed. Furthermore, the use of urban polluted rivers as source of water and nutrients, is also discussed. In particular, the use of the polluted urban “Sordo” River located in the city of Xalapa, Veracruz, México provides a good model for discussion. The use of phytofiltration for its treatment requires the selection of appropriate aquatic plants for maximum biogas production. In relation to the use of the treated water for microalgae cultivation with potential for biodiesel production, several aspects such as the availability of sufficient nutrients, the presence of contaminants, the population dynamics which is established among the inoculated and the native microalgae species, are also reviewed. Finally, some general aspects related to the major technological challenges to overcome in order to make such integrated system the most cost-effective as possible, are discussed.
