AN INTEGRATED AND FLEXIBLE PROCESS CONCEPT FOR THE SUGAR AND ETHANOL PRODUCTION WITH ELECTRICITY CO-GENERATION

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Nowadays, due to the recent instability of petroleum prices, perspectives of resource scarcity, geopolitical risks derived from petroleum dependence on political unstable countries and the most solid commitments with environmental issues, attention to alternative renewable resources for the production of the fuels and chemicals have been drawn increasingly. In Brazil, the sugar cane industry keeps the greatest commercial energy production in the world with bioethanol. In addition to growing sugar cane and processing it to produce bioethanol and electricity, new biorefineries in Brazil should focus on marketing conventional bioethanol, its associated agricultural assets and co-generation plants, as well as making use of the acquired data and experience to contribute to research aimed at developing next generation biofuels. In 1st generation bioethanol production (sugarcane fermentation), wine obtained from fermentation of sugars contains between 7-10 wt% bioethanol, depending on process operating conditions. Ordinary distillation is used to produce hydrous bioethanol with approximately 93.2 wt% bioethanol. The conventional configuration of the distillation process employed in Brazilian refineries consists of a series of distillation and rectification columns. An alternative to the conventional distillation process is the use of multiple effect operation in the distillation columns, with different pressure levels, which gives rise to different temperature levels on condensers and reboilers of the different columns. Thus it is possible to integrate these equipments and reduce steam consumption on reboilers with the direct consequence of bagasse surplus increase. In this work, the simulation of an integrated process for bioethanol and sugar production with co-generation power and total utilization of raw materials and byproducts was developed as well as the thermal integration based on pinch analysis of the process. In the simulation was considered, the main process steps, to know, sugar cane extraction, juice treatment and, concentration for sugar production and fermentation to produce ethanol as well as producing steam for power generation. The simulation and optimization studies were carried out with the aid of Aspen PlusTM process simulation environment, being possible to optimize the bioethanol production process with energy consumption and residue generation reduction. With the development of this work was possible to observe the flexibility of the integrated production of fuels and energy from an economical and efficient process.

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