Improving bioethanol production – comparison between extractive and low temperature fermentation

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One of the key issues that must be addressed in the Brazilian sugarcane industry, if second generation ethanol production from sugarcane bagasse is considered, is the energy consumption of the process, which has direct impact on the amount of lignocellulosic material available for use as feedstock.

A significant fraction of the energy consumption in bioethanol production occurs in the purification step, due to the fact that conventional fermentation systems employed in the industry require low substrate concentration and, consequently, produce wine of low (around 8.5 °GL) ethanol content that must be purified in order to meet product specifications.

Different configurations of the alcoholic fermentation process have been investigated; the low temperature fermentation employing chilled water to maintain reactors temperatures below 32°C has been studied under pilot scale in Brazil for the past few years. In this process absorption chillers using lithium bromide solutions are employed, and the temperature inside the reactors is kept at levels that reduce substrate and product inhibition of yeast, allowing the use of concentrated feed. Another process that has gained attention in the Brazilian scenario over the past decade is the extractive fermentation process coupled with a vacuum flash chamber, which allows produced ethanol to be simultaneously removed from the reactor, increasing the concentration of the wine fed to the distillation columns.

In this work simulations of the first generation ethanol production process from sugarcane in an autonomous distillery were carried out, comparing different configurations of the fermentation system: extractive fermentation coupled with a vacuum flash chamber and low temperature fermentation using chilled water provided by absorption chillers. The advantages of each process are pointed out; ethanol, electricity and surplus lignocellulosic material produced are evaluated for each configuration.

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