Benchmarking real-time monitoring strategies for ethanol production from lignocellulosic biomass

The goal of this paper is to review and critically assess different methods to monitor key process variables for ethanol production from lignocellulosic biomass. Because cellulose-based biofuels cannot yet compete with non-cellulosic biofuels, process control and optimization are of importance to lower the production costs. This study reviews different monitoring schemes, to indicate what the added value of real-time monitoring is for process control. Furthermore, a comparison is made on different monitoring techniques to measure the off-gas, the concentrations of dissolved components in the inlet to the process, the concentrations of dissolved components in the reactor, and the biomass concentration. Finally, soft sensor techniques and available models are discussed, to give an overview of modeling techniques that analyze data, with the aim of coupling the soft sensor predictions to the control and optimization of cellulose to ethanol fermentation. The paper ends with a discussion of future needs and developments.

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