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### **Optimization of ethanol production addressing environmental aspects**

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Currently there is a growing increase in fuel consumption, but also an increased concern about the end of fossil fuels and their environmental damage. In this scenario, second-generation ethanol (E2G) appears as an option to increase the production of first generation ethanol (E1G), produced from sugarcane. Second-generation ethanol produced from sugarcane bagasse and straw is still at the beginning of its journey with the study of more efficient ways of exploiting the fraction of cellulose to convert it into ethanol. However studies involving environmental impacts of ethanol 2G production process should also be conducted. The aim of this work was to evaluate how to reduce the environmental impacts such as waste production and water use without, however, compromising the production of E1G and E2G. This evaluation was formulated in terms of multiobjective optimization problems in the biorefinery modeled in EMSO (Environment for Modeling Simulation and Optimization). The modeling of closed water circuits and of vinasse stream concentration, as well as the multiobjective optimization involving ethanol 2G production, power generation and steam production were performed obtaining satisfactory results. The results obtained by multiobjective study enabled the construction of a Pareto front showing the operating points that represent a trade-off among the different proposed objectives.

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