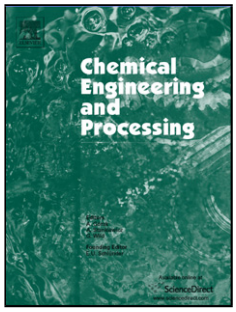

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Economic and environmental analysis of the cumene production process using computational simulation

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Highlights

- Simulation of five different cumene production processes.
- Simulation of utility plants for more realistic results.
- Development of six different categories of eco-indicators.
- Eco-indicators lumping in a single index for global eco-efficiency comparison.
- Economic analysis by estimating the processes' gross annual profits.
- The heat integrated process proved to be the most economical and sustainable.

Abstract

The need for mitigating environmental impacts has been heading towards the development of new technologies that could lead the industries to a greater ecological efficiency. Countless methodologies for evaluating processes' efficiency in relation to their respective ecological footprint have been employed, among which the concept of eco-efficiency has stood out. In this context, this work aims to compare six different cumene production plants, namely conventional, transalkylation, heat-integrated, dividing wall column, reactive distillation and double-effect distillation technologies, with regard to their economics and environmental efficiencies. The economic analysis was performed by estimating their respective Gross Annual Profit (GAP) and determining the specific production costs indicator, whereas the environmental assessment was carried out by calculating six eco-indicators, namely raw materials consumption, fuel consumption, energy use, CO_2 emissions, water consumption and wastewater generation. The processes' environmental performances were then compared