

## **Operating Cost Analysis of an Annexed Ethanol Distillery in a Rural, Landlocked African Country**

**B. Amigun<sup>a</sup> and H. von Blottnitz<sup>b</sup>**

*<sup>a</sup>Sustainable Energy Futures, Natural Resources and the Environment, Council for Scientific and Industrial Research (CSIR), Stellenbosch, South Africa; bamigun@csir.co.za (for correspondence)*

*<sup>b</sup>Environmental and Process Systems Engineering Research Group, Department of Chemical Engineering, University of Cape Town, Private Bag, Rondebosch, 7701 Cape Town, South Africa*

### **Abstract**

Given the high cost of crude oil, uncertainties regarding future reserves as well as the phenomenon of global warming, alternative fuels such as bioethanol need to be developed and deployed. This work presents an economic analysis (operating cost analysis) of one annexed African distillery operating in a landlocked and rural location. Specifically, the study attempts to analyze the impacts that some of the critical factors influencing bioethanol production will have on its viability and also present an analysis of the breakdown of the operating costs of the distillery, in an equation format to enable easier and more rapid use of the data in numerical and economic models, and in the preliminary design and optimization of bioethanol plants. The cost of ethanol production was estimated at \$19.57/HL with cost of feedstock (molasses “type C”) constituting about one third of the production cost. The study also identified other major, intermediate, and minor input factors, which can provide insights to both the possible barriers to implementation that should be overcome, and on the technological improvement options that should be stimulated by research and development in ethanol industry. Finally, from the operating cost analysis of the annexed distillery, it emerged that the factorial approach to estimation is principally a sound one, with no indication of untypical cost items. Some of the typical cost items do however display ratios to the base cost that are outside of previously reported limits.