

## Exergetic and economic analysis of hydrogen production by steam reforming from cassava biogas

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### Abstract

The use of bioenergy has become a good alternative to reduce the emission of polluting gases. In Brazil, this type of energy has increased in the last years. Hydrogen has presented itself as an alternative fuel in relation to fossil fuels, becoming economically competitive. Informations on the viability of biohydrogen production using wastewater from cassava processing is very limited. This paper analyzes the exergetic and economic efficiency of the biohydrogen production using cassava wastewater from a large-scale plant, through a computer simulation of the process performed by the reformer using the software HYSYS (version 8.0). The exergetic analysis revealed that the Pressure Swing Adsorption (PSA) is the step with highest irreversibility, being responsible for 85.7% of all exergy destroyed in the productive process. The study showed that the global exergetic efficiency of the plant was 79%, which is a good value in comparison to others in the literature. The economic feasibility calculation was performed to evaluate how interesting the process is by analyzing the investment, operation and maintenance costs of the biogas steam reformer and the hydrogen production cost achieved the value of 0.13 US\$/kWh with a payback period of 7 years. The results obtained by these analyses showed that this type of hydrogen production is a good choice for power generation.

production ; Thermoeconomic tools; Life Cycle Analysis; Ecological Efficiency, Mathematical Modeling, Nuclear Energy.

### Speaker Publications:

1. "Ecological analysis of hydrogen production via biogas steam reforming from cassava flour processing wastewater"; Journal of Cleaner Production. / 2017 / Volume 162, Issue20(2017) 709-716
2. "Exergetic and economic evaluation of incorporation of hydrogen production in a cassava wastewater plant"; Applied Thermal Engineering / Vol 123(2017) 1072-1078
3. "Performance Study of a Microturbine System for Cogeneration Application Using Biogas from Manipueira"; BioEnergy Research, pages659–667(2020)
4. "Electricity Generation from Biogas of Cassava using Cattle Manure as inoculum: An Assessment of Potential in the Quilombola Community (Brazil)", International Journal of Advanced Engineering Research and Science, Vol 6, Issue 6,2019
5. "New, efficient and low-cost technology to separate oil from bilge water International Journal of Advanced Engineering Research and Science / Vol 7, issue 3,2020, Pages 2456-1908(O)

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### Biography:

Jonni Guiller Ferreira Madeira is a mathematician with a Master's degree in Nuclear Engineering and PhD in Applied Math. He is a researcher and teacher at the Federal Center for Technological Education Celso Suckow da Fonseca (CEFET-Angra dos Reis(Brazil)). Experience in following scientific areas: - Biofuels production (Biogas, Syngas from Biomass, Biohydrogen); - Bioenergy

