



THE ECONOMIC AND ENERGY EVALUATION OF BIO-HYDROGEN AND BIO-METHANE PRODUCTION BY ASPEN PLUS

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ABSTRACT

Earth is facing energy crisis, but the past energy crisis, this will be long-term and sustained crisis. The main reasons, the first is the rapid increase of the population, human needs expansion, as well as the pollution caused by the "city" and "industrial" development. With the continuous development of human economic activities, human life has become more convenient and more progress. In progress at the same time, energy is drastically reduced harm to the environment in which we live. Therefore, the development of alternative renewable energy and reduce greenhouse gas emissions has become an important issue.

This study was aimed at economic and energy evaluation of bio-hydrogen and bio-methane production by Aspen Plus software. Assess the cost only for the process of bio-hydrogen and bio-methane production, not consider separation bio-hydrogen, storage, transportation, energy conversion and application. Waste molasses was the feeding substrate which was from amino acids producing process and can be ignored the cost of feedstock. It was found that the total capital cost for bio-hydrogen and bio-methane facilities is 3.3 million USD which based on Annual Percentage Rate of 1.37%. The annual payback cost is 0.33 million USD per year by dividing to 10 years. The return on investment (ROI) is 3.1 years by using waste molasses to sale bio-hydrogen/bio-methane/CO₂, that was predicted by Aspen Plus Software based on mass and energy balance simulation.

Finally, the total energy output was 3.5 times high than the energy input the system which assumed the efficiency for heating converter is 15%. However, the total energy output was 11.8 times high than the energy input the system which assumed the efficiency for electricity converter (Fuel Cell) is 50%. Therefore, this system is very impressive for heating and energy recovery from the factory with high organic wastewater by renewable energy of bio-hydrogen and bio-methane.

Keywords: Energy Crisis, Bio-hydrogen, Bio-methane, Waste Molasses, Fuel Cell