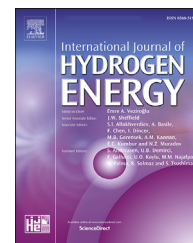




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# Analysis of biohydrogen production from palm oil mill effluent using a pilot-scale up-flow anaerobic sludge blanket fixed-film reactor in life cycle perspective

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## HIGHLIGHTS

- The LCA of bio-H<sub>2</sub> production from POME in the pilot-scale reactor was conducted.
- Electricity usage contributed highest impact especially in global warming potential.
- Improvement analysis was conducted to reduce impact to 54.9 kg CO<sub>2</sub> eq per kg H<sub>2</sub>.

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## ABSTRACT

This study aims to analyse the life-cycle assessment of biohydrogen production from palm oil mill effluent (POME) in a pilot-scale up-flow anaerobic sludge blanket fixed-film reactor. The SimaPro LCA software and ReCiPe 2016 impact assessment method were used. Electricity usage was found to be a significant source of environmental impacts, with 50–98% of the total impacts. Furthermore, an improvement analysis was conducted, resulted in a reduction in all impacts, especially global warming impact with 77% reduction from 818 to 189 kg CO<sub>2</sub>-eq per kg biohydrogen. While shifting the pilot reactor to Sarawak may further lessen the impact to 142 kg CO<sub>2</sub>-eq due to cleaner grid in that region. Besides, if the environmental burden avoided due to usage of POME is considered, the global warming impact can be further reduced to 54.9 kg CO<sub>2</sub>-eq. Thus, the pilot reactor has huge potential, especially in utilizing waste to produce bioenergy.

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## Introduction

Increased industrial development across the globe has produced considerable environmental problems. To come across the immense energy necessities, massive energy production

requires to be assumed with a continually growing development. Most of the methods in energy production conservatively are relied on fossil fuel resources. Hence, the utilization of this source of energy results in harmful gas emissions, which adversely affects the environment. Therefore, the substantial concern should be focused on the clean and

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