



**ANAEROBIC DIGESTION OF BIOGAS PRODUCTION FROM THE
COMMERCIAL FOOD WASTE SOURCE AND
COW DUNG INOCULUM**

This report is submitted in accordance with requirement of the Universiti Teknikal
Malaysia Melaka (UTeM) for Bachelor Degree of Manufacturing Engineering (Hons.)



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I hereby, declared this report entitled “Anaerobic Digestion of Biogas Production from the Commercial Food Waste Source and Cow Dung Inoculum” is the result of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of Universiti Teknikal Malaysia Melaka as a partial fulfilment of the requirement for Degree of Manufacturing Engineering (Hons). The member of the supervisory committee is as follow:



ABSTRAK

Pencernaan anaerob adalah teknologi yang layak dengan potensi tertinggi untuk menukar sisa makanan menjadi tenaga yang boleh diperbaharui. Oleh itu, banyak penyelidik telah meneliti pendekatan pencernaan anaerob dalam kajian mereka untuk meningkatkan pengeluaran biogas. Selanjutnya, penyelidikan yang menggunakan jenis sumber sisa makanan tertentu untuk pengeluaran biogas, untuk menghasilkan jumlah hasil biohidrogen yang relevan masih belum mencukupi. Oleh itu, penyelidikan ini telah dijalankan untuk mengesan pengeluaran gas biohidrogen dengan memberi tumpuan kepada jenis sumber sisa makanan tertentu. Kemudian, komposisi kimia sumber sisa makanan terpilih dianalisis dengan menggunakan analisis Fourier transform infrared (FTIR). Melalui analisis FTIR, didapati bahawa sifat komposisi kimia untuk substrat yang digunakan untuk pengeluaran biohidrogen difahami sepenuhnya. Tujuan kajian ini adalah untuk mengesan gas biohidrogen dengan menggunakan alat analisis Gas Chromatography-Thermal Conductivity Detector (GC-TCD). Oleh itu, nisbah gas yang dikumpulkan dari ayam ke nisbah sisa beras (1: 1), (1: 2) dan (2: 1) dinilai melalui ujian analisis GC-TCD. Melalui ujian pengesanan gas, didapati bahawa nisbah substrat 1: 2 telah mendorong kemungkinan pengeluaran biohidrogen lebih tinggi. Hingga kini, sebahagian besar penyelidikan memfokuskan pada faktor pH, nisbah C / N dan suhu pada pengeluaran biohidrogen. Walaupun begitu, masih belum ada kajian atau kajian yang serupa mengenai nisbah substrat antara sisa ayam dan sisa beras. Oleh itu, korelasi nisbah substrat antara sisa ayam dan sisa beras yang telah menyebabkan pengeluaran biogas dan hasil gas biohidrogen lebih tinggi dinilai dalam penyelidikan ini. Pada akhir kajian ini, reaktor mini biogas disahkan berfungsi dan berpotensi menghasilkan gas biohidrogen yang berjaya dikesan dari ujian analisis gas GC-TCD. Penyelidikan ini sangat penting untuk dilakukan kerana memberikan alternatif lain untuk menghasilkan alternatif biohidrogen hijau dari sumber sisa makanan yang bermanfaat untuk persekitaran yang lestari dan hijau.

ABSTRACT

Anaerobic digestion is feasible technology with highest potential to convert food waste into renewable energy. Therefore, many researchers have investigated anaerobic digestion approach in their studies for enhancing biogas production. Furthermore, research utilizing specific types of food waste sources for biogas production, to produce relevant amount of biohydrogen yield are still at scarce. Hence, this research has carried out to detect biohydrogen gas production by focusing on specific type of food waste source. Later, the chemical composition of selected food waste source was analysed by using Fourier transform infrared (FTIR) analysis. Through FTIR analysis, it was found that the nature of chemical composition for substrate used for biohydrogen production was fully understood. The purpose of this study is to detect biohydrogen gases by using a Gas Chromatography-Thermal Conductivity Detector (GC-TCD) analytical equipment. Therefore, the collected gases from chicken to rice waste ratios of (1:1), (1:2) and (2:1) were evaluated through GC-TCD analysis testing. Through gas detection testing, it was found that the substrate ratio of 1:2 had promoted higher possibility of biohydrogen production. Up until now, most of the research has mainly focused on the factors of pH, C/N ratio and temperature on biohydrogen production. Nevertheless, there is still no similar study or research study about the substrate ratio between chicken waste leftover and rice waste leftover. Therefore, the correlation of substrate ratio between chicken waste leftover and rice waste leftover that has led into biogas production and even higher biohydrogen gas yield was further evaluated in this research. At the end of this study, the biogas mini-reactor was validated functioning and had potential in producing biohydrogen gases that has been successfully detected from the GC-TCD gas analysis test. This research was significantly important to be carried out as it provides another alternative for producing green biohydrogen alternative from food wastes resources which beneficial for sustainable and green environment.

DEDICATION

Dedicated to

My beloved father, Yip Cheok Yuen,

My appreciated mother, Wong Lai Peng,

My supervisor, Ts. Dr. Jeefferie Bin Abd Razak,

*My appreciated families and all my friends and colleagues
for giving me moral support, cooperation, encouragement and also understandings.*



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