INVENTOPIA 2025

FBM-SEREMBAN INTERNATIONAL INNOVATION COMPETITION (FBM-SIIC)

INNOVATION IN ACTION: TURNING IDEAS INTO REALITY

Chapter 52
The Waste-to-Energy Concept

Shaik Irshad Mikail Bin Shaik Abbas, Ahmad Aiman Hidayat Bin Ahmad Shauwal, Nuramira Maisarah Binti Azrul Amri, Afrina Binti Ahmad Kamaruddin, Sharifah Nur Batrisyia Binti Syed Hasbullah & Noorita Mohammad

Faculty of Business and Management, Universiti Teknologi MARA Cawangan Selangor Kampus Puncak Alam, 42300 Bandar Puncak Alam, Selangor, Malaysia.

2024676734@student.uitm.edu.my

ABSTRACT

Malaysia is currently facing a serious problem with solid waste, especially in cities where landfill space is running out. Due to a lack of environmental understanding and concern, this country also struggles with improper trash disposal by people.This method breaks down biodegradable waste to produce methane gas, which can be used to generate electricity through a turbine. The research also suggests involving communities through small-scale biogas systems, and awareness campaigns. This approach helps reduce pollution, manage waste better, and supports Malaysia's goal of becoming more sustainable.

Key Words: *Waste-to-Energy, Biogas, Renewable Energy, Solid Waste Management, Malaysia*

1. INTRODUCTION

Waste management systems in Malaysia have not improved generally with the increase in waste generation due to urban and population growth. According to our observation, although the waste disposal literacy has spread widely to the community, however, the practical level of it in their daily routine is still low. As a result, overflowing landfills, and insufficient waste is being recycled can lead to a risk ecosystem and human health. Therefore, we have come up with an innovative solution to solve this matter that provides benefits in the long term. Our innovation focuses on how anaerobic digestion, a waste-to-energy method, can help solve this issue by having this system be put in place in a university. This method turns food waste and other organic material to decompose, which releases methane gas which then powers the turbine to generate electricity and reduce the amount of waste that ends up in landfills.

2. LITERATURE REVIEW

The idea of waste-to-energy (WTE) originated from the increase in waste disposal concerning Malaysia to face significant challenges in waste management. Only a few of the landfills located in Malaysia are designed to minimize the environmental damage which is not enough to eradicate the huge amount of waste sent to the landfills. The Waste Management Association of Malaysia (WMAM) has warned Malaysia will be at risk of running out of landfills by 2050. Hence, 174 landfills reported to have been closed due to prevention of environmental contamination costing the government over 1.6 billion annually since 2015 (December 2023, K. Harinderan). Therefore, WTE is a great initiative created to solve this issue for a long term beneficial to both government and society. WTE is a method of converting solid waste into usable energy like electricity or heat through technologies such as incineration, gasification, and anaerobic digestion. It helps reduce landfill use, lowers greenhouse gas emissions, and recovers energy from non-recyclable waste. WTE can be expensive and raise environmental concerns if it is not properly managed. Based on our research, a few countries such as Sweden, Japan, Denmark, and the United States have implemented this innovation. Malaysia can also get benefit by this innovation reducing the total waste from 82% to the lowest percentage such as Sweden impressively reduce its waste at 4% end up in the landfill (April 2019, Dr Prem Jagyasi and Team).

3. METHODOLOGY

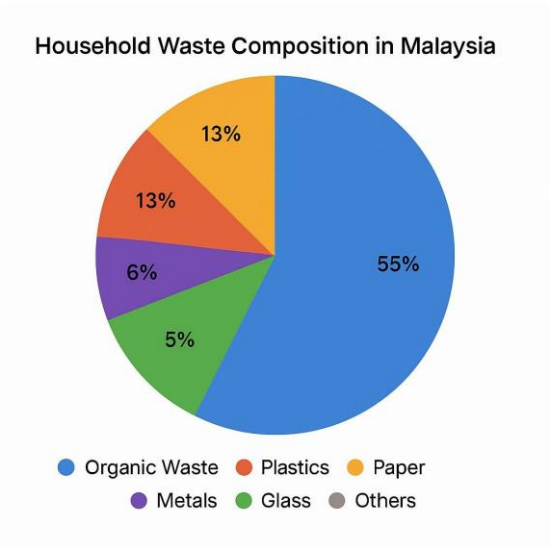
This research is based on information collected from previous studies and data about waste generation and management in Malaysia. It also uses a proposed model of a decentralized anaerobic digestion system. The idea is to introduce small-scale biogas units in local universities to process organic waste directly. This would reduce the pressure on public collection systems and allow for faster waste processing. Other parts of the method include promoting public education, giving rewards for waste separation, and improving student involvement in waste management.

4. STUDY AREA

The focus of this study is on highly populated urban areas in Malaysia such as UiTM Puncak Alam, Selangor. These places generate a large amount of waste daily and high energy demand for industrial uses and residential. These areas are suitable for introducing small-scale waste-to-energy systems because of their high waste production and community potential for participation in energy recovery.

5. ATTITUDE OF PEOPLE AND ITS EFFECT ON THE ENVIRONMENT

Currently, waste is collected once or twice a week by municipal authorities. A lot of people are not aware of how poor waste disposal affects the environment. Some people throw garbage illegally such as throwing it into drains, open spaces, or burning due to lack of collection services or awareness which causes pollution and health problems. Without strong public awareness and education, it will be hard to implement waste-to-energy systems. Changing public attitudes is very important for these systems to succeed.



6. RESULT AND DISCUSSION

In UiTM Puncak Alam, household waste is produced every day i.e. cafeteria and residents of UiTM Puncak Alam. Most household waste is made up of biodegradable materials like food waste, vegetables, and paper. This kind of waste is suitable for anaerobic digestion. Plastics, metals, and glass make up a smaller part of the waste and can be recycled through other channels. If organic waste is separated properly, the amount of waste available for biogas production will increase, less waste will go to landfills and more electric can be produced due to the high traffic of waste

7. RECOMMENDATION AND CONCLUSION

Waste-to-energy using anaerobic digestion is a practical and sustainable way to manage Malaysia's growing waste problem. It not only reduces landfill waste but also provides clean energy. To make this system work, it is important to involve the public, promote waste separation at home, and build small-scale biogas systems. With proper education and university support by providing funding and awareness programs, this waste-to-energy system can work effectively in many parts of the country and contribute to a greener future for UiTM. Since UiTM is also aligning their mission with ours to reduce carbon emission in 2030 by 45%, it would be very beneficial if it could be implemented on a university campus with the help of UiTM management to oversee the output.

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