ECO DAVANAGERE: A VACUUM ASSISTED PIPELINE MODEL FOR EFFICIENT KITCHEN WASTE TO BIOGAS CONVERSION

Project Reference No: *49S_MBA_0228*

College : GM University, Davanagere
Branch : Department of Business Analytics
Guides : Dr. K Jagadeswari
Mr. Darshan B
Students : Ms. Sakshi Awate
Mr. Prajwal K S
Ms. Sanjana Nikkam

Keywords:

Biogas, Kitchen Waste Management, Vacuum Pipeline, Renewable Energy, Sustainable Waste System

Introduction:

Urban areas like Davanagere generate a large amount of kitchen waste daily, which often ends up in landfills, causing environmental pollution and health hazards. Converting this organic waste into biogas is an effective and sustainable solution.

This project proposes a vacuum-assisted pipeline system that efficiently transports kitchen waste from households or collection points to a centralized biogas plant. The use of vacuum technology reduces manual handling, improves hygiene, and ensures faster waste transfer. This system aims to promote eco-friendly waste management while generating renewable energy in the form of biogas.

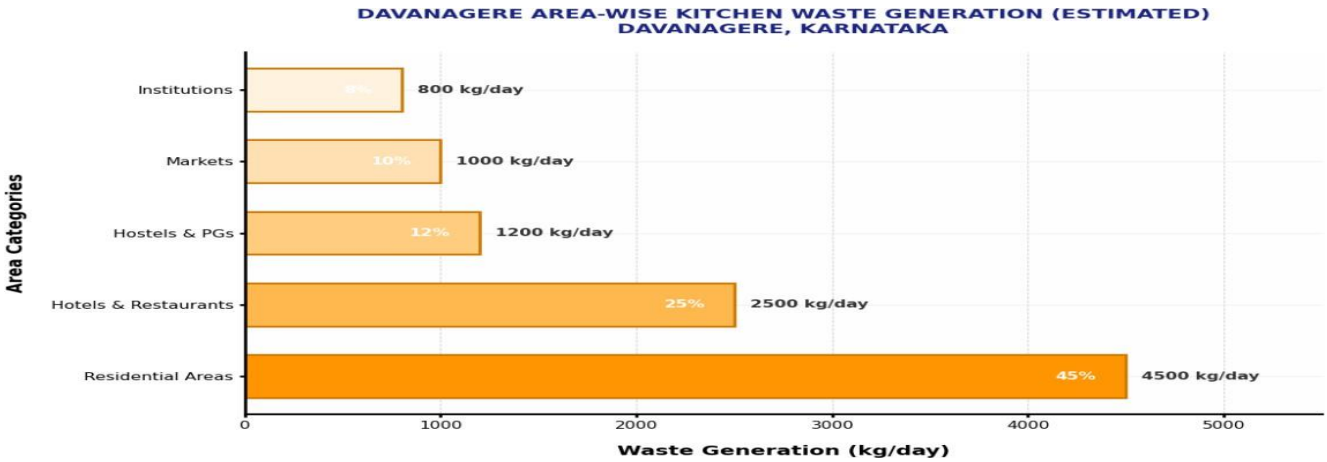

Figure 1.0: Area-wise Kitchen Waste Generation in Davanagere Estimated Source: Compiled by Authors

Objectives:

1. To assess the volume and composition of kitchen waste generated in Davangere.
2. To design and develop an underground vacuum-powered system for transporting kitchen waste through pipelines for biogas plant
3. To evaluate the feasibility and efficiency of implementing this waste transport model in Davangere.

Methodology:

The project involves designing a model where kitchen waste is collected through inlet points connected to a vacuum pipeline system. The vacuum pump creates suction that transports waste to a central processing unit.

At the processing unit, the waste is segregated and fed into an anaerobic digester. Microorganisms break down the organic waste in the absence of oxygen to produce biogas.

The system includes:

1. Waste inlet units for collecting kitchen waste
2. Vacuum pump and pipeline network for transportation
3. Storage tank for temporary waste storage
4. Anaerobic digester for biogas production
5. Biogas collection unit for energy storage

The model will be tested for efficiency, waste flow rate, and gas production

Result and Conclusion:

The proposed system is expected to improve the efficiency of kitchen waste collection and conversion into biogas. It reduces human effort, minimizes environmental pollution, and enhances hygiene.

In conclusion, the vacuum-assisted pipeline model provides a smart and sustainable solution for urban waste management and renewable energy generation, especially for cities like Davanagere.

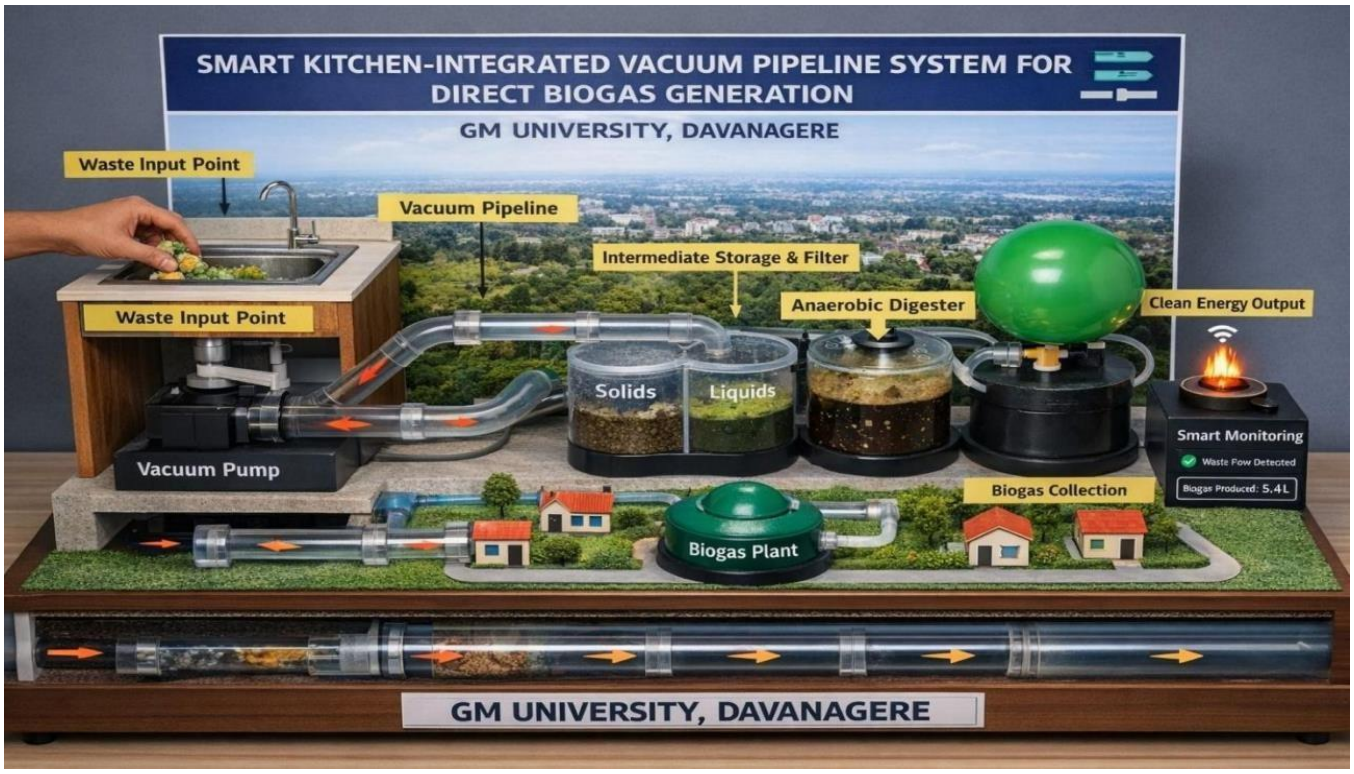

Figure 2.0: Vacuum-Assisted Pipeline System for Kitchen Waste to Biogas Conversion

Source: Developed by Authors

References:

[1] A. Kumar, “Biogas production from food waste,” Renewable Energy Journal, vol. 45,
[2] no. 3, pp. 120–130, 2023.
[3] S. Patel, “Vacuum waste collection systems in smart cities,” *International Journal of Engineering Research*, vol. 12, no. 2, pp. 85–92, 2024.
[4] M. Rao, “Waste-to-energy technologies for sustainable development,” *Environmental Science Review*, vol. 18, no. 1, pp. 55–70, 2023.
[5] R. Singh, “Smart waste management using IoT-based systems,” *Sustainable Cities and Society Journal*, vol. 30, no. 4, pp. 210–225, 2025.
[6] International Energy Agency, *Global Biogas Outlook Report*, Paris, France, 2026.
[7] Ministry of New and Renewable Energy, “National Bioenergy Programme,”
[8] Government of India, 2024. [Online]. Available: https://mnre.gov.in

Future Scope:

1. Implementation in smart city infrastructure
2. Integration with IoT for smart monitoring
3. Scaling the system for large urban areas
4. Improving efficiency of biogas production