



# MICRO MODULAR ANAEROBIC DIGESTION SYSTEM

AHMAD ALFAIFI - EE || BADR ALHARBI - AME || MESHAL ALSHAE - ISE || OSAMA ALAMOUDI - ISE  
HASSAN ALGHAZAL - CHE || MOHAMMED ALMADANI - ACHE

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS  
TEAM DESIGN II - SENIOR PROJECTS  
35<sup>th</sup> TEAM'S PROJECT  
SEMESTER (232)

PREPARED FOR: DR. MUHAMMAD SIDDIQUEE

## INTRODUCTION

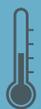
Confronting the multifaceted challenges posed by municipal waste accumulation, our project employs an innovative waste-to-energy conversion strategy to transform organic waste into a renewable source of energy. Utilizing the principles of anaerobic digestion, we efficiently catalyze the conversion of organic matter into methane. This biogas is then harnessed to generate electricity, offering a sustainable solution to waste management and energy production.

## PROBLEM STATEMENT

MMAD employs the conversion of organic waste into methane, which:

- Transforms waste into sustainable electricity.
- Reduces environmental pollution effectively.
- Lowers health hazards associated with waste accumulation.
- Cuts down management costs of waste handling.
- Measures and improves the efficiency of waste-to-energy conversion.

## PRODUCT'S CONSTRAINTS



Temperature  
37 - 42 °C



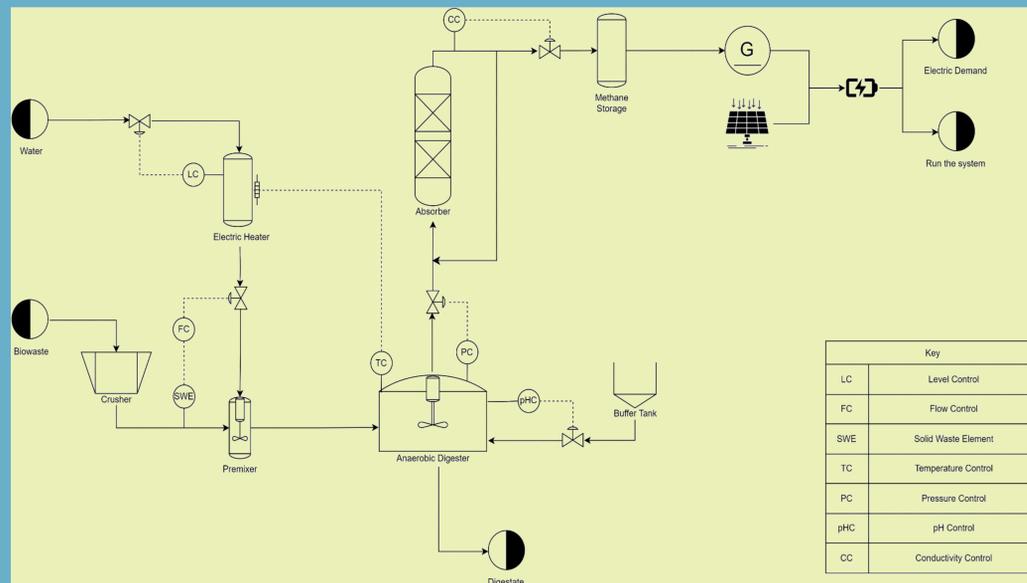
H<sub>2</sub>S  
< 10 PPM



Methane Potential  
40 % - 74 %



Feed c/N  
25 - 35



## ENGINEERING SPECIFICATIONS



CH<sub>4</sub> Produced  
> 5 L/Day



Power Generated  
> 100 Wh/Day



Reactor TEMP.  
37 - 42 °C



pH Level in  
reactor ~ 6.5

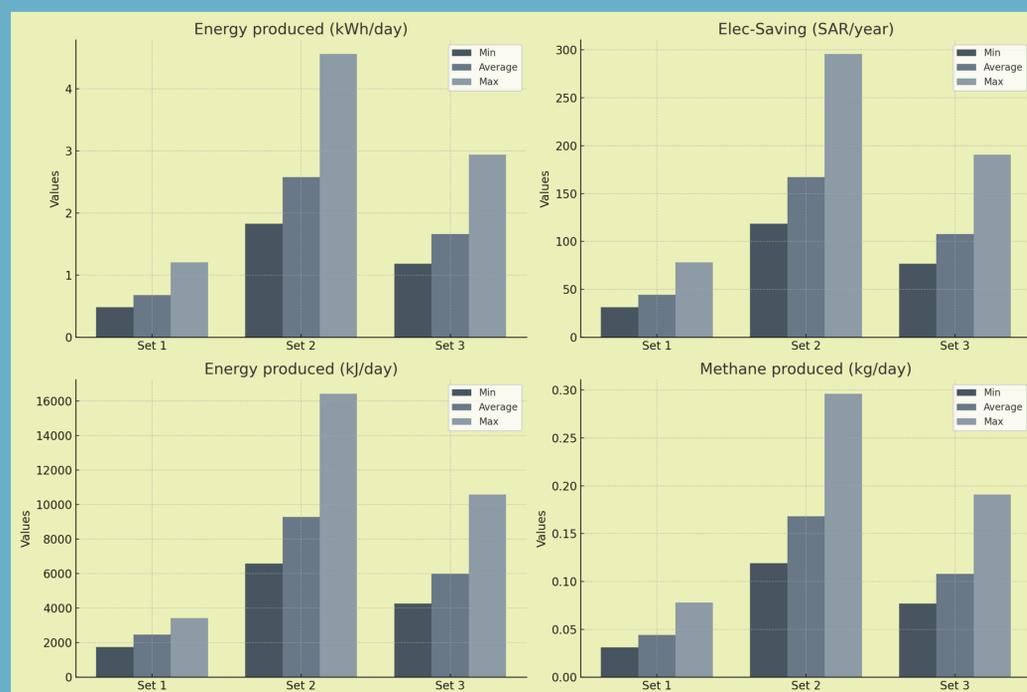


Prototype Footprint  
< 2 m

## TESTING & VALIDATION

Validating Our Specifications and Analytical Overview

Methane Produced (m <sup>3</sup> /day)				
Mixed Food Waste With Non-Veg.	kg/day	Min	AVG	Max
Wet (15% TS)	0.82	0.048	0.068	0.12
Dry (40% TS)	3.1	0.182	0.256	0.453
Dry (30% TS)	2	0.118	0.165	0.292



## CONCLUSION



Our project showcases a pivotal solution by converting organic waste into electricity through anaerobic digestion and methane extraction. This sustainable strategy not only mitigates waste but also generates clean energy, proving integral in advancing environmental, economic, and social objectives.

- **Environmental Impact:** Reduces landfill waste and methane emissions while decreasing dependency on non-renewable energy resources.
- **Economic Benefits:** Lowers municipal waste management costs and generates economic value from organic waste.
- **Social Advantages:** Enhances community health and aesthetics by reducing waste-related nuisances, thus improving living conditions.

