Final Year Project Showcase Batch-2020
Year 2024

Department: Chemical Engineering Programme: Chemical Engineering	
1	**Project Title** Anaerobic digestion of NED waste water sludge / Food waste
2	**Project Idea** This project explores anaerobic digestion of food waste and untreated wastewater for sustainable waste management and renewable energy production.
3	**Process** The process objective is to optimize the anaerobic digestion of food waste and untreated wastewater to maximize biogas production, while evaluating operational parameters and assessing the economic feasibility of scaling up the process for sustainable waste management and renewable energy generation.
4	**Outcome** The study confirmed that anaerobic digestion of food waste and untreated wastewater is an effective method for biogas production, offering a sustainable approach to waste management. Laboratory-scale experiments showed that an inoculum-to-food waste ratio of 1:2.5 produced the highest biochemical methane potential (BMP) of 82.96 ml/g VS added while Pilot-scale experiments identified 10% total solids as the most effective for gas generation, achieving a peak biogas yield of 3174.6 ml and a BMP of 30.56 ml/g VS added. These findings highlight the potential for optimizing anaerobic digestion for renewable energy production.
5	**Evidence (Theoretical Basis)** This report investigates the optimization of biogas production through anaerobic digestion of food waste and wastewater at NED University, employing a PDAN anaerobic digester. Beginning with a review of anaerobic digestion's process chemistry, the study examines its potential as a sustainable waste management and renewable energy solution. The analysis includes a comprehensive examination of the types and quantities of food waste and wastewater generated at NED University, establishing a baseline for further experimentation. Essential parameters of samples such as BOD, COD, and others are analyzed at PCSIR, providing insights into the composition of waste streams. Through laboratory-scale experiments, the research aims to identify the optimum composition of food waste and wastewater to maximize biogas production. Additionally, the report discusses the role of anaerobic digester in waste management and its role in generating renewable energy. These findings contribute to advancing anaerobic digestion technology and offer practical solutions for sustainable waste management practices in educational institutions like NED University
6	**Competitive Advantage or Unique Selling Proposition** (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over a competitor. In summary, any striking aspect of the project that compels the industry to invest in FYP or purchase it. Some detailed description is required in terms of how, why when what. You can select one or more from the following dropdown and delete the rest of them). Please keep relevant options, delete the rest of them, and correct the sequence
a	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region) **SDG 9: Industry, Innovation and Infrastructure** This study promotes advanced, eco-friendly techniques for waste-to-energy and resource recovery, converting food waste and wastewater into valuable methane gas. It supports efficient resource use, contributing to sustainable energy infrastructure development through electricity generation and fuel production. **SDG 11: Sustainable Cities and Communities** This study enhances urban organic waste management by utilizing methane for energy,

	reducing reliance on fossil fuels and air pollution. It also promotes better wastewater and sanitation management, fostering community involvement and sustainability. **SDG 12: Responsible Consumption and Production** This project plays a pivotal role in managing organic waste, effectively minimizing the environmental footprint of waste disposal in urban areas. Through the conversion of organic waste into biogas and organic fertilizer, they advocate responsible consumption and production, thus promoting sustainable waste management practices. Additionally, by producing biogas as a renewable energy source for electricity and heat generation, anaerobic digesters enable cities and industries to decrease their dependence on non-renewable energy sources, fostering the adoption of sustainable energy practices	
b	**Any Environmental Aspect** (e.g. carbon reduction, energy-efficient, etc.) The project incorporates following environmental aspects: 1. Reduction of Methane Emissions 2. Decreased Fossil Fuel Dependence 3. Improved Waste Management	
c	**Cost Reduction of Existing Product:**By using methane from organic waste for energy, the project reduces the need for purchased fossil fuels, leading to lower operational energy costs and Efficient waste management and conversion processes lower the costs associated with waste collection, transportation, and disposal.	
d	**Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process** (e.g. What is the issue is current process and what improvement you suggests) Improved process design reduces operational and maintenance costs by maximizing the use of available resources and minimizing waste, resulting in lower production costs. Process improvements ensure higher quality and purity of the end products, such as energy or compost, enhancing their market value and performance.	
e	**Expanding of Market share** (e.g. how it expand and what is the problem with the current market The reduction in overall costs incurred, results in substantial decrease in selling price due to which market share can be expanded.	
f	**Capture New Market** (e.g. Niche market or unaddressed segment) Identify and target specific types of organic waste or industries that are currently underutilized in waste-to-energy systems, such as food processing or agricultural waste, to capture niche markets. Moreover, scaling up of this project will reduce the current energy crisis and high utility consumption cost in city.	
g	**Any Other Aspect** Align the project with smart city and sustainability initiatives to attract partnerships and funding from government grants aimed at improving city infrastructure and reducing environmental impact.	
7	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service Target markets include municipalities, industrial waste generators, House Hold energy consumers, agricultural businesses, and energy providers.	
8	**Team Members** (Names along with email address)	Muhammad Ehsan Ashraf (ehsanashraf487@gmail.com) Talha Ali (talha.alicc.23@gmail.com) Abdul Moiz (moizburiro68@gmail.com) Muhammad Waleed Ali (aliwalid579@gmail.com)
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11	**Video (If any)**	-

Pictures (to be pasted below
Anaerobic Digester Equipment with Food Waste and Waste Water samples