

CleanFlow: Empowering Communities with Sustainable Sewage Solutions

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Brief Overview:

Biodigester System:

At the core of our project is a state-of-the-art biodigester system. Organic waste, including sewage, is fed into the bio digester, where anaerobic digestion takes place. This biological process breaks down the organic matter, producing biogas and digestate as valuable byproducts.

Manual Separation:

Prior to entering the biodigester, the waste undergoes a manual separation process. Skilled workers utilize advanced sorting techniques to remove non-biodegradable materials, such as plastics and debris, ensuring that only biodegradable organic waste enters the biodigester. This step prevents clogging and improves the overall efficiency of the system.

Biogas Generation and Utilization:

The biogas produced during anaerobic digestion is captured and utilized for various purposes. We have integrated a biogas capture and purification system that allows for efficient biogas collection. The captured biogas can be used as a renewable energy source for cooking, heating, or electricity generation, reducing reliance on fossil fuels and promoting sustainable energy practices.

Digestate Management and Resource Recovery:

The digestate, a nutrient-rich byproduct of the biodigester, is carefully managed for resource recovery. Skilled workers oversee the treatment and processing of the digestate, ensuring its safe and effective utilization. Through proper treatment, the digestate is transformed into a high-quality organic fertilizer, rich in essential nutrients. This nutrient-rich fertilizer can be used for agricultural purposes, promoting sustainable farming practices and reducing the dependence on chemical fertilizers.

How do we plan to sort out the waste?

If we have a sewage line of a small diameter then we use water at high pressure to pump out the waste, otherwise we add additional water to create 2 layers of waste based on their density

Before separating the liquid waste from the sewage, we collect the debris floating above. Although the denser debris goes into the biodigester, we use manual labour to sort the plastic from the waste floating above



Filtration and Separation

Manual Labour:

-Manual work to ensure that jobs are not lost and people don't lose their livelihood. This can reduce the cost compared to the machines that are expensive to purchase and maintain.

-To make sure that the manual work done by workers in the filtration and separation does not lead to any health hazards and contamination, the workers will be given protective coveralls, gloves, masks and training on how to handle the waste.

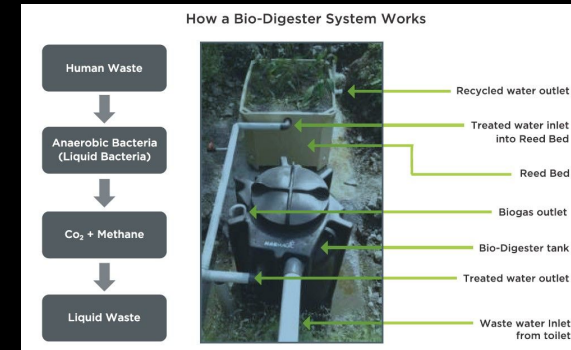
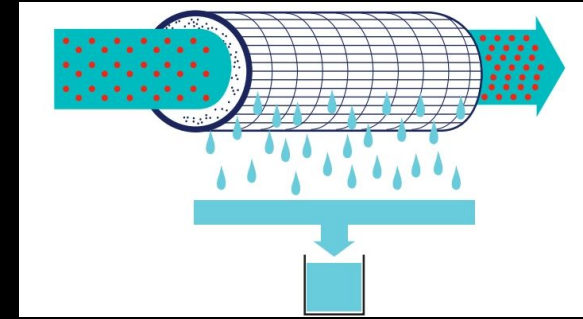
Components:

-Filters made from locally sourced materials

-We will be using Sand filters as they are generally more affordable but may **require** more frequent backwashing and maintenance, for this we can employ more people which creates jobs.

-Screens- for large solids

-Dewatering systems, such as belt presses, screw presses, or filter presses, can be cost-effective for reducing sludge volume and moisture content.



BIODIGESTER COMPLETE PROCESS

Biodigester units can be used without water plants, although they are commonly integrated into sewage treatment plants to enhance the overall treatment process.

- Used in rural areas, small-scale sewage treatment for communities or for individual households
 - These units typically receive sewage or organic waste directly from the source
 - Anaerobic digestion; breaks down organic matter in the absence of oxygen: biogas and digestate
 - Biogas utilized for cooking, heating, electricity generation, or other energy needs.
 - Digestate, which is nutrient-rich, can be used as fertilizer for agricultural purposes.
 - However we will be extracting the preferential fertilizers for further implementation.
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- A sustainable solution particularly for areas where centralized water treatment infrastructure is not available or feasible.
 - Offers the benefits of waste reduction, renewable energy generation, and nutrient recycling, contributing to environmental protection and sustainable development.

"HEY GUYS,
CHECK OUT
HOW BIOGAS
IS CREATED!"



1

WASTE FED INTO
SYSTEM SINK.
UP TO 6 LITERS PER DAY.

2

BACTERIA DIGEST THE ORGANIC
WASTE IN THE TANK AND TURN
IT INTO BIOGAS.

3

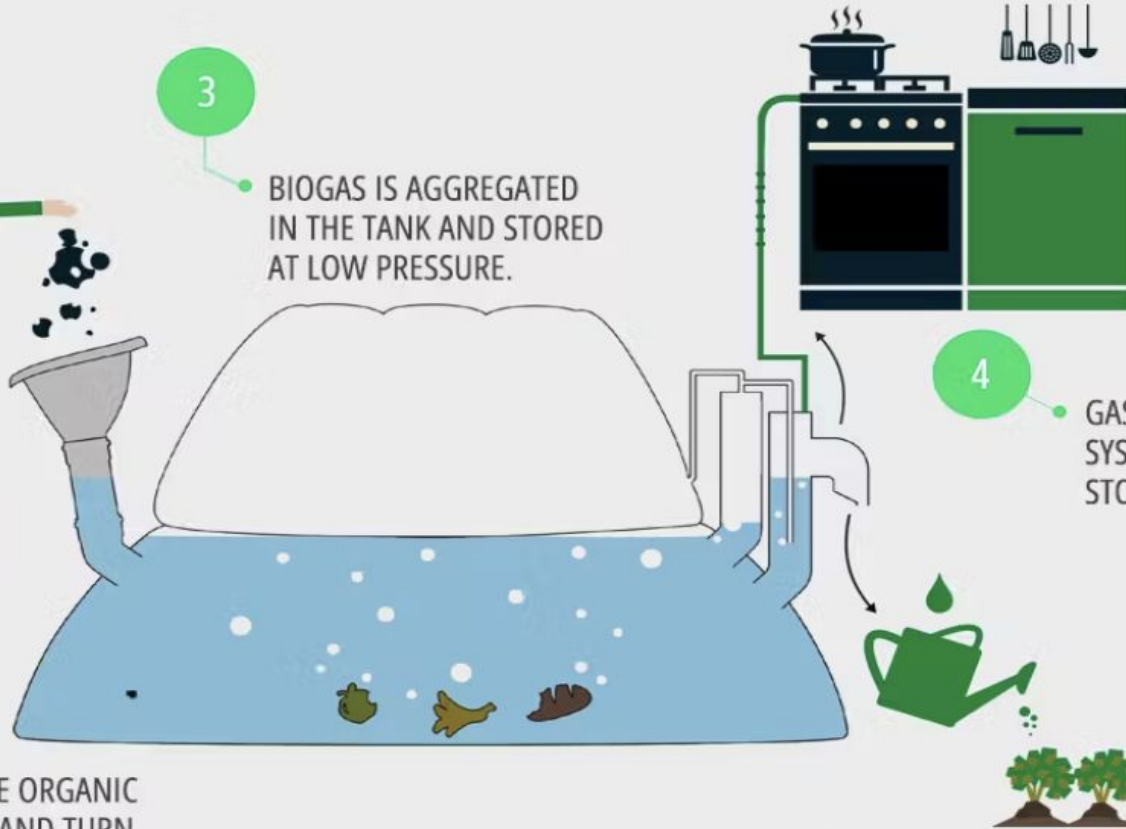
BIOGAS IS AGGREGATED
IN THE TANK AND STORED
AT LOW PRESSURE.

4

GAS FLOWS FROM THE
SYSTEM TO THE KITCHEN
STOVE VIA A PIPE

5

LIQUID FERTILIZER IS CREATED AS
THE BY-PRODUCT OF THE WASTE
DIGESTION PROCESS



Process for Non-biodegradable

- Biodigester systems primarily focus on decomposing organic waste and are not designed to handle non-biodegradable materials like plastics.
- Plastic waste does not readily decompose in a typical biodigester due to its chemical composition and resistance to microbial degradation.
- Prior to entering the biodigester, it is crucial to separate and remove plastic and other non-biodegradable materials from the waste stream.
- Pretreatment steps such as mechanical sorting or manual separation can be employed to ensure only biodegradable organic waste enters the biodigester.
- Plastic waste can negatively impact biodigester performance by clogging pipes, hindering organic waste breakdown, and affecting the quality of the digestate.
- Alternative waste management methods like recycling, incineration, or appropriate disposal should be considered for non-biodegradable waste.

Further Purpose:

After the Bio-digestion procedure some organic substances might remain. These can be used as fertilizers for the agriculture sector. The biogas released from the decomposition process can be used to power the surrounding or it could even be used for creation of electricity which again can power living areas around the biodigester.

As for retaining jobs the people who previously used to work in the sewers will be trained accordingly and will work, maintain and even produce more of such machines.



What are the benefits

- Reduced Operational Cost
 - Solar Panels used to generate power
 - Generates employment
- 1) Assembly Line
 - 2) Sorting out waste
 - 3) Maintenance
- Lower contamination and health issues
 - Biogas as energy source
 - Resource recovery and fertilizer production
 - Potential Revenue Streams

What are the challenges

- Disposal of plastic collected
- Odor Generation
- Nutrient imbalance (no need to write)

Why we are approaching this method:

While it is true that biodigesters and manual separation techniques are already employed in various sewage treatment processes, our project stands out due to its **unique combination** and integration of these methods. We have carefully designed our project to address the specific challenges faced by sewage cleaning workers while maximizing efficiency, cost-effectiveness, and employment opportunities.

One of our primary objectives is to **protect the health and safety of sewage cleaning workers**. By utilizing manual separation techniques, we reduce their direct contact with sewage and hazardous materials, minimizing health risks. This approach promotes worker well-being while still allowing them to actively contribute to the process, maintaining employment levels.

Our project focuses not only on sewage treatment but also on **resource recovery**. The biogas produced from the biodigestion process serves as a renewable energy source, **reducing reliance on fossil fuels**. Additionally, the conversion of digestate into organic fertilizer promotes agricultural sustainability and reduces the need for chemical fertilizers. This circular economy approach adds value to the project by maximizing resource utilization.

Our project aims to be highly cost-effective and sustainable. By integrating biodigesters and manual separation techniques, we optimize operational costs, energy consumption, and maintenance requirements. The use of local labor and resource recovery strategies further enhances cost efficiency, making the project economically viable and attractive.

THANK YOU