

BIOGAS- A BEGINNER'S GUIDE

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Biogas is a type of biofuel that is produced naturally by the decomposition of organic waste. When organic materials, such as food scraps and animal wastes, break down in anaerobic environments (an atmosphere absent of oxygen), they release a mixture of gases, mainly methane and carbon dioxide. Because this decomposition occurs in anaerobic environment, the process of manufacturing biogas is also known as anaerobic digestion.

Anaerobic digestion is a natural form of waste-to-energy that uses the process of fermentation to break down organic materials. Animal manure, food scraps, wastewater, and sewage are all examples of organic materials that can produce biogas by anaerobic digestion. Biogas is flammable due to its high content of methane in biogas (typically 50–75%), and therefore produces a deep blue flame, and can be used as an energy source.

THE ECOLOGY OF BIOGAS

Biogas is known as an environmentally friendly energy source because it simultaneously removes two major environmental problems:

1. Global waste epidemic that releases dangerous levels of methane gas every day
2. Dependence on fossil fuel energy to meet global energy demand

By converting organic waste into energy, biogas recycled into productive resources using nature's beautiful instincts. Biogas generation recovers waste materials that would otherwise pollute landfills; Sewage treatment prevents the use of toxic chemicals in plants, and saves money, energy and materials by treating waste on site. In addition, the use of biogas does not require fossil fuel extraction for energy production. Instead, biogas takes a problematic gas,



and converts it into a very safe form. More specifically, the methane content present in decomposing waste is converted into carbon dioxide. Methane gas has about 20 to 30 times the heat-trapping capacity of carbon dioxide. This means that when a loaf of bread is converted into biogas, the environmental impact of the loaf, left to rot in the landfill, will be approximately 10 times less efficient.

BIOGAS DIGESTERS

As opposed to releasing methane gas into the atmosphere, biogas digesters are systems that process waste into biogas, and then channel that biogas so that energy can be used productively. There are many types of biogas systems and plants that are designed for efficient use of biogas. Although each model varies based on input, output, size, and type, the biological process that converts organic waste into biogas is similar. Biogas digesters obtain organic material, which decomposes in the digestive chamber. The digestive chamber is completely immersed in water, which makes it an anaerobic (oxygen-free) environment. The anaerobic environment allows microorganisms to break down organic matter, and convert it into biogas.

ALL-NATURAL FERTILIZER

Because organic matter decomposes in a liquid environment, the nutrients present in the waste dissolve in water, and form nutrient-rich sludge, which is commonly used as fertilizer for plants. This fertilizer production is produced on a daily basis, and is therefore a highly productive by-product of anaerobic digestion.

BIOLOGICAL BREAKDOWN

With the help of bacterial communities to produce biogas, organic matter fermentation. The four stages of fermentation transfer organic matter from its initial structure to its biogas state.

1. The first phase of the digestion process is the hydrolysis phase. Insoluble organic polymers (such as carbohydrates) break down in the hydrolysis phase, making it accessible to the next stage of bacteria called acidic bacteria.



2. Acidogenic bacteria convert sugars and amino acids into carbon dioxide, hydrogen, ammonia and organic acids.
3. In the third phase, acetogenic bacteria convert organic acids into acetic acid, hydrogen, ammonia, and carbon dioxide, allowing for the final phase — methanogens.
4. Methanogens convert these final components into methane and carbon dioxide — which can then be used as flammable, green energy.

SEVERAL USES OF BIOGAS:

Biogas can be produced with a wide variety of organic materials, and therefore there are several types of models for biogas digestion. Some industrial systems are designed to treat: municipal wastewater, industrial wastewater, municipal solid waste and agricultural waste. Small-scale systems are commonly used to digest animal waste. And new family-sized systems are designed to digest food waste. The resulting biogas can be used in several ways: gas, electricity, heat, and transportation fuels.

Biogas is a technique that mimics the ability of nature to give back. Biogas units of both industrial size and family size are becoming incredibly popular and relevant in today's world. As applications and efficiency increase, biogas can have a significant effect on reducing greenhouse gases. As a clean source of energy and a renewable means of treatment of organic waste, biogas is applicable in both developed and industrialized countries.