

Septic tank waste to bio-energy: Full stop to energy crisis, water pollution and waste management

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Abstract

India, as a developing country of fast growing population with an increasing rate of urbanization faces threefold crisis of shortage of energy, high rate of pollution, and abundance of waste. Though, technologies are available, high cost of production and maintenance, made solar energy less attractive to people in India. All major rivers and water bodies in India are heavily polluted, mainly by fecal waste. This considerably reduces the availability of drinking water. There are a few massive projects in initiation to clean those rivers and water bodies. But such efforts may be successful only when, we could ensure all people in our nation use toilets. There should not be simple toilets, as we have experience in our daily life, but technologically designed and planned in a statewide manner. There should not be separate septic tank for each house or building, but a centralized processing unit should be constructed and bio-gas can be produced with minimal amount of cost. The fuel thus generated can be used for domestic as well as auto fuels. Decentralized planning and execution of the project for each locality in our country will be an effective alternative to solve severe scarcity of energy that we are going to face in near future, by minimum expenditure.

Keywords: waste management, biogas, energy crisis, water management, pollution

Introduction

Ensuring facilities for preliminary needs of people in public places is a major headache to almost all countries. In India the situation is more complicated as there is still even educational institutions in the most literate state do not have enough toilet facilities. Then there is no meaning to debate on public toilets. There are uncountable families don't have such facilities is now a great concern of the present government. It is better to think at family level before move on a large scale. First of all it is essential to understand septic tank waste. The very term septic stands for dangerous / lethal, and hence need proper attention. Septic tanks are inevitable component of any building meant for human habitation.

How waste is accumulated in a house need to be analysed thoroughly to identify proper ways and means to manage the same in a useful and harmless manner. Many a things we purchased from market contribute to our bulk of waste. But, what important here is we need to rethink on the concept of waste, i.e., waste is that material which cannot be used for any purpose. In this sense, many things including septic waste can be utilized for various purposes. Usually septic waste at family level includes water, detergents & chemicals, debris from food, human excreta, etc. It is our perception and lack of awareness and a attitude prevent proper waste management. Aerobic degeneration of waste in septic tank produces lethal gases. Gases produced in a septic tank are dangerous, as a potential source of explosion and as a cause of death by asphyxiation if someone falls into or deliberately enters a septic tank. It should also beware that because some waste contains other toxins including heavy metals, amateur attempts to collect and burn sewage-produced gases could produce dangerous levels of carcinogens or other contaminants.

Various efforts have been made to use sewer gas or septic gas as a fuel for heating or lighting deriving methane from bacteria-powered manure or even human waste or food waste digesters

in many countries. Don't try just piping or pumping sewer gas out of a septic tank or sewer line for fuel use.

What is Biogas?

The gas formed by degeneration of biological matter is termed as bio gas. It is a mixture of methane and carbon dioxide produced by the break-down or digestion of organic waste such as manure, vegetable matter, sewage, or even food waste. The gas produced is clean and burns clean, providing a more healthy fuel than some alternatives such as wood, gobar, etc.

Because biogas is high in methane it can be used as a fuel for cooking, lighting, or even powering vehicles or other machines. And because bio gas can be produced from waste material its production is considered a potentially sustainable energy source.

Biogas Production

A proper container (an anaerobic *biogas digester*) is the key in biogas production. When organic materials such as dung, vegetable matter, or sewage break down in the absence of large amounts oxygen the result is the production of methane in useful quantities that can be used as a fuel, along with lower amounts of hydrogen and other trace gases.

The decomposition of waste matter by anaerobic bacteria occurs in two phases: acidic anaerobic bacteria break down the organic waste into peptides, glycerol, alcohol, sugars that are then further converted by other anaerobic bacteria into methane and the other materials.

In large or commercial biogas production systems such as using large amounts of manure, the waste is mixed with water to form slurry that is fed continuously through the digester. In smaller home or farm biogas producing designs the waste is fed into the digester in batches, manually and water is also added manually as required.

Biogas can be produced, captured, compressed (like natural gas) and used as a fuel, including vehicles. BIOTECH produced one

cubic meter floating-dome home-scale biogas plant and installed in various parts of South India including Kerala. The household waste materials excluding a few things such as, lemon, egg shell, paper, soap, large pieces of bone, can be used as raw material in such biogas plant. Approximately one and half kilograms of solids can be added to the plant daily. Water used to wash vegetables, rice, and first wash of plates (without soap) that we use for taking food, etc can be added. The plant produces gas upto one and half hours working of a single burner stove. The most fascinating thing is that, once, the gas formed is fully utilized, after sometime; the plant provide more gas for cooking, which is impossible in normal LPG cylinders. The healthiest side of the plant is that it helps to keep our premises clean.

Objectives of the Paper

To develop an awareness about various practices of septic tank waste management

To develop a positive attitude towards adopting suitable plan of action for septic tank waste management

Initiatives

The idea of turning waste into energy has been around for centuries. In most homes in Lagos, Nigeria, toilet waste is stored in rudimentary septic tanks beneath the ground, where it decomposes into a poisonous compound, before being sucked out by a tanker that deposits it all in a nearby lagoon. In the crowded slums, untreated sewage mingles with the chaotic network of pipes that deliver water to the city. Unfortunately, the system of water pipes is much disorganized, and they often pass through the same place where the sewage is dumped, and it's not uncommon for poorly constructed septic tanks to leak directly into the drainage system. It is the same instance that happened in the university campus at the beginning of this year. With a cheap retrofit, household septic tanks were converted into biogas generators, Obayomi, converted the whole system in a dramatic way.

Obayomi's approach makes use of the existing septic tanks by equipping them with new waste entry pipes that remove oxygen from the decaying process. As he explained: "When excreta decompose with oxygen, it creates a useless, incombustible mixture that carries disease. But without oxygen, the germs die and the mixture produces a combustible gas. This biogas can be stored in an adjacent underground chamber and used to power cooking stoves, heat homes or even generate electricity.

What makes the initiative so elegant that it resolves a life-threatening sanitation issue while simultaneously creating a much-needed source of carbon-free energy ECO-FRIENDLY TOILET (Toilet attached Biogas Plant)

The different kinds of bio waste including human excreta causing serious threat to human health and cleanliness of the surroundings can be converted to bio-energy and bio manure by treating with the application of biogas technology. Eco - friendly toilets are developed by BIOTECH in India.

In view of the ever increasing population and the scarcity of housing facilities, people particularly those belonging to the below poverty line are compelled to dwell in small cottages or huts built near the coastal areas of water bodies such as the sea, lakes and rivers. Modern facilities required for maintaining cleanliness are far beyond their reach. The main reasons attributable for this state of affairs are scarcity of suitable land, financial difficulties and above all the ignorance of the people as well.

As a result of all these, a situation has emerged by which, people have to go searching for open spaces for finding a convenient place for primary needs. It is also noticed that in many places people are building toilets by erecting logs of woods over the water in the rivers and back waters. Even in the city areas in some places it is seen that pipes coming out of the toilets of many buildings directly open to the waste water drains and canals for flushing out the waste water and human excreta. All these tendencies will lead to the problem of serious contamination of water and pollution of the atmosphere. According to many studies published in recent times, it is seen that the drinking water sources as well as the underground water springs are being considerably contaminated. So the drinkability of the water even in a private well is in high alert, due closely packed housing colonies and flats with septic tanks very close to well. If the contamination of drinking water is continued as at present, the availability of pure water will be a global issue in the near future. The poisonous gases produced by the human excreta which are flushed out indiscriminately may linger in the atmosphere, and this may lead to such of the havocs as global warming, climate change etc.

Even though many scientific methods and technologies have been developed for the treatment of toilet waste, it has not so far become possible to take the full benefit to the people or to make the people fully aware of the advantages of the process. So it is essential made people aware about the benefits of the technology. Further the common people should be provided with adequate financial support to utilize such technologies.

A treatment plant of 2 m³ in size is sufficient for treating human waste and bio waste generated in a household having a family comprising up to a total of five members. The most important point to be taken note of while operating a plant is, to regulate the quantity of waste to be fed into the plant, strictly in accordance with the optimum treatment capacity per day. If, however, the plant is overfed by the deposit of more quantity of waste, the working efficiency of the plant will gradually become deteriorated. In such situations the gas produced from such plants may not be ignited. In some cases stink smell also may come out from the plant. But if the plant is fed with the bio waste in accordance with its treatment capacity, the plant will work very efficiently for a long period of time. Even if the quantity of waste fed into the plant is a little less than the prescribed limit, or the plant is not fed at all for a few days the working of the plant will not be affected. Apart from households, the public institutions like schools, hostels, convents, hospitals, public toilets etc where people are coming in for short stays, the toilets can be attached with large sized plants for treating the human wastes for the production of energy. The size of such plants is determined in accordance with the total number of inmates of those institutions.

After the plant has been installed, anaerobic bacteria are allowed to grow and multiply within the plant. After a period of two or three weeks the plant will be in working condition and the production of biogas will commence in full scale. A pipe from the toilet can be attached to the plant. The required facility for this will be provided in the plant. The food waste formed in the household and the waste water can be treated in the plant. Separate inlets for depositing these wastes are provided in the plant. The biogas produced by decomposition is collected in the gas chamber of the plant. This gas can be taken as fuel for cooking purposes by connecting the gas to the stove in the kitchen using separate pipe line. The biogas obtained from the

waste treatment plants installed in the houses having a total number up to five family members, will be sufficient for meeting more than 90% to 100% of the fuel requirement of the family can be met from the biogas produced in the plant.

By utilizing the biogas produced by the waste treatment plant attached to the toilet, the entire expenditure incurred for the installation of the plant is seen received back within a period of nearly one and a half years. The whole amount spent for the purpose of constructing the toilet can be fully retrieved within a short period of time. The amount required for the construction of the septic tank in normal toilet can also be saved.

By the implementation of the scheme through which a lasting solution is sought against the increasing fuel crisis, frightening environmental pollution, and alarming hygienic problems, we are launching the commencement of a new era of silent revolution in areas of waste treatment, pollution free atmosphere and cleaner environment.

Conclusion

What we need is a scientific and comprehensive approach in this matter. A policy may be framed at first in this regard, which clearly spelt out programme of action for individual houses, housing colonies, public institutions, Business institution, slum areas, etc. A detailed plan for implementing the initiative should be the second step. A mass awareness campaign as in the total literacy drive in nineties is essential for getting good momentum. Detailed plan for independent household plants and large scale plants should be made. The drive can be better implemented by public private undertaking, so that various agencies in different areas may have to contribute to the project for a sustainable future.

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