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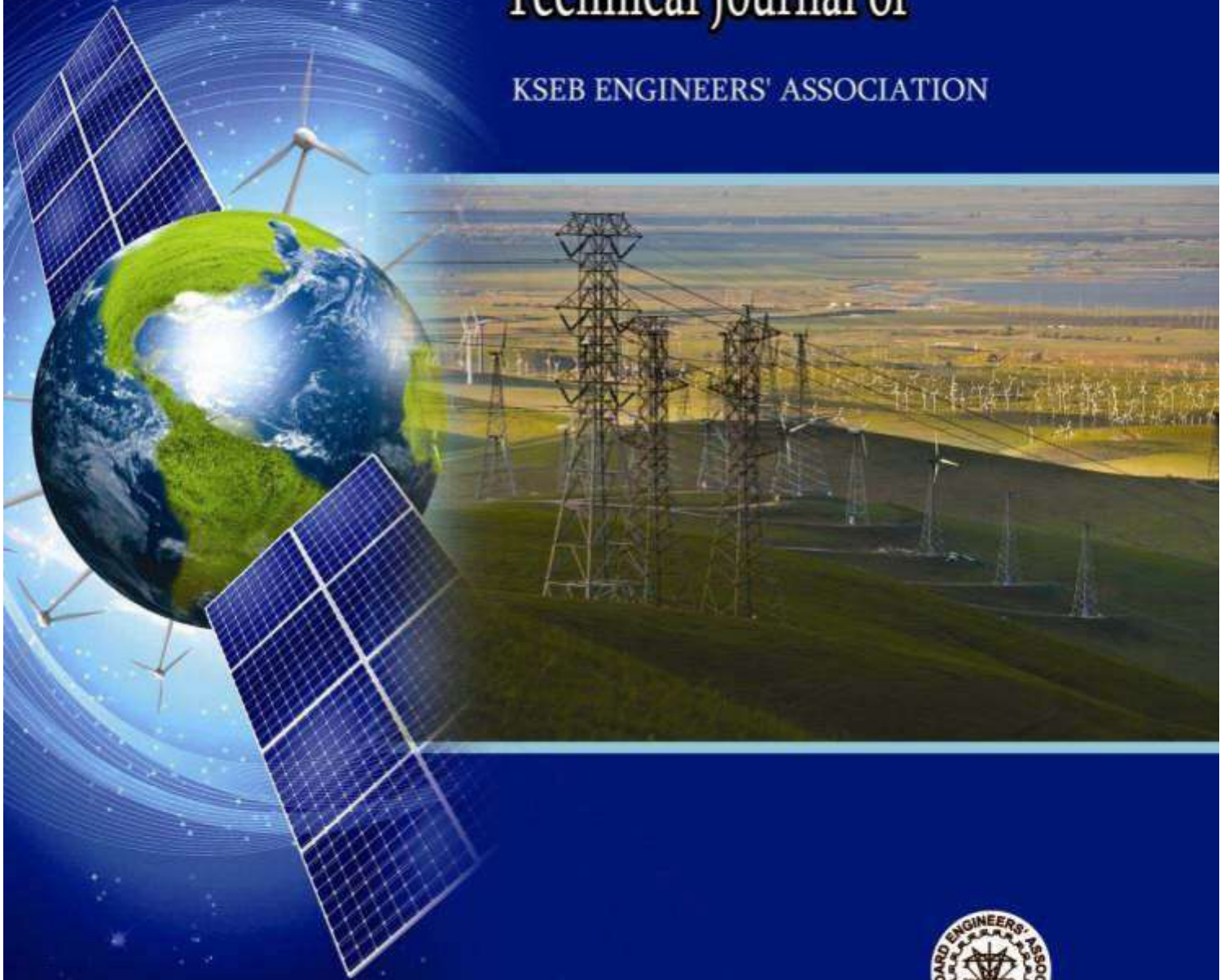
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Generation of Electricity from Organic Waste

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1. Introduction

In accordance with the fast growing population, the demand for energy and the discharge of waste are increasing day by day. To overcome the energy crisis, alternative energy sources are the only remedy. Generation of energy from waste is beneficial in many ways. It is most suitable for eco-friendly waste disposal and also for energy generation.

With a view to finding out a permanent solution to the problem of contagious diseases caused by the accumulation of waste that is being increased day by day it is quite necessary that we have to extend the scheme of implementation of decentralized waste treatment programmes all over the country. The biogas technology enables one to produce bioenergy in the households by treating the wastes generated in the houses. This technology is also made applicable for treating the wastes produced from public places like markets, slaughter houses, hotels, convents etc and for generating electricity without causing any pollution to the atmosphere.

2. Technology adoption for fast degradable materials

Through the utilization of Biogas Technology (Biomethanisation) for decentralized waste management, the collection, transportation and segregation of waste can be totally avoided as the wastes are treated at source itself.

3. Biomethanisation Technology

Biomethanisation is a universally accepted and proven technology for Bioenergy Generation from bio waste. It is very simple, user friendly and it needs no recurring expenses. Through the adoption of biomethanisation technology all degradable waste can be treated with the help of different types of anaerobic bacteria / microbes in a concealed chamber / digester. Treated biomaterials, coming out from the digester in the form

of liquid or semi liquid can be used as a very good bio manure / organic fertilizer.

4. Generation of Electricity from Biogas

The main advantage of waste to electricity project is that no external power is required for the operation of the plant. The power generated in the treatment plant can be utilized to meet the in-house requirement completely. Excess quantity can be utilized for any type of application, like the street lighting, providing lights to the markets etc.

Normally, 1.5 kw electricity can be produced from one cubic metre of biogas. Depending upon the percentage of methane content in biogas, the power generation may slightly vary. The size of the generator can be fixed depending upon the availability of gas, the quantity of gas and the duration for the requirement of the power. The gas can be utilized as operation fuel in generators. Before feeding biogas as the fuel in generator the gas has to be passed through a gas scrubber to remove unwanted particles, gases, moisture etc.

There are two types of generators used for generating electricity from biogas. One is the dual fuel model and the other is 100% biogas model. Dual fuel models are diesel gensets. In this system the biogas is connected to the generator through air mix. Once the biogas is passed through the generator, automatically consumption requirement of the diesel is reduced. Normally dual fuel generators are working in 80% - 20% mode.

In 100% biogas engines no other fuel is required either for starting or for operation. Any type of petrol engine can be modified for operating the same using biogas as operation fuel. The imported models of 100% biogas engines are very costly and the maintenance of such systems is very expensive. These engines are installed in various projects and the performance of all of them is very good.



5. Operation of Waste to Electricity Plant

The biowaste generated in fish & vegetable markets, slaughter houses etc. are collected in separate bins which are carried to the treatment plant site. After final sorting, easily degradable biowaste is allowed to pass into the digester/ reactor. Slow degradable materials are fed in to the pre-digester and the treated slurry is mixed with this feed material every day. The leachate from the pre-digesters is extracted through specially designed filters and channelized to the digesters for biogas production. The organic waste thus fed into the plant decomposes within days through anaerobic process and the methane gas generated is collected in the gas holder of the plant. For the effective operation and long life of generators, the gas generated has to be purified before utilization. For eliminating H_2S , unwanted dust and moisture content, this gas is allowed to pass through filters and gas scrubbers. After filtration it is channelized to the generator for electricity generation. Electricity thus generated from the plant is utilized to meet the in-house requirements and for street lighting. The treated bio waste can be collected from the pre digesters and this can be utilized as biomanure.

6. Bio manure

The treated biowaste materials coming out from the digester is in the form liquid or semi liquid. This is a very good fertilizer for all types of plants. This can be mixed with equal or more quantity of water and directly be applied to plants. The solid manure from this slurry can be separated through the filtering process. Filtered liquid can be utilized and kept as solid fertilizer for later use. Treated solid biomanure can also be collected directly from the pre-digester. The biomanure generated through the biowaste treatment is a better substitute of chemical fertilizer. Through the utilisation of this, Lakhs of rupees spent for purchasing chemical fertilizers can be saved to a great extent. The growth ratio of plants will be highly improving with in a short period through the use of bioliquid fertilizer. The resistance power of plants from the insects is will also be improved. In short the treated slurry can be called as a tonic of plants. The water storage capacity of the soil will be improved through the application of solid biomanure. The presence of insects in the soil can also be avoided to an extent.

7. Types of wastes that can be treated under Biomethanisation Technology

All easily degradable materials including cooked and raw food wastes, fruits and vegetable waste, fish and meat waste, excreta of all domestic and wild animals and birds and waste water containing bio waste materials can be treated with this technology. Slow degradable materials like vegetables, green or wet plant parts can also be treated with this technology, using specially designed pre-digesters

8. Main parts of a Waste to electricity Plant

Digester, Gas Collector, Anaerobic Pre digester, Slurry loop system, 100% biogas generator, Standby generator, Biogas scrubber, Dehumidifier, Control panel, Power distribution system, Excess Gas reservoir.

9. Waste to electricity project –Success stories from Kerala

BIOTECH – Kerala started functioning from 1994. The main activities of BIOTECH from the very inception of the organization include promotion, implementation, training, R&D, and also the creation of awareness to the people in the field of conservation of renewable energy by waste management.

The installation of Kerala's first bio waste treatment power generation plant at Pathanapuram Grama Panchayat in the Kollam District was 10 years back. This plant is treating 500 Kg of organic waste every day and generating 40 kW electric power every day. After the successful completion of the above project, 52 Grama Panchayats in Kerala State came forward for the installation of such plants and BIOTECH had completed the installation of the power generation projects using market / slaughter house waste with power generation capacities ranging between 3 kW to 20 kW. The power generated from these projects is being utilized for energy requirements of the concerned markets and to meet the in-house requirement of the plant. The main components of the waste to electricity plant -100% biogas engines filters and gas scrubbers and the pre-digester are developed by BIOTECH

Advantages of BIOTECH Waste to electricity projects

1. There is no need of grid electricity for the regular operation of the plant. A part of the power



generated from the plant is utilizing to meet the in-house requirement of the plant.

2. No much moving parts or complicated machineries.
3. Introduction of anaerobic pre digesters helps to treat the waste completely and to collect the treated waste. It prevents the scum formation tendency of the plant. The inbuilt slurry loop systems accelerate the fermentation process and reduce the consumption of drinking water. As per of the treated slurry is selling as liquid organic fertilizer.

10. Waste to Energy

Different models of plants for the treatment of waste, according to the requirement of the consumers and nature of waste, have been developed by BIOTECH. These models cater to the needs of different categories of beneficiaries such as domestic households, public institutions like hospitals, schools, hostels, convents

etc. and also Local Body establishments like Panchayats, Municipalities, Corporations etc. for treating different types of waste. BIOTECH has successfully installed around 30,000 family size plants with the financial assistance from MNRE, Govt of India, and with the active co-operation of the local bodies.

In recognition of our selfless services to the society BIOTECH was honored by conferring on it the prestigious International Ashden Award "GREEN OSCAR 2007".

11. Conclusion

If similar decentralized waste treatment plants are installed all over country, it would be very helpful for the production of biogas, electricity and also bio manure apart from treatment and disposal of unwanted waste. The similar projects may be implemented all over the country with the cooperation and support of all concerned.



Dr. A. SAJIDAS is recipient of several national and international awards including WINNER OF GREEN OSCAR (INTERNATIONAL ASHDEN AWARD-2007) FOR GENERATION OF ENERGY THROUGH DECENTRSALIZED WASTE TREATMENT From UK, Presented by Al Gore, American Vice President (Former) in the presence of Prince of Wales - Prince Charles.

He holds a Masters Degree (MA) in Sociology and Doctorate in Solid Waste Management and has experience of more than 29 Years in designing and execution of various models of Waste to Electricity Biogas plants, other Renewable energy projects, Waste management projects and Energy conservation activities. He has in his credit 22 Important Inventions relating to the development of various green energy projects. Presently working as the Managing Director, BIOTECH, Trivandrum and an International Consultant-Biogas in the Ministry of Agriculture, Republic of Yemen under the project funded by the World Bank and Government of Japan.

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