East Africa's First Solid Waste Bio Methanation Plant

Production of renewable energy has been upheld by majority of governments in the world as a result of adverse climate changes; violent weather changes and atmospheric turbulences, which were not occurring in the past. A proactive approach to addressing the issue is opening opportunities in new markets creating new business prospects in developing countries.

In view of this, Mboga Tuu Limited has inaugurated a floating dome biogas plant; the only one of its kind in East Africa. The obvious bio plants in the region are based upon the use of dung to produce gas and are used commonly in rural areas. The Mboga Tuu plant is unique in that it uses farm based wastes such as weeds wastes, beans wastes, vegetable wastes, fruits wastes, maize wastes and any other biodegradable waste.

Construction of the plant started on 12th January and officially commissioned by Permanent Secretary Ministry of Environment and Mineral Resources, Honourable Mr. Ali D. Mohamed on 6th March 2011.

Bio gas expert Mr. Hepi Patel drew the optimal design of the plant, including a comprehensive profitability analysis; giving a breakdown of the required investment, the expected biogas, energy production and the expected profitability of the plant.

The design of the plant is tailored to use collected wastes chopped into small pieces which are continuously fed to digester through-flow procedure. On daily basis Mboga Tuu feeds in 1000 cubic meters of waste and water mixed in the ratio of 1:1 and the resultant slurry containing 9% total solids is fed to the inlet chamber.

This slurry is retained in the digester (a cylindrical container floater in reinforced 1000 cubic meters concrete tank) for a period of 35-50 days. The bacterial flora is developed and fermentation process begins.

Biogas is a gas whose primary elements are about 65% of methane (CH_4) and about 35% of carbon dioxide (CO_2). It is a product of the natural decomposition of any organic substance of animal or plant origin due to the activity of anaerobic (functioning in a non-oxygen environment) bacteria. The bacteria involved in the process are methanogenic bacteria, which are subdivided into psychrophilic, mesophilic and thermophilic strains according to their optimum temperature range. The optimum temperature for the fermentation process is between 19°-25°C.

During cold season the digester is thermal inducted with hot water and agitated so as to produce biogas. The digesters are fitted up with stirring devices and double membrane roofs for the purposes of gas storage. The double membrane comprises an inner film for holding the gas, and an outer film to protect against the weather. Wall and floor heaters are installed inside the concrete walls of the digester. The exterior walls of the digesters are thermally-insulated.

During retention period, 400-500 litres of 100% organic fertiliser is collected for the first 15 days. The biogas collected is used for cooking, Gas lighting, Electricity-running a diesel generator saving up to 50% and 100% for a petrol generator. If the methane gas is purified, it can be used to run motor vehicles.

Part of the generated thermal energy is utilised for heating the digesters, while the excess heat can be used to heat residential homes and buildings, as well as in agricultural or industrial processes with high thermal energy requirements.

Advantages of the biogas and separation technology include-:

- The environmentally friendly fertilizer from the separation plant can be adjusted for crops far better than traditional livestock manure. The plants' absorption of the nutrients is much more effective. Thus the leaching of nutrients to streams and ground water is reduced to a minimum.

- By producing biogas from crude slurry and utilizing the biogas, the release of methane and carbon dioxide that would be produced in on-farm containment is reduced. Further, organic conversions at the biogas plant spares the environment the added CO2 emission that coal and oil would have caused by similar energy production.

  The concentrated fertilizer product reduces the farmer's need for storage and transport. Further, it reduces damage from wheel tracks and unnecessary pressure on the fields.

- When the water is separated from the fertilizer, the result is not only a more concentrated fertilizer product but also purified water that can be spread on the fields or upgraded to drinking water quality.

- By producing the methane you can use as a cooking fuel, lighting, power generation, and transport fuel.

- All pathogenic bacteria, virus and weed seeds from the waste products are totally degraded. Further, odour nuisances from slurry and waste are completely removed.

- The plant is a 100% closed circuit. It is operated entirely by the organic residual material supplied to and processed by the plant.

  The energy produced from biogas is a major source of renewable electricity and heat, alongside with energy produced from wind, solar, hydro-electric and geothermal sources.