

BIOMETHANATION POWER PROJECT

Managing agro-waste for sustainability and generating energy



Jain Irrigation Systems Limited (JISL) is one of India's leading companies in the agricultural sector. The wide sector of the businesses consist of manufacture of irrigation systems, polyethylene pipes, plastic sheets, agro processed products consisting of dehydrated onion and processed fruit purees, agricultural tissue culture and solar heating and lighting systems. The fruit plant handles up to 800 MT/day during the peak season of May to July and 300 MT/day during the other months. The Vegetable processing plant principally produces dehydrated onions to the tune of 300 tons/day. This generates a significant amount of agro-waste with a yield to waste ratio of 50:50 on an average basis. Jain Irrigation Systems Limited has adopted a uniquely sustainable method to handle this waste - A combined cycle Bio-Methanation Plant.

Motto behind setting up a Bio-Methanation Plant

The purpose of the Bio-Methanation Plant is to utilize organic waste and produce biogas to be used as fuel in gas based engines. The Plant is generating 1.668MW gross power which is grid interactive captive consumption purpose. Not only will the plant help in making use of biomass wastes into energy, it will also replace the use of fossil fuels that would have been used for power generation in the absence of the Plant. Waste disposal, which is a serious concern (since it requires large dumping lands and can also lead to foul odor and pollution), will also be addressed as an integral part of the project. Above all, it accomplishes the stated mission of their visionary Chairman Shri. Bhavarlal Hiralal Jain - "Leave this World better than you found it"

Process Description

The Biogas power plant was commissioned on 9th July 2010 with a design capacity of 1.668 MW. The power plant was constructed in-house with technical assistance from a German Engineering House. The bio-Methanation plant can treat over 200 MT/day of mixed organic wastes and generate electric power from Biogas.

The biogas power plant is a two-phased, controlled temperature (mesophilic range) Bio-Methanation process. The waste acquired from the fruit processing facility is received, crushed and mixed in mixing tanks thoroughly and homogenized into uniform slurry before feeding into a series of Hydrolysis tanks. The indigestible parts such as stones and highly fibrous material is separated and taken to a bio-mass boiler. Within the Hydrolysis tanks, aerobic micro-organisms break down the complex biomaterials into simpler forms such as sugars and acids. The process then proceeds to anaerobic digester tanks, where anaerobic micro-organisms, principally composed of methanogens (micro-organisms capable of generating methane as an end product of their metabolism) consume the volatile fatty acids and sugars to generate Biogas. The biogas is cleaned in Biological scrubbers and stored in gas buffers or balloons before transferring to specially designed Biogas engines via blowers. These engines convert biogas into electric power (1.668 MW), which is then synchronized with the grid network, with sufficient protection at the substation so as to ensure internal consumption (prevent seepage beyond JISL). Vapour Absorption Machine (VAM) absorb waste heat and provide 400 tones of refrigeration (TR) to cool the Solar PV manufacturing Unit and 27 Onion cold storage chambers (Onion dehydration plant). The digested slurry from the Biogas digesters is an enriched source of nutrients such as Nitrogen, dissolved phosphate among others. This is then taken for composting process in composting yard, and converted to soil conditioner. A flowchart is given in Fig.1.

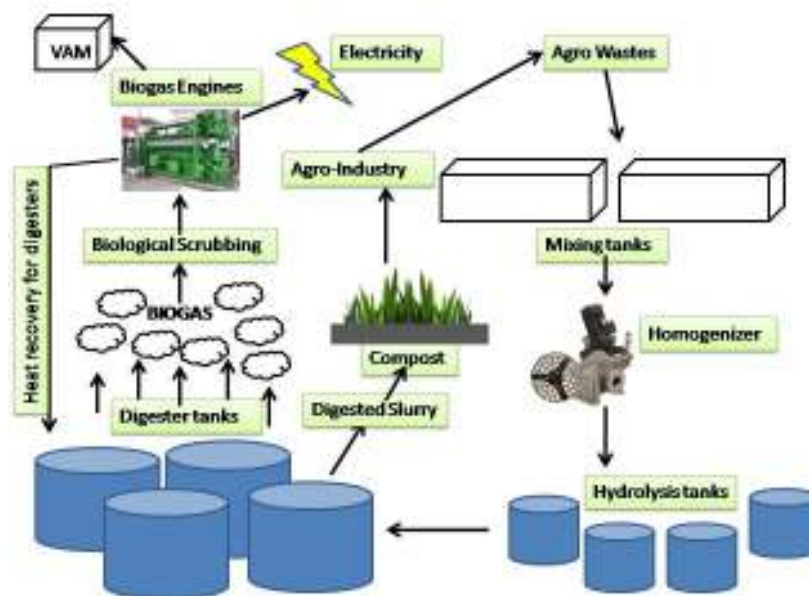


Fig.1. Basic process flow diagram of unit processes in Biogas power plant

The power plant has been recognized by the Ministry of New and Renewable Energy as “first of its kind” project in India to treat diverse agro based products. The power plant has also obtained approval for Renewable Energy Certification (REC) & got CFA through MEDA. The Biogas power project has generated additional employment for over 50 local associates in the power generation and fertilizer unit. The project reduces carbon footprint by converting methane to energy and improves soil health by generating good quality organic manure. By generating electrical energy and refrigeration alongwith heat

recovery, the project has significantly lowered fossil fuel dependency. Any technology that reduces the dependence on fossil fuels is a significant eco-friendly technology that can be touted as being highly essential. This is because fossil fuels such as petroleum, coal and natural gas are actually stored carbons present deep in the earth. Their sudden use as fossil fuels exhausts these carbons directly into the atmosphere greatly increasing CO₂ levels in the atmosphere.

In a typical natural cycle, Carbon is trapped by vegetation from the atmosphere and re-released to the atmosphere and soil. The Biogas Power plant taps this natural cycle and generates Biogas. Any carbon that is released is only within the limits of carbon that would have been released to the atmosphere by the natural cycle. Thus, it is an environmentally friendly and socially responsible project that is a highly sustainable venture.

A complete life cycle is followed from "soil to soil" since as a compliment, the digested slurry from the biogas power plant is converted to value added enriched soil conditioner

The programme on Recovery of Energy from Industrial Waste has policy objectives that are geared to access and upgrade various conversion technologies; to create a conducive environment for the development of the sector in the country and to accelerate the installation of energy recovery projects from industrial wastes with a view to harness the available potential by 2017".

The application is relevant pertaining to industrial waste to biogas, power generation from biogas and power generation from solid industrial waste.