

Proposal under Project Varanasi

1. Title: Improving Solid Waste Management at IIT (BHU) and Adopting the Bio-digestion System of Bhagwanpur Sewage Treatment Plant for biogas production

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3. Introduction:

A bio digester of around 1000 kg/d feed capacity, capable of producing approx. 1300 m³/d of biogas has been installed at Bhagwanpur sewage treatment plant (STP) of Varanasi. For several operational reasons, the digesters are not being used to their full potentials.

The primary objective of installation of Bhagwanpur STP was to reduce the pollution load reaching to river Ganga through Assinala, which has its own catchment of receiving rainwater runoff or domestic waste waters. The activated sludge process based waste water treatment system had planned to produce biogas from the concentrated sludge obtained from secondary clarifier.

There appear two prime reasons for poor performance of bio digester:

- i. The generation of feed sludge from the ASP is very low.
- ii. The bio digester gets a mixed sludge from the bottom of primary clarifier in which the recycled sludge from secondary clarifier is also pumped.

Even when the bio digester was reported to be working, the average gas production ranged between 150-180 m³/d, which is around 11-13% of design value.

It is proposed to restart the bio digester using supplementary bio degradable organic material obtained from IIT (BHU) and Banaras Hindu University campus.

4. Motivation and Vision

IIT (BHU) is located within the larger campus of Banaras Hindu University (BHU). It has been estimated that IIT (BHU) generates around 450 kg/d of biodegradable organic waste. With proper segregation in place and taking additional residential quarters from BHU campus, it is envisioned that around 1000-1200 kg/d of biodegradable organic material can be collected to use as feed material for bio digester at Bhagwanpur STP. The sludge produced from STP will be supplemented with this additional source of biodigestible material to use the full design capacity of biodigester. The biogas so produced may be planned to be used for economic recovery in consultation with STP authorities.

5. Advantages:

- a. Biogas produced from the system will give economic benefits to STP establishment.
- b. The biodegradable component of municipal solid waste from IIT (BHU) and BHU will be treated properly at this existing facility of Bhawanpur STP, without burdening its functioning.
- c. A non working facility may be revived for proper utilization under scientific monitoring and control.
- d. The study will provide workable data and experience to be used for other similar facilities, such as STPs at DLW and Dinapur of Varanasi.

6. Proposed Work Plan:

It is proposed to develop a pilot scale door to door municipal solid waste collection system in IIT (BHU) and BHU campus. The segregated biodegradable component of the collected waste is proposed to be carried to Bhagwanpur STP where it will be used as bio digester feed after proper shredding and slurry preparation. The functioning of biodigester is planned to be studied under varying proportions of sludge and external feed materials, C/N ratio, and other applicable scientific parameters. The performance of bio digester in terms of quantity and quality of bio gas generated, its thermal and economic values etc. will be evaluated to understand the working process under our climatic and socio cultural conditions.

Thus following work plan is envisaged:

1. Establishing a modular door to door municipal solid waste collection system in IIT (BHU) and BHU campus to collect biodegradable, papers and plastics in separate streams.
2. Estimation of bio digestible feed material and establishment of supply chain to Bhagwanpur STP.
3. Performance evaluation of biodigester unit at Bhagwanpur STP in current working condition.
4. Development of system for feed material preparation from collected external waste stream.
5. Pilot study through mixing of STP sludge and external feed to enhance the biogas production.
6. Evaluation of bio digester performance and observations of working environmental factors.

7. Proposed Project Duration: 2 Years