Saraswati 2.0

Identifying best available technologies for decentralized wastewater treatment and resource recovery for India

D2.13 Pilot 5 implementation report final version

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1 Context information and overview of the pilot

In Pilot 5, the proposed technology is based on concomitant anaerobic and bacterial wastewater treatment and recovery of necessary nutrient after the treatment. electroconductive filtering system. The pilot consists of an acid digester coupled with a photoheterotrophic bioreactor (PHBR) constructed in IIT Kharagpur campus to offer full treatment.
In acid digester, wastewater is converted to volatile fatty acids which acts as a carbon source in the subsequent PHBR. In PHBR, the treatment is being provided by the purple non-sulfur bacteria. Moreover, this led to the growth of biomass rich in protein recovered in the form of single cell protein which required further downstream processing. Also, there is a removal of nutrients such as ammonia nitrogen and phosphates in the wastewater.

Overview of the implementation area 1.1 – Pilot scale anaerobic digester coupled with PHBR

2 Changes of the technology compared to the DOA

No changes have been made in the technology provided till now.

3 Detailed design and project report (task a)

The detail design should include the following points:

- Description of the technical solution adopted, including flow sheet/diagram, technological basis-including fundamentals, potential of resource/energy recovery, reuse, recycle, technical characteristics of the units, and any other technical information of interest)

3.1 Description of technology adopted:

The composite technology proposed here consists of an acidifying anaerobic digester to a photoheterotrophic bioreactor (PHBR). In the first stage, AD is tailored to produce volatile fatty acids (VFA) under low HRT to stimulate metabolic activities of acidogens, resulting in low pH. Furthermore, research has shown that the VFA composition can be steered using elevated pCO_2. With a reactor broth rich in undissociated volatile fatty

acids (VFA) the low pH digester forms an improved barrier against pathogens compared to conventional biogas digesters. The second stage of the treatment is designed to promote the growth of photoheterotrophs which convert ammonium, phosphorus and VFA into a biomass rich in single cell proteins (SCP). SCP has added value as organic fertilizer, feed or potentially food additives

3.2 Potential of resource/energy recovery, reuse, recycle

This technology will facilitate an economical treatment of wastewater with low mechanical infrastructure and energy consumption, to produce a treated water of reusable quality. The process fosters the recovery of VFA and of a nutrient-enriched sludge as fertilizer. Partial reuse of treated sewage for irrigation is practised inside the campus. Perspectives envision reuse of the treated water for aesthetics development and other activities such as cleaning. It can be used as construction water after proper solids removal and pH adjustment. Toilet flushing using treated water can be employed as case study in a building complex in campus.

4 Detailed engineering design and construction (task b)

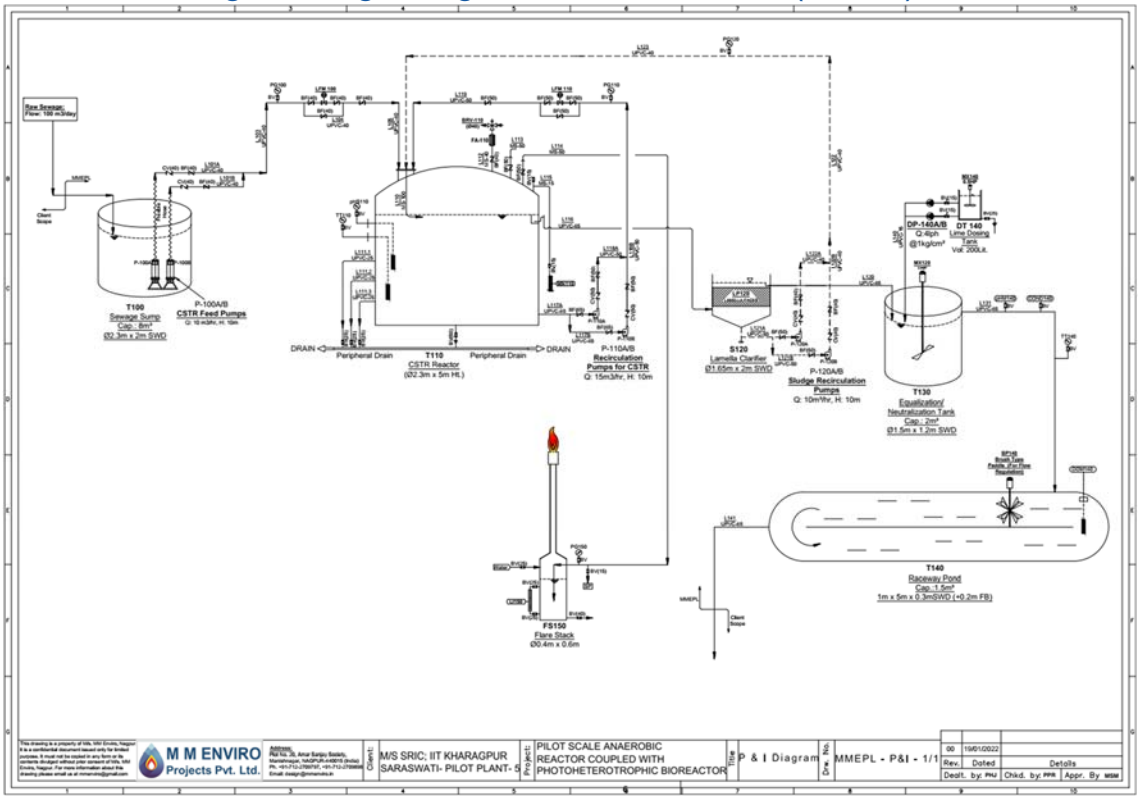

Figure 1.4.a. PID diagram

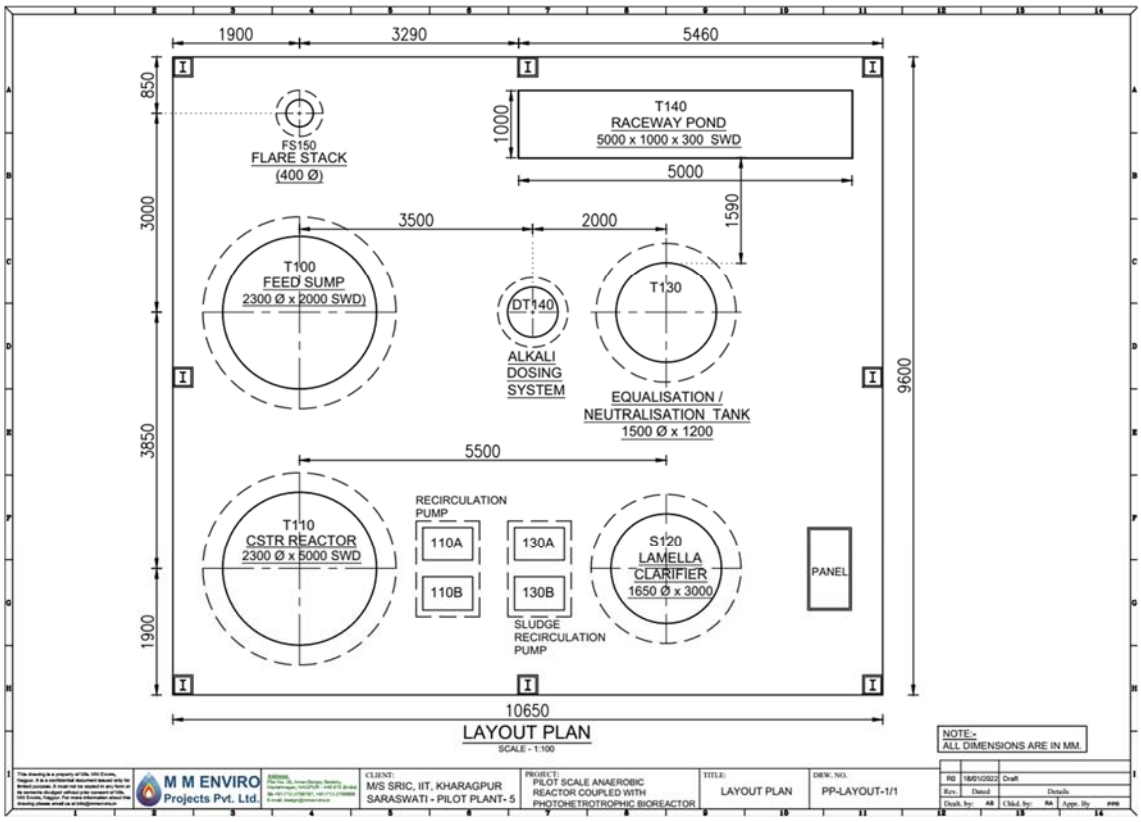

Figure 1.4.b. Layout

5 Commissioning and start of operation (task c)

The construction of the pilot was completed at the end of October 2022 and commissioned in November and the same is shown in Figure 1.5.

Figure 1.5 Commissioned pilot