1. FSTP OPERATIONS IN PERIYANAICKEN PALAYAM

1.1 Background information

Periyanaicken Palayam (PNP) and Narasimhanaicken Palayam (NNP) are two neighbouring Town Panchayats (TP) in the outskirts of the city of Coimbatore, with a collective population of 53,000 people and 14,366 households. Both the TPs are unsewered, with households having either septic tanks or soak pits. 7,752 HHs are identified to have septic tanks. An estimated 5 loads of septage is desludged everyday by private operators, amounting to 20,000 - 25,000 lts of septage.

The proposed Faecal Sludge Treatment Plant (FSTP) is designed to handle a waste load of 25,000 lts of septage per day, with a peak capacity of 30,000 lts per day. 1.3 acres of land is identified in PNP for setting up (FSTP) for the TPs.

1.2 Operational components

Septage receiving station (SRS)

The desludged faecal matter i.e. the septage from the onsite sanitation systems, either the septic tanks or the pits, is collected by vacuum suction tankers and is directly fed into the Septage Receiving Station (SRS) via inlet pipe. The SRS unit consists with screens (Mesh - 3 no's) of dimension 0.6 m x 0.84 m, with a pore size of 12mm to separate the solid waste particles like cloths, paper, packets, etc. mixed with the septage. The mesh is placed at an angle of 45° in SRS. The screened septage flows into the grit chambers (2 no's) within the SRS for pre-settling the grit before entering the holding tanks. The SRS is designed with a hydraulic retention time of 1 day. The sand and silt present in the septage get settled in the SRS under the influence of gravity.

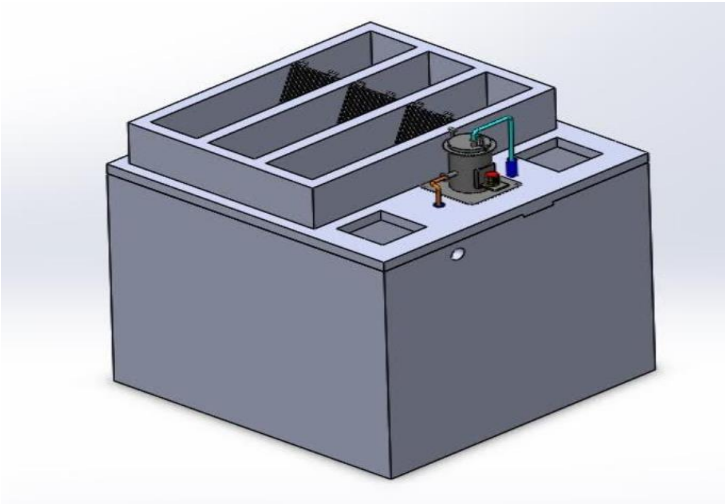


Figure 1-1:Septage Receiving Station

Storage Tank (Collection tank) –

The septage flows from the SRS to the storage tank by gravity. The storage tank has a capacity of 80 cu.m and equipped with 3 vertical baffles with vents. Thus, the storage tank consists of 4 chambers. Each chamber or tank has a dimension of 2.6m x 3.5m x 2.3m.

The storage tank provides a total of 3 days of retention time, and thus the following actions occur in the tank:

i) The septage gets homogenised in the Storage tank. Different quality septages from different sources is mixed in this unit.

ii) Effective settlement of sludge occurs due to the 4-chambered tank as well as the retention time.

Submersible pumps are placed in the Storage tank (collection tank) to pump the settled sludge in the storage tank (collection tank) to the sludge holding tank. Two pumps are placed in the first 2 chambers of the storage tank (collection tank), and one pump is placed for the last two chambers of the storage tank. Around 60 -70% of the sludge is pumped to the sludge holding tank. The supernatant flows to the MBBR unit by gravity.

Figure 1-2:Storage Tank (Collection Tank)

Sludge Holding Tank –

The sludge from the Storage tank is pumped to the Sludge holding tank of dimension 4.2m x 3m x 2.65m. The settled sludge is then pumped to the dewatering unit.

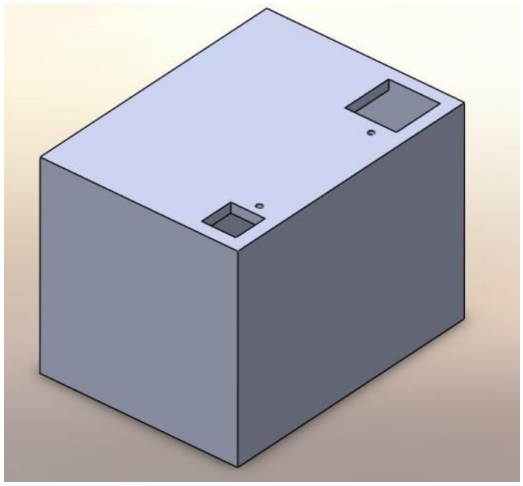


Figure 1-3:Sludge Holding Tank

Dewatering Unit

The septage from the sludge holding tank is pumped to the dewatering unit. The dewatering unit consist of 2 parts:

- Polymer application system
- Volute Press

The polymer application system consists of Polymer mixing system, Polymer maturation tank and polymer dosing pump. The polymer solution is prepared in the polymer mixing system by mixing polymer and water at appropriate ratios and kept

for maturation in the maturation tank. Post, maturation, the polymer is dosed to the septage at pre-determined dosing rate, for solid-liquid separation through flocculation.

The sludge is then passed through the dewatering unit. The dewatering unit consists of two phases:

- Phase 1: Thickening of the flocs formed occurs
- Phase 2: Squeezing of the sludge occurs

There will be 2 screws in the dewatering unit - model 302, with DM handling capacity 60 Kg/hr/screw and handling a peak flow rate of 1500 lph/screw. Hence, together 2 volute press can handle 25,000 lt of septage. Desired flowrate of septage can be is set in the dewatering unit.

There are different outlets for sludge and filtrate. Sludge generated in the dewatering unit is then collected and transported for composting. The dewatered sludge is of about 20% of TS, and with good concentration of plant nutrients like N, P and K. At the composting yard it will be co-composted with the municipal solid waste. The filtrate flows by gravity to MBBR for further treatment.

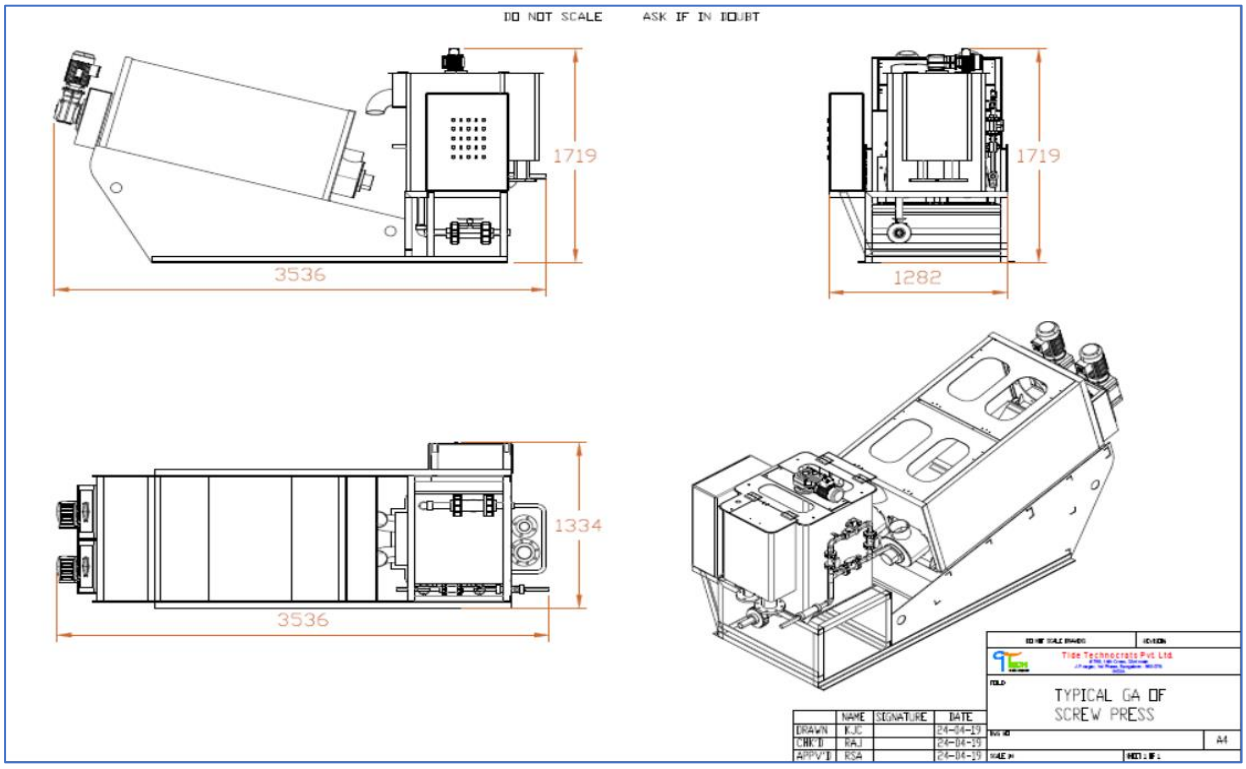


Figure 1-4:Layout of the Dewatering unit

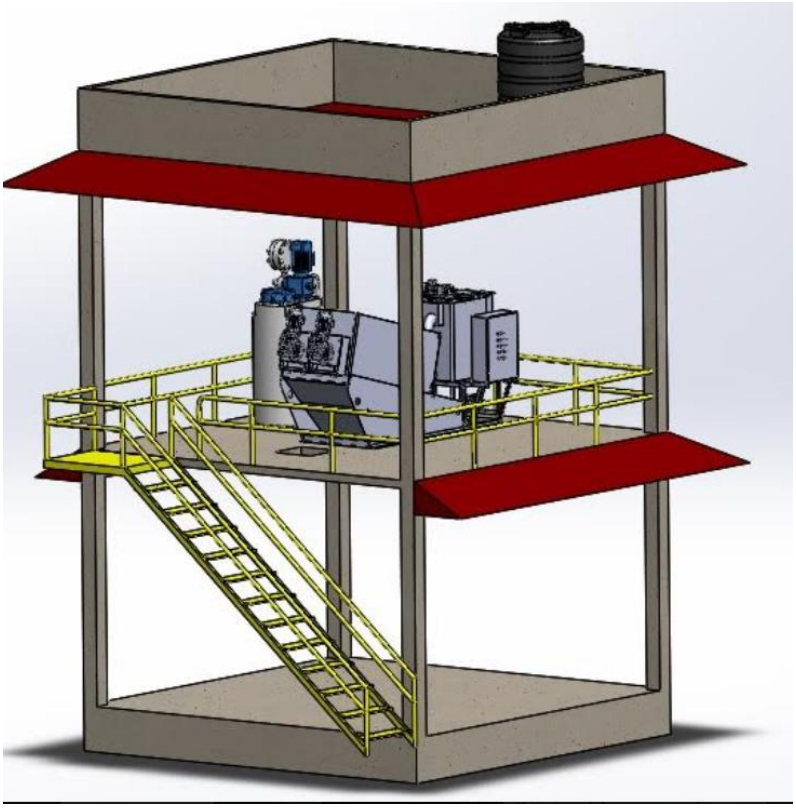


Figure 1-5:Dewatering unit

MBBR (Moving Bed Bio Film Reactor)

The supernatant from the Storage tank (Collection tank) and filtrate from the dewatering unit is fed to the MBBR for treatment. It consists of anoxic, aerobic tank, and Sedimentation Tank. The anoxic tank is the denitrification basin. The process involves the de-nitrification of waste streams using bacteria which breaks down the nitrate in the waste to use as an oxygen source. This breakdown of nitrate from the waste stream releases oxygen and nitrogen gas. The oxygen is consumed by the bacteria and the nitrogen gas releases to the atmosphere. The free-form nitrogen present in the wastewater is removed at this stage. From anoxic tank water flows to the next tank i.e. aerobic tank. Aerobic tank is an aerated tank with moving biofilm. It is a super-activated biofilm aeration system. The moving bio films provide large surface for the optimal contact between the water, air and the bacteria. The bacteria or the activated sludge grows on the surface of the bio film. The bacteria breakdown the organic matter in the wastewater. The tank is aerated to keep the bio films and the activated sludge in moving condition. The excess bacteria grown on the film i.e. the excess sludge get detached from

the bio films and flow with the treated water to the sedimentation tank. The sludge gets deposited in the sedimentation tank. The COD and BOD reduction take place here.

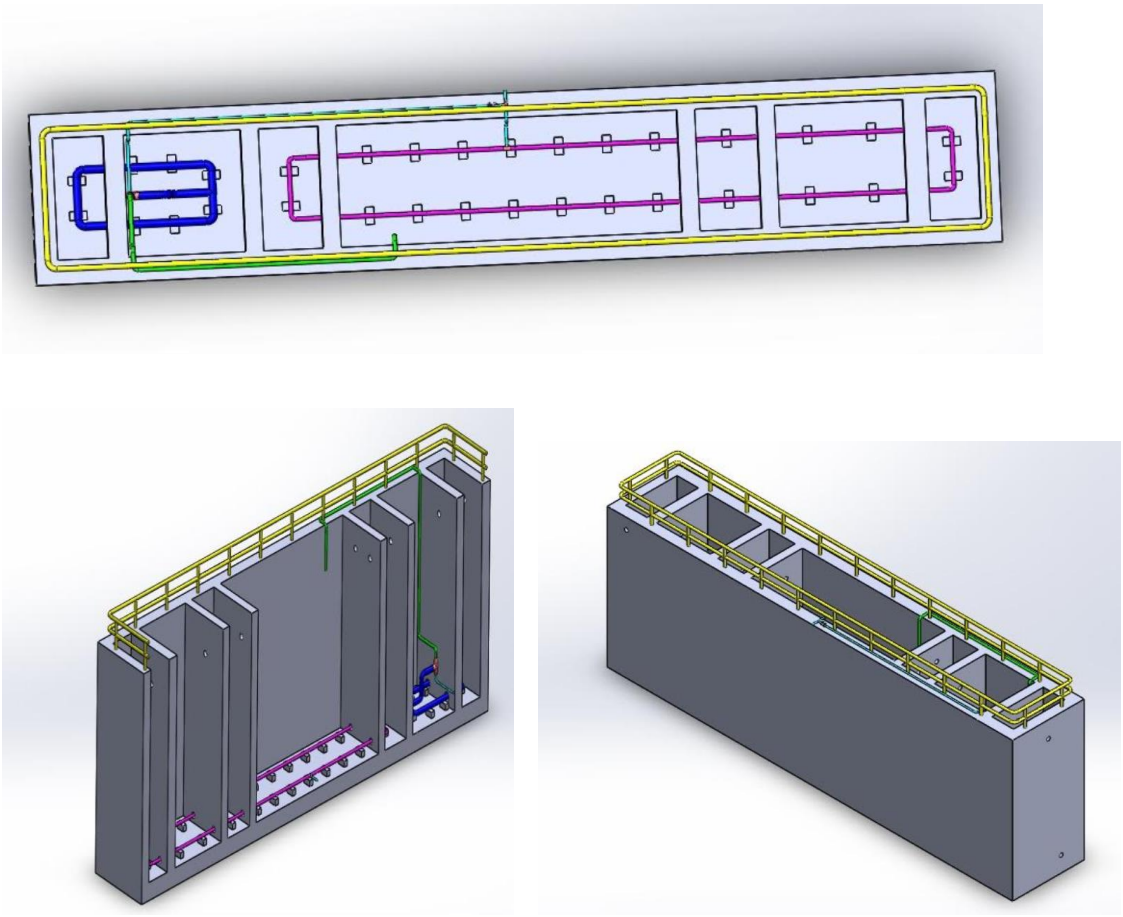


Figure 1-6:Moving Bed Biofilm Reactor

Treated Water tank - 1

The treated water from the MBBR is stored in the pre-tertiary treated water tank. Further its pumped to the Pressure Sand filter.

Pressure Sand Filter (PSF)

The treated water moves from the treated water tank to pressure sand filter. A pressure sand filter is contained under pressure in a vertical FRP tank. The turbidity reduction takes place here. The Pressure Sand Filter consists of a multiple layer of sand with a variety in size and specific gravity. These Filters are designed to remove turbidity and suspended particles present in the feed water with minimum pressure drop.

Activated Carbon Filter (ACF)

From pressure sand filter the water is pumped to the Activated carbon filter. ACF consist of a bed of activated carbon which adsorb the any contaminants, impurities etc present in the water. It also removes smell in water and makes cloudy water clear by removing colour causing compounds in the water.

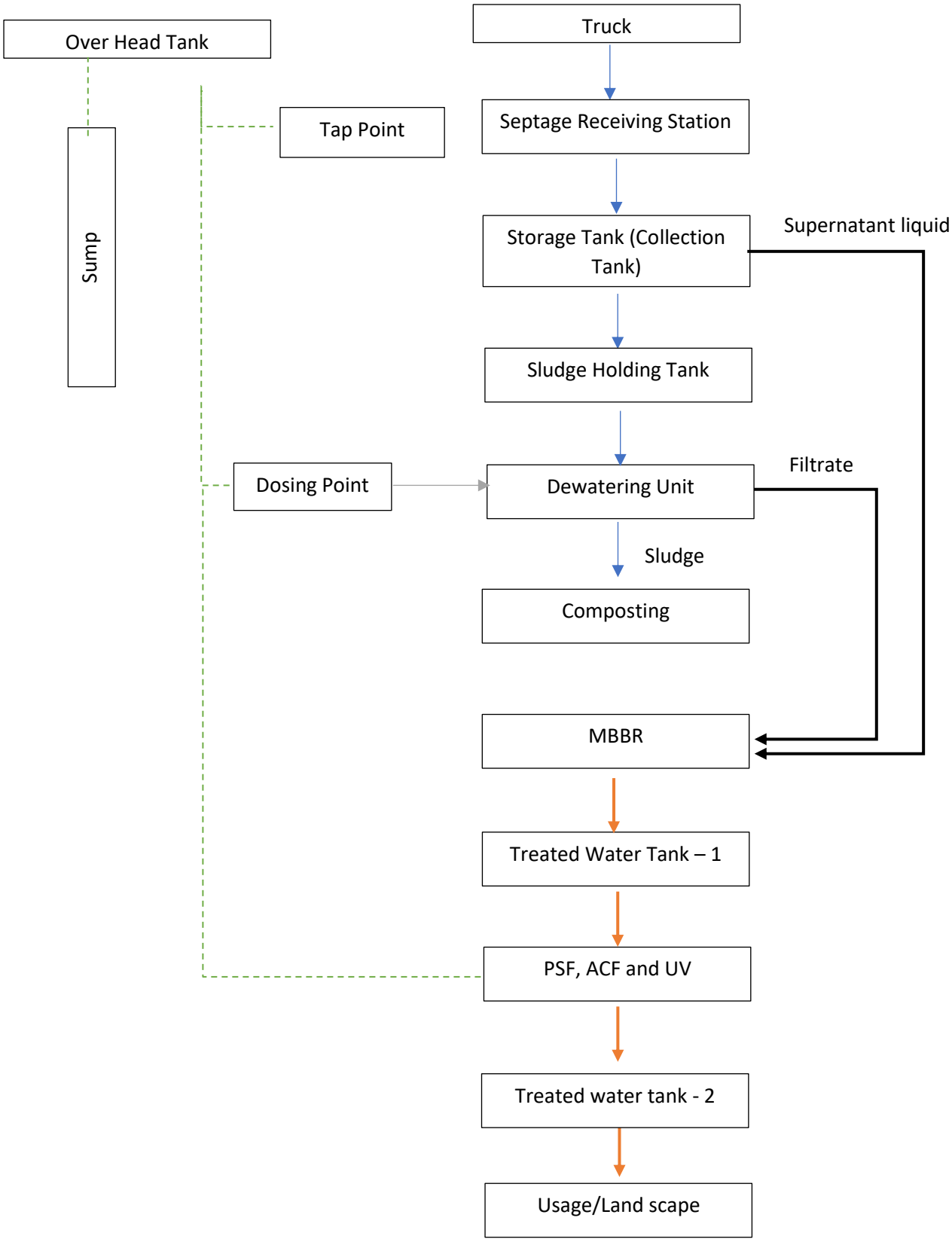
UV Disinfection

From ACF water is passed through the UV disinfection unit. The UV provides rapid, effective inactivation of microorganisms through a physical process. When bacteria, viruses and protozoa are exposed to the germicidal wavelengths of UV light, they are rendered incapable of reproducing and infecting. UV light has demonstrated efficacy against pathogenic organisms, including those responsible for cholera, polio, typhoid, hepatitis and other bacterial, viral and parasitic diseases.

Treated water tank 2

After the tertiary treatment, the treated water is stored in the Treated water tank 2 and available for utilisation.

Flow Chart


Over Head Tank
Truck
Tap Point
Septage Receiving Station
Sump
Storage Tank (Collection Tank)
Supernatant liquid
Sludge Holding Tank
Dosing Point
Dewatering Unit
Filtrate
Sludge
Composting
MBBR
Treated Water Tank – 1
PSF, ACF and UV
Treated water tank - 2
Usage/Land scape