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ANAEROBIC STABILIZATION + SLUDGE DRYING BED – FSTP Technology

TECHNOLOGY BRIEF

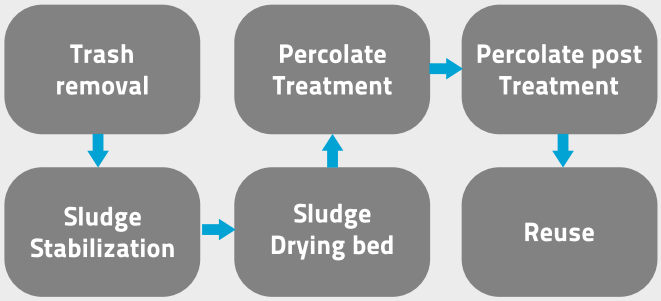
Anaerobic stabilization is a process for stabilizing partially digested sludge from on-site containment units. Faecal sludge with high volatile solids has potential for digestion and release of biogas before undergoing drying in Unplanted Drying Beds/Sludge Drying Beds (UPDB/SDB). It is also essential that such sludge be digested before application onto farmlands as un-stabilized biosolids can leach organic pollutants when in contact with water. Stabilization improves dewatering capability. Anaerobic stabilization combined with sludge drying beds can convert faecal sludge into treated water and dried biosolids and produce biogas as an additional byproduct.

SLUDGE DRYING BED (SDB) TREATMENT

Sludge drying beds are open structures with a sloping base for holding graded filter media. SDBs consist of a layer of sand, underlined with gravel, contained within low walls and with an under drain system to pick up liquid that percolates through the bed. Wet sludge is discharged onto a bed to a depth of 150–300 mm. The sludge undergoes solid-liquid separation and evaporative drying. The percolate from the sludge drying bed is collected and further treated. The dried sludge from the beds are removed periodically and transferred to the sludge storage shed located within the premises.

SYSTEM IN BRIEF

The faecal sludge received at the treatment facility is discharged into the screen and grit chamber by means of gravity where large and heavy inert solids get trapped using bar screens and gravity settling. The liquid sludge (mixture of liquid and solids in slurry form) from the screen and grit chamber is further conveyed to a sludge stabilization (anaerobic) reactor through gravity for treatment. The stabilization tank can be designed in various forms and shapes depending on the objective - chambers can be designed as biogas digestors (fixed and floating) or baffle reactors. Upflow velocities and retention times are two important design criteria. Retention time is dependent on the organic load of the input sludge and ranges between 6 -20 days. Other than sludge digestion, these modules can also be used for solid-liquid separation. The sludge from stabilization reactor is desludged onto the drying beds for further dewatering and drying. Liquid undergoes treatment in liquid treatment units.

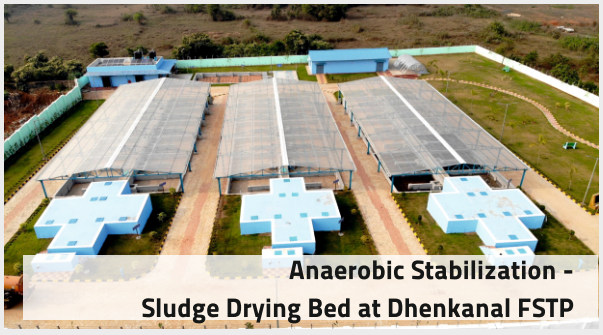


Process Flow of Treatment

Salient Features

Area (treatment modules):
60 -100 m^2 per m^3/day (or KLD)

Cost (treatment modules)
CAPEX : ~Rs 6-9 Lakh per m^3/day (or KLD)
OPEX (treatment) : ~Rs 2-2.5 Lakh per KLD/year



Anaerobic Stabilization - Sludge Drying Bed at Dhenkanal FSTP

SDB system at Sircilla FSTP

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Anaerobic Stabilization and Sludge Drying Bed system for treatment of faecal sludge are operational at Sircilla (Telangana), Dhenkanal (Odisha) and Devanahalli (Karnataka)

The treatment consists of six stages

1. Screen Chamber
2. Stabilization Reactor
3. Sludge Drying Beds
4. Sludge Pasteurization Unit
5. Wastewater treatment – Integrated Settler
   - Anaerobic Baffle Reactor and Planted Gravel Filter
6. Sand Carbon Filter and UV for separated liquid and percolate treatment.

FSTP having a AT-SDB treatment system at Dhenkanal, Odisha

OPERATION AND MAINTENANCE

FSTPs with Sludge Drying Beds have minimal O&M requirements:

- Valve operations and trash removal from screens
- Removal of sludge from drying bed
- Harvesting of plants in gravel filter
- Record keeping

REUSE OPTIONS

- The treated wastewater can be used for irrigation and other non-potable purposes
- The stabilized sludge can be used as a soil conditioner (bio-solids)

TYPICAL CHARACTERISTICS OF TREATED WASTEWATER FROM FSTP

Parameter	Results
BOD inlet (of sludge in (mg/L))	8,000 – 20,000
COD inlet (of sludge in (mg/L))	45,000 – 65,000
TSS (Total Suspended Solids) of inlet (mg/L)	16,000 – 20,000
VS (Volatile Solids)/TS (Total Solids) ratio of inlet	0.4 – 0.7
VS/TS ratio of outlet sludge from SR	0.3 – 0.5
BOD of percolate from drying bed (mg/L)	250 – 350
Total suspended solids percolate (mg/L)	200 – 300

Source: CDD's internal research

Parameter	Expected Output
COD	< 100 mg/L
BOD	< 30mg/L
TSS	<50 mg/L
E-Coli	< 100 MPN/100 ml

Source: CDD's internal research

Removal of Dried sludge from SDB

Faecal sludge in Sludge Drying Beds

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