

PLANTED DRYING BED (PDB)

– FSTP Technology



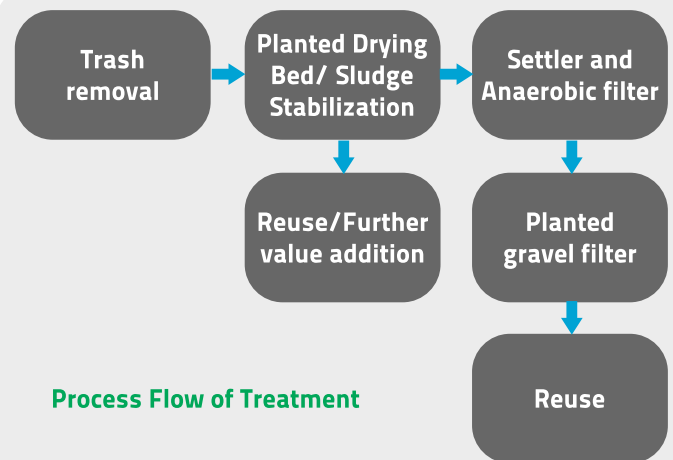
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TECHNOLOGY BRIEF

Planted Drying Bed (PDB) is a physical and biological dewatering treatment unit for treating faecal sludge from pits and septic tanks. They are similar in construction to sludge drying beds but are planted with emergent macrophytes - plants that are rooted in the bed but emerge above the sludge surface. Water loss from planted drying beds takes place through a combination of evapotranspiration from plants, and percolation through the bed. Differing from regular drying beds, these are sequentially loaded for long periods ranging from months to years. This is possible because the plant roots open up drainage paths in the sludge, facilitating both evaporation and percolation. Commonly used plants include reeds (*Phragmites* spp.) and cattails (*Typha* spp.). Cattails are an attractive option because of their high initial growth rate. Other options for use in tropical climates include antelope grass (*Echinochloa* spp.) and papyrus (*Cyperus papyrus*). Plant selection for a particular location is influenced by the plants that grow locally.

SYSTEM IN BRIEF

Faecal sludge received from septic tanks and pits is directly fed into the PDB after screening it for solid waste. PDBs are loaded in layers of sludge that are subsequently dewatered and stabilized through multiple physical and biological mechanisms. A PDB is designed on the basis of sludge loading rate and the total solids in the incoming sludge. A PDB operates in a batch process, with each cycle consisting of two stages a) loading and b) resting. Resting stage is usually dependent on climatic conditions and may vary between days to weeks. Sludge gets accumulated in a PDB over many cycles and till it reaches the desired height. Once this stage is reached, the PDB is removed out of service and the sludge is left to stabilize and dry for a couple of months. After this, the sludge is removed and the PDB is prepared for the next loading cycle. Percolate is collected from the bottom of the bed on a regular basis and further treated through a wastewater treatment system.



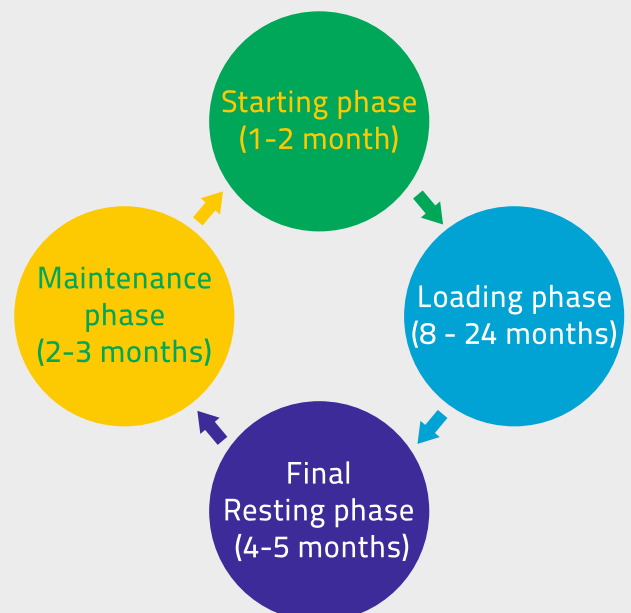
Process Flow of Treatment

Salient Features

Area (treatment modules):
100 – 150 m² per m³/day (or KLD)

Cost (treatment modules)
CAPEX : Rs 7-11 Lakh per m³/day (KLD)
OPEX (treatment) : Rs 1-1.5 Lakh per KLD/Year

Life Cycle of PDB



A PDB system for treatment of faecal sludge has been implemented and is operational at Leh (Ladakh) and Jhansi (Uttar Pradesh).

The treatment consists of

- Solid liquid separation - Planted Drying Beds
- Wastewater treatment – Integrated Settler and Anaerobic Baffle Reactor with Planted Gravel Filter for separated liquid and percolate treatment.

OPERATION AND MAINTENANCE

Planted drying beds have minimal O&M requirements:

- Trimming of plants once every month
- Removal of dry sludge after the final resting period (once in 2 years per bed)
- Replacement/washing of filter media to be done once in five years
- Racking of sludge before application of new load can enhance the performance

TYPICAL CHARACTERISTICS OF TREATED WASTEWATER FROM FSTP

Sampling parameter	Results
BOD inlet (of sludge in (mg/L))	1,000 – 11,000
COD inlet (of sludge in (mg/L))	45,000 – 65,000
BOD percolate (mg/L)	200 – 300
COD percolate (mg/L)	600 – 800
Total solids percolated (mg/L)	4,500 – 6,500
Volatile solids in percolate (mg/L)	1,500 - 2,000
Total suspended solids in percolate (mg/L)	~100

Source: CDD's internal research



PDB at Leh



Faecal Sludge being disposed off in a planted drying bed system at Jhansi FSTP

REUSE OPTIONS

- The treated water can be used for gardening, irrigation and non potable purposes
- The stabilized dry sludge can be used as a bio-solids for soil conditioning

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

Source: CDD's internal research



PDB at CASS, Bangalore