Optimization Of Planted Drying Beds (PDBs)

Planted Drying Bed (PDB)

Research Background

Planted Drying beds (PDBs) are used for the treatment of faecal sludge and are preferred for their low-cost treatment mechanism. However, there is no literature/ data for the Indian context currently available that will help in deriving a better understanding of PDBs.

For example, the common design today is to provide a freeboard of 1 meter for sludge accumulation and a final resting phase of 8 - 12 months. Limiting the height to 1 meter, increases the number of PDBs required, thereby increasing the area as well as the construction cost required for a project. There is also insufficient data regarding the percolate quality from the PDB, which leads to oversizing of percolate treatment systems.

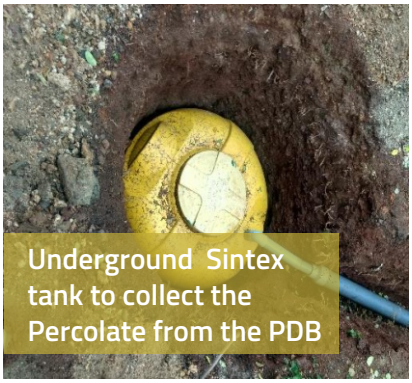
In order to derive a better understanding of the performance of the PDBs and the characteristics of the sludge and percolate, this research was conducted. It was designed to verify initial design assumptions - further experiments need to be conducted to arrive at a concrete solution.

Objectives Of The Study

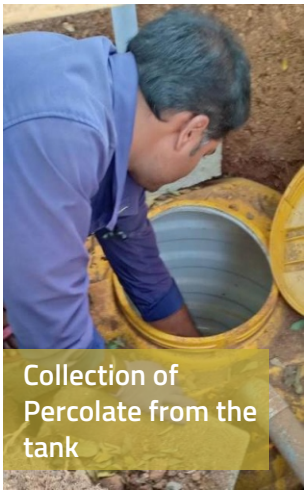
- To estimate treatment performance efficiency of the PDB.
- To reduce the number of drying beds in the PDB.
- To determine percolate characteristics over time.
- To estimate percolate flow rate over time.

Methodology

- A 3 KL capacity PDB was used for this study.
- The PDB was loaded with FS every 9 days (over a period of ~45 days).
- The quantity of FS loaded onto the PDB was kept constant (i.e. 3 KL). However, there were variations in its characteristics - which were noted by studying the inflow characteristics.
- Compositive samples were collected from the percolate and flow rates were estimated at periodic intervals till there was no flow from beds.
- For each load, measurements with regards to accumulation of sludge in the drying beds was also recorded.



Underground Sintex tank to collect the Percolate from the PDB



Collection of Percolate from the tank

FS being discharged into the PDB

Percolate flow being measured using the beaker and timer method

Measuring sludge level through wall markings

Result And Inferences

1) Percolate Characteristics

Parameters/Day	pH	Conductivity [mS/cm]	COD [mg/L]	BOD [mg/L]	TS [mg/L]	VS [mg/L]	TSS [mg/L]	TDS [mg/L]
1st Day	6.82	3.83	230.2	20	2,930.6	956.6	74.8	2,690
2nd Day	6.62	3.49	154.4	11.4	2,770.6	1,024.6	18	2,405

Table 1: Percolate characteristics day wise

2) Treatment Efficiency

Parameters	Reduction
BOD [mg/L]	99.38 %
COD [mg/L]	99.20 %
TSS [mg/L]	99.71 %
TS [mg/L]	88.51 %

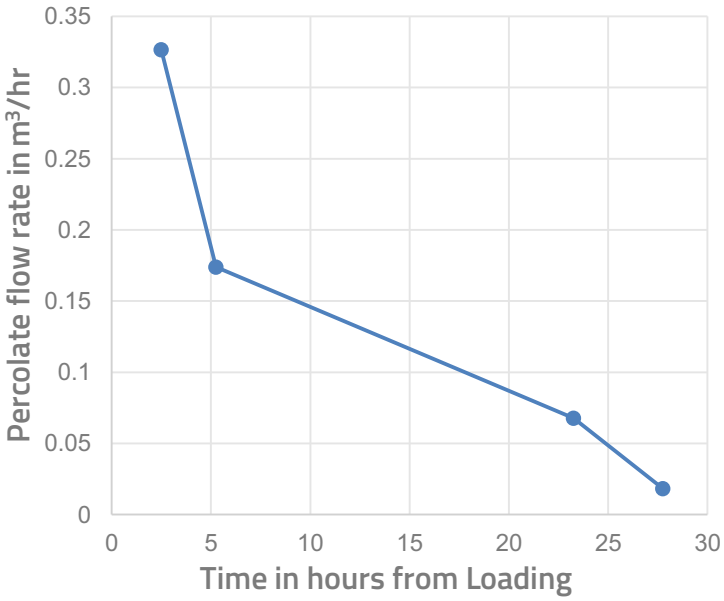
Table 2: Percentage reduction in the characteristics of the percolate with respect to the inlet faecal sludge

Inlet faecal sludge from septic tanks/pits

1st day percolate from PDB

2nd day percolate from PDB

3) Percolate Flow rate



Graph 1: Percolate flow rate with respect to time

Conclusion

- It is evident that PDBs are efficient in reducing BOD & COD by <99%.
- They are also effective in reducing TSS and TS by 99.7% and 88.5% respectively

Further Research

- There is a large variation in the percolate flow rate and quantity from the PDB, which needs further analysis in upcoming trials.
- The analysis of the sludge during the resting period is not yet commissioned.
- These are all intermediate results and further experiments need to be conducted to arrive at a concrete solution.

Unloading of FS in PDB

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