

Faecal Sludge Treatment Plant (FSTP) at Rajbandh for Khulna City Corporation



Khulna is the 3rd largest city of Bangladesh located in the southwestern part of Bangladesh. Khulna city is located on the banks of the Rupsha and the Bhairab rivers. The city is 4 m above the Mean Sea Level (MSL) and the area is 45.65 sq. km. The population is about 1.5 million with a density of 32,900 per sq. km. There are 31 wards with 68,477 holdings. Faecal sludge quantity of Khulna were approximately 710,000 m³/year and 721,000 m³/year from field survey and theoretical estimation, respectively. Faecal sludge treatment plant (FTP) of Khulna is located at 22°47'39" lat and 89°29'32" long, just outside Khulna municipality. The area where FTP is constructed is in one of the municipal waste dumping site in Rajbandh. The major limitation of this site is that the area where FTP is constructed is on an old landfill pilot test site and if there is any disturbing of landfill it may cause the failure of land stability, gas leakage etc. Hence the plant is constructed using earth and HDPE sheet. Asian Institute of Technology, Thailand and Khulna University of Engineering and Technology is providing technical support for designing, constructing and commissioning of FTP.



- Legend:
1. CW as a pre-treatment-CW-FS (6 Units)
 2. CW as a post-treatment-CW-P
 3. Drying Bed (6 units)- DB
 4. Office building
 5. Shed for harvested sludge & plant
 6. Truck Cleaning Platform



Name of Technology: Constructed Wetland or planted drying bed (with a small Unplanted Drying bed)

Capacity: On Average 180 m³/day

Cost: USD 240,000.00

Constructed Wetland/Planted drying beds (PDBs):

Vertical-flow constructed wetlands and sludge drying reed beds, are beds of porous media (e.g. sand and gravel) that are planted with emergent macrophytes. PDBs are loaded with layers of sludge that are subsequently dewatered and stabilised through multiple physical and biological mechanisms. FS is repeatedly loaded onto PDBs, with up to 20 cm of FS per loading, where it accumulates for several years depending on the loading rate, the capacity of the system and mineralisation rates. Long-term bed permeability is maintained by the dynamic system of percolation canals created by the continuously growing root system of the plants. The volume of sludge on the PDB reduces continuously (through moisture loss and degradation), and the plants maintain porosity in the sludge layer thereby significantly reducing the need for sludge removal compared to unplanted drying beds (which require sludge removal every two to three weeks). Emergent macrophytes are therefore essential to the improved performance for stabilisation, pathogen reduction and clogging of PDBs over unplanted drying beds.

Present Scenario of Khulna FSTP



1. CW as a pre-treatment-CW-FS (6 Units)
2. Drying Bed (6 Units)-DB

Design considerations for Khulna FTP are as follows:

Plant: water emergent plants are selected to use for CW. The species used in the wetland receiving FS is the species that can stand for the high pollution as high TDS. Moreover, the species should be available in Bangladesh. Heliconia, Cyperus and Canna are selected in this design for the first CW. While, the later CW treating percolate uses mixed plants as Heliconia, Canna, Padanus plam and Lotus.

Drying Bed: In Khulna, there are 6 Units (3m x 3m) of drying bed. This is an unplanted drying bed where sludge will be dried and dry sludge to be collected every two to three weeks. The dry sludge will be supplied to the compost producer for making co-compost and to sell.

Tank: Plastic lining (PE) is designed to use as lining material for all CW units. It is due to the flexible of plastic which can be settle if the land settle as the behavior of old landfill. Compacted soil embankment is also expected to hold the CW pond.

Media: Media in FS- CW units are aggregated brick and sand. The 3", 2" and 1" are laid from bottom to top direction. Then, sand is the top layer. For media in P-CW, shredded plastic is added in strip. The shredded plastic is used due to the availability in Bangladesh. It is also cheaper than rock, aggregate brick, or sand. The benefit of shredded plastic is the higher surface area which increasing amount of bacteria more than other media.

Hydraulic Loading 0.3 m³/m²; HRT (2 days ponding-1 days empty and rest)

Area of CW treating FS = 10m x 15m x 6 units

Area of CW treating percolate = 10m x 40m; HRT 1 days (batch, Depth 0.65 m

Loading	Day1	Day2	Day3	Day4	Day5	Day6	Day7
CW1	30						30
CW2		30					
CW3			30				
CW4				30			
CW5					30		
CW6						30	
DB (1-6)	Feeding and keep 15 days for drying						

Operation Plan

Project Partners:



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