Consortium for DEWATS Dissemination Society

Treatment of Septage at pilot unit in peri-urban locality of Bangalore

Treatment of Septage at pilot unit in peri-urban locality of Bangalore

A. Jacob*, R. Pai, R. Pradeep***, S. Sinha******

CDD Society, Survey No 205, Opp Beedi Workers Colony, Kommagatta Road, Bandematt, Kengeri Satellite Town, Bengaluru 560 060, INDIA
* (Email: andrews.j@cddindia.org)
** (Email:rajesh.p@cddindia.org)
***(Email: rnd.unit@cddindia.org)
****(Email:susmita.s@cddindia.org)

Abstract:

Census of India 2011 shows that, 30 million urban households, equivalent to 38 percent of urban households have on-site sewage collection systems either as septic tanks or as pit latrines. USAID (2010) estimates that by 2017, 148 million urban people would have septic tanks. A study of around 300 Class-I and Class-II cities by National Institute of Urban Affairs in 2005 shows that only a third of Class-I cities and less than one-fifth of smaller sized urban centers have sewerage system for discharge of domestic sewage. The rest are having either on-site sewage collection systems like septic tanks / pits or discharging into open lands or water bodies.

Most of these septic tanks and pit latrines are not constructed as per the Central Public Health and Environmental Engineering Organisation (CPHEEO) standards. Generally these septic tanks are not maintained well. The practice of Septage (Settled solid matter in a semi-solid condition at the bottom of septic tank) collection and disposal is neither scientific nor safe. Septage collected from onsite systems during its cleaning is mostly dumped in drains and open areas posing considerable health and environmental risks. Sanitary workers also work manually in hazardous conditions to clean on-site tanks and pits without adequate protective gear and equipments. Hence, septage management needs urgent attention in Indian cities.

Consortium for DEWATS Dissemination (CDD) Society, a non-for profit organisation based in Bangalore and BORDA (Bremen Overseas Research and Development Association, Bremen, Germany) who are specialized in providing Decentralised Wastewater Treatment system (DEWATS™) has implemented a pilot Septage treatment plant at the campus of CASS (Centre for Advanced Sanitation Solutions), Bangalore. CASS is located in a peri-urban location of Bangalore city where in sewer network is not available and most houses have septic tanks or pits for collection of faecal matter. This treatment system, first of its kind in the nation, highlights the anaerobic treatment process for septage and faecal sludge and also aims to assess the suitability of DEWATS™ in treating septage. This project is implemented with financial support from Bill and Melinda Gates Foundation.

Treatment Concept:

Based on the preliminary studies on septage characteristics, it has been found that septage contains high organics and solids. Considering high organic content of septage, its treatment is highly feasible through biological processes especially in anaerobic conditions i.e. Biogas digester. The treatment modules implemented are biogas digester, Anaerobic Baffle Reactor, Planted Gravel Filter and collection tank. These modules are selected to achieve the maximum treatment efficiency so that treatment byproducts like treated water, biogas and sludge can reused safely. The pilot septage treatment plant is designed to treat 3000 liters of septage in a day. Septage at the treatment plant is received through cesspool vehicles.

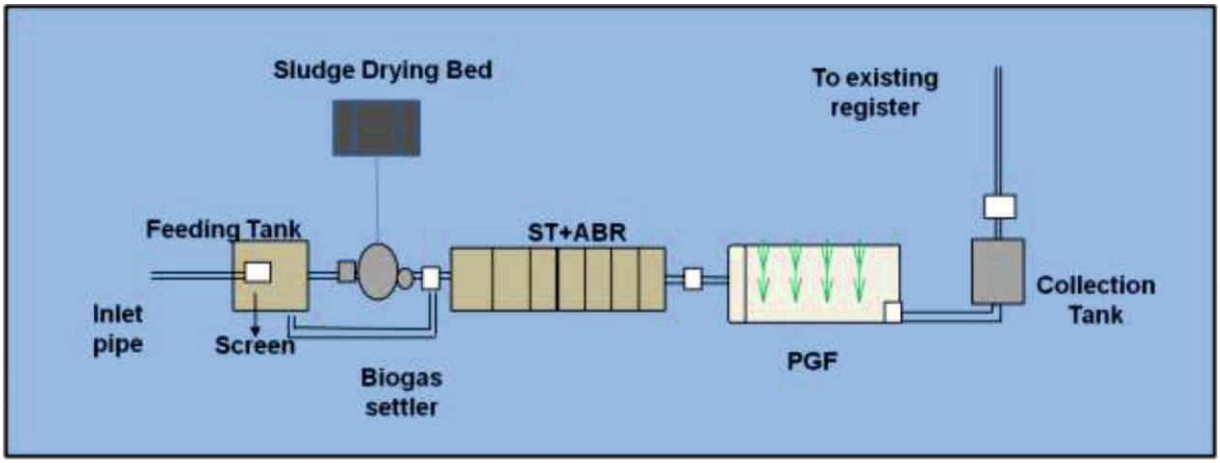

Figure 1 Plan of Septage Treatment Plant at CASS, Bangalore

Description of Modules:

Initially a Feeding Tank (FT) is provided to separate the solids and liquid of septage. With septage different types of solid materials come. However, the solid materials are screened at the inlet pipe in the feeding tank using screen chamber of pore size 15mm. This is to avoid solid waste from septage entering into treatment system. When the septage is received, it is allowed for settling at the feeding tank for separation of liquids and solids. The separated liquid from septage is connected to an integrated Settler (ST) with Anaerobic Baffle Reactor (ABR) whereas the solids are fed into Biogas Settler (BGS) for anaerobic digestion. The overflow of water from digested sludge from BGS is also connected to ABR for further treatment. The treated water from ABR is connected to Planted Gravel Filter (PGF) for aerobic and tertiary treatment for removal of nutrients, odour, and colour. The treated wastewater is collected in a collection tank and reused for irrigation. The sludge from BGS is pumped into Sludge Drying Bed (SDB) and the dried sludge from the SDB may be used as a soil conditioner.

Observation:

Septage from pits and septic tank located at individual households, institutes is disposed into septage treatment plant by cesspool vehicles. These septic tanks and pits were desludged at an interval of three to four years. The solid content in septage varies between 30-70%. Approximately 2- 3 kg of solid wastes such as napkins, shampoo covers, cigarettes, condoms are collected in each load of septage. In the initial observation it has been measured that 0.11 m^3/day of biogas is generated from the collected septage.

Performance:

Preliminary analysis of the solids and liquid streams during first month of operations shows good organic load reduction in the range of 90-99% from feeding tank inlet to PGF outlet (Refer Figure 2 and Figure 3). The NPK values of dried sludge from SDB are in ratio of 2.8: 0.63: 0.14.

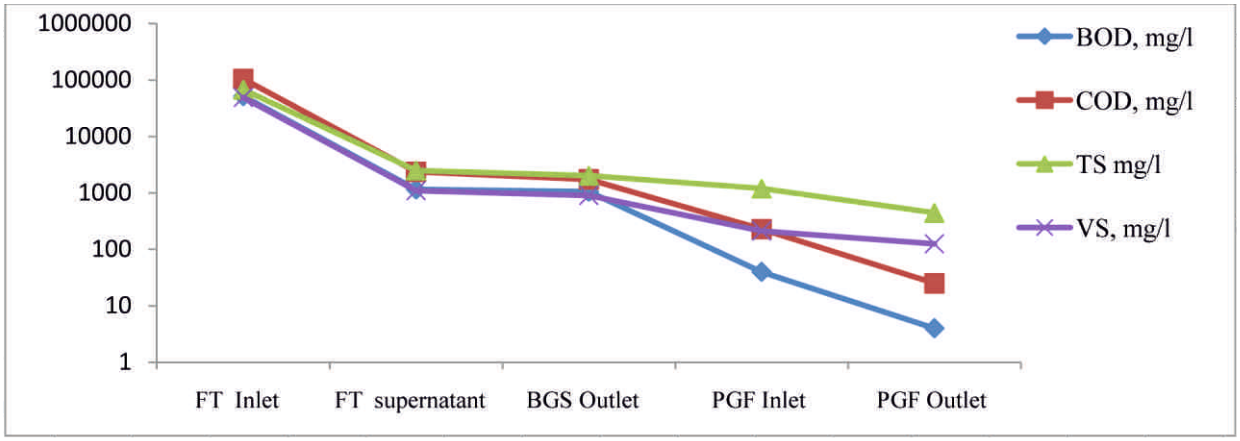

Figure 2 BOD, COD and Solids reduction

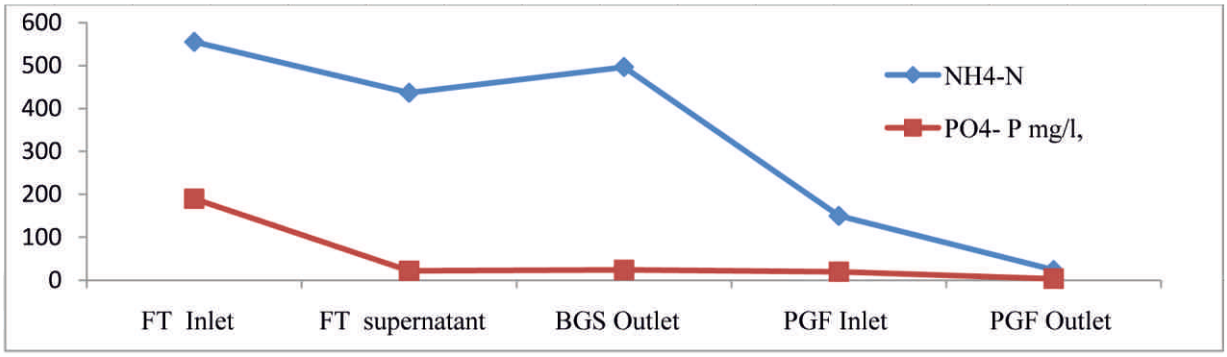

Figure 3 Nutrient removal at STP

Conclusions:

The feed of septage to the treatment system on a regular basis is a challenge due to various difficulties such as non availability of cesspool vehicles, location of treatment plant and desludging requirements. The influent septage characteristics are unstable with varying BOD, COD and solids content based on the type of collection systems, source and desludging intervals.

Next Steps:

The treatment system need to be further monitored in order to determine its treatment efficiency with gas production, peak time of gas production, quality of biogas, organic load reduction, and nutrient removal capacities during regular and continuous feeding of septage into the system. The sludge collected from the SDB need to be assessed for nutrient values and pathogen content for safe reuse.

References:

1. Ministry of Urban Development, India (March 2013), Advisory Note on Septage Management in urban India