DOMESTIC WASTE WATER TREATMENT BY USING BIO-SOIL FILTER

Ajit Chandgude ,
Student Civil Engineering,

Gaurav Shinde ,
Student Civil Engineering,

Nikhil Bandgar,
Student Civil Engineering,

Samadhan Farate
Student Civil Engineering,

Prof. Kumbhare P.P,
Assistant prof

Dr. P.D. Nemade
Principal

Abstract- Water resource management major challenge for development worldwide. While water demand will continue to increase, the limited amount of natural fresh water available will always be problematic in term of water resources management. Large portion of domestic waste water in small and remote communities few discharge in environment without effective treatment in areas with low population densities and dispersed household, waste water system strategies are needed which are environmentally ,socially and economically sustainable. A waste water treatment and disposal method the study aim to present the removal of suspended solid, bacterial indicators of fecal contamination, dissolved solid and parasites using bio-soil filter consist of three glass column .Two column contain gravel, red soil, murum, brick and rock wool.

Introduction

Domestic waste water collection and disposal are now one of the most public health and environmental problems worldwide. The wastewater generation globally is huge. The available data suggest that high income countries like USA 70% of wastewater is treated , upper middle countries treat about 38% generated wastewater is generated is treated. Lower middle income countries treat only 28% wastewater; low income counties treat only 8% wastewater. Most part of the world lack waste water collection system and also secondary treatment for wastewater.(Sato,etal., 2013). In India now still only 26 % of waste water in treated remaining waste water is directly deposed into environment without any treatment which creates a lot of environmental problems27cities only have primary treatment facilities 49 cities have primary plus secondary treatment facilities (ENVIS Center 2015).

As in India only 26% wastewater is treated remaining wastewater is disposed into the environment that is in river, sea and on land (ENVIS Center 2015).This pollutes our natural sources, biological cycle of this source, biodiversity which leads to climate change. Also in rural area there is waste water generation. In rural area the quality of wastewater is not good as urban area because water demand in rural area is less as compared to urban area. So we have to choose or develop another method for treatment.

Water resources management represents a major challenge for future development worldwide. While water demand will continue to increase, the limited amount of natural fresh water available will always be problematic in terms of water resources management .The reuse of waters with lower quality, such as domestic sewage previously treated, as alternative water sources should be considered for less restrictive uses. In view of the stringent water quality requirements in relation to water reuse, granular-medium filtration may offer an important tertiary treatment step. This filtration removes substantial amounts of wastewater particles and thus promotes effective disinfection as well as aesthetic acceptance of reclaimed water for beneficial uses.

In activated sludge process sludge with abundant atmospheric oxygen and aerobic bacteria. They act as fertilizing agent this activated sludge is mixed with row sewage at primary settling tank. This method has advantage like low installation cost, low land, loss of head is less. This method also has disadvantages as high operation cost, sludge disposal problem, sensitive to industrial waste, skilled supervision is required(Nagwekar, 2014).

Trickling Filter is an attached growth type of process in which micro-organic attached to the medium are used for removing organic matter from waste water. A rotary or stationary distribution mechanism distribution waste water from top or the filter percolating through the with very low operating cost. It also has the disadvantages like clogging. High skilled labour are required (Guyer et. al.,2014)

So overcome the problem of waste water treatment the BSF is most economical as well as efficient technique than the other method. This technique is best suitable in

decentralized rural area.The objective of the present study is to find performance of BSF treating wastewater and analyze the characteristics of raw and treated wastewater. As there is moving parts, maintenance is very low, greening and odor free and also required less land. This will prove the best system in rural part and urban areas too.

Literature review

- **Lahbibet.al.,(2016)** has studied performance of domestic waste water treatment by MSL-SF in laboratory scale. In this study three columns of glass having 120cm height and 12.5 cm diameter. Column consists of sand gravels at top & bottom having 10cm size. Between gravel the sand having 80cm height and 20cm opening. The results shows removal of suspended solids (99%), BOD(97%), COD (92%) and Helminthes egg (100%).
- **Mahi et al.,(2016)** has treat waste water by MSL system is composed of locally available materials soil, iron particles, jute or sawdust, charcoal and zeolite. The MSL system consist two-layer permeable layer alternate with soil mixture blocks. They concluded that MSL technology successfully used in pilot scale and full scale. Excellent efficiency was observed with waste water.
- **Mohammed and. Salih, (2004)** has researched and introduced to the subject of water purification through the types of water treatment Plants. Then focused on the work of the filters with different design with special emphasis on the type of materials (media) used in the filters with the standard specifications, tables and curves of head losses during filtrations and backwashing for each media type. Then displayed models of the designs of filters in water treatment Plants in some Kurdistan cities.
- **Lamzouriet.al., (2016)** were experimented on the MSL system which consist first layer of permeable gravel layers (PL): consists of gravel, pumice. Perlite or zeolite with a small and uniform diameter of 1-5 mm and second of Soil mixture blocks (SMB) consists of: Soil, Charcoal, Sawdust. The experimental setup included three parallel similar MSL pilot. Three HLRs were applied; 250, 500 and 1000 $L/m^2/day$ respectively for each MSL system. The results obtained are average reduction efficiency for SS, BOD5 and COD of 83-89, 78-86 and 71-82 %, respectively, and nutrients (61-85 % of NH4+-N, 71-84 % of TKN, 67-82 % of TN, 81-91 % of PO-4-P and 74-90 % of TP). The mean removal percentage of SS, BOD5, COD and TP tended to be higher at lower HLRs.
- **Ho and Wang, (2015)** had done the work on multi-soil-layering (MSL) system. The multi-soil-layering (MSL) system primarily comprises two parts, specifically, the soil mixture layer (SML) and the permeable layer (PL). In Japan, zeolite is typically used as the permeable layer material. In the present study, zeolite was substituted with comparatively cheaper and more environmentally friendly materials, such as expanded clay aggregates, oyster shells, and already-used granular activated carbon collected from water purification plants.TP removal efficiency higher than 90%. A series of indoor tests indicated that the suspended solid (SS) removal efficiency of granular activated carbon was between 76.2% and 94.6%; zeolite and expanded clay aggregates achieved similar efficiencies that were between 53.7% and 87.4%, and oyster shells presented the lowest efficiency that was between 29.8% and 61.8%.
- **Healy, et al., (2007)** analyzed a stratified sand filter column, operated in recirculation mode, over a period of 342 d. Then they found that it was capable of removing over 99% of COD, and 100% of TSS. By increasing the hydraulic loading on the column in gradual increments, the best performance occurred at a forward flow of 10 $L/m^2/day$ with a 3:1 recirculation. This gave a Tot-N reduction of 86%.As the proportional surface area requirement for the sand filter described in this study isless than the recommended surface area requirement of a free water surface (FWS) wetland treating an effluent of similar quality, it could provide an economic and sustainable alternative to conventional wetland treatment.
- **Mohamed et al., (2004)** has studied the filtration by two methods of flow i.e. Ascendant Filtration and Descendant Filtration. In the case of filtration in the ascendant mode, the liquid flows from the higher to lower porosity through the bed, and suspended solids retention therefore occurs through the entire bed. The COD, turbidity and color removal for experiments using sand. The efficiency of ascending filtration was near about 80%. In case of the descending filtration the efficiency observed is average 40% to 70%.

Conclusions

Laboratory based Bio-Soil Filter (BSF) system is to be designed and experiments were conducted to observe the performance of domestic waste water treatment.

1. The BSF system is proved efficient technique to remove SS, organic matter & parasites from domestic waste water.
2. The efficiency of sand filter is dependent on HLR, filter media of bio-soil.
3. By providing alternate drying and wetting cycle to avoid frequent clogging of BSF, and maintain the microbiology and cleaning the voids at top layer to get maximum flow rate.
4. It is observed that pH and DO of influent is get increased when it passes through the filter media i.e. bio soil filter.

It is observed that BOD and COD of effluent are decreased.

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