Efficiency of Betel nut powder,Corn waste, and sand filter in reducing pollutants from wastewater

Hardik M. Manvr[1],Dr. S. A. Puranik[2]

[1]*Chemical Engg. Dept., L. D. College of Engineering, Ahmedabad – 380015*
[2] *Director Atmiya Institute of Technology and Science,Rajkot*

Abstract:
In this work, I tried to improve the efficiency and performance of the sand filter with a simple low cost method, to facilitate good environmental and health conditions in developing countries. This work successfully reported an alternative for the traditionalbiological sand filter which was considered as a time consuming filter. Betel nut powder, Corn waste added to the filter and their effects were observed. The filter was designed and then UV treatment is given to the water to reduce further pathogens removal. The results of this work indicated that chemical oxygen demand (COD) was reduced by 53%. Moreover, the total suspended solids (TSS) removal % reached to 86%. Also, the total organic carbon (TOC), surfactants (SUR), biochemical oxygen demand(BOD), and total bacterial count were reduced whenwere used.

Keyword: *Betel nut powder, Corn waste, Sand filters, Pollutant, Wastewater*

1. INTRODUCTION

Recycling and reusing of wastewater has become one of the most important parts of water management demands.One of the economical and effective process for the waste water treatment is sand filtration. Soil treatment has emerged as one of the promising technologies for wastewater renovation. In addition, the removal of pathogens, nutrients, suspended solids and other organic pollutants is necessary for safe and healthy environment. Wastewater treatment by filtration is considered to be one of the most used processes to produce high quality water and effluent which can be reused for various purposes. The efficiency of thefiltration process depended on the chemical and physicalproperties of the filter and the nature of the materials neededto be removed.In recent years, peoples returned to use sand filters (SFs) inwater treatment due to their simplicity, low cost, and efficiency. In this study, Betel nut powder, Corn wastewere added to the sand filter to increase its efficiency and performance. Betel nut powder is used in wastewater treatment as it is considered as a cheap natural enzyme inhibitor, detergent, and astringent like activities, moreover it has ability for high adsorption capacity

One if the economical and effective process for the west water treatment is sand filtration. Soil treatment has emerged as one of the promising technologies for wastewater renovation. In sand filtration treatment, wastewater is first treated by conventional physicochemical and/or biological treatment and then allowed to infiltrate through aerated unsaturated zone wherein it gets purified through unit operations and processes such as filtration, adsorption, chemical processes and biodegradation. Operation cost, operating requirements with local skills and space constraint particularly in the urban sector of the developing world have limited their application to a great extent.Recycling and reuse of maximum quantity of treated wastewater on-site will help in reducing the use of potable water.Improvement in environmental conditions and reduction of the water pollution.Improvement in environmental conditions and reduction of the water pollution.

2. Materials and methods

The Betel nut powder, Corn waste were bought from the local market in Ahmedabad. Also, commercial white sand is used. Preparation of Betel nut powder, Corn waste: The raw Betel nut powder is washed with distilled water to remove impurities and then dried in oven. Corn waste is converted in powdered form and then blended in a food processing blender. The Betel nut powder and corn waste was sieved to obtain homogeneous particle size. And then filled in the column as shown in the fig-1.

3. Experimental Setup

Constructed lab scale sand filter packed column. With soil and other prepared media. With UV lights to improve the pathogen removal.

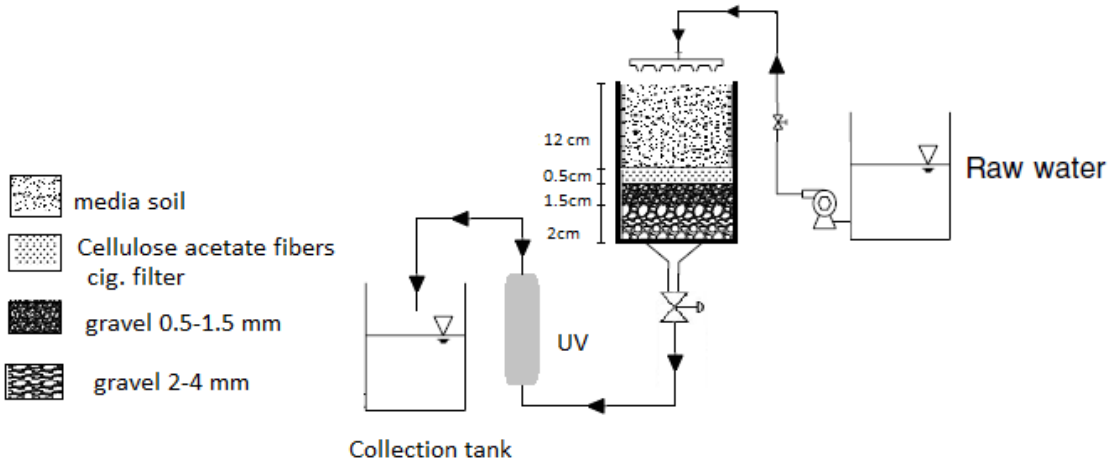

Fig. 1 Process flow design for Experimental setup

Specification of system

Centrifugal pump with head 5ft.
Philips Uv Lamp, Chamber, 8'tuv 11 WT
UV light has different wavelength between 100- 400 nm.
100-200 vacuumUV, 200-280 UV-C, 280-315 UV-B, 315-400 UV-A
UV-C radiation used for treatment is most effective at a wavelength of 264
And prepared soil media with fine sand, corn waste, betel nut powder
Column dia. 20.5 cm
Height 16 cm

4. Results and discussion

Sr.no.	*Parameter*	*Inlet*	*Outlet from soil bad*	*Outlet from uv*
1	pH	7.13	7.4	7.4
2	COD	380	210	178
3	BOD	126	80	57
4	TDS	1260	1253	1253
5	TSS	250	34	34
6	DO	0.6	0.8	

Table 1- Parameter results from inlet and outlet

- COD is decreed by 53%
- BOD is decreed by 40%
- TSS is decreed by 86%
- There is no significant change in the pH, TDS and DO.
- DO level may increase if we increase the residence time.
- These parameters can further be reduced by increasing the height of the column and may increase if we increase the residence time.

4. CONCLUSION

Hence the media used in this analysis is very effective in reducing parameters COD is decreed by 53%BOD is decreed by 40%TSS is decreed by 86%. Further research in this area for different composition of media can be done.

5. REFERENCES

[1]. Avinash M. Kadam, Pravin D. Nemade, G.H. Oza, H.S. Shankar *"Treatment of municipal wastewater using laterite-based constructed soil filter"* Ecological Engineering 35 (2009) 1051–1061

[2]. *Nemade PD, Kadam AM and Shankar HS, "Arsenic and iron removal from water using constructed soil filter–a novel approach." Asia- Pacific J ChemEng 3:497–502 (2008).*

[3]. *S. Luanmanee, T. Attanandana , T. Masunaga , T. Wakatsuki "The efficiency of a multi-soil-layering system on domestic wastewater treatment during the ninth and tenth years of operation" Ecological Engineering 18 (2001) 185–199*

[4]. *Nadine Kotlarz, Daniele Lantagne, Kelsey Preston and Kristen Jellison "Turbidity and chlorine demand reduction using locally available physical water clarification mechanisms before household chlorination in developing countries" Journal of Water and Health 07.3 2009*

[5]. *Katja Sonja Nitzsche, Pascal Weigold, Tina Lösekann-Behrens, Andreas Kappler, Sebastian Behrens "Microbial community composition of a household sand filter usedfor arsenic, iron, and manganese removal from groundwater in Vietnam", Chemosphere 138 (2015) 47–59*

[6]. *Mohamed Ramadan "Efficiency of new Miswak , titanium dioxide and sand filters in reducing pollutants from wastewater" beni-suef university journal of basic and applied sciences 4(2015) 47-5 1*

[7]. *Almoayied Assayed, Jonathan Chenoweth, and Steven Pedley "Assessing the efficiency of an innovative method for onsite greywater treatment: Drawer compacted sand filter – A case study in Jordan" Ecological Engineering 81 (2015) 525–533*

[8]. *Elisabeth Richter, Fabian Hecht, Nadine Schnellbacher, Thomas A. Ternes,*

[9]. *Arne Wick, Florian Wode, Anja Coors "Assessing the ecological long-term impact of wastewater irrigation on soil and water based on bioassays and chemical analyses" Water Research 84 (2015) 33e42*

[10]. *Khengaouia, MahfoudHadjMahammeda, YoucefTouila, AbdeltifAmraneb "Influence of secondary salinity wastewater on the efficiency of biological treatment of sand filter" Khairia ,International Conference on Technologies and Materials for Renewable Energy, Environment and Sustainability, TMREES15 Energy Procedia 74 (2015) 398 – 403*

[11]. *Bruce Petrie, Ruth Barden, Barbara Kasprzyk-Hordern "A review on emerging contaminants in wastewaters and the environment: Current knowledge, understudied areas and recommendations for future monitoring" water research 72(20 5) 3-2 7*

[12]. *Luz E. de-Bashana,,YoavBashana "Recent advances in removing phosphorus from wastewater and its future use as fertilizer (1997–2003)" Water Research 38 (2004) 4222–4246*

[13]. *Sarah-Jane Haig , Christopher Quince, Robert L. Davies,Caetano C. Dorea ,Gavin Collins "Replicating the microbial community and water quality performance of full-scale slow sand filters in laboratory-scale filters" water research61(2014)141-151*

[14]. *Mathilde J. Hedegaard, Erik Arvin, Charlotte B. Corfitzen, Hans-JørgenAlbrechtsen "Mecoprop (MCPP) removal in full-scale rapid sand filters at a groundwater-based waterworks" Science of the Total Environment 499 (2014) 257–264*

[15]. *A.M. Al Omron, S.E. El-Maghraby, M.E.A. Nadeem, A.M. El-Eter, H. Al-Mohani "Long term effect of irrigation with the treated sewage effluent on some soil properties of Al-Hassa Governorate, Saudi Arabia" Journal of the Saudi Society of Agricultural Sciences (2012)11,15–18*

[16]. *Ju¨rgen Kern "Treatment of domestic and agricultural wastewater by reed bed systems" Christine Idler Ecological Engineering 12 (1999) 13–25*