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Wastewater Treatment System for Residential Society in Badlapur, Thane District Maharashtra

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ABSTRACT

One of the most persistent problem of today is water scarcity. It has been estimated that one in three persons will face water scarcity by the year 2025 in India (IWMI 2013) or around 2.7 billion people worldwide by the same time (UN Report 2016). Water resources are abundant, but they are unevenly distributed: 97% of water available on earth is related to the seas and other water resources. The need for increased water requirement for the growing population in the new century is generally assumed, without considering whether available water resources could meet these needs in a sustainable manner. The question about from where the extra water is to come, has led to this study.

In this research paper a low cost treatment system has been proposed for Mohan Willows society in Bhosale Nagar, Badlapur(E). As per literature review the presence of heavy metal content is negligible or absence in residential building. So the research is focused on the treatment of COD, BOD, Turbidity and Total Hardness before reusing for gardening, vehicle and floor cleaning, etc.

Keywords: Waste water, Badlapur, Water Management, Treatment System

INTRODUCTION

1.1 General

Residential water consumption approximately makes up 10% of overall water consumption, preceded only by water consumed by agricultural irrigation and water consumption by industries. Building industry practitioners like Engineers and Designers have begun to pay consideration to scheming and controlling the ecological damage due to their activities. Particularly frontline professionals have a unique opportunity to reduce ecological impact through the accomplishment of sustainability objectives at the planning and design stage of a building plan. [1]

Wastewater is any water that has been polluted by human use. Domestic wastewater can contain physical, chemical and biological pollutants. Broadly we can classify waste water as blackwater and greywater. Black water can contain feces, urine, water and toilet paper from flush toilets. Black water is distinguished from grey water, which comes from kitchen sinks, bathrooms, washing machines, and other kitchen appliances apart from toilets. Greywater can be further categorized based on the source of waste like light greywater and dark grey water. In the recent past, there is comparatively increased awareness among the governments and bodies dealing with water management to address the challenges related to water security. Measures to reduce water usage through increased awareness, installation of rainwater harvesting and grey water (GW) treatment systems are seen as promising solutions, especially in developing countries that are more vulnerable to water scarcity like India. Water is an essential part of human's life. In water shortages, three key methods: water conservation, desalination and recycling could be considered. Due to lower costs and possibility of wastewater treatment in waste production site, water recycling is much better than the other two methods. Greywater reuse is increasingly emerging as an integral part of water demand management. [2, 3]

The need for increased water requirement for the growing population in the new century is generally assumed, without considering whether available water resources could meet these needs in a sustainable manner. The question about from where the extra water is to come, has led to this study. The research work in this research article will illustrate the possibility and opportunity to reuse of light greywater in a residential building

1.2 Study Objective

The main objective of the research article is to study suitable wastewater treatment system for the case study residential society.

2. LITERATURE REVIEW

A literature review of scholarly articles, books, dissertations, conference proceedings and other resources which are relevant to the study of light greywater effluent, carried out to set the background on what has been explored on the topic so far. An extensive literature review provides background information on current knowledge related to the research topic.

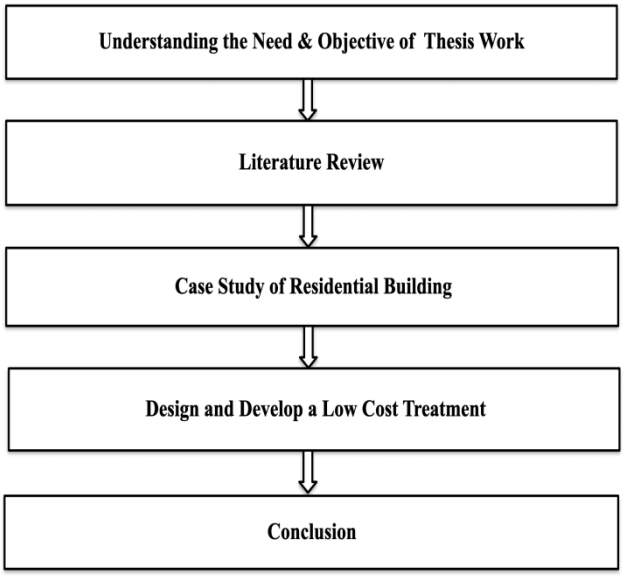
Table No. 1: Various approaches to reuse of Grey Water Treatment System from Various Research Paper

Sr. No.	Tittle	Year of Publication	Characteristics of Treatment System
1.	The Design Of Wastewater Treatment System In Tall Residential Building Using Phytorid By Komal Hemant Malpani	2015	• Decentralised biological wastewater treatment system. • Suitable for Tall Building. • Using a patented 'Phytorid' technology. • This technology uses no electricity, requires minimal manpower and uses natural plants. • Reused for landscape and gardening.
2.	Water filter-based MBR unit in laundry effluent treatment M A Islam Et. al	2017	• An aerobic membrane bioreactor (MBR) system with filter. • Suitable for group of Buildings. • Efficient to remove flux, COD.
3.	Laundry wastewater treatment using coagulation and membrane filtration By S. Šostar Turk Et. al	2017	• Precipitation/coagulation and the flocculation process with adsorption on granular-activated carbon (GAC) – No scope or possibility of selection of parameters. • Precipitation/coagulation and the flocculation process with reverse osmosis. - possibility of selection
4.	Design and Treatability Studies of Low Cost Grey Water Treatment with Respect to Recycle and Reuse in Rural Areas By Vijaya V. Shegokar Et al.	2018	• Laboratory scale grey water treatment system. • Five stages of physical operations of raw grey water unit.
5.	Greywater Reuse System Design and Economic Analysis for Residential Buildings in Taiwan By Yi-Kai Juan	2019	• Applicable for the family unit (size of 4 to 6 persons). • Interior Customized Greywater System (ICGS). • This system has a minimum payback period of 4 years.

METHODOLOGY

In this section the step by step method to carryout the research work is illustrated in flow diagram as shown following.

Figure 1: Methodology Process



CASE STU DY

In this section basic detail of case study is illustrated as follows

PROJECT DETAILS	
Building Name	Mohan Willows
Address	Bhosale Nagar, Shirgoan, Badlapur(E), near Asaram Bapu Ashram, Badlapur, Maharashtra
Total No of flats	131
Parameters Studied	pH, turbidity, TDS, while chemical tests should be performed for its COD, BOD, Oil & Grease, Conductivity, Total Hardness, Calcium, Magnesium, dissolved oxygen, alkalinity, Sulphate, Iron, Lead, Zinc, DO and Nitrate

Figure No. 2: Case Study Building

Figure No. 3: Photos While Collecting Light Greywater at Source

The physicochemical composition of light greywater effluent samples was statistically analysed in April - May 2022 and the results are presented in the form of acceptability or class of the parameter based on Water recycle/reuse standards based on protection of human health and the environment and suitability for the intended reuse application in below section.

Figure No. 4: Glimpse of Conducting Test in Laboratory

Table No. 2: Washing machine Quality Classification based on Recycle/Reuse Standards

Sr. No.	Analysis Parameters	Mean Value	Acceptability
01	pH	9	On border limit
02	COD	1547.4	Above the permissible limit
03	BOD	179.3	Above the permissible limit
04	Oil and Grease	1.8	Doubtful
05	Turbidity	107.9	Above the permissible limit
06	Conductivity	640	Doubtful
07	TDS	722.7	Within Permissible limit
08	Total Hardness	621.6	Above the permissible limit
09	Calcium	4	Within Permissible limit
10	Magnesium	1.4	Within Permissible limit
11	Total Alkalinity	36.7	Doubtful
12	Sulphate	25.3	Within Permissible limit
13	Iron	0.7	Within Permissible limit
14	Lead	<0.003	Within Permissible limit
15	Zinc	<0.01	Within Permissible limit
16	Dissolved Oxygen	N.D	Insufficient to be in permissible limit
17	Nitrate	0.2	Within Permissible limit

The table represents the parameters have exceed the permissible limit of recycle/reuse of water like COD, BOD, Turbidity, TDS and Total Hardness so there is a need for an appropriate treatment system to reuse the light greywater in the case study building.

TREATMENT SYSTEM

5.1 Treatment System Model

The experimental setup was performed by using low cost materials and their performance was evaluated. The low cost material such as sand, gravels, granular activated carbon was used in the filtration unit. The sample of water was taken before and after filtration of each filter bed at 10 ml/min of water flow rate.

The samples were analysed for the physical and chemical parameters to check the quality of light greywater collected. The filtration system consist of following four unit:

i) Influent storage Chamber

ii) Filter Media- I

ii) Filter Media – II

iv) Effluent storage Unit

5.2 Treatment System Analysis

The samples were analysed for the parameters which are above the permissible limit as per standards in the same laboratory where the previous examination has been carried out. The pH and turbidity of wastewater was 9.1 and 171 NTU respectively which is reduced to a level of 7.61 and 28.9 NTU and become within permissible limit. The total hardness of waste water is reduced to 262.7 mg/l from 614 mg/l. Additional parameters like COD reduced from 1520 mg/l to 78.20 mg/l with BOD from 187 mg/l to 21.4 mg/l. The values are illustrated in graphical form.

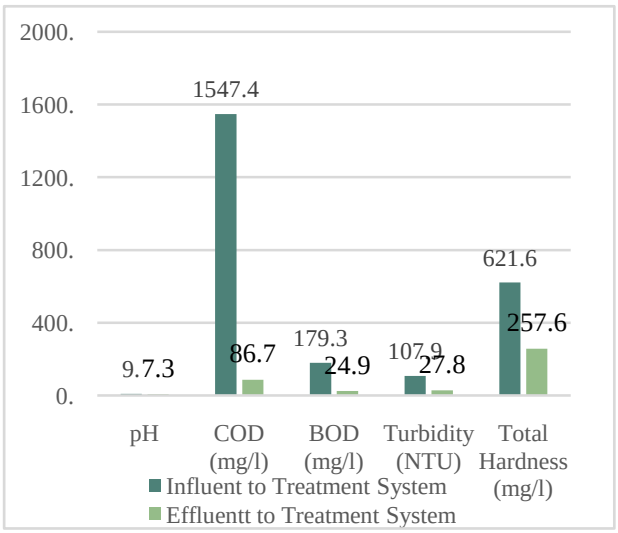


Figure No. 5: Inlet and Outlet Value Designed Filter System

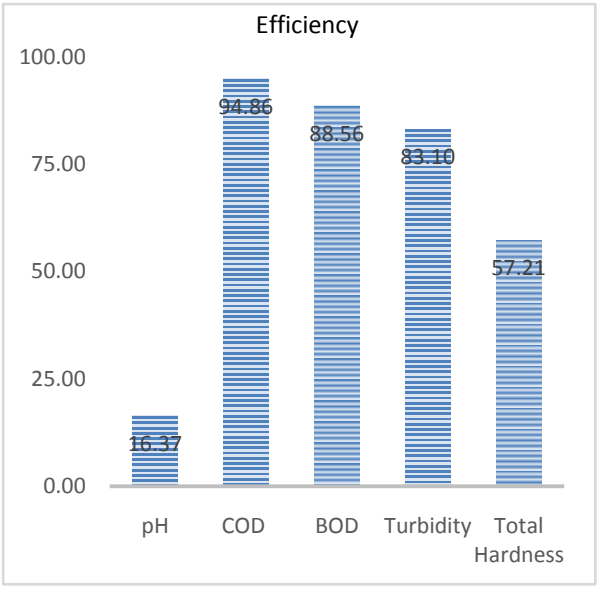


Figure No. 6: Efficiency of Designed Treatment System

Readings indicates the removal of pollutants in water treatment system. Due to sedimentation, the course size and fine solid particles are settled down by gravitational force and only clear water flew towards sand and gravel filters. The result the pH has been reduced to 18.67%, were as COD and BOD has a much higher efficiency which is about 94.40% and 86.11% respectively. The turbidity and total hardness removed about 74.24% and 58.56% respectively. In following the efficiency % has been illustrated in graphical format.

CONCLUSION

While everyone is active in washing their hands regularly to stay safe from the virus and infection, but we cannot afford to take water for granted by leaving taps on for the 20-second cleansing routine and all.

From the study, it can be concluded by providing an appropriate treatment system in case study building, society can be able to reuse grey water for other purposes and able to save the water. In simple words we can say providing a decentralise treatment system we can able to reduce the load on central sewage treatment system and able to meet the gap of state in terms of untreated water and safeguard towards waste water management and environment. However, the vast majority of these parameters were lower than recommended value, which does not minimise the environmental and public health impact. However, this does not eliminate the need for special treatment before the disposal of light grey wastewater.

REFERENCE

[1] Shirazi MMA, Kargari A, Shiraz MJA (2012) Direct contact membrane distillation for seawater desalination. Desalin Water Treat 49: 368-375. Link: https://goo.gl/gvo7AS

[2] Nemerow Nelson Leonard, Dasgupta Avijit, "Industrial and Hazardous Waste Treatment", van Nostrand Reinhold, 1991

[3] Dolnicar S, Schafer AI (2009) Desalinated versus recycled water: public perceptions and profi les of the accepters. J Environ Manag 90: 888-900. Link:https://goo.gl/r6RDEs

[4] Lu W, Leung AYT (2003) A preliminary study on potential of developing shower/laundry wastewater reclamation and reuse system. Chemosphere 52: 1451-1459. Link: https://goo.gl/2kYyQn.

[5] Shirazi MMA, Kargari A, Shiraz MJA (2012) Direct contact membrane distillation for seawater desalination. Desalin Water Treat 49: 368-375. Link: https://goo.gl/gvo7AS

[6] Dolnicar S, Schafer AI (2009) Desalinated versus recycled water: public perceptions and profi les of the accepters. J Environ Manag 90: 888-900. Link: https://goo.gl/r6RDEs

[7] Lu W, Leung AYT (2003) A preliminary study on potential of developing shower/laundry wastewater reclamation and reuse system. Chemosphere 52: 1451-1459. Link: https://goo.gl/2kYyQn

[8] Wendland C, Albold A (2010) Sustainable and Cost-effective Wastewater Systems for Rural and Peri-urban Communities up to 10,000 Population Equivalents: Guidance Paper. Women in Europe for a Common Future (WECF), Munch, Germany. Link: https://goo.gl/Kv4Neq

[9] Pakula C, Stamminger R (2010) Electricity and water consumption for laundry washing by washing machine worldwide. Energy Effi c 3: 365-382. Link:https://goo.gl/FSRrSJ

[10] Ciabatti I, Cesaro F, Faralli L, Fatarella E, Tognotti F (2009) Demonstration of a treatment system for purifi cation and reuse of laundry wastewater. Desalination 245: 451-459. Link:https://goo.gl/wbyLPt

[11] Dolnicar S, Saunders C (2005) Marketing recycled water: review of past studies and research agenda. Integrated concepts in water recycling. Wollongong: University of Wollongong, Australia. 181-92. Link: https://goo.gl/e2Xut2

[12] Ngo HH, Chuang H, Guo WS, Ho DP, Pham TTN, et al. (2009) Resident's strategy survey on a new end use of recycled water in Australia. Desalination Water Treatment 11: 93-97. Link:https://goo.gl/ps92VH

[13] Pham TTN, Ngo HH, Guo WS, Dang HPD, Mainali B, et al. (2011) Response of community to the public use of recycled water for washing machine: a case study in Sydney, Australia. Resource Conservation Recycling 55: 535-540. Link:https://goo.gl/utc1kc

[14] Janpoor F, Torabian A, Khatibikamal V (2011) Treatment of laundry wastewater by electrocoagulation. J Chem Technol Biotechnol 86: 1113-1120. Link:https://goo.gl/jkVdB9

[15] Berstein M (1986) Water and Wastewater: a Guide for Industrial Launderers, first ed. Institute of Industrial Launderers, Washington DC, USA.