Abstract

Journal of Mechanical Engineering Advancements - Volume 2 (Issue 1) May, 2025

Pages: 16-25

Next-Generation Greywater Treatment: MBR Technology and its Applications - A Case Study

Author: Susmita Pandit, Swachchha Majumder, S. N. Roy and Sourja Ghosh

Category: Renewable Energy Sources

[Download PDF]

Abstract:

Greywater is non-industrial wastewater generated from household works like dishwashing, laundry and bathing. Before decay, it was just an imagination of treating wastewater and reusing it, but in today's scenario, this is happening for treatment of greywater for non-potable or potable purposes. According to the researchers, it is anticipated that one out of every three people would encounter water scarcity by the year 2030 or by the same period, there will be around 2.7 billion people on the planet. Governments and citizens have become more conscious of the issue in recent years. Authorities' in-charge of water management handles the issue of water security and poses several concerns. Reduced cost measures increased awareness of water usage, as well as the installation of water-saving devices. Rain water collection and greywater treatment systems are viewed as possible alternatives, particularly in developing nations, where water constraint is more prevalent.

The current study was done to reuse the waste (grey) water from the main canteen at Adamas University and use it for drinkable purposes utilizing membrane bioreactor (MBR) technology. Total wastewater generated daily from the university canteen is 12,200 L. This was recorded, and physicochemical characteristics like BOD5, DO, COD, TDS, oil and grease, MPN, TOC, and others were analyzed. With various sludge doses, a bio-reactor setup was created in which the most organic matter was breaking down. Low-cost clay alumina based 19 channels configuration with TiO2-coated UF ceramic membranes developed at CSIR-CGCRI was used in this study. Greywater that has been treated had a pH of 7.9. Oil and grease (99%); turbidity (99%); COD (99%); suspended solids (99%); BOD (99%); E. coli, total coliform; the efficacy of removal for all of the factors with the ultrafiltration membrane was as follows. Excellent results have been obtained from the permeate sample, which states that all the values of physicochemical parameters have successfully been reduced and when compared with the raw samples, clearly indicates that the treated water may be used for non-potable purposes and is within WHO-permissible limits.

Keywords: Grey water, MBR, Bio reactor, Optical density, Ceramic membrane

Cite this article:

Susmita Pandit, Swachchha Majumder, S. N. Roy and Sourja Ghosh, Next-Generation Greywater Treatment: MBR Technology and its Applications - A Case Study, Journal of Mechanical Engineering Advancements. Vol 2 (Issue 1: January-April, 2025), pp 16-25.

References:

1. Majumdar S., Sarkar S., Ghosh, S., Bhattacharya, P., Bandyopadhyay, S., Amrita Saha, Sayantika Mukherjee, Dipanwita Das, G. L. Sharma and S. N. Roy (2018), New Trends for Wastewater Treatment and Their Reuse Using Ceramic Membrane Technology: A Case Study. In: Water Quality Management (Vol.79, pp. 339-348). Springer, Singapore. [DOI: 10.1007/978-981-10- 5795-3_29]

2. Bandyopadhyay S, Kundu D, Roy S. N, Ghosh B. P. and Maiti H. S. (2006), Process for preparing water having an arsenic level of less than 10PPB. US Patent7014771.

3. Kele, B., Wolfs, P., Tomlinson, I., Hood, B. and Midmore, D. (2005). Greywater Reuse in a Sewered Area Design and Implementation at Research House in Performance assessment for on- site systems: regulation, operation, and monitoring: Proceedings of On-site'05 Conference (pp. 257-264), LanfaxLaboratories.

4. Laasri L, Elamrani M. K,Cherkaoui O. (2007), Removal of two cationic dyes from a textile effluent by filtrationadsorption on wood saw dust, Environ. Sci. Pollut. Res.14:237–240.

5. Tolkou A., Zouboulis A and Samaras P., (2014), The incorporation of ceramic membranes in MBR systems for wastewater treatment: advantages and patented new developments, Recent Patent, Eng 8:1–9

6. Bhattacharya, P., Sarkar, S., Ghosh, S., Majumdar, S., Mukhopadhyay, A., and Bandyopadhyay, S. (2013), Potential of ceramic microfiltration and ultrafiltration membranes for the treatment of graywater for an effective reuse. Desalination and Water Treatment, 51 (22-24), 4323-4332.

7. De Gisi, S., Lofrano, G., Grassi, M., and Notarnicola, M. (2016), Characteristics and adsorption capacities of low-cost sorbents for wastewater treatment: a review, Sustainable Materials and Technologies, 9, 10-40.