**Performance of Vertical Flow Constructed Wetland with Continuous Feed for Laundry Wastewater Treatment.**

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**Abstract:** Water shortage has been escalating daily in recent years. A fraction of this issue can be solved by segregating laundry wastewater treatment for household washing machine and laundry industry effluents. Given the long-term sustainability of the environment, this will serve two purposes. One will be preventing the negative effects of anionic surfactants on aquatic life and foaming in water bodies. The other will involve getting rid of the nuisance effects of detergents in sewage treatment plants.

This research investigates the potential of using vertical flow constructed wetland (VFCW) system to treat laundry wastewater. The VFCW system is a low-cost and sustainable technology that utilizes natural processes to remove pollutants from wastewater. In this study, three laboratory-scale continuous flow VFCW reactors (each of 50 cm height, 20 cm diameter) were designed and operated to treat synthetic as well as actual laundry wastewater. The flow was set as a continuous system with a hydraulic retention time of 48 hours. Unit-1 comprised of only media (i.e., gravel of size 10-12mm), while unit-2 and unit-3 were both were planted with locally available macrophyte *Typha angustifolia* (Narrow Leaved Cattail). Gravel and bamboo waste chips served as the media for reactor-2 and reactor-3, respectively. The whole setup was used to examine the role of plant and media in removal of anionic surfactant, organic matter and sulphate from laundry wastewater by the combination of physical, chemical, and biological processes.

The performance of the three CW units were evaluated based on the removal efficiency of pollutants such as anionic surfactants, chemical oxygen demand (COD), biochemical oxygen demand (BOD), total suspended solids (TSS), and sulphates. The results show that all three units were effective in removing pollutants from the laundry wastewater, with the planted units exhibiting higher removal efficiencies compared to the unplanted unit. The study also examined the effect of temperature on the plants’ growth. The chlorophyll content of macrophytes remained stable initially but decreased later with time. Also, the variation in total number of viable bacteria was studied using heterotrophic plate count method. Overall, this study provides valuable insights into the effectiveness of continuous flow vertically downward constructed wetlands for treating laundry wastewater and highlights the potential of using bamboo waste chips as a low-cost, sustainable media for such systems.

**Keywords**: Detergent, Pollutants, Anionic Surfactant, COD, BOD, Sulphate, Laundry Wastewater, Vertical Flow Constructed Wetland, Bamboo Waste, Decentralized Treatment, Removal Efficiency