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A Review of the Domestic Wastewater Treatment (DWWT) Regimes

Karan Veer*

Department of Electronics and Communication Engineering, University Institute of Engineering and Technology Sector 25, Panjab University, Chandigarh, India

Abstract

It is predicted that by 2050, the rapid increase in population and concurrent urbanisation will deplete clean water supplies. Domestic wastewater (DWW) contains inorganic and organic constituents that are toxic to aquatic organisms. Traditional remediation methods (physical, chemical and biological) can be used on-site or off-site to purify polluted domestic water (activated sludge, built-wetlands, stabilisation ponds, trickling filters and membrane bioreactors) and each has advantages and disadvantages. Biosorption of toxic chemicals and nutrients by microorganisms, bacteria (microbe-mediated remediation), fungi (mycoremediation) and algae (phycoremediation) has shown promising results. The type of waste, its concentration, heterogeneity level and the percentage of clean-up required, as well as the feasibility of the clean-up technique and its efficiency, practicability, operational difficulties, environmental impact and treatment costs, are all factors to consider.

Keywords: Stabilisation ponds • Organisms • Fungi • Toxic

Introduction

Water, as everyone knows, is "the elixir of life" and a valuable resource for agricultural, industrial and domestic purposes. However, it is also true that we have limited access to safe freshwater. The global increase in water scarcity has prompted the reuse of treated wastewater (WW). Global water consumption has increased by a factor of six in the last century and will continue to rise at a rate of 1% per year. Furthermore, variability in rainfall patterns, rapid population growth, urbanisation and industrialization have exacerbated the issue of water security.

The practise of protecting and maintaining the quality of drinking water began several hundred years ago. Rapid medical and scientific advancements have resulted in the provision of basic sanitation services in both urban and rural areas. Philadelphia was one of the first cities in the United States to have piped drinking water. In 1801, drinking water began to flow through the Philadelphia Water Department's mains. Surprisingly, connecting disease spread with centralised water systems was a major step forward for the public health protection system. Under the auspices of the Centers for Disease Control and Prevention (CDC), various water treatment and purification techniques for domestic wastewater (DWW), such as filtration, well-maintained distribution systems and disinfectants, are used [1].

Description

Conventional processes can treat sullage/greywater and convert sludge into a variety of less harmful byproducts. Conventional treatment methods are classified as preliminary, primary, secondary and advanced. The primary goal of WWT is to I remove biodegradable organic substances; (ii) remove various nutrients, such as phosphates; (iii) destroy pathogens; and (iv) prevent water pollution to protect aquatic organisms. However, the major constraints are maintenance and monitoring, emerging contaminants, low efficiency and sludge treatment and disposal, which raise the total cost of WWT [2].

PHA produced by microorganisms has numerous potential applications as a biodegradable plastic with thermoplastic properties such as softness and reversible deformation. The cost of carbon substrate is one of the major impediments to profitable PHA production. Large amounts of PHA can be obtained from activated sludge and other mixed microbial cultures, where food wastes (e.g., cooking oil or other inexpensive waste material from industry) can be used as potential substrates to reduce the cost and energy consumption in bioplastic production. This is especially important for wastewater treatment plants because removing fats from wastewater increases costs and consumes more energy. As a result, the PHA produced during biosynthesis is a more environmentally friendly alternative to traditional plastics manufacturing. The use of previously cooked food [3,4].

The literature describes various approaches to microorganism, nutrient medium and culture condition selection. The use of the microalgae Chlorella sp. is one example. as well as an anaerobic fermentation fluid rich in volatile fatty acids (VFAs), which is one of the best substrates for PHB recovery. Another method is to use CO_2 as a carbon source and sulphur as an energy source. This method has been successful in Gram-negative aerobic heterotrophic bacteria of the species Acidiphilium cryptum. Furthermore, it has been demonstrated that supplementing the medium with glucose can improve microorganism growth. Peptone is another popular component that is used in a variety of applications. Peptone was the main nitrogen source in studies on PHB production by Bacillus spp, while glucose provided the carbon, there is little information on the effects of key Pseudomonas fluorescens bacteria were used in this study because they are Gram-negative aerobic rods with a high capacity for PHB accumulation and secretion of a fluorescent pigment that allows them to be observed under UV light. Pseudomonas fluorescens can be used in wastewater treatment plants due to their ability to perform denitrification and lipolysis. To determine the amount of PHB in activated sludge, staining microscopic techniques were developed and used in conjunction with digital microscopic image analysis. The primary goal of this research was to investigate the effect of substrate composition on Pseudomonas fluorescens PHB accumulation [5].

Various chemicals are used during WWT precipitation processes that can react with HMs to produce insoluble precipitates. Precipitates are separated from the water further by filtration or sedimentation. Precipitation of metal ions as hydroxide compounds at elevated pH can remove metal ions from wastewater. Sulfide precipitation can also separate them. To remove the

***Address for Correspondence:** Karan Veer, Department of Electronics and Communication Engineering, University Institute of Engineering and Technology Sector 25, Panjab University, Chandigarh, India, E-mail: karanveer25@gmail.com*

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phosphorus compounds, metal ions and radioactive elements dissolved in WW, a precipitation technique is usually used. As a cost-effective method, hydroxide treatment is the most commonly used method in the precipitation process. The hydroxide treatment method is the simplest precipitation technique due to its automatic pH control. As precipitants, calcium and sodium hydroxide compounds are commonly used.

Conclusion

Chemical precipitation is a tried-and-true method for removing inorganic, HMs, fats, oils and grease from wastewater. It captures ions during processing and can remove different ions from wastewater to improve its quality. Precipitation of HM, phosphorous, fat, oil and grease suspended in wastewater is accomplished in stages and water softening is induced. To change the properties of hard water, divalent cations are removed by adding calcium oxide. To neutralise the emulsification formed by an oily substance in solution, their hydrophobic interactions must be broken. Polymers are used to break down the interactions of large oily particles. Phosphorous removal is an important step in reducing the concentration of polluted debris in bodies of water and can be done in a variety of ways.

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Conflict of Interest

There are no conflicts of interest by author.

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