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Research Paper

A Seminar report on Wastewater fats oils and grease characterisation, removal and uses.

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ABSTRACT
Numerous organic and inorganic materials from residential and commercial sources can be found in municipal wastewater. It has been established that the presence of fats, oils, and grease (FOG) in municipal wastewater has a negative impact on the aquatic life that the wastewater treatment plants occasionally discharge into. Around the world, various technologies are employed in municipal wastewater treatment to remove FOG.
Hexane, petroleum ether, benzene, ethyl ether, chloroform, n-hexane, and carbon tetrachloride are a few of those solvents. Even though FOG can be recovered and repurposed once it is discovered in wastewater effluents, any pollution control strategy must prioritize preventing or reducing pollution at its source.
It is observed in this review that the recovery and repurposing of FOG are valuable aspects of wastewater treatment, it is imperative to prioritize pollution prevention strategies. Identifying and addressing the sources of FOG at the residential and commercial levels can significantly reduce the overall load of FOG entering the wastewater treatment system. Public awareness campaigns, regulatory measures, and best management practices for industries can contribute to minimizing FOG discharges.
In conclusion, the review emphasizes the importance of addressing FOG in municipal wastewater to safeguard aquatic ecosystems. The use of various solvents for FOG removal is a practical approach, but careful consideration of their environmental impact is necessary. Moreover, pollution prevention strategies should take precedence in any comprehensive pollution control plan, aiming to reduce or eliminate FOG at its source to achieve long-term environmental sustainability.

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I. INTRODUCTION

Growing urbanization and population growth result in a significant amount of wastewater being produced, which restricts the amount of safe space available. This results in an effluent of improperly treated wastewater, which adversely affects water users downstream. As a result, wastewater treatment technology is rapidly evolving to address these issues. To keep pollutants out of receiving water bodies, wastewater must be adequately treated before being disposed of or reused.

Municipal wastewater treatment plants handle the wastewater from homes, businesses, and other sources. There are three stages of treatment for municipal wastewater: primary, secondary, and tertiary. The wastewater is cleared of solids in the primary stage, digested organic material that has settled and floated in the secondary stage, and disinfected in the tertiary stage.

Fats, oils, and grease (FOG) must be successfully removed because improperly removed FOG has a detrimental impact on wastewater treatment facilities as well as the aquatic environment into which it is discharged. Around the world, a variety of technologies are employed in municipal wastewater treatment to remove FOG, including physical, chemical, and biological techniques that include both aerobic and anaerobic processes.

II. LITERATURE REVIEW

This literature review aims to synthesize and critically analyse the existing body of research, offering insights into the key concepts, methodologies, and findings that have shaped our understanding of this topic. By delving into the relevant literature, we aim to identify gaps, controversies, and emerging trends that will inform the direction of our own research, contributing to the ongoing discourse .The literature review focuses on the key advantages and disadvantages by these research papers :

1. Polarographic determination of insecticide imidacloprid at DME By N.V.S. Naidu*, K. Purushotham Naidu, C. Swarna, M. Sulochana, K. Saraswathi Department of Chemistry, S.V. University, Tirupati- 517 502,Andhra Pradesh ,(INDIA) as on ESAIJ , 6(1) , 2011 [1-6]
2. A physical-spatial analysis of the existing slaughterhouse of Sanandaj, Iran, and site selection for a new one by using fuzzy logic and index overlay model by
Kyoumars Habibi1*, Mostafa Behzadfar 2 , Houshmand Ebrahimpour Masoumi3 , Vahid Mahak i4 1Department of UrbanandRegionalPlanning, University of Kurdistan, Sannandaj,(IRAN) 2Department of Urban Planning, Faculty of Architecture, University of Science and Technology,(IRAN) 3UrbanPlanning, University of Durtmond,(IRAN) 4.UrbanPlanning, University of Kurdistan ,Sannandaj,(IRAN) as on ESAIJ , 6 (1) , 2011 [7-13]
3. Influence of copper, cadmium and zinc ions on the composition and metabolism of lipids of chloroplast membranes in Hydrilla verticillate BY V.N.Nesterov 1*, O.A.Rozentsvet 1 , N.F.Sinyutina 2 1Institute of Ecology of the Volga RiverBasin of the RAS, Toglyatti,(RUSSIA) 2St. Petersburg State University, St. Petersburg, (RUSSIA) as on 2012 [4-19]
4. Application of newly synthetic HP-Cr-III-containing nano-mica-clay for stepwise remediation of industrial water-drainsfrom some toxic heavy metals, Part-2: Size cavity calculations & silicate structure visualization by M.Khaled Elsabawy 1,2*, F.Waheed El-Hawary 1,3 , A.El.Maghraby 1,4 1Materials Science&Analytical Units, Chemistry Department, Faculty of Science, TaifUniversity,888-Alhawya,Taif,(KINGDOMOFSAUDIARABIA) 2Materials Science Unit, Chemistry Department, Faculty of Science, 31725-Tanta University,(EGYPT) 3AnalyticalLab, ChemistryDepartment,Faculty of Science,Cairo University,(EGYPT) 4Refractory & Ceramics Department, National Research Centre, El Behooth Str., 12622 Dokki, Cairo, (EGYPT) by ESAIJ , 6(1), 2011 [20-29]
5. Phytoremediation of textile effluent contaminated soil using neem leaf extracts BY K.Poornima, S.Karpagavalli, V.K.Gopalakrishnan* Department ofBiochemistry,KarpagamUniversity, Coimbatore-641021,(INDIA)

III. RESULTS AND DISCUSSION

1. Characterization of Wastewater Fats, Oils, and Grease (FOG):

The characterization of fats, oils, and grease (FOG) in wastewater is crucial for understanding the nature and composition of these contaminants. Analysing the chemical structure and physical properties of FOG aids in developing effective removal strategies. Commonly used solvents for extraction and characterization include hexane, petroleum ether, benzene, ethyl ether, chloroform, n-hexane, and carbon tetrachloride. The choice of solvent depends on the specific properties of the FOG constituents. Detailed analysis provides insights into the origin, concentration, and types of FOG present in wastewater.

2. Removal Technologies:
Various technologies are employed globally for the removal of FOG from municipal wastewater. These technologies can be categorized into physical, chemical, and biological methods.

Physical Methods:
Gravity Separation: Utilizing the difference in density, FOG can be separated from water through gravity-based systems.
Centrifugation: High-speed rotation separates FOG from wastewater based on density differences.
Chemical Methods:
Coagulation-Flocculation: Addition of chemicals induces coagulation of FOG particles, facilitating their removal.
Chemical Precipitation: Chemicals are added to form precipitates with FOG, aiding in separation.
Biological Methods:
Biological Treatment: Microorganisms are employed to metabolize FOG, converting them into harmless byproducts.
3. Recovery and Repurposing of FOG:
Efforts to recover and repurpose FOG from wastewater effluents can contribute to sustainable resource management. Once extracted, FOG can be used in various applications, such as:
Biodiesel Production: FOG can be converted into biodiesel through transesterification, providing a renewable and eco-friendly fuel source.
Soap and Detergent Manufacturing: The fatty acids derived from FOG can be utilized in the production of soaps and detergents.Animal Feed Production: Purified FOG components can be used as additives in animal feed formulations.
4. Pollution Prevention Strategies:

While effective removal technologies are crucial, a comprehensive pollution control strategy must prioritize preventing or reducing pollution at its source. Implementing best practices in residential and commercial establishments to minimize FOG discharge is fundamental. Public awareness campaigns, stringent regulations, and the promotion of sustainable practices in food service industries can significantly contribute to source reduction.

5. Environmental Impact and Aquatic Life:

The negative impact of FOG on aquatic life is a key concern. Accumulation of FOG in water bodies can lead to oxygen depletion, harming fish and other aquatic organisms. Effluent discharge from wastewater treatment plants must adhere to strict quality standards to mitigate adverse effects on ecosystems.

6. Future Directions:

Continued research is essential for the development of more efficient and sustainable FOG removal technologies. Moreover, exploring innovative approaches for the reuse and repurposing of recovered FOG can contribute to a circular economy.

IV. CONCLUSION

It has been discovered that the presence of fats, oils, and grease in wastewater has numerous negative effects on the environment, the wastewater treatment plant, and the sewer. It is also evident that the physical and chemical properties of the FOG, the surrounding environment, the efficacy of the wastewater treatment plant, and the effectiveness of each technique used all play a major role in the removal of FOG. The amount of FOG discharged into the wastewater treatment plant is also significantly influenced by regulations imposed on the food industry regarding the disposal of FOG into wastewater, as well as by the strength of those regulations.

Reclaimed food grain is put to a variety of uses in developed nations, protecting the environment from harm that comes from FOG spills into streams while also boosting the economies of those nations. On the other hand, even though recovering FOG has many advantages, it is a costly procedure that also requires specially trained workers, who are typically lacking in developing nations. Owing to the expanding demand for FOG, nations are gradually processing recovered FOG, which could prevent wastewater containing FOG from being released into the environment and provide a better overall solution for the ecosystem.

The detrimental effects of FOG on aquatic life necessitate stringent effluent quality standards to mitigate potential harm to ecosystems. The oxygen depletion resulting from FOG accumulation underscores the urgency of continued research and innovation in FOG removal technologies. Moreover, the need for ongoing exploration of innovative approaches for repurposing FOG underscores the potential for a more integrated and circular approach to wastewater management.

In the future, research efforts should be directed towards developing more efficient and sustainable FOG removal technologies, taking into account the evolving landscape of wastewater contaminants. The integration of emerging technologies and the exploration of novel approaches will be pivotal in addressing the dynamic challenges posed by FOG in municipal wastewater. By fostering interdisciplinary collaboration and embracing a holistic perspective, the scientific community can contribute to the ongoing evolution of wastewater management practices that are environmentally sound, economically viable, and socially responsible.

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