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Review article

Management of tannery waste effluents towards the reclamation of clean water using an integrated membrane system: A state-of-the-art review

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ABSTRACT

Tanning and other leather processing methods utilize a large amount of freshwater, dyes, chemicals, and salts and produce toxic waste, raising questions regarding their environmental sensitivity and eco-friendly nature. Total suspended solids, total dissolved solids, chemical oxygen demand, and ions such as chromium, sulfate, and chloride turn tannery wastewater exceedingly toxic for any living species. Therefore, it is imperative to treat tannery effluent, and existing plants must be examined and upgraded to keep up with recent technological developments. Different conventional techniques to treat tannery wastewater have been reported based on their pollutant removal efficiencies, advantages, and disadvantages. Research on photo-assisted catalyst-enhanced deterioration has inferred that both homogeneous and heterogeneous catalysis can be established as green initiatives, the latter being more efficient at degrading organic pollutants. However, the scientific community experiences significant problems developing a feasible treatment technique owing to the long degradation times and low removal efficiency. Hence, there is a chance for an improved solution to the problem of treating tannery wastewater through the development of a hybrid technology that uses flocculation as the primary treatment, a unique integrated photo-catalyst in a precision-designed reactor as the secondary method, and finally, membrane-based tertiary treatment to recover the spent catalyst and reclaimable water. This review gives an understanding of the progressive advancement of a cutting-edge membrane-based system for the management of tanning industrial waste effluents towards the reclamation of clean water. Adaptable routes toward sludge disposal and the reviews on techno-economic assessments have been shown in detail, strengthening the scale-up confidence for implementing such innovative hybrid systems.

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