Design of a Sequential Coagulation-Flocculation-Electrochemical Peroxidation Process for the Treatment of Highly Contaminated Industrial Textile Wastewater with The Ab194 Dye

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Abstract:

This study introduces a systematic conceptual design approach for an industrial textile wastewater treatment facility (ITWTF) that integrates sequentially coagulation-flocculation and electrochemical peroxidation procedures, among others. The raw effluent, originated from a local textile plant, characterized with a COD of 3.3 g O2/L, a BOD5 of 0.65 g O2/L, a TSS concentration of 55.6 mg/L, a SS concentration of 144 mg/L a phenol concentration of 0.89 mg/L, a total chromium concentration of 25.9 mg/L, an intense black color (AB194 azo-dye concentration of 0.94 g/L), a total organic carbon content of 1.3 g C/L, and a low biodegradability index of 0.19, among others, was selected as a case study. The ITWTF was designed to treat up to 9 m3 of raw effluent per day in order to comply with maximum permissible limits established for various physicochemical parameters before its discharge into water surface bodies and public sewage system. The design approach involved: (i) the environmental legislation criteria, (ii) the mathematical modeling in the assessment of needed process units, and (iii) the wastewater treatment plant flowsheet. The key elements for the integration of these treatment processes are identified, which may serve as a point of reference for future research and development efforts.

Keywords:

Electrochemical peroxidation, Acid black 194 dye, Industrial textile wastewater, Treatment plant design.