Pilot-scale integrated process for the treatment of dry-spun acrylic fiber manufacturing wastewater

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ABSTRACT

An integrated process of membrane bioreactor (MBR)—advanced ozonation (AO)—biological aerated filters (BAFs) was developed for the treatment of dry-spun acrylic fiber manufacturing wastewater in pilot scale. The results show that the removal efficiencies of chemical oxygen demand (COD) and ammonia nitrogen (NH\textsubscript{4}+ -N) could exceed 90.0 and 95.0%, respectively. The COD concentration in the total effluent was maintained at 80.0–100 mg/L, and the NH\textsubscript{4}+ -N concentration was below 10.0 mg/L. Both the MBR and BAFs could adapt to the influent of practical wastewater after a period of sludge acclimatization. The removal efficiencies of COD and NH\textsubscript{4}+ -N in the MBR were maintained at 65.8–71.9 and 59.4–67.5%, respectively. Excitation–emission matrix spectroscopy confirmed that most of the easy degradable organics were removed in the MBR process. After the AO treatment, COD concentration in the wastewater was reduced by 106–157 mg/L and the biodegradability was enhanced. Simultaneous nitrification–denitrification was performed in the biofilm of BAFs, and the removal efficiency of total nitrogen was in the range of 58.2–71.6% after the entire integrated process.

Keywords: Dry-spun acrylic fiber manufacturing wastewater; Pilot scale; Integrated process; Pollutants removal; Excitation–emission matrix spectroscopy