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"Gheorghe Asachi" Technical University of Iasi, Romania

COMBINING BIOLOGICAL PROCESSES WITH MEMBRANE FILTRATION FOR TEXTILE WASTEWATER RECOVERY

Selene Grilli, Alessandro Spagni

ENEA-Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Water Resources Management Laboratory, via M.M. Sole, 4, 40129 Bologna, Italy

Abstract

Textile industry involves the use of several dyes and auxiliary chemicals (e.g. salts, organic compounds) in many different industrial processes (dyeing, bleaching, printing, washing etc.) that produce wastewater with very variable and complex characteristics that make their treatment particularly difficult. Moreover, the textile industry is a very water-consuming sector. Although textile wastewater treatment can be accomplished by physical, chemical or biological processes, biological treatments are usually preferred because they are cheaper.

The biological treatment of textile wastewater is greatly influenced by process conditions. In fact, azo dyes are quite easily reduced under anaerobic biotreatment with the elimination of colour but with the formation of potentially harmful aromatic amines, whereas they are stable to aerobic biodegradation. On the contrary, aromatic amines are usually stable under anaerobic conditions whereas are aerobically biodegradable. Therefore, wastewater containing azo dyes (e.g. textiles) is usually biotechnologically treated by combining anaerobic and aerobic conditions.

Over the last decades, membrane technologies have been successfully applied for textile wastewater treatment. Membrane bioreactors (MBRs) consist of the combination of biological processes with membrane technologies and are being applied when very high-quality effluents are required.

This work aimed to evaluate the applicability of biological processes combined with ultrafiltration (UF) and nanofiltration (NF) for the treatment of textile wastewaters to achieve water quality for reuse.

The investigated bench-scale biological treatment system comprises an anaerobic biofilm, an anoxic and an oxic reactor. The treatment system was tested treating both synthetic and real textile wastewater.

The results of the study demonstrate that a system comprising an anaerobic biofilter and an anoxic-aerobic MBR is suitable for textile wastewater treatment.

COD removal was usually higher than 95%. The use of an anerobic biofilter allowed good colour removal which reached values usually higher than 70%. Treating real wastewater sometimes a partial nitrification inhibition was observed.

However, although aromatic amines are considered easily degradable under anaerobic conditions, the results confirm that at least the sulfonated aromatic amines formed under anaerobic conditions from the reactive orange 16 (the azo dye used for the synthetic wastewater) are recalcitrant to biodegradation.

NF of the effluent of the biological and UF treatment allowed further COD, colour and salt removal producing water suitable for reuse inside the textile factory.

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