Layered compact textiles applied in fixed-bed column as filters for dye-rich textile wastewaters treatment—a case study

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ABSTRACT

The presented case study examined the possibility of using four commercially available compact textiles in small-scale column purifying system conducted in a continuous-flow operation as filters for colour, organic pollutants and salt reduction. Two wastewaters were prepared for the experimental purposes by combining chemically different dyestuffs, auxiliaries and chemicals in order to simulate dye-bath effluents from cotton (reactive) and wool (acid) dyeing, respectively. Treatment of the laboratory-prepared wastewaters was carried out in columns packed with alternating layers of sand and individual compact textile and, for comparison, in a column comprised merely of sand. It was found that both non-woven textiles, either made from polypropylene (PP) or bicomponent PP/polyethylene (PE) yarn with more complex structure and higher total void area, were more suitable for adsorption/filtration of colour and organic pollutants from dye-rich textile wastewaters in comparison to both woven fabrics. Monitored pollution parameters in the initial and outflow samples indicate that the sand/non-woven system reduced colour by up to 71%, and also appreciably lowered the organic pollutants in both dye-rich wastewaters depending on the wastewater’s composition and trial duration. The efficacy of the control columns was attained—maximally 30% of colour and total organic carbon reduction. Generally, the system showed an explicit buffering capacity, and on the other hand, negligible reduction of the salt content.

Keywords: Compact textiles; Textile wastewaters; Biofilter; Decoloration; TOC reduction

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