

Treatment of household grey water with a UF membrane filtration system

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Received 21 February 2008; Accepted 19 May 2009

ABSTRACT

As water is becoming a rare resource, the onsite reuse and recycling of grey water are practiced in many countries as a sustainable solution to reduce the overall urban water demand. In this paper, a decentralized grey water treatment system, which used a submerged spiral-wound ultrafiltration (UF) membrane module, was studied. This grey water treatment system aimed to treat and recover the resources present in the grey water. The study revealed that the UF membrane filtration system was able to maintain a permeate flux between 6 and 10 L/m²/h. TOC can be reduced from the influent value of 161 to 28.6 mg/L in the permeate, meaning an average elimination rate of 83.4%. In addition, soluble nutrients such as ammonia and phosphorus can pass through the UF membrane and remain in the permeate. The total nitrogen and total phosphorus in the permeate were 16.7 and 6.7 mg/L respectively. The permeate was low in turbidity (below 1 NTU) and free of suspended solids and had an excellent physical appearance. Around 40 organic substances were tentatively detected by the non-target GC/MS analysis in the permeate. Phthalates, flame-retardants, and several other unknown substances were identified as the major detected trace organics. The concentrations of trace organic substances in the permeate were found to be comparable with those of the secondary municipal effluents. The permeate can be used in gardening and agriculture for irrigation and soil fertilization or alternatively for toilet flushing after disinfection. The retentate generated in this system can be treated with blackwater and kitchen waste in an anaerobic digester at a later stage for producing biogas or compost.

Keywords: Ecological sanitation; Grey water; Wastewater reuse; Ultrafiltration membrane; Trace organics

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