

Ablution gray water qualitative assessment and treatment by submerged membrane bioreactor: a case study in Jordan

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ABSTRACT

This study assesses ablution gray water and its treatment at JUST (Jordan University of Science and Technology). A submerged membrane bioreactor (SMBR-pilot plant) is used to treat ablution water that generated from mosque at JUST. The inflowing gray water is conveyed to sedimentation tank, aerated for biological processing, and then ultrafiltrated via membrane utilizing vacuum pump. The SMBR was operated for 33 d at constant flow rate of 5 m³/d. An acclimatized seed of mixed liquor suspended solids with concentration of 2,200 mg/L was used in bioreactor. A complete retention for activated sludge was maintained in the bioreactor. Individual membranes with constant spacing between filter plates and their absolute evenness ensure a precisely distributed flow and backflushing procedures. The average removal efficiencies are 80% for chemical oxygen demand; 89% for BOD₅; 95% for turbidity; and 100% for total suspended solids. Furthermore, the SMBR pilot plant successfully removed part of nutrients, where the average removal efficiencies are 43% for ammonium; 29% for nitrate; and 50% for phosphorus. The average removal efficiency of *Escherichia coli* bacteria is 88%. This work provides useful practical information about ablution gray water and the technical feasibility of treatment. Overall the produced effluents embrace excellent quality that meets the Jordanian and International standards for gray water reuse. The treated ablution gray water performs important nonconventional source of water in arid and semi-arid areas.

Keywords: Gray water; Membrane; Ultrafiltration; SMBR; Reclaimed water

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