

Bathroom Greywater Treatment using Advanced Sequencing Batch Reactor (SBR)

Vahab Ghaleh Khondabi¹, Alireza Fazlali^{1*}, Mojtaba Zolfaghari²

¹Department of Chemical Engineering, Faculty of Engineering, Arak University, 38156-88349, Arak, Iran

²Department of Mechanical Engineering, Faculty of Engineering, Arak University, Arak, Iran

*Corresponding Author's E-mail: a-fazlali@araku.ac.ir

Abstract

Greywater (i.e., discharges from shower, hand basin, bath, laundry and kitchen) accounts for up to 75% of the wastewater produced in households. It contains low concentrations of organic compounds, nutrients and pathogens compared to the more highly concentrated black water (toilet). Therefore, it makes sense to collect greywater, treat it separately and re-use it for irrigation, infiltration, washing or other non-potable applications. The purpose of this study was to investigate the performance of an advanced SBR in the bathroom greywater treatment (in particular the detergent). For this purpose, a rectangular SBR reactor was used in a lab scale with a working volume of 12 liters. The primary microorganisms of this reactor were prepared from the active sludge return to the aeration pond of the Arak municipal wastewater treatment plant. The reactor was fed with the effluent from the initial settling ponds of the same treatment plant. After the system was set up and sufficient microorganisms were grown, the exploitation phase began with synthetic greywater. The experiments were carried out in three cycles of 4, 6 and 8 hours. The concentrations of LAS, COD and BOD₅ at the inlet were 6.8 mg/l, 385 mg/l and 170 mg/l, and in the outlet, 0.95 mg/l, 19.25 mg/l and 8.5 mg/l, in fact, in the 8-hour cycle, the removal efficiency were 86%, 93% and 95%, respectively.

Keywords : BGW, LAS, SBR, ICEAS, ASS

Research Highlights

- Possibility of LAS biodegradation using ICEAS.
- High removal efficiency of detergent and achieving the standard of wastewater discharge to the environment.
- Real operational conditions (Temperature, pH, DO and duration time) of an advanced SBR.

1. Introduction

Energy and water resources are major issues in most parts of the world. Indeed, scarcity or even shortage of freshwater is of particular concern as well in the developing as in the industrialized countries. These phenomena are mainly due to population growth, increased urbanization, high level of water consumption, and finally climate changes [1].

Greywater is a wastewater derived from kitchens, bathrooms (i.e., discharges from shower, hand basin, bath), and laundry water. Grey water does not include the wastewater produced from toilet use, which is considered black water. The generated quantity of grey water can greatly vary between different households within one community and depends on different factors, such as availability of water and lifestyle of household. In general, the volume of grey water accounts between 50% and 80% of the domestic household water uses [2-4]. The published literature indicates that about 27% of greywater originates from the kitchen sink and dishwasher, 47% originates from the wash basin, bathroom, and shower, and 26% originates from laundry and the washing machine [5-7].