

## Sequencing batch reactor for a sewage water treatment plant for the removal of nutrients

H. M. N. Priyashantha<sup>1</sup>, K. A. Serisena<sup>1</sup>, U. G. N. P. Darshani<sup>2</sup>, S. A. T. D. Sakalasuriya<sup>2</sup>,  
C. Hewawasam<sup>2</sup>

<sup>1</sup>*Department of Environmental Technology, Faculty of Technology, University of Colombo, Sri Lanka*

<sup>2</sup>*Department of Civil and Environmental Technology, Faculty of Technology,  
University of Sri Jayewardenepura, Sri Lanka*

Discharging of untreated or partially treated wastewater from domestic and institutional sources presents significant threats to public health and aquatic ecosystems, due to high concentrations of organic loads and nutrients. These high nutrient levels can cause eutrophication, which degrades water quality, while high organic loads increase biochemical oxygen demand (BOD) in the receiving water. This study evaluated the performance of a laboratory-scale Sequencing Batch Reactor (SBR) to treat sewage wastewater. The SBR is a modified activated sludge process that is time-based and integrates the phases of filling, reacting, settling, and decanting within a single tank. The aim of the study was to assess the efficiency of the SBR in removing key pollutants like, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Ammonia-N, nitrates, nitrites, and total phosphorus (TP) as well as in reducing Chemical Oxygen Demand (COD). The treated effluent quality was compared with Sri Lankan effluent discharge standards. The SBR was operated continuously for 68 days, and samples were collected and analyzed to evaluate its performance. The results showed that the SBR was effective in treating municipal wastewater loads. The average removal efficiencies were 72.41% for COD, 59.64% for TSS, 33.22% for TDS, 34.82% for Ammonia-N, and 55.53% for TP. The treated effluents were within the Sri Lankan discharge standards for COD, TSS, pH, and Ammonia-N, where TP concentrations remained above the limit. The study concluded that the SBR system can integrate biological nutrient removal and organic matter degradation within a compact, single-tank reactor. By using time-based aeration, the system reduces its reliance on continuous aeration and external chemical dosing, making it a more cost-effective and environmentally sustainable option compared to conventional systems. Future research needs to focus on advanced operational controls and adaptive cycle optimization to enhance the system's strength and nutrient removal efficiency.

**Keywords:** *Sequencing batch reactor, Wastewater treatment, Nutrient removal, Sewage, Biological treatment*