



"Gheorghe Asachi" Technical University of Iasi, Romania



KINETIC EVALUATION AND PROCESS PERFORMANCE OF A PILOT GAC-SBBR SYSTEM TREATING RECYCLED PAPER INDUSTRY WASTEWATER

**Mohd Hafizuddin Muhamad, Siti Rozaimah Sheikh Abdullah*, Abu Bakar Mohamad,
Rakmi Abdul Rahman, Abdul Amir Hasan Kadhum**

*Department of Chemical and Process Engineering, Faculty of Engineering and Built Environment,
Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia*

Abstract

Recycled paper industry wastewater generates potentially persistent and toxic pollutants which can affect the ecological balance and cause aesthetic concerns. In this study, the biodegradability of recycled paper mill wastewater by a granular activated carbon-sequencing batch biofilm reactor (GAC-SBBR) pilot plant system during a period of 53 days was evaluated while on-line monitoring was used to observe the influence of parameter changes during the treatment process. The effect of nitrogen (N) and phosphorus (P) addition on removal of chemical oxygen demand (COD) in four phases was investigated. The COD:N:P ratio in the nutrient medium was considered as an independent variable at a fixed value hydraulic retention time (HRT) of 24 hours. The study demonstrated that the process was unstable during the initial phase and started to stabilise during the last phase when a COD:N:P ratio of about 100:5:1 was achieved. Degradation of COD was seriously affected by variation of COD:N:P ratios, resulting in the highest removal efficiency of COD at COD:N:P ratio of 100:5:1 (80.1 %) and a minimum degradation at COD:N:P ratio of 1000:7:0.2 (33.8 %). Using the Monod model, the kinetic parameters (μ_m , K_s , Y and K_d) were determined as 0.1007 mg MLSS/mg COD.day, 65.917 mg COD/L, 0.5199 mg MLSS/mg COD and 0.0048 mg MLSS/mg COD.day, respectively. These findings can be used to improve the performance of the pilot GAC-SBBR system.

Key words: COD:N:P ratios, kinetic evaluation, Monod model, pilot GAC-SBBR, recycled paper industry

Received: November 2010; Revised final: July, 2011; Accepted: August, 2011

* Authors to whom all correspondence should be addressed: e-mail: rozaimah@eng.ukm.my; ir_din84@yahoo.com.my; Phone: +603 89216407; Fax: +603 89216148