

## **Performance comparison of conventional and modified Upflow Anaerobic Sludge Blanket (UASB) reactors treating high-strength cattle slaughterhouse wastewater**

### **ABSTRACT**

Cattle slaughterhouse wastewater (CSWW) with an average chemical oxygen demand (COD) and biochemical oxygen demand of 32,000 mg/L and 17,000 mg/L, respectively, can cause a severe environmental hazard if discharged untreated. Conventional upflow anaerobic sludge blanket (UASB) reactor is used in the treatment of slaughterhouse wastewater to meet the discharge standard limit of wastewater discharge set by the Department of Environment Malaysia (DOE). However, at higher loading rates the conventional systems are characterized by slow-growing microorganism resulting in long startup period, surface scum formation, and sludge washout. In this work, the performance of two laboratory scale (12 L) conventional (R1) and modified (R2) UASB reactors treating CSWW at mesophilic ( $36 \pm 1$  °C) condition were investigated. Both reactors were subjected to increasing organic loading rate (OLR) from 1.75 to 32 g L<sup>-1</sup> day<sup>-1</sup>. The average COD, BOD<sub>5</sub>, and TSS removal efficiencies were >90%, at an OLR between 1.75 to 5 g L<sup>-1</sup> day<sup>-1</sup>. The study revealed that R1 drastically reduced to 50, 53, and 43% with increasing OLR until 16 g L<sup>-1</sup> day<sup>-1</sup>, whereas R2 maintained 76, 77, and 88% respectively, under the same OLR. Sign of reactor instability was very much pronounced in R1, showing poorly active *Methanosaeta* spp., whereas R2 showed a predominantly active *Methanosarcina* spp.

**Keyword:** Anaerobic treatment; UASB reactors; Wastewater; Environment; Organic loading rate; Hydraulic retention time