

Enhancement of bioreactor performance using acclimatised seed sludge in anaerobic treatment of chicken slaughterhouse wastewater: laboratory achievement, energy recovery, and its commercial-scale potential

ABSTRACT

Lack of good management practice of chicken slaughterhouse wastewater (CSWW) has caused pollution into water bodies. In this study, the potential of seed sludge acclimatised modified synthetic wastewater (MSWW) on bioreactor performance and energy recovery of CSWW treatment was investigated. Two sets of upflow anaerobic sludge blanket (UASB) reactors were employed. The seed sludge in UASB 2 was acclimatised with MSWW for 30 days. In UASB 1, no acclimatisation process was undertaken on seed sludge for control purposes. After the acclimatisation process of UASB 2, both reactors were supplied with CSWW under the same condition of organic loading rate (OLR = 0.5 to 6 gCOD/L/d) and mesophilic condition (37 °C). COD removal efficiencies of UASB 2 were >80% all through the steady-state of the OLR applied. Meanwhile, a drastic decrease in overall performance was observed in UASB 1 when the OLR was increased to 3, 4, 5, and 6 gCOD/L/d. Energy recovery from laboratory scale and projected value from commercial-scale bioreactor were 0.056 kWh and 790.49 kWh per day, respectively. Preliminary design of an on-site commercial-scale anaerobic reactor was proposed at a capacity of 60 m³.

Keyword: Anaerobic digestion; Specific methane production; Organic loading rate; Energy yield