Improved anaerobic treatment of palm oil mill effluent in a semi-commercial closed digester tank with sludge recycling and appropriate feeding strategy

ABSTRACT

Anaerobic treatment of palm oil mill effluent (POME) in a semi-commercial closed digester tank with sludge recycling was studied using different feeding strategies; one fixed at every three hour and another at every six hour. The organic loading rate (OLR) was increased step-wise and stopped once inhibition on methane production occurred. The chemical oxygen demand (COD), feeding rate, hydraulic retention time (HRT),OLR, and sludge recycling ratio were measured. Performance was based on the COD removal efficiency and methane yield, while stability was assessed in terms of total volatile fatty acids (VFA) accumulation, total VFA-to-alkalinity ratio (VFA:Alk) and food-to-microorganisms ratio (F/M ratio). The feeding strategies, at every three hour and six hour, gave satisfactory COD removal efficiency of higher than 90%, but the latter feeding strategy gave a more stable process with total VFA concentration recorded below 500 mg L-1 and VFA:Alk ratio of less than 0.3 at maximum OLR of 6.0 kgCOD m-3 d-1. The treatment period could also be extended up to 100 days without any obvious problems.

Keyword: Anaerobic treatment; Biogas; Feeding interval; Methane; Palm oil mill effluent; Sludge recycling