Role of Biogas Recirculation In Enhancing Petrochemical Wastewater Treatment Efficiency of Continuous Stirred Tank Reactor

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ABSTRACT
Although the co-digestion of petrochemical wastewater (PWW) with activated manure (AM) is providing an improved production of bio-methane, still several researches are going on how the bio-methane generation and COD removal efficiency can be maximized? Therefore, a question strikes our research motivation to find out does biogas recirculation really play a part in enhancing bio-methane generation and COD removal efficiency? This work explains the continuous stirred tank reactor (CSTR) performance with and without biogas recirculation effect for better mixing during the anaerobic co-digestion of PWW and AM. Four distinct rates of biogas recirculation (10.15, 15.81, 24.14 and 36.25 Ld−1) were examined for a trial period of 100 days. Bio-methane generation and COD removal efficiency were greatly improved as the biogas recirculation rate was increased. The newly incorporated CSTR arrangement with biogas recirculation effect achieved COD and VFA removal efficiencies up to 98.5% and 94% with a hydraulic retention time (HRT) of 9 days. The corresponding mean Biogas and methane generation were observed to be remained at 9.2 ± 0.5 and 6.08 ± 0.5 m3 m−3 d−1. It shows a maximum increase of 55% and 26% in biogas and methane generation efficiency compared to that of without biogas recirculation CSTR. Biomass retention efficiency of the CSTR showed an increment of 16.78%, 20% and 25% in biomass level with the gradual increment of biogas recirculation rates of 10.15; 15.81 and 24.14 Ld−1. This work may depict the environmental and financial feasibility of renewable technology that will open the scope for deeper study in minimizing the environmental issues of petrochemical manufacturing in the future.

KEYWORDS: Biogas recirculation; Petrochemical wastewater; Activated manure; Methane production; COD removal efficiency

DOI: 10.1016/j.jclepro.2014.12.036