Effect of the addition of fat oil and grease (fog) on the performance of a dry anaerobic digestion food waste reactor

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Abstrak

Organic waste mostly comes from food waste, which has characteristics of high concentrations of nitrogen and fat, and high humidity. Domestic waste in Indonesia has a high organic content, which is suitable for anaerobic conditions. Waste oil and fat can be used as co-substrates and are helpful in yielding biogas in an anaerobic digestion (AD) process. The aim of this research is to analyze the performance of a food waste dry anaerobic digestion reactor after the addition of fat oil and grease (FOG) waste. The research was conducted using a semi-continuous stirred tank reactor (SCSTR) with an active volume of 400 L, operated at an average temperature of 27.8±1.07oC. Two experimental scenarios were performed, using varying types of food waste, food waste with cow dung as substrate, and FOG waste as co-substrate. The experiment was conducted using an Organic Loading Rate (OLR) of approximately 10 kg VS/m3, with a constant mixing intensity of 30 rpm. The results show that there was a significant difference between the input of food waste substrate with and without the addition of FOG ($p<0.05$). The average reduction of volatile solids (VS) and chemical oxygen demand (COD) removal in the substrate input with FOG addition was higher than without the addition. The mean percentages of COD removal and VS reduction in the substrate input with FOG addition were 63.3±2.71% and 89.30±1.55%, whereas those for substrate input without FOG addition were 59.45±4% and 77.65±1.46%, respectively. The study concludes that the use of FOG as a co-substrate in a dry AD food waste reactor is not only beneficial in reducing FOG waste generation, but also has a significant impact on reducing COD and VS, which can enhance potential biogas yield.