World Academy of Science, Engineering and Technology
International Journal of Energy and Environmental Engineering
Vol:16, No:02, 2022

The Importance of Storage Period on Biogas Potential of Cattle Manure

Authors : Seongwon Im, Jimin Kim, Kyeongcheol Kim, Dong-Hoon Kim

Abstract : Cattle manure (CM) produced from farmhas been utilized to soils for increasing crop production owing to high nutrients content and effective microorganisms. Some cities with the concentrated activity of livestock industry have suffered from environmental problems, such as odorous gas emissions and soil and water pollution, caused by excessive use of compost. As an alternative option, the anaerobic digestion (AD) process can be utilized, which can reduce the volume of organic waste but also produce energy. According to Korea-Ministry of Trade, Industry, and Energy (KMTIE), the energy potential of CM via biogas production was estimated to be 0.8 million TOE per year, which is higher than that of other organic wastes. However, limited energy is recovered since useful organic matter, capable of converting to biogas, may be degraded during the long storage period (1-6 months).In this study, the effect of storage period on biogas potential of CM was investigated. Compared to fresh CM (VS 14±1 g/L, COD 205±5 g/L, TKN 7.4±0.8 g/L, NH4+-N 1.5±0.1), old CM has higher organic (35-37%) and nitrogen content (50-100%) due to the drying process during storage. After stabilization period, biogas potential of 0.09 L CH4/g VS was obtained in R1 (old CM supplement) at HRT of 150-100 d, and it was decreased further to 0.06 L CH4/g VS at HRT of 80 d. The drop of pH and organic acids accumulation were not observed during the whole operation of R1. Ammonia stripping and pretreatment of CM were found to be not effective to increase CH4 yield. On the other hand, a sudden increase of biogas potential to 0.19-0.22 L CH4/g VS was achieved in R2 after changing feedstock to fresh CM. The expected reason for the low biogas potential of old CM might be related with the composition of organic matters in CM. Easily biodegradable organic matters in the fresh CM were contained in high concentration, butthey were removed by microorganisms during storing CM in a farm, resulting low biogas yield. This study implies that fresh storage is important to make AD process applicable for CM.

Keywords : storage period, cattle manure, biogas potential, microbial analysis
Conference Title : ICBAD 2022 : International Conference on Biogas and Anaerobic Digestion
Conference Location : Amsterdam, Netherlands
Conference Dates : February 07-08, 2022