

Enhancing Biogas Yield of Co-digestion with Slaughterhouse Waste and Conventional Organic Waste

Sakshi Vaya, Mohammed Anas Islam Khan, Min Jae Jung, Sunmin Lee, and Hyunook Kim

*Department of Environmental Engineering,
Water-Energy Nexus Lab, University of Seoul,
Seoul, Republic of Korea*

Abstract

In the contemporary world, there is a growing demand for renewable energy sources as well as a pressing need for a sustainable organic waste management strategy. These have brought anaerobic digestion (AD), which transforms organic waste to biogas, to the forefront of this global discussion, promising to be a one-stop solution to both desires. However, existing industry practices face persistent technical issues resulting in lower biogas yield, substrate conversion efficiency, and effective management of challenging wastes high in protein and fat. Slaughterhouse waste, in particular, remains underutilized in biogas systems due to its complex and recalcitrant matrix making degradation of protein and lipids difficult. To address these challenges, a lab-scale AD reactor has been constructed to co-digest slaughterhouse waste with food waste. Before the waste is digested, it is pretreated with ball-milling and subsequent thermal hydrolysis (TH). Ball milling mechanically grinds slaughterhouse waste into small particles, which can be more easily hydrolyzed by a TH process. Structurally breaking-down the waste and solubilizing are aimed, in this pre-treatment stage, eventually to result in better biogas production. This approach collectively improves substrate bioavailability and digestion kinetics, and increases methane yield, compared to conventional substrate pretreatment strategies which are being practiced in the relevant industry.

Keywords: *Anaerobic Digestion, Unconventional Biomass, Methane yield, Pre-treatment*

Acknowledgement: *This research is supported by the Carbon Neutrality, a specialized program of the Graduate School through the Korea Environmental Industry & Technology Institute (KEITI) funded by Ministry of Environment (MOE, Republic of Korea).*