Institute of Chemical Engineering

Analysis of currently used feedstocks in biogas economy

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Summary: The increasing energy demands together with flue gas emissions resulting from conventional energy sources accelerates the research for renewable energy and technologies such as anaerobic digestion (AD) to limit the environmental damage [1]. Anaerobic digestion process depends on a four biological steps (hydrolysis, acidogenesis, acetogenesis, and methanogenesis). involving different microbial species such as bacteria and archaea [4]. The stability of the AD process as well as the biogas yields depends on the characteristics of the available feedstocks , C/N ratio, biodegradability, nutrient content or buffering capacity. Generally this process depends on several relevant parameters: feedstock type and its composition, organic loading rate, fermentation temperature, pH, hydraulic retention time and carbon to nitrogen ratio. Methane yields and process stability can be impacted by different shortcomings such as low biodegradation, lag-phase, foam formation, over-acidification and high apparent
viscosity or inhibitory elements. In this work the main feedstocks were compared and analyzed. Traditionally agricultural and animal waste (manure, slurry) are use as the main type of feedstock. The mono-substrates or co-substrates may be used in biogas production. The co-substrates digestation is applied when two or more substrates are used depending on the local wastes, nutritional imbalance or other important parameters depending. on the variability among feedstocks such as slaughter waste, blood waste, seafood by-products, mix of bio-waste, sewages, municipal wastes and industry wastes. The following tables (Table 2-6) summarizes the main characteristics of different feedstocks used and their biogas yields. Because of the

variability among feedstocks used, different troubleshooting may occur and need to be watched by the operators of biogas plants. These overall issues are summarized below in table. The analysis shows that carbon-nitrogen ratio (C/N) is the most important factor to produce a biomethane. The (C/N) ratio is also important in the quantity of biogas production, even low deviances may cause pH changes to either volatile fatty acid or dangerous ammonia accumulation. It was found that systems containing less than 50% manure show different pH correlations and reduced C/N ratio. Any changes in pH may cause inhibition in biogas production as microbial performance reduces. The low C/N ratio of 15–25 is vital for good performance, whilst especially manure-heavy digestions perform better under higher pH conditions. The existing potential of converting waste streams into biogas production is not sufficiently exploited.

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