**Anaerobic Co-Digestion of Industrial Wastewater with Municipal Sludge.**

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**Highlights**

* AcoD of sewage sludge and industrial wastewater increase biomethane yield.
* COD reduction for both sludge and wastewaters was observed.

**1. Introduction**

The depletion and environmental impact of conventional fuel in form of greenhouse gases has led to the systemic shift on its dependence for generation of energy into alternative means known as renewable energy. In contrast, food industries are said to utilize large volumes of water daily in their production processes which in turn leads to increase wastewater generation [1]. The characteristics of these wastewater make them a potential source for generation of renewable energy when appropriate technology is applied [2].

This study is geared towards the use of industrial wastewater as co-substrate for digestion of sewage sludge (SS) while optimizing the process parameters to maximize biomethane production and minimize organic pollutants.

**2. Methods**

Anaerobic co-digestion (AcoD) techniques were employed in this study. The substrates considered were municipal SS, sugar wastewater (SW) and dairy wastewater (DW), while anaerobic digested sludge from the municipal treatment plant was used as the inoculum. Characterization of the substrates were done following the standard procedure for wastewater by APHA [3] for total solid (TS), volatile solid (VS), chemical oxygen demand (COD), mineral nutrients and volatile fatty acids (VFAs) in duplicate.

In order to achieve a good dilution, the ratio of wastewater to sludge used was 3:2 base on volume while the inoculum to substrate (ISR) ratios were varied at 1:2, 1:1 and 2:1. The digestion process was run at 25 and 35oC and as semi-batch so as to accommodate for weekly analysis of the digestion assays for pH, solids and COD.

Gas analyses were carried out every 2 – 3 days to determine the composition of the biogas produced using gas chromatography. Bioreactors with a working volume of 5L were used for the digestion process. Two sets of bioreactors contain varying organic loading were set up in duplicate with a control.

**3. Results and discussion**

Characterization result indicate that the industrial wastewaters have high COD, VS and substantial minerals for improve microbial activity. The pH, VS, COD and ammonium content of SW were 6.30, 75.6 (%TS), 1778mgL-1, 0.59 and 0.39, respectively while that of DW was 9.10, 86.4 (%TS), 3012.5mgL-1, 0.38 and 0.71 respectively.

Figure 1 shows the preliminary yield of biomethane on a daily basis from each assay. The results reveal that the maximum production was obtained within the first 20 days of the digestion process and that the sugar wastewater has the highest methane content of 73% as compared to 70% for the dairy and 65% for sludge.

**Figure 1.** Daily biomethane yield at 35oC.

**4. Conclusions**

Preliminary analysis indicated that sugar wastewater co-digestion was more efficient for biomethane production as compared to dairy wastewater. Likewise, results show that co-digestion of sewage sludge helps in the reduction of VS and COD content. COD reduction was observed for both wastewaters and sewage sludge.

**References**

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