Enhancing Biogas Production by Co-Digestion of Food Waste and Carbon Rich Co-Substrate

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Food waste management by anaerobic digestion is proved to be a potential alternative than composting, landfilling or incineration. It can lead to renewable energy production coupled with the minimization of waste volume and greenhouse gas emissions. Low C/N ratio of food waste inhibit the process stability and decreases the methanogenesis rate, so enhancement of biogas yield and degradability is often required to optimize by co-digesting it with another substrate. Co-digestion balances the carbon and nitrogen and increases digester performance and operations more efficiently. The addition of rice straw as co-substrate avoided the ammonia inhibition and volatile acid accumulation during the process and increases the process stability. Mixing food waste and rice straw balances the C/N ratio to 25, which is required for the maximum biogas production, whereas in case of food waste C/N ratio was 14.5. The study was performed in batch reactor under mesophilic (35+2oC) condition. The result showed that balancing C/N ratio increases the biomethane yield and 75 % of the methane was produced during initial 15 days. Methane yield and VS removal efficiency were higher significantly in comparison to mono-digestion of food waste. The biochemical methane potentials (BMP) of food waste and rice straw was calculated in a 1 L anaerobic reactor in mesophilic condition. The optimum methane yield of 0.295 m3/kg- VS was obtained which was 41.7% higher compared to the individual digestion food waste. The methane content and biogas production was obtained to be 62.37 % and 0.438 m3/kg- VS which was much higher than the mono-digestion value.

High solids (dry) digesters are intended to handle materials with a solids content somewhere in the range of 25 and 40%. Dissimilar to wet digesters that cycle pumpable slurries, high solids (dry – stackable substrate) digesters are intended to handle strong substrates without the expansion of water. The essential styles of dry digesters are constant vertical fitting stream and cluster burrow even digesters. Consistent vertical attachment stream digesters are upstanding, tube shaped tanks where feedstock is ceaselessly taken care of into the highest point of the digester, and streams descending by gravity during absorption. In group burrow digesters, the feedstock is kept in passage like chambers with a gas-tight entryway. Neither one of the approaches has blending inside the digester. The measure of pretreatment, for example, toxin evacuation, depends both upon the idea of the waste streams being prepared and the ideal nature of the digestate. Size decrease (crushing) is useful in nonstop vertical frameworks, as it quickens absorption, while bunch frameworks abstain from pounding and rather require structure (for example yard squander) to decrease compaction of the stacked heap. Ceaseless vertical dry digesters have a more modest impression because of the more limited viable maintenance time and vertical plan. Wet digesters can be intended to work in either a high-solids content, with an all out suspended solids (TSS) fixation more noteworthy than ~20%, or a low-solids focus under ~15%.

High solids (wet) digesters measure a thick slurry that requires more energy contribution to move and handle the feedstock. The thickness of the material may likewise prompt related issues with scraped area. High solids digesters will normally have a lower land prerequisite because of the lower volumes related with the moisture.[citation needed] High solids digesters additionally require adjustment of customary execution counts (for example gas creation, maintenance time, energy, and so forth) initially dependent on exceptionally weaken sewage absorption ideas, since bigger divisions of the feedstock mass are possibly convertible to biogas.

Low solids (wet) digesters can move material through the framework utilizing standard siphons that require fundamentally lower energy input. Low solids digesters require a bigger measure of land than high solids because of the expanded volumes related with the expanded fluid to-feedstock proportion of the digesters. There are benefits related with activity in a fluid climate, as it empowers more careful dissemination of materials and contact between the microscopic organisms and their food. This empowers the microbes to all the more promptly access the substances on which they are taking care of, and builds the pace of gas creation.

This work is partly presented at Event on 7th International Conference on Pollution Control & Sustainable Environment March 02-03, 2020 Rome, Italy