Laboratory Scale Anaerobic Reactors for Bioenergy from Wastes: Materials, Mathematical Models, and Stoichiometry

06/08/2020

Full Abstract

Anaerobic processes are being explored for the production of bioenergy in the form of biomethane and biohydrogen in a “waste-to-value” approach that considers wastes as a resource. Laboratory scale Biomethane potential (BMP) tests and upflow anaerobic sludge blanket (UASB) reactors can be used to indicate the potential recovery of bioenergy from industry wastes. The goals of this research were to: (1) conduct a critical review of models for determining biomethane potential, (2) develop a theoretical relationship for stoichiometry for biomethane and biohydrogen from wastes, and (3) develop key design aspects for geometry and infrastructure, including gas-liquid-solid separation in laboratory UASB reactors. This research resulted in the development of a unified Process Flow Diagram, applicable for a variety of industry-relevant wastewaters. Also, in the process of achieving this goal the novel design of Gas-Liquid-Solid separator for laboratory-scale UASB reactor was invented and manufactured utilizing the Fused Filament Fabrication as a special case of Additive Manufacturing.

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