

The Effects of Temperature on the Anaerobic Digestion of Agricultural Wastes

A Major Qualifying Project

Submitted to the Faculty of

Worcester Polytechnic Institute

In partial fulfillment of the requirements for the

Degree of Bachelor of Science

In Chemical Engineering

By

Samuel V. Flibbert

Victoria L. Patterson

Date: 20 April 2016

Sponsoring Organization:

École nationale supérieure des industries chimiques (ENSIC)

Advisor:

Professor Stephen J. Kmiotek, Advisor

This report represents the work of WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its website without editorial or peer review. For more information about the projects program at WPI, please see <http://www.wpi.edu/academics/ugradstudies/project-learning.html>

Abstract

This study investigated the temperature effects on anaerobic digestion, a sensitive biochemical process which uses bacteria to break down organic matter into biogas and soil augmentation products. Specifically the differences between the mesophilic operation temperatures of 35°C and 42°C were observed. Four different agricultural waste substrates and a control with no substrate were individually loaded into small bottles, digesters, and each analyzed at the two temperatures in triplicate. Gas production volume was measured daily and the gas composition was analyzed via gas chromatography every day for the first week and then every other day thereafter. Experimental data showed that temperature did not have a consistent effect on production or quality of biogas, and that substrate properties weighed much more heavily on process output than temperature did. Further experimentation could help elucidate a clearer relationship between temperature and biogas production and quality.

Confidentiality Statement

This report is confidential. For more information, please contact Dr. Nouceiba Adouani at nouceiba.adouani@univ-lorraine.fr.