Executive **Summary**

A framework for co-digestion programs

Lessons Learned: Developing Solutions for Operational Side Effects Associated with Co-Digestion of High Strength Organic Wastes (ENER8R13)

The Central Issue

Co-digestion is an emerging practice that many utilities want to incorporate at their facilities. It presents opportunities to increase biogas production while potentially producing a revenue source, but there is not significant data on the benefits and challenges. The goal of this research was to present a foundation for more consistent and successful co-digestion programs. The study aimed to help utilities plan, design, and implement co-digestion projects and programs to improve both the design process and operations.

Context and Background

Co-digestion involves combining sewage sludge with an external high strength organic waste (HSW) feedstock. The resulting biogas can be collected and recovered. Co-digestion is a beneficial option for water resource recover facilities (WRRFs) as it generates more biogas than the digestion of wastewater solids alone. This practice provides the best sustainable management of both resources from water and organic wastewater.

This research relied on operational data of utilities that are performing pilot or full-scale co-digestion of HSW. The research team's survey took part in two phases that included questions related to general demographics, the status of the co-digestion program, and operational and pilot studies of co-digestion.

Findings and Conclusions

The research team collected data from over 40 facilities that either implemented or considered implementing co-digestion. The researchers identified and quantified operational implications of co-digestion with HSW. The results created an accessible framework of operational solutions to challenges as well as a list of best management practices.

The researchers made several important conclusions. Primarily, there is no standard approach to monitoring co-digestion system performance. Co-digestion generally increased biogas production while minimally affecting WRRF operations, and several WRRFs indicated a higher quality biogas with a greater energy value. The most common challenge cited was nuisance odors at the receiving and pretreatment facility. Operational challenges were typically associated with issues that arose as a result of failing to fully characterize or pilot test the addition of HSW.

Gwinnett County's F. Wayne Hill Water Resources Center reduces energy costs through co-digestion of fats, oils, grease, and high strength waste.

Management and Policy Implications

The research team developed recommendations for facilities that are considering implementing a co-digestion program. The recommendations include identifying the reasons for implementing a co-digestion program to build a business case evaluation before proceeding, and determining if the program is suitable for the facility. Also, to research the current disposal practices and costs, and identify the current issues of these potential sources.

The resulting framework can guide future development in processing, operational controls, regulatory interactions, and institutional approaches. It can continue to refine the current approach to co-digestion monitoring and process control to improve guidance to facility operators, and grow the collective knowledge of the WRRF community and maximize co-digestion benefits.

Related WE&RF Research

Project Title	Research Focus
Co-Digestion of Organic Wastes – Addressing Operational Side Effects (ENER9C13)	Evaluates co-digestion facility design, performance data, and operation and maintenance issues to examine the impacts of co-digestion on methane production, sludge production, and nitrogen and phosphorus concentrations in recycle streams.
Co-Digestion Experience in Central Europe and Case Study Analysis (ENER9C13a)	Evaluates operational side effects associated with co-digestion of high strength waste (HSW) and wastewater solids at water resource recovery facilities (WRRFs).
Understanding Impacts of Co-Digestion: Digester Chemistry, Gas Production, Dewaterability, Solids Production, Cake Quality, and Economics (ENER12R13)	Develops a fundamental analytical approach to understand and predict the broad array of impacts of co-digestion, including effects of digester chemistry, digestate rheology, dewatering, and cake quality.
Food Co-Digestion in Wastewater Resources Recovery Facilities (ENER19C17)	Identifies alternative sustainable business models, focused on operational and environmental risk management and return on investment for co-digestion of food waste.
Advancing Anaerobic Digestion of Wastewater Solids and Food Waste for Energy and Resource Recovery: Science and Solutions (ENER20W17)	Provides an overview of recent research findings on co-digestion of organic wastes with wastewater solids.

Principal Investigators:

Matthew Van Horne, P.E.
Hazen and Sawyer

Project Team:

Mohammand Abu-Orf, Ph.D.
Hazen and Sawyer

Micha Blate, P.E.
Hazen and Sawyer

C. Michael Bullard, P.E.
Hazen and Sawyer

Irene Chu, P.E.
Hazen and Sawyer

Rebecca Holgate
Hazen and Sawyer

Wendell O. Khunjar, Ph.D., P.E.
Hazen and Sawyer

Tim Muster
CSIRO

Paul Pitt, Ph.D., P.E.
Hazen and Sawyer

Lori Stone, P.E.
LA Stone, LLC

Water Environment & Reuse Foundation
1199 N. Fairfax Street ▪ Alexandria, VA 22314
www.werf.org

For more information contact:
Lauren Fillmore lfillmore@werf.org

Project #ENER8R13 **December 2017**