



Decision Support System for Food Feedstock Viability and Anaerobic Digestion

Prepared for:



October 2016

Executive Summary

About

Waste diversion and the support of a circular economy through the reuse of waste are increasingly important aspects of municipal sustainability. In the United States, zero waste and food waste action plans are blossoming, and the City of Tempe is already a regional leader in fats, oils and grease (FOG) collection, green organics and multi-family recycling, community outreach and the use of compost by its Parks Maintenance Division.

This project takes the next step toward a sustainable future for Tempe by exploring opportunities to succeed financially, socially and environmentally from the repurposing of food waste and FOG through anaerobic digestion (AD). Specifically, the initiative addressed in this report was to gather food scraps and FOG waste from various locations in Tempe and bring them to a central location where AD would transform these feedstocks into biogas and other usable products. These products could potentially be used by Tempe and/or marketed to third parties as a source of revenue.

Benefits to the city from a successful AD program would include waste diversion, new revenue streams, energy, fuel or fertilizer cost savings, greenhouse gas mitigation and improved quality of life.

The goal of the research conducted for this report is to provide the City of Tempe with tools, processes and methods to support decision-makers in determining the viability of AD to convert food scraps and FOG into biogas and other usable products.

The Decision Support System (DSS) described in this report can be used by Tempe and other municipalities in the region to evaluate feedstocks and AD. The DSS is not customized for Tempe alone; this is critical because ultimately, regionalization will be the key to making this type of program work.

Research Agenda and Methodology

The Global Sustainability Solutions Services (Global Services), one of the Rob and Melani Walton Sustainability Solutions Initiatives at Arizona State University (ASU) developed and utilized the DSS to determine the viability of a potential AD program using the following steps:

- Interviewed city officials and assessed existing plans in order to determine city priorities.

- Performed a literature review to uncover best practices, technology considerations and lessons learned from similar initiatives conducted by other municipalities.
- Developed a food waste generator database for Tempe by locating and mapping clusters of major commercial food waste generators such as grocery stores, restaurants, food manufacturers and processing facilities.
- Assessed the potential of each of these food waste generators to determine which would be good candidates for an anaerobic digestion initiative, using the information gleaned from generator interviews and the generator database regarding volumes of waste and physical location.
- Developed an attractiveness tool to measure benefits, ease and likelihood of waste generators participating in a food and FOG waste diversion program.
- Tested samples from several generators to obtain baseline information on the specific energy content of their food waste.
- Analyzed the financial viability of proposed anaerobic digestion project scenarios.

Key Considerations

Feedstock. It is critical to know the type, volume and biogas potential of organic waste produced and how it varies by location and season, as this can influence technology choices, cost and long-term operational challenges.

Technology. Selection of the “best available” technology varies by project. There are over 50 different providers of AD technologies, many with numerous testimonials of successful projects.

Financial Performance. Overall financial performance of an AD facility depends on multiple factors. Case studies around the world show that AD facilities can be both environmentally and financially beneficial by diversifying revenue streams, pursuing biogas-based incentives and grants and reducing risk to owners and financiers.

Biogas Incentives. Federal and carbon market funding mechanisms can assist municipal AD projects that use biogas to produce renewable electricity or compressed natural gas (CNG) for pipeline injection or transportation fuel. A number of tax benefits are also available, and there are developing markets for carbon emission and nutrient offset credits.

Product Development and Operations. The AD industry in the U.S. continues to grow exponentially and with this industry growth come challenges. Planning should start with active discussions between municipalities, industries and local food service establishments (FSEs) regarding the benefits and challenges of AD, and information on local waste availability should be shared. AD operations require a specialized workforce, so training and collaboration are key.

Planning and Next Steps

The research team recommends the following actions in order to foster relationships with the many potential feedstock providers in Tempe:

- Continue to gather data and conduct interviews regarding both FOG and food waste, especially with Tempe Grease Cooperative (TGC) members.
- Given the success of the TGC, continue to increase TGC membership as a means of securing feedstock, with an emphasis on restaurants in the medium to largest categories.
- Maintain and utilize mapping tools so that an updated picture is always available for analysis.
- Recruit current TGC members for a pilot food collection program.
- Continue to develop existing relationships with neighboring municipalities to evaluate the potential for future partnerships and assess availability of existing codigestion capacity.

In order to fully understand feedstock biogas potential, the Global Services team recommends:

- Annual study of feedstock volume and biogas potential to determine appropriate size and technology for an AD facility or feedstock processing facility.
- Incorporate biogas potential into the mapping database.
- Catalog biogas potential as new TGC members are recruited.
- Continue to refine methods and validate results of initial laboratory biogas studies to verify the best combination of waste sources for biogas production.

At this time, further research is needed regarding the best approach for the City of Tempe to utilize AD technologies, as well as further research into the various products of AD and their respective uses and markets. Based on the analysis in this study, current ROIs seem prohibitive; however, these alternatives should continue to be evaluated as technologies and markets evolve.

Conclusion

Limitations in data prevent the research team from coming to any specific or even general conclusions from the research conducted. This report provides the tools, processes and methods (a Decision Support System) to help Tempe conduct further research into a successful, profitable and sustainable AD program.

Acknowledgements

This feasibility study is a joint effort by the City of Tempe Public Works Department and the Global Sustainability Solutions Services, one of the Rob and Melani Walton Sustainability Solutions Initiatives at Arizona State University (ASU) with assistance by Dr. Emily Viau of Fresh Recycling, Inc. in a subcontractor role to ASU.

We would like to thank Dr. Nick Brown, Mick Dalrymple and Mara DeFilippis for their early efforts with Dr. Emily Viau of Fresh Recycling and Tempe staff to develop target project deliverables, initial processes and plans.

We would like to thank City of Tempe personnel from the Water Utilities and Solid Waste Divisions who contributed significant time and efforts to produce this work, including Marilyn DeRosa, David McNeil, Cassandra Mac, Craig Caggiano, Richard Dalton, Tara Ford, Mark Weber and Jaime Pesquiera from Water as well as Tony Miano and Dawn Ratcliffe from Solid Waste.

Additionally, we would like to thank the valued city, university and Fresh Recycling student workers who worked closely with Dr. Viau and the city at each phase of the study to gather crucial industry information. Thanks to Cassandra Mac, Destiny Cebuhar, Mukunth Natarajan and Jefferey Swofford for coordinating summer outreach efforts; to the biogas laboratory crew of Greg Roliardi, Julia Thompson, Qing Zhong and Rikin Patel for dedicated back-house sample processing; Dylan George-Sills for GIS mapping; and to Cassandra Lubenow and Natalie Melkenoff for their efforts on case studies and reports.

This project would not have been possible without help from our stakeholders. We would like to thank the City of Mesa Northwest Water Reclamation plant for providing sludge inoculum to start our laboratory biogas studies and Dr. Bruce Rittmann and his staff from ASU's BioDesign Institute for helping Dr. Viau develop the City of Tempe Biomethane Potential (BMP) assay specific to food and fats, oil and grease(FOG) feedstocks.

We are extremely grateful to the 14 Tempe companies who participated in industry interviews and provided samples for biogas testing.

Most of all, we would like to thank Dr. Viau for her intensive efforts throughout the project toward making it a success. Her expertise, dedication and willingness to help one and all are truly inspirational. Without her above and beyond efforts, this project would not have been possible.

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