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Measuring bioenergy potential of city food, grease, grass, and zoo manure mixes

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Food recycling is the next frontier for cities looking to reduce costs for solid waste, to create clean energy, and to make good soil in parks – how? With anaerobic digestion (AD), a technology already used for wastewater, but only recently being applied to food and grease destined for a landfill. Anaerobic digestion is used throughout Europe for decades for creating biogas electricity or CNG fuel and US cities are now looking to apply this technology. The City of Tempe, a university town in Arizona, set out to develop a good city recipe for making biogas with food, grease, manure, and grass wastes that were not currently recycled at its local businesses. In a public-private collaboration with Fresh Recycling Inc, and the Global Sustainability Solutions Services, a program of the Walton Sustainability Solutions Initiatives at Arizona State University, and the ASU Biodesign Institute, the city performed a first phase feasibility study used a bench-scale biomethane potential (BMP) assay optimized for city labs to test food and grease for energy potential. Understanding a good recipe for a City anaerobic digester means balancing high energy feedstocks, like grease and food, with buffering feeds, like grass and manure, to keep microorganisms functioning and not foaming. Bench-scale digesters were then used to show the methane potential of food and grease samples from schools, major food manufacturers, restaurants and a golf course. The experiments measured methane and total gas production for 40-45 days for each feed at a low feeding rate, while monitoring for toxicity to microbes. Next, this information was used to develop two City food and grease ‘recipes’ that would limit toxicity caused by certain feedstocks; we created a ‘City Regular’ mix and a ‘City Industrial’ recipe and then combined these mixes with eight different animal manures, from elephant to rhino to sheep to horse. The first phase BMP studies will be presented here. Grass was the most productive long-term gas producer alone. Food – grease recipes with manure and grass were the best for gas production within a balanced system. Bench-scale digestion studies provide a nice jumping point for Cities to recycle food on a large scale from city restaurants and food producers. Tempe has optimized this biogas experimental method for future experiments, as food and grease feeds change and for collaboration with other cities.

Biography

Emily Viau has completed her PhD in Environmental Engineering at Yale University and Postdoctoral studies from Stanford University. She is the Founder and Director of Fresh Recycling Inc., a premier biotechnology R&D service firm dedicated to streamlining city development of organic recycling and bioenergy production systems. She has completed BSE and MS in Civil Engineering from Arizona State University, USA. She has published 13 papers in peer-review journals and currently serves as a Professor of Microbiology and Earth and Space Science at Grand Canyon University.

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