A Full-Scale Biodigester: Engineering Campus Sustainability Via Anaerobic Processes

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As state flagship, the University of Massachusetts Amherst bears a responsibility to serve as an example to other college campuses as a modern leader of innovation and sustainability. However, the campus generates thousands of tons of food waste annually, exacerbating a distressing sustainability issue. Anaerobic digester technology presents a feasible solution to campus and global sustainability. Primary benefits include decreased landfill use, recycling of organic waste, and the provision of an efficient energy source for campus energy demands. Not only could anaerobic digestion technology offset campus costs of $55,000 per year in transporting organic waste to off-site composting facilities, it could also supply 5% of UMass' annual energy consumption (Feasibility Study for Siting Anaerobic Digestion Facility at UMass Amherst Campus, 2013). Thus, we are proposing the implementation of a full-scale anaerobic biodigester on campus to improve campus sustainability.

In 2013, a feasibility study on the implementation of a biodigester on campus concluded economic payback of over 15 years. In the 5 years following, however, the amount of compostable waste generated on campus has increased by roughly 33% (UMass FY Waste Management Report 2013 & 2018), which could decrease the duration of economic payback by roughly 33% to 10 years.

The most palpable benefit of installing a full-scale biodigester at UMass is significant contribution to offsetting energy costs on campus. Considering 2,300 tons of biomass waste produced annually by UMass, 2.25 million kWh of energy can potentially be produced annually through anaerobic digestion. The integration of a digester with the combined heat and power plant would result in annual savings of up to $265,000 in electricity costs.

A full-scale anaerobic digester would also have a largely positive impact on the environment. When food is thrown in the trash, it produces carbon dioxide and other gases as it decomposes. By anaerobically digesting food waste generated by campus dining halls, we would be able to capture these gases and prevent them from entering the environment. By processing these gases further, we are able to give them a second life saving UMass roughly 1,833 tons of carbon dioxide emissions annually.

Overall, implementing a full-scale anaerobic digester would reduce economic costs in disposing of campus-generated organic waste while simultaneously offsetting greenhouse gas emissions. This would fall perfectly in line with broad university goals of improving campus sustainability and image as the flagship university for the State of Massachusetts.