Food waste diversion for enhanced methane gas production at the drake water reclamation facility

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Abstract. Food waste diversion to enhance methane gas production in municipal wastewater treatment plants is an emerging trend in the United States. Food waste is diverted from the landfill, processed, and added with wastewater biosolids to an anaerobic digestion system. Food waste is highly biodegradable and produces methane gas in anaerobic digesters of a municipal wastewater treatment plant that can be used to produce renewable energy to meet electric and heating needs of the plant. The Drake Wastewater Reclamation Facility in Fort Collins, Colorado is very interested in implementing energy generation from anaerobic digester biogas and a food waste diversion program. The objective of this study is to determine the efficacy and viability of implementing a food waste diversion program utilizing an energy generation technology to provide electricity and heating generation to meet the plant's needs. A food waste characterization study of the Colorado State University's Ram's Horn Dining Facility processed food waste was conducted to determine important characteristics of a readily available food waste. An analysis of the operating capacity of the Drake Wastewater Reclamation Facility anaerobic digesters was conducted to determine the maximum amount of food waste that could be added on a daily basis. The maximum amount of food waste that could be added to the Drake Wastewater Reclamation Facility anaerobic digesters is 37.5 tons per day. 2010 data for the Drake anaerobic digesters was analyzed and used as a baseline for analysis of the addition of various amounts of food waste ranging from 800 pounds of food waste per day to the maximum amount of 37.5 tons per day. The effects of the food waste on important parameters such as anaerobic digester biogas production and solids reduction in the digester were reported. Various energy generation technologies were evaluated using reported cost data and characteristics. An economic analysis utilizing flared methane gas as fuel for the various technologies was completed which showed that microturbine and reciprocating engine technologies are economically viable options for the Drake Wastewater Reclamation Facility to use for both electricity and heating generation. A triple bottom line analysis, with a rigorous economic analysis, of implementing a food waste diversion program at the Drake Wastewater Reclamation Facility was conducted. Costs associated with a food waste processing facility and associated equipment was outlined and evaluated against the energy savings that enhanced methane gas production from various amounts of food waste addition provided. At this time, it is not economically feasible for the Drake Wastewater Reclamation Facility to implement a food waste diversion program but should reevaluate in four to five years to determine if the economics have improved.