Low-cost Anaerobic Digesters

Professor Stephanie Lansing researches lower-cost anaerobic digesters and co-digestion substrates to enhance the benefits of digestion technology, thereby, increasing the value of waste materials, such as domestic wastewater, manure, and food waste. Benefits of anaerobic digestion technology include renewable energy production, fertilizer creation, and sharp reductions in wastewater pollution, greenhouse gas emissions, and noxious odors.

What Is Anaerobic Digester?
When wastewater flows through an enclosed digestion container without oxygen, microorganisms can use the wastewater as a nutrient source to produce methane-enriched biogas. This biogas can be used directly for heating or cooking, or can be used to power an electric generator. During the digestion process, solids, organic matter and pathogens are drastically reduced while nutrients are retained, resulting in a high-value liquid fertilizer.

Where Are Anaerobic Digesters Located?
Low-cost anaerobic digestion is a proven technology in developing countries, with 35 million low-cost digesters in India, China, and Latin America. The approximately 150 agricultural digesters in the United States are capital and management-intensive systems. With an average cost of over $1.0 million, these digesters are inaccessible to medium and small-scale farmers. Due to capital requirements, the U.S. EPA recommends digester installation for herds with more than 500 cows, which puts this beneficial technology out of the hands of 94% of Maryland dairies which have less than 200 dairy cows. With low-cost digesters these dairy farmers, as well as swine and poultry facility operators, could greatly benefit from the environmental and economic benefits of anaerobic digestion.

What are Anaerobic Digestion Substrates?
Professor Lansing is researching various substrates to increase the value and efficiency of digestion technology. Algae can be used for cleaning polluted water, extracted for biofuel production, with the remaining substrate digested for biogas production. Food waste has a high biogas potential, with more than 34 million tons of food waste entering landfills each year, diverting food waste to digesters could increase biogas production and economic viability of agricultural digesters. In addition, to agricultural digesters, human wastewater digesters using latrine wastes in Haiti and Africa are being designed, which reduces pollution from untreated waste and deforestation by providing biogas for cooking, replacing charcoal and firewood as the main energy sources in developing countries.

Anaerobic Digester Benefits Include:
- Renewable energy production in the form of biogas
- Wastewater treatment with a large decrease in organic pollutants
- Creation of a fertilizer that is high in dissolved nutrients
- Large reductions in noxious odors
- Capture of methane, a greenhouse gas 21 times more powerful than CO2