



# Waste to Energy

## Associate Professor Stephanie Lansing Research Focus:

- Bioenergy and waste treatment using ecological engineering
- Waste to Energy Research: Anaerobic digestion, microbial fuel cells, gasification, microbial electrolysis cells, and solid-oxide fuel cells
- Life cycle assessments (LCA) and Energy (eMergy) of bioenergy
- Antimicrobial resistance, persistence and treatment in dairy and beef manure waste management processes
- Recovering nutrients from waste using post-nutrient extraction after anaerobic digestion
- Nutrient recovery from Chesapeake Bay using algal turf scrubber (ATS) with anaerobic digestion of algae feedstocks to drive a fuel cell at the Port of Baltimore
- Food waste, dairy and poultry manure digestion in Maryland, as well as sanitary waste digestion in Haiti
- Small-scale digesters for the US and developing countries
- High temperature and high pressure anaerobic digestion
- Effects of nanoparticles on anaerobic digestion and post-digestion utilization

## What Is Anaerobic Digester?

When organic waste substrates enter an enclosed digestion container without oxygen, microorganisms can use the waste as a carbon/nutrient source to produce methane-enriched biogas. This biogas can be used directly for heating or cooking, can be used to power an electric generator, or upgraded to renewable natural gas. During the digestion process, solids, odor, and pathogens are drastically reduced while nutrients are retained, resulting in a high-value liquid fertilizer.

## What Are Anaerobic Digestion Substrates?

Dr. Lansing researches various substrates to increase the value and efficiency of digestion technology. Algae can be used for cleaning polluted water, with the carbon-rich 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 manure used in agricultural digesters in Maryland, Dr. Lansing has designed and constructed sanitary wastewater digesters using latrine wastes in Haiti, which reduces pollution and pathogens from untreated waste and deforestation, by providing biogas for cooking, replacing charcoal and firewood, which are the main energy sources in Haiti.

## Anaerobic Digester Benefits Include:

- Renewable energy production in the form of biogas
- Wastewater treatment, with large decreases in organic pollutants
- Creation of a fertilizer that is high in dissolved nutrients
- Large reductions in noxious odors
- Capture and utilization of methane, a greenhouse gas 25 times more powerful than CO<sub>2</sub>