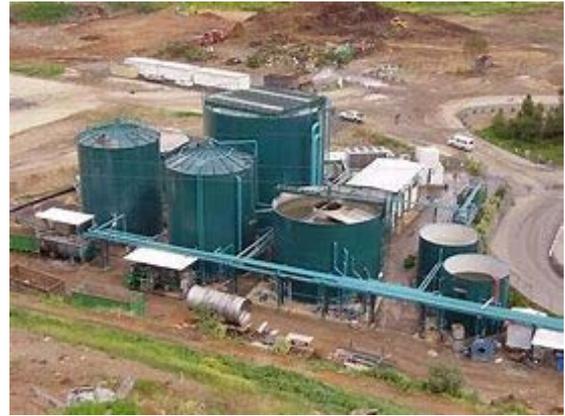


CLEAN ENERGY: ANAEROBIC DIGESTERS

JULY 2018 TECH BRIEF FOR FOOD INNOVATIONS
TALENT NETWORK



Food Waste Converted to Biogas or Biodiesel

Anaerobic digestion is a biological process that produces a gas principally composed of methane (CH₄) and carbon dioxide (CO₂), otherwise known as biogas. Natural processes break down organic materials in the absence of oxygen, producing gas. Depending on the waste feedstock and the system design, biogas is typically 55 to 75 percent pure methane. State-of-the-art systems report producing biogas that is more than 95 percent pure methane.

Biogas is considered a clean-burning fuel with the added advantage of being derived primarily from waste materials. It is a renewable alternative to natural gas. Similarly, waste material feedstock can be used to produce **biodiesel**, mitigating the “**liquid fuel**” problem – the reality that demand for transportation fuels such as gasoline and **diesel** are largely “inelastic,” meaning that demand doesn’t adjust quickly even if prices increase sharply.

In the current waste-to-energy market, anaerobic digestion offers the most sustainable conversion process. It is also less controversial than waste incineration because it emits fewer particles and toxins into the air. Commercially available technologies can be tailored to suit waste streams of all volumes and systems may be sized for use in small farm systems, commercial enterprises, utilities and industry.

Labor Force Takeaway

According to the American Biogas Council (ABC), New Jersey currently has **62 operational biogas** systems. The ABC sees the potential for more than 120 new projects to be developed based on the estimated amount of available organic material.

Jobs created by the development and operations of a biogas plant will include:

- Design, procurement and construction
- Equipment installation, operation and maintenance
- Food science experts to refine processes
- Operators educated in bacterial growth
- Logistics and delivery workers to manage the food waste supply chain
- Safety and health professionals

TAN recommends FITN include anaerobic digestion and related forms of clean energy generation within their mandate. As part of this: develop relations with Cape May County Municipal Utilities Authority.

Bio-Gas, the Other Natural Gas

There are various proven waste-to-bio-fuel process technologies based on the starting material: wastewater and wastewater sludge, food and other organic wastes (derived from municipal solid waste streams), agricultural and livestock waste and industrial wasteland. Landfill gas collection is in a special category because the anaerobic activity happens naturally within the landfill itself. Figure 1 below provides an overview of the processes used for food and livestock waste.

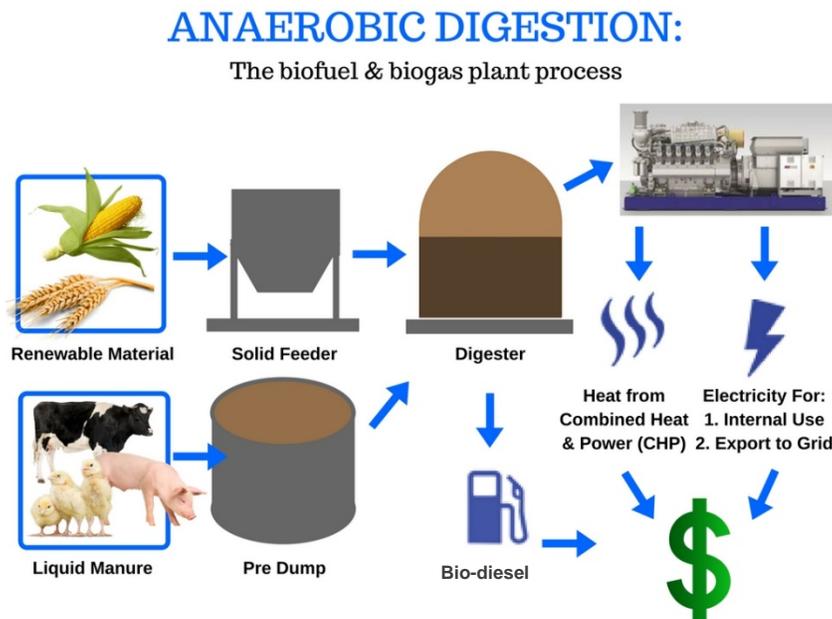


FIGURE 1 WIKI COMMONS

Bio-Gas Industry Organizations

American Biogas Council	Seeks to facilitate energy independence and create jobs by growing the biogas industry. Developing tools to share best practices among biogas system operators.
Solid Waste Association of North America	SWANA consists of 9K+ public and private sector professionals advancing from <i>solid waste</i> management to <i>resource</i> management through shared education, advocacy and research.
Renewable Natural Gas (RNG) Coalition	The non-profit organization is dedicated to advancing RNG as a clean, green, alternative and domestic energy source.
World Biogas Association	Global trade association for the biogas, landfill gas and anaerobic digestion industries

Make no mistake: **anaerobic digestion** is as much a form of farming and food processing as it is fuel production. The word “digestion” refers to what the bacteria in the food waste are doing; they are eating (then burping). Process temperature affects the rate of digestion. The process is most stable when maintained at 100 degrees F plus/minus 5 degrees F. It is possible to operate between 135 to 145 degrees F, but the digestion **process is subject to upset if not closely monitored**. Moisture content is also a key process parameter.

As a market, anaerobic digestion plants supporting food and organic waste management is expected to grow rapidly and to **outpace landfill gas in market share by 2022**. The U.S. market for digesters (all technologies) rose from \$50.0 million in 2016 to \$58.4 million in 2017, and will advance to \$119.3 million in 2022, as the country continues to develop its food and organic waste digestion capacity. The U.S. market from 2017 through 2022 will have a Compound Annual Growth Rate (CAGR) of 15.4%.

Biogas sector companies with installations and offices in NJ include AB Energy USA, Delta Instrument, JDV Equipment Corp, Veolia Biomethane Anaerobic Treatment and Natural Systems Utilities, among others.

TAN recommends FITN develop relations with Cape May County (CMC) Municipal Utilities Authority (MUA.) Their feasibility study, due to be published this September, involves construction of a combined heat and power wastewater plant from residual biosolids. Trenton Biogas LLC is currently building a food-waste biogas plant and is expected to convert 100,000 tons of food waste into biogas and fertilizer annually.