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## **Glossary of Biogas- and Anaerobic Digestion-related Terms**

**Activated Carbon** – Charcoal that has been heated or otherwise treated to increase its adsorptive power

**Ambient** - outside air temperature.

**Amine Scrubber** – Amine gas treating, also known as gas sweetening and acid gas removal, refers to a group of processes that use aqueous solutions of various alkylamines to remove hydrogen sulfide and carbon dioxide from gases.

**Anaerobic** – in the absence of oxygen microbes breakdown organic material.

**Anaerobic Bacteria** – microbes whose metabolisms require the absence of oxygen to survive

**Anaerobic Digester Gas** – the gas produced after-which microorganisms break down biodegradable material in the absence of oxygen.

**Anaerobic Lagoon** – (or Manure Lagoon) is a man-made outdoor earthen basin filled with animal waste that undergoes anaerobic respiration as part of a system designed to manage and treat refuse created by Concentrated Animal Feeding Operations.

**Anaerobic Digestion** – the breakdown of animal manure and other organic material in the absence of oxygen, (methane producing bacteria are most active in two temperature ranges, 95 to 105°F and 130 to 135°F. This is a living system and must be treated as such. The organic material is decomposed by acid formers into fatty acids and then into biogas by methane formers or methanogens.

**Biofibers** – the solid material separated from the effluent stream after treatment by an anaerobic digester. This is the solid material that could not be volatilized into biogas.

**Biofiltration** – A pollution control technique using living material to capture and biologically degrade process pollutants. Common uses include processing waste water, capturing harmful chemicals or silt from surface runoff, and microbiotic oxidation of contaminants in air.

**Biogas** – a mixture of carbon dioxide (CO<sub>2</sub>) and hydrocarbons, primarily methane (CH<sub>4</sub>) gas, from the biological decomposition of organic materials. Biogas usually consists of 60-80 percent methane, 30-40 percent carbon dioxide, and other trace gases such as hydrogen sulfide (H<sub>2</sub>S), ammonia (NH<sub>3</sub>) and hydrogen (H<sub>2</sub>).

Biomethane--- biogas-derived, high-BTU gas that is predominately methane after the biogas is upgraded to remove most of the contaminants and a majority of the carbon dioxide (CO<sub>2</sub>) and nitrogen (N<sub>2</sub>) found in biogas.

Biochemical Methane Potential (BMP)—Maximal potential production of biogas by a substrate (m<sup>3</sup> biogas/tons of VS). Also, a common test done to a feedstock to estimate the amount of biogas a certain feedstock or mix of feedstocks might produce.

Biosolid – Sludge refers to the residual, semi-solid material left from industrial wastewater, or sewage treatment processes. It can also refer to the settled suspension obtained from conventional drinking water treatment, and numerous other industrial processes.

BOD (Biochemical Oxygen Demand) – a qualitative measurement indicating how fast biological organisms use up oxygen in a water body. It is an indication of the availability of nutrients and food in the water and used as a measure of the degree of pollution in waterways.

BTU—Unit of energy. British Thermal Unit

Certified Digestate: Digestate that has been certified to meet the health and safety criteria of the American Biogas Council's Digestate Standard Testing and Certification Program at [www.Digestate.org](http://www.Digestate.org)

Conditioned Biogas—medium-BTU biogas that is stripped of some trace contaminants and water, but maintains the relative mix of carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>).

Complete Mix Digester - a tank designed above or below ground as part of a manure management system to handle manure containing 2-10 percent solids. The digester is heated and mixed mechanically or with gas-mixing systems to keep the solids suspended. This maximizes biological activity for destruction of volatile solids, methane production, and odor reduction.

Co-Product – Other products made by ethanol plants as a result of ethanol production.

Covered Lagoon Digester – an anaerobic lagoon is commonly used when manure has less than 2 percent solids. Decomposition of the manure occurs, methane is produced, and effluent odor is reduced. The lagoon is covered with a gas-tight cover to capture the biogas.

Digestate – The material remaining after the anaerobic digestion of a biodegradable feedstock. Anaerobic digestion produces two main products: digestate and biogas. It is produced both by acidogenesis and methanogenesis and each has different characteristics. See also Certified Digestate.

Digester – a sealed container or tank, where the biological digestion can occur of animal manure and biogas formed.

Digester Gas – Another form of biogas produced by the anaerobic digester system

Dry Digester – The anaerobic digestion system in which most bio-solid organic material is placed for anaerobic digestion

Dryer – A machine or device used to remove the humidity from a raw biogas substance to assist in the transformation of biogas to biomethane

Effluent – organic liquid and solid material (slurry) leaving a digester.

Feedstock – liquid and/or solid material fed to the digester, also known as influent.

Fixed Film Digester – a tank designed as part of a manure management system to handle manure up to 3 percent solids. The digester is temperature controlled and a media is placed inside the digester. This design allows the microbial populations to attach to the media and grow as a biofilm (fixed film), thus preventing the microbes from being removed with the effluent.

High Strength—a term that is usually applied to industrial wastewater to indicate that it contains a higher than normal percentage of solids or other soluble or suspended material

Holding Tank – A large container in which liquids are temporarily held

Hydraulic Retention Time (HRT) – the average length of time the liquid influent remains in the digester for treatment.

Influent – liquid and solid material fed to the digester.

Induction Generator – (or asynchronous generator) is a type of AC electrical generator that uses the principles of induction motors to produce power. Induction generators operate by mechanically turning their rotor faster than a synchronous speed, giving negative slip. This type of generator operates in parallel with the utility for its phase, frequency and voltage and cannot operate in isolation (stand alone) – i.e., it cannot operate without the power company.

Industrial Wastewater – Wastewater not otherwise defined as domestic wastewater, including the runoff and leachate from areas that receive pollutants associated with industrial or commercial storage, handling or processing facilities.

Inorganic Material – Compounds derived from other than vegetable or animal sources, generally do not contain carbon atoms

Iron Sponge – A machine that removes sulfides during the anaerobic digestion process

Loading Rate – the total amount of solids and liquids fed to the digester daily.

Mesophilic – the temperature range of 95 to 105°F in which methanogenic microbes thrive.

Methane – a combustible gas produced by anaerobic digestion; also the principal component of natural gas.

Methanogens – methane producing microbes.

Microturbine – a small-scale gas turbine generation system to combust gas and generate electricity.

Municipal Solid Waste (MSW) – (or trash/garbage) refuse or rubbish is a waste type consisting of everyday items that are discarded by the public

Net Metering – an agreement with the utility company to purchase the electricity produced by the digester system at a rate equal to the farm electricity purchase rate.

Organic Material – Matter composed of organic compounds that has come from the remains of once-living organism such as plants and animals and their waste products in the environment

Plug-Flow Digester – a tank designed for a manure management system which handles organic material containing 11-14 percent solids. The digester is given daily influent plugs that flow-through the digester. The digester is heated. This helps with the destruction of volatile solids, methane production and odor reduction.

Psychrophilic – less than 68°F.

Renewable Compressed Natural Gas (R-CNG): RNG that is compressed to a high pressure, often for use as a transportation fuel.

Renewable Liquefied Natural Gas (R-LNG): RNG that is converted to liquid form, often for use as a transportation fuel.

Renewable Natural Gas (RNG): biomethane that is upgraded to natural gas pipeline quality standards such that it may blend with, or substitute for, geologic natural gas, including odorizing.

Residence Time – The average length of time during which a substance, a portion of material, or an object is in a given location or condition, such as adsorption or suspension

Settled Solids – the separated manure solids which settle to the bottom of the digester.

Silica Gel – hydrated silica in a hard granular hygroscopic form used as a desiccant

Siloxanes – A compound having a molecular structure based on a chain of alternate silicon and oxygen atoms, esp. (as in silicone) with organic groups attached to the silicon atoms

Sludge – Thick, soft, wet waste or a similar viscous mixture of liquid and solid components, esp. the product of an industrial or refining process.

Slurry – the mixture of solids and water processed in the digester.

Sulfide – A binary compound of sulfur with another element or group

Syngas: a gas mixture composed primarily of hydrogen (H<sub>2</sub>) and carbon monoxide (CO), along with hydrocarbons from the thermochemical decomposition of organic or inorganic materials.

Synchronous Generator – this type of generator can operate in parallel with the utility or operate in isolation from the power company (stand-alone). This generator does not need the utility voltage to create electricity; the machine is self-excited. Generally, more expensive utility breaker controls are required.

Temperature-Phased Anaerobic Digester (TPAD) – two tanks designed as part of a residuals management system. The digesters are heated, the first digester in the thermophilic temperature range and the second digester in the mesophilic temperature range. This will maximize biological activity for the destruction of volatile solids, methane production and odor reduction.

Thermophilic – temperature range of 125 to 135°F where certain methanogenic bacteria are most active, the greatest pathogen destruction occurs in this temperature range.

Total Dissolved Solids (TDS) – the volume of solid material that cannot be filtered out. A measure of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro-granular suspended form

Total Suspended Solids (TSS) - the volume of solid material that can be filtered out.

Toxicant – a component in manure or some other feedstock causing an adverse effect on bacterial metabolism. E.g., a pesticide.

Volatile Acids – these are present in the feedstocks and also produced in the digester by acid-forming bacteria and then used by the methane-forming bacteria to produce methane. Carbonic acid is the chemical compound with the formula H<sub>2</sub>CO<sub>3</sub>, a weak acid that forms two kinds of salts: carbonates and bicarbonates

Volatile Solids – Solids, frequently organic, which volatilize at a temperature of 550 degrees Celsius. This is the actual organic matter which can be converted to gas.

Sources:

- MI Department of Agriculture & Rural Development
- American Biogas Council