ABC Digestate Standard, Testing Protocol & Quality Certification Program

CTDEEP SWAC Presentation

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The Need to Maximize the Value of Digestate

- **ABC Primary Goal:** ensure that all biogas systems maximize the economic value of all outputs
- **Early Recognition:** ABC needed to work to raise awareness of the economic and environmental value of digestate
- **Assembling ABC's Advocacy Toolkit:**
  - Collect industry information and build an arsenal of educational materials
  - Develop and certify a standard set of tests, uses and quality management protocols for digestate

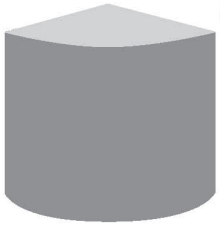
USDA United States Department of Agriculture | EPA United States Environmental Protection Agency | American biogas Council

Organic material is delivered to the digester system

This may include animal manure, food scraps, agricultural residues, or wastewater solids.

Digested material may be returned for livestock, agricultural and gardening uses.

Some biogas can be used to heat the digester.



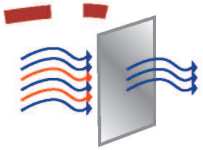
BIOGAS

DIGESTED MATERIAL

Organic material is broken down in a digester

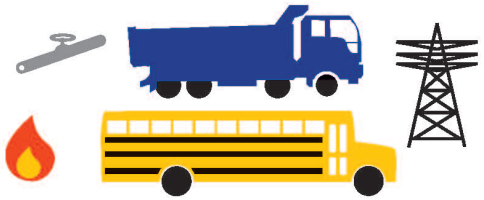
The digester uses a natural biological process under controlled conditions to break down organic material into products for beneficial use or disposal.

Liquids and solids may be separated.



Raw biogas is processed

Typically, water, carbon dioxide and other trace compounds are removed, depending on the end use, leaving mostly methane.



Processed biogas is distributed and used

The gas may be used to produce heat, electricity, vehicle fuel or injected into natural gas pipelines.

SOLIDS

LIQUIDS

Digested material is processed and distributed

Solids and liquids from the digester may be used to produce marketable products, like fertilizer, compost, soil amendments or animal bedding.

organic material

Organic materials are the "input" or "feedstock" for a biogas system. Some organic materials will digest more readily than others. Restaurant fats, oils and grease; animal manures; wastewater solids; food scraps; and by-products from food and beverage production are some of the most commonly-digested materials. A single anaerobic digester may be built for a single material or a combination of them.

the digester

An anaerobic digester is one or more airtight tanks that can be equipped for mixing and warming organic material. Naturally occurring microorganisms thrive in the zero-oxygen environment and break down (digest) organic matter into usable products such as biogas and digested materials. The system will continuously produce biogas and digested material as long as the supply of organic material is continuous, and the micro-organisms inside the system r

biogas processing

Biogas is mostly methane, the primary component of natural gas, and carbon dioxide, plus water vapor, and other trace compounds (e.g. siloxanes and hydrogen sulfide). Biogas can replace natural gas in almost any application, but first it must be processed to remove non-methane compounds. The level of processing varies depending on the final application.

biogas distribution

Processed biogas, often called "biomethane" or "renewable natural gas," can be used the same way you use fossil natural gas: to produce heat, electricity, or vehicle fuel, or to inject into natural gas pipelines. The decision to choose one use over another is largely driven by local markets.

digested material

In addition to biogas, digesters produce solid and liquid digested material, containing valuable nutrients (nitrogen, phosphorus and potassium) and organic carbon. Typically, raw digested material, or "digestate," is processed into a wide variety of products like fertilizer, compost, soil amendments, or animal bedding, depending on the initial feedstock and local markets. These "co-products" can be sold to agricultural, commercial and residential customers.

http://www.americanbiogascouncil.org/biogas_howSystemsWork.asp

ABC Process

- ABC-EPA exploratory workshop October 2014, Baltimore, MD. Consensus to develop an ABC product like the USCC's Seal of Testing assurance (STA) and UK's PAS 110 Protocol for digestate in the U.S.
- Drafts of Standard and Certification Program with Testing Protocols prepared by AD Co-Products Working Group shared with key stakeholders including industry and regulatory community, feedback incorporated at ABC Workshops in:
  - April 2015, Portland, OR
  - October 2015, Boston, MA
  - April 2016, San Diego, CA
- Final Draft, ABC Workshop at REFOR 16, October 2016, Orlando, FL
- Program launched late 2017

ABC Digestate Standard Testing & Certification Program

- Voluntary, industry-led specification setting forth the testing methods and quality management system for characterizing digestate.
- Quantifies the beneficial physical and chemical changes resulting from the digestion process, and delineates the physical and agronomic properties of the digestate products. This information includes:
  - Input materials
  - Physical characteristic of concern and importance
  - Chemical characteristics of concern and importance
  - Agronomic properties
  - Potential restrictions on use

ABC's Digestate Standard Testing & Certification Program (Cont)

- Prescribes standardized test methods, performed by laboratories certified under ABC's Digestate Lab Certification Program
- Provides a descriptive quality hierarchy based on the feedstocks and analytical results for the digestate products
- Provides documentation specific to the digestate produced for use in marketing materials to establish customer assurance for the purchase of a producer's digestate, as well as regulatory submissions
- Broad industry usage of the Program will increase the ABC's ability to effectively communicate the valuable environmental contributions of the biogas industry thereby increasing the economic value of outputs
- Benefits to project developers; digester owners/operators; regulators; recipients of digestate for either direct use or further processing; testing laboratories; certification bodies; communities and neighbors and the ABC.
- Intended to serve as a model for any future local, state or federal regulation of digestate

Relation to Regulations

PROGRAM'S RELATION TO REGULATIONS

- Requirement to comply with all applicable local, state and federal legislation
- Producers must contact the appropriate local, state and federal agencies to determine what regulations apply to their production, sale and use of digestate.
- ABC's Program does not set regulatory limit values for the quality and use of digestate (whole digestate, separated liquids and separated solids).
- Program does not replace or alleviate the regulatory requirements of EPA's Part 503 Rule for digestate produced from digestion of biosolids or sewage sludge as defined in Part 503.
- Testing in compliance with the ABC Program cannot confer immunity from legal obligations.

Scope

SCOPE

- The Program covers digestate (either whole or separated into liquid and solids, but without further chemical modification) to be directly land-applied or to be used as a feedstock in further manufacturing.
- Digestate that is further processed and then marketed as a fertilizer, compost or other product is not covered by this Program.
- The Program does not set forth any new specifications for digestate derived from feedstocks that include waste activated sludge and other sewage products. Those digestates are already subject to specific regulations per EPA Part 503.

ABC Digestate Program Value Proposition

SUBGROUP	BENEFITS
Project Developers	• Establishes best practices/legitimacy for integration into project design, operation and permitting • Enables more detailed discussion with potential offtakers during development stage • Provides way to communicate with neighboring properties, stakeholders
AD plant owners/operators	• Establishes best practices/legitimacy for training and operations • Provides standardized, credible documentation for negotiating offtake agreements and ongoing regulatory compliance • Increases differentiation, value perception in marketplace • Provides way to communicate with neighboring properties, stakeholders
Regulators	• Provides rationale for regulatory differentiation of inputs (e.g. solid waste) from outputs (digestate) and incorporating this into either voluntary compliance standards or compulsory regulations • Provides industry-accepted protocol for testing, characterization for incorporation into permitting process • Provides ongoing source of data for ensuring permit compliance
Digestate Recipients	• Provides standardized, credible documentation for negotiating offtake agreements and ongoing regulatory compliance • Provides accurate, credible material characterization to determine and monitor digestate composition to ensure highest and best use
Testing Laboratories	• Provides industry-accepted, standardized array of tests • Provides source of new business
Certification Body	• Provides source of new business
ABC	• Provides increased value to existing members and source of new members
Communities and Neighbors	• Source of credible information while plant is operating

Testing Protocol

Standard Tests to Establish Minimum Quality and Determine Pertinent Characteristics of Digestate

- Intended to accommodate a wide variety of digestate produced from a diverse combination of feed stocks, and AD systems, the testing protocol is designed to assess the basic physical, chemical, and biological characteristics of Program digestate
- Since digestate can be used for a variety of end uses, the Testing Protocol is broken down into three broad “End Use” Classifications” that each have their own distinct set of laboratory tests associated with assessing digestate for its producer’s stated intended end use
- Depending on the intended end use, different tests are required for a Producer to establish quality and fitness, assess agronomic value, and establish any use restrictions for the digestate’s intended end use
- The testing protocol provides Program participants a feedback loop whereby laboratory testing can help guide intended end uses

End Use Classifications

- **Alternative Daily Cover at Landfill or Refuse Derived Fuel (RDF)**
  - Digestate that may have higher health and safety risks as evidenced by higher human pathogen loads, or higher heavy metals. Digestate in this end use classification will have Producer's stated intended uses for non-agricultural purposes such a use for Alternative Daily Cover (ADC) in landfills, or use as Refuse Derived Fuel (RDF) in other waste to energy applications such as pyrolysis, gasification, and incineration
- **Restricted Land Application**
  - Digestate that is marketed and sold as a product that may warrant some restrictions to land application. Restrictions for land application are equivalent to EPA Part 503, Producers required to recommend additional time between application of this product and harvesting of crops, or other exposure which equates to EPA part 503, "Site Restrictions for Class B Biosolids Applied to Land." Laboratory tests required for this end use classification are intended to adequately characterize digestate to qualify Program participants to market and sell this product with these land application restrictions
- **Generally Unrestricted Bulk Sales or Land Application**
  - Digestate that has undergone equivalent PFRP processes and has physical and biological characteristics equivalent to EPA part 503 Class A and "Exceptional Quality (EQ)" standards. Will generally have no Program restriction to recommended end use for soil amendment bulk sales and land application. Laboratory tests required for this end use classification are intended to adequately characterize digestate to qualify Program participants to market and sell this product for generally unrestricted use

Use Restrictions & Tests

Table 1: Use Restrictions and Tests Needed for Different Digestate End Use			
Possible Digestate End Use ⟶	Generally Unrestricted Bulk Sales or Land Application	Restricted Land Application	Alternative Daily Cover at Landfill or Refuse Derived Fuel
Laboratory Test Packages:			
Fecal Coliform	X*	X	X
Enteric Viruses or Helminth Ova TBD	X+		
Total N, P, K	X	X	
Organic Ammonia and Nitrate	X	X	
Micronutrients	X		
pH	X		
Ag Index	X		
Total Solids and Moisture Content	X	X	X
Volatile Solids	X		
Physical Particle Size (liquid/solids?)	X		X
Metals	X	X	X
Physical Contamination, Inerts	X	X	
Electric Conductivity and Salts (needs discussion)	X		
Stability (VFA or CO_2 Respiration)	X	x	
Bioassay (Cucumber)	X		

Testing Protocol Based on End Uses

Use Restrictions →	Generally Unrestricted Bulk Sales or Land Application	Restricted Land Application	Alternative Daily Cover at Landfill or RDF
Main Health and Safety Concerns	Nutrient levels	Nutrient levels, bacteria	Nutrient levels, bacteria or viral pathogens
AD Process	"Process to Further Reduce Pathogens" (PFRP) or ALT, per EPA Part 503	PFRP, Process to Significantly Reduce Pathogens (PSRP) or ALT, per EPA Part 503	PSRP or Fecal Coliform Test
ALT to AD Process*: Helminth OR Enteric Virus Test	<1 viable helminth or < 1CFU enteric virus per 4g	<1 viable helminth or < 1CFU enteric virus per 4g	Not required
Vector Attraction Reduction	As per EPA Part 503	As per EPA Part 503.33 (b)(1) through (b)(10)	Per ADC regulations of State
Metals	< concentration limits in EPA Part 503.13, Table 3	< concentration limits in EPA Part 503.13, Table 3	EPA Part 503 503.23 Tables 1 and 2 for ADC and Federal Regulations 503.43
Fecal Coliform OR Salmonella Test	<1000 MPN/g fecal coliform OR 3 MPN salmonella/4g	<2,000,000 MPN/g fecal coliform	<2,000,000 MPN/g fecal coliform if ADC
EPA Part 503 Equivalent	Class A (pathogens) plus Table 3 (metals) plus VAR options 1-10	Class B (pathogens) plus Table 3 (metals) plus VAR options 1-10	Class B
Land Application	Unrestricted	Restricted in time of application per EPA Table 5-6 governing Class B**	See EPA Site Restrictions
Physical Contamination (Plastic, Glass, Metal, Sharps)	< 1% total by weight and < .25% film plastic and no sharps	TBD	N/A, not required per Table 1

Required Information For Marketing, Distribution & Use

The ABC Digestate Standard Testing and Certification Program Logo together with the statement:

- "This digestate product has been produced, sampled and tested in accordance with the American Biogas Council's ("ABC") Digestate Standard Testing and Certification Program. Test results are available upon request by contacting (Participating Producer Name) at (Telephone number/email address). The ABC makes no warranties regarding this digestate product or its contents, quality or suitability for any particular use"
- Producer name and contact details, Type of Digestate: Whole Digestate, Separated Liquids or Separated Solids
- Digestate process address and/or process identification code relating to QMS
- Directions for Use, Ingredients, Digestate testing frequency, and
- Analysis of the following characteristics based on laboratory results: pH, Maturity, Soluble Salts, Stability, Nutrient Content, Particle Size, Pathogen Content (Fecal Coliform or Salmonella), Organic Matter Content, Moisture Content, Trace Metals

Digestate Data Sheet

Laboratory:

Digestate Properties	Units	Test Results	Test Results
Digestate Feedstocks	%weight basis at input to digester		
Moisture Content	%, wet weight basis		
Fecal Coliform	Pass/Fail (reference to std for a Pass?)		
Salmonella	Pass/Fail (reference to std for a Pass?)		
Helminth Ova	Pass/Fail (reference to std for a Pass?)		
Total Nitrogen	mg N/L		
Total Organic—N	mg N/L		
Total Ammonia—N	mg N/L		
Total Nitrite/Nitrate—N	mg N/L		
Total Phosphorus	mg P_2O_5/L		
Total Potassium	mg K_2O/L		
Micronutrients			
Assay of various	mg/L Ca, Mg, Fe, S…		
pH	n/a		
Soluble Salts (Chloride, Flouride, Sulfide)	dS/m (mmhos/cm)		

Total Solids	% dry matter		
Volatile Solids	% dry matter or % of TS		
Physical Particle Size	% under 9.5 mm, dw basis		
Metals: Ar, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Se, Zn	Pass/Fail (per US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3.)		
Contamination	[needs discussion, especially for the impact on HSAD]		
Stability (VFA or CO2 Respiration)	mg CO2-C/g VS/day OR g Total VFA/l		
Maturity Indicator/Bioassay (Cucumber)			
Percent Emergence	average % of control		
Relative Seeding Vigor	average % of control		
Physical Contamination (Plastic, Glass Metal, Sharps)	% by weight		
Inerts?			

This Digestate has been tested according to guidelines from the ABC Digestate Standard Testing and Certification Program. Participants in the ABC Digestate Certification Program represent that their product has undergone prescribed QAP protocols for the intended use of this product.

Other Key Features

- Guidelines for Sampling of Digestates
- Quality Management Systems ("QMS")
- Minimum Testing of Digestate and Quality Requirements for Certification
- Test failure: Management of Non-Compliant Digestate & Corrective Action
- Required Information for the Marketing, Distribution and Use of Digestate
- Laboratory Certification Program: Auditing and Third Party Verification
- Web Platform: http://digestate.org/

Next Steps

- Grow Implementation of Program
- Identification of Research Needs to Demonstrate Agronomic and Economic Value of Digestate. Partner with Academic Institutions to Facilitate Research
- Outreach to Industry & Regulatory Community
- Continued Development of Program's Value Proposition
- Advocate for Organic Classification from National Organics Standards Board
- Drive Innovation in Use and Additional Processing
- Seek Specifications from Large Professional and Governmental Consumers

What you Can Do: Get Involved!

- **Learn More**
  - Sign up for the **FREE Biogas News**
  - www.AmericanBiogasCouncil.org
- **Enroll in the Digestate Certification Program**
  - http://digestate.org/
- **Become a Member**
  - Dues start @ $75-$1,300
  - Application online, or contact us

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