



PlanET BIOLOGICAL SERVICES

Transforming Biogas through Biological Excellence



Providing Biological Testing for the Health of your Digester






 **870+**

Biogas plants in operation worldwide, including 150+ AD to RNG plants.

 **25+**

years of global experience (since 1998) and serving the North American Market since 2006

PlanET Biological Service:

-  Helps clients control H₂S at the source with non-corrosive chemicals and biological sulfide reduction
-  Maximizes biogas production and quality through biological optimization
-  Helps avoid costly digester upsets
-  Supports the health of 250+ digesters globally, providing valuable operational guidance from biological health monitoring
-  Provides actionable insight into digester health

What is Biological Monitoring and why do we do it?

Biogas production is entirely dependent on the health of various microorganisms that exist within an anaerobic digester. Through a series of biological steps that take place over many days, the community of microorganisms in an Anaerobic Digester gradually convert organic materials into biogas. This is a complex and delicate process that requires continuous monitoring of the chemical state of the digester, as well as careful control of various operational parameters.



Three essential Factors for the Digester's Biological Health:

The Substrate that is Fed to the Digester

- Appropriate Feeding Rate
- Biologically Available Organic Matter
- Lack of Inhibiting Chemicals (e.g. Antimicrobials, Heavy Metals)






Consistent, Supportive Temperature

- Reproduction & Growth of Desirable Microorganisms
- Stable Temperature for Sensitive Biological Processes





Ideal Ranges for Various Chemical Reactions

- Temperature Stability
- Nutrients
- pH and Alkalinity
- Organic Acids
- Trace Elements and Enzymes"

Benefits of Regular Biological Testing

-  Prevention of major upsets that cause costly downtime
-  Assists with decision making
-  Preventative treatment rather than reactive, costly efforts
-  Optimized biogas yield and production
-  Efficient use of chemicals (i.e., avoids overdosing)

PlanET offers a variety of testing options which include:

-  Sample analysis at the PlanET Biological Service Laboratory in Colorado
-  Periodic testing of trace elements and volatile fatty acid (VFA) profiles
-  Site-specific testing of key health parameters including FOS, TAC, total solids (dry matter), volatile solids (organic dry matter), pH, conductivity, and ammonium
-  Testing of acid-insoluble ash for the monitoring of sand, silt and other insoluble material contamination



PlanET's Biological Testing Service

PlanET believes that balanced and healthy digester biology means optimal biogas production and the avoidance of costly troubleshooting efforts. In addition to biogas optimization, regular testing of digester health helps avoid major biological upsets that result from overfeeding and underfeeding, temperature changes, chemical imbalances, and other common process disruptions.

PlanET's Biological Testing Service provides actionable digester insights when you need them. Our biological laboratory and consultation service is designed for fast turnaround time and high-accuracy results, providing the information you need to make timely adjustments for optimal biogas production and operational confidence.

The testing program is designed for continuous, timely monitoring and effective operational guidance. We monitor individual health parameters to ensure they stay in healthy ranges, but also track the comprehensive digester health status through a combination of health parameter data.

Our testing parameters include:

Total Solids (i.e. Dry Matter): All solid material contained within a substrate, both organic and inorganic.	Ammonium: Investigates toxicity risk to methanogens and product quality risk for biogas upgrading.	Periodic Testing of Trace Elements: Ensure microorganisms can create required enzymes to break down substrates.
Volatile Solids (i.e. Organic Dry Matter): The organic fraction of total solids, i.e. the food necessary for microbes to produce biogas.	pH: Measures hydrogen or hydroxide ion concentration, indicating whether digestate is acidic (under pH 7) or basic (over pH 7).	Periodic Testing of Volatile Fatty Acid Profiles: Checks for fatty acid imbalances that can indicate various types of health issues.
FOS, TAC, and FOS/TAC Ratio: <ul style="list-style-type: none"> • FOS: For testing organic acids. • TAC: For testing alkalinity or carbon buffer capacity. • FOS/TAC Ratio: Ratio of organic acids to alkalinity. 	Conductivity: Avoid salt contamination that can inhibit biogas production.	Acid-Insoluble Ash: Tracks inert, acid-insoluble materials such as sand and silt.



Quality Biogas Through Quality Testing

PlanET provides operational guidance based on lab results and biogas production data. We also help clients explore new substrates and the mixture of novel substrate blends via bench-scale and mini digester-scale testing that is performed in our laboratory in Gescher, Germany. To support operator effectiveness, PlanET provides Operator Training to help with biological commissioning and steady state operation.

Biological testing results could indicate that the desulfurization of biogas is necessary. Hydrogen sulfide (H₂S) can accumulate to thousands of parts per million (ppm) levels in anaerobic digesters, creating significant toxicity, safety, corrosion, and gas quality issues. Without preventative treatment, these high levels of H₂S require expensive, high-maintenance mitigation with large filtration systems.

To circumvent this issue, PlanET offers MicroNOX powder for direct treatment of H₂S in liquid phase digestate.

H₂S Reduction with MicroNOX ON16

MicroNOX ON16 is an iron-rich powder which is exclusively distributed by PlanET in North America. MicroNOX reduces H₂S levels in digestate and biogas, similar to ferric chloride but without the corrosivity or additional expense. What's more, it's safer to handle and easier to use! MicroNOX does not require special storage or training for handling. It can be delivered via small, easy-to-apply bags or 1-ton super sacks, depending on which option is more useful for your application.

For more information on this easy-to-use solution for H₂S, contact us today.

Advantages of using PlanET Biological Service:

- | | |
|---|---|
| Testing the right health monitoring parameters at the right frequency | Continuous Monitoring and Actionable Data |
| Ability to expand operational insights via biogas quality and production analysis | 25 years of AD construction, service and operation experience |
| Experience across a wide range of digester sizes and substrate types | Comprehensive knowledge of the entire AD process which allows for significantly more operational guidance from biological health data than other labs can |
| Quick Turnaround of Results that Allows Timely Process Adjustments | |

About PlanET

PlanET Biogas Global – Biogas is our passion

Founded in 1998, PlanET Biogas is an innovative international company with offices in Germany, France, United States, Canada, Italy, and Brazil. We have extensive experience and knowledge of the global market for biogas technologies and specialize in the design, construction, and servicing of anaerobic digestion and biogas utilization systems including RNG plants.

PlanET Biogas in North America

PlanET's North American companies are subsidiaries of PlanET Biogas Group, headquartered in Germany. With offices in Colorado, New York and Ontario, PlanET's localized presence is well positioned to support your project anywhere in North America.

With a specific emphasis on the agriculture, slaughter-house, food, and organic waste sectors, PlanET Biogas has solidified our position as key providers of AD & RNG technology solutions. Our expertise and experience enable us to address the unique challenges and requirements of these sectors, providing tailored solutions to meet the needs of our clients.

PlanET Biogas Group New Headquarters

2022 marked the opening of PlanET Biogas Group's headquarters in Gescher, Germany. This state-of-the-art facility showcases our commitment to sustainability by integrating a renewable energy concept that combines RNG-fueled CHP, geothermal technology,

and solar power. With a focus on meeting our energy needs and reducing peak loads, we efficiently generate electricity and heat while minimizing our carbon footprint. Our geothermal system provides heating and cooling, and solar panels contribute clean energy. Additionally, we have installed 18 charging stations to support electric vehicles.

Research & Development

We actively engage in research and development, collaborating on scientific projects dedicated to organics resource recycling, upcycling, and diversion, as well as the beneficial use of biogas. This commitment directly benefits our customers by ensuring that our products and technology incorporate the latest scientific findings. We gain valuable insights into emerging technologies and best practices, enabling us to continually enhance the performance of our biogas plants. By staying at the forefront of research and innovation, PlanET provides our customers with state-of-the-art engineering design and technology solutions that improve energy production, organic waste management, and environmental sustainability.

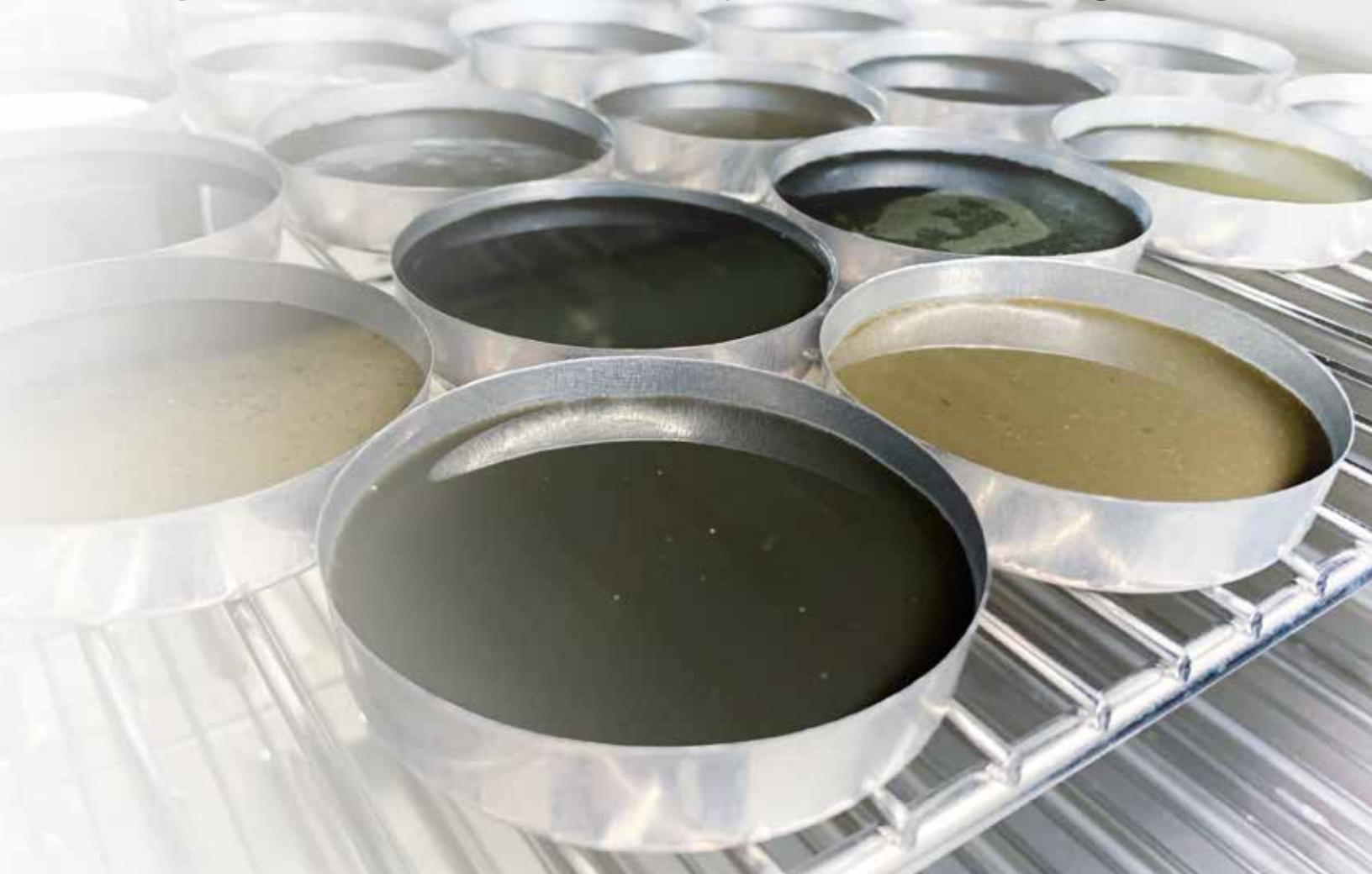
Our Clients

We serve a diverse customer base, including gas & electric utilities, fuel suppliers & distributors, agricultural businesses (including farms & slaughterhouses), the food & beverage industry, organic waste diversion companies (involved in processing pre- & post-consumer food waste & source-separated organics), municipalities, and other industries seeking sustainable energy solutions.



<p>25+ YEARS OF EXPERIENCE IN THE BIOGAS INDUSTRY</p>	<p>15+ YEARS IN NORTH AMERICA</p>	<p>100% DEDICATED TO ANAEROBIC DIGESTION, BIOGAS UTILIZATION & RNG TECHNOLOGY SOLUTIONS</p>
<p>870+ BIOGAS PLANTS OPERATIONAL WORLDWIDE</p>	<p>150+ AD TO RNG PLANTS IN OPERATION WORLDWIDE</p>	<p>350+ EMPLOYEES WORLDWIDE</p>

Continuous, Timely Monitoring and Effective Operational Guidance for your Anaerobic Digester



If you need Biological services and support,
contact us today



PlanET Biogas USA Inc.
3370 Walden Avenue, Suite 120
Depew, NY 14043
United States



PlanET Biogas USA Inc.
33247 Highway 85
Lucerne, CO 80646
United States



PlanET Biogas Solutions Inc.
157 Cushman Rd.
St. Catharines, ON, L2M 6T4
Canada
Phone: + 1 905 935 1969
E-mail: info@planet-biogas.ca

Phone: + 1 877 266 0994

E-mail: contact-usa@planet-biogas.com