quasar energy group

www.quasareg.com

Optimizing Biomass Resources

Anaerobic Digestion

Sustainable technology solutions . . .

energy economy environment

Our Company

- Headquarters in Cleveland, OH
- Over $150M in Executed Projects
- 14 Anaerobic Digesters (OH, NY, MA, and ME)
- Capacity to annually manage 700,000 tons of organic waste
- Municipal, Industrial & Agricultural ADs
- Mature US Supply Chain with in-house fabrication

Full Suite of Services

Design → ***Permit*** → ***Build*** → ***Commission*** → ***O&M***

Sustainable technology solutions . . .

energy economy environment

Building an Industry

2006 — Company incorporated in Ohio
2007 — **Total Employment:** 4
2008 — Akron, OH digester operational
2009 — **Total Employment:** 10
2010 — lab and engineering on OSU-OARDC campus
2011 — **Total Employment:** 19
Wooster - OSU/OARDC digester breaks ground
Total Employment: 27
Wooster, OH digester operational
Columbus, OH digester operational
Total Employment: 39
Zanesville, OH digester operational
Rutland, MA digester operational
Haviland, OH digester operational
2012 — **Total Employment:** 47
Cleveland, OH digester operational
North Ridgeville, OH digester operational
iADs (quasar - OSU) operational
2013 — **Total Employment:** 63
City of Wooster, OH WWTP digester operational
Barberton, OH digester operational
Ashley, OH digester operational
Buffalo, NY digester operational
Niagara, NY digester operational
Fairborn, OH digester operational
Cleveland, OH expansion completed
Columbus, OH expansion completed
2014 — **Total Employment:** 85
Clean Water R&D
2015 — Water Resource Recovery Open House
Total Employment: 92
Brunswick, ME project starts
Phosphorus Recovery System Demonstration
2016 — **Total Employment:** 87

Sustainable technology solutions . . .

energy economy environment

Anaerobic Digestion Applications

quasar energy group

INDUSTRIAL

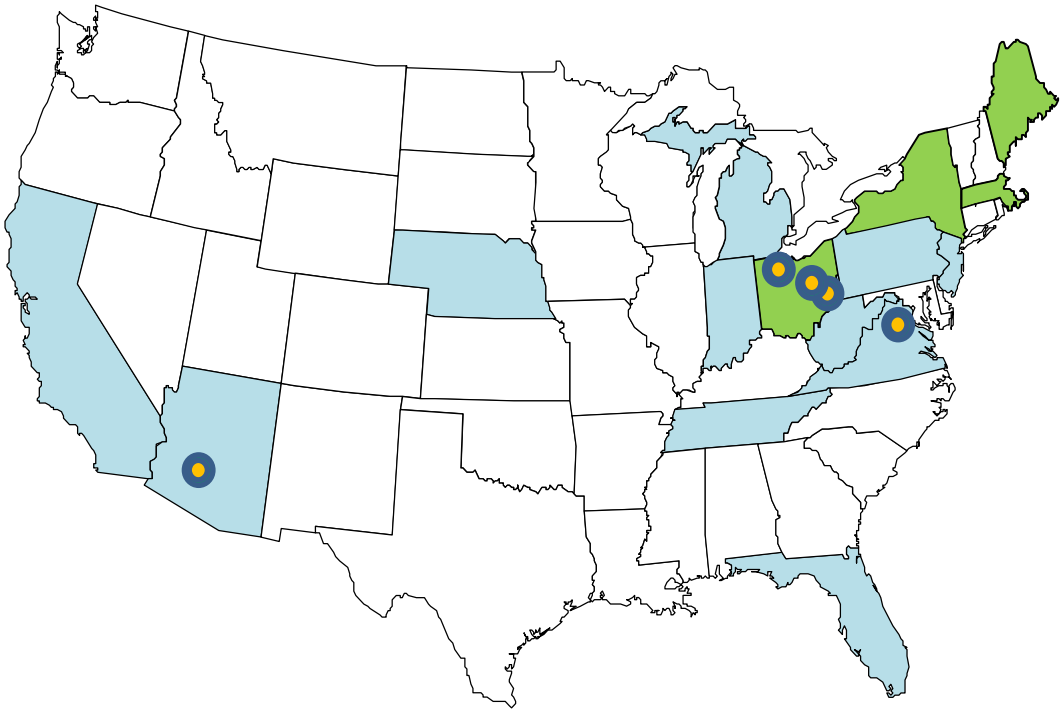

AGRICULTURAL

MUNICIPAL

Sustainable technology solutions . . .

energy economy environment

quasar's National Presence



Key

- Contains Project in Development
- Contains Operational Digester
- Project Under contract

- ✓ 14 Digesters in 4 states
- ✓ 5 Projects Under Contract
- ✓ Projects in development in 12+ states

Sustainable technology solutions . . .

energy economy environment

What is Anaerobic Digestion

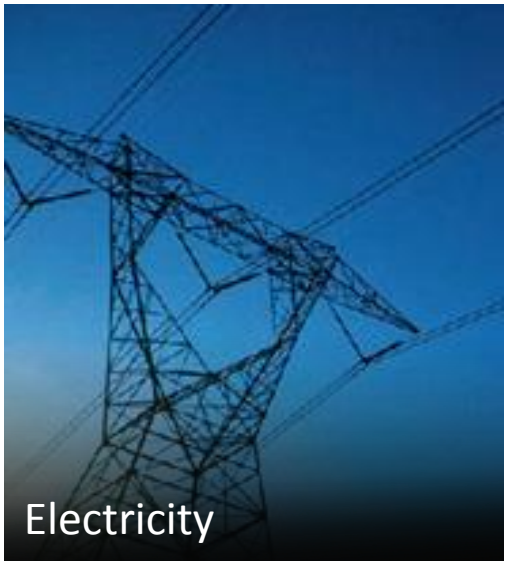
Anaerobic digestion is a natural process where microorganisms break down organic waste in the absence of oxygen producing renewable energy and a valuable natural fertilizer product.

Types of Organic Waste:

Food waste
Fats, oils and greases
Manure
Biosolids (sewage sludge)
Ethanol residuals

Environmental Benefits

- Renewable energy – natural gas, electricity, motor vehicle fuel (CNG/LNG)
- Animal bedding, peat alternative, or compost
- Natural solution to chemical fertilizers.
- Reduced greenhouse gas emissions, cleaner air, soil and water



Sustainable technology solutions . . .

energy economy environment

Where is the Industry Going?

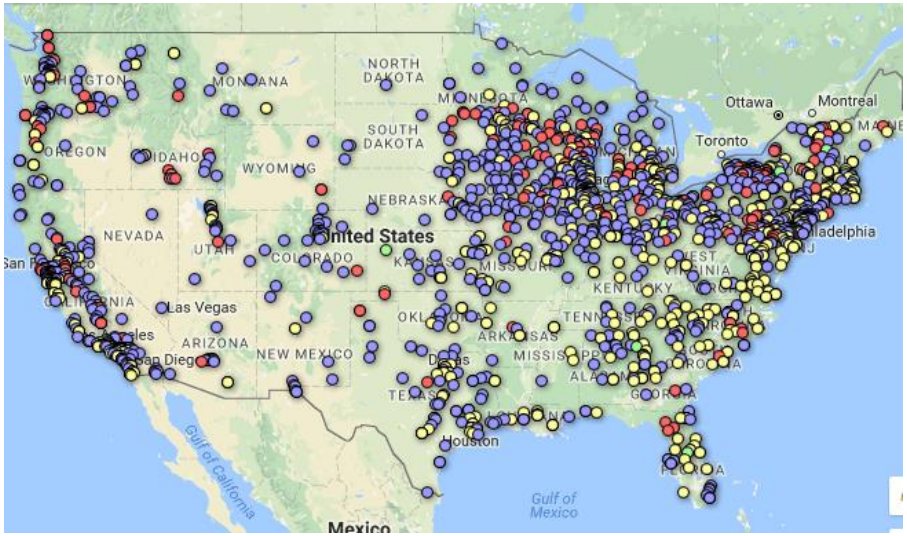
Today, there are approximately 2,200 operating anaerobic digesters in North America:

- 247 on **farms** (dairy & swine)
- 1,269 at **wwtp**
- 39 at **food waste generators**
- 652 at **landfills**

CONSERVATIVE potential for the industry:

- 8,241 on farms
- 3,888 at wwtp
- 931 at food waste
- 415 at landfills

Source: American Biogas Council



Current Locations

Sustainable technology solutions . . .

energy economy environment

Our Vision: The Utility of the Future

"The Utility of the Future transforms itself into a manager of valuable resources, a partner in local economic development, and a member of the watershed community seeking to deliver maximum environmental benefits at the least cost to society."

It does this by:

- reclaiming and reusing water
- extracting and finding commercial uses for nutrients
- capturing heat and latent energy in biosolids.

The Water Resources Utility of the Future: A Blueprint for Action - NACWA, WERF, and WEF

Sustainable technology solutions . . .

energy economy environment

Optimizing Resources

Biosolids (Wastewater Sludge):
Wastewater treatment plants consume 3% of the total US electricity demand.

Biosolids have the potential to produce 12% of the total US electricity demand. Using anaerobic digestion technology, wastewater treatment plants can become energy neutral and upgrade aging infrastructure without increasing costs.

How Do We Encourage Adoption?

- Education & outreach with wastewater treatment plants
- Coordinate with the state USDA Rural Development Office to understand and market the opportunity to leverage REAP funds to upgrade treatment plants through public/private partnerships.
- Work with state regulatory agencies to streamline the permit application process for digester projects.

Optimizing Resources

Food Waste:
Food production accounts for 10% of the US energy budget, requires 50% of our land, and 80% of our freshwater consumption[1].

Yet – 40% of food produced goes uneaten and 33.8 million tons of organics ends up in landfills or incinerators.

Anaerobic digestion turns food waste into renewable energy and nutrients. Food waste has up to 3 times the energy potential of biosolids!

How Do We Encourage Adoption?
Establish a state wide commercial food waste diversion program.

- more than 1 ton per week
- Massachusetts was an early adopter in 2014

1. NRDC Issue Paper – Wasted: How America is Losing Up to 40% of Its Food from Farm to Fork to Landfill.

Biosolids and Food Waste

Location: Wooster, Ohio
Placed in Service: 2013
Energy: 1 MW
Annual Tons: 100,000 wet tons

Sustainable technology solutions . . .

energy economy environment

Optimizing Resources

Renewable Energy:

Anaerobic digestion is the most versatile advanced energy technology. Biogas can be used to generate:

- electricity & heat
- natural gas (biomethane)
- motor vehicle fuel (CNG)

How Do We Encourage Adoption?

- Establish a renewable portfolio standard
- Develop a virtual net metering program
- Incentivize fleets to convert to run on renewable fuels
  - Conversion funding and/or fueling station funding

Columbus, OH

Placed in Service: 2010
Annual Tons: 90,000 wet tons
Fuel/Day: 2,800 GGE *or*
Electricity: 1 MW
Federal Program: EPA RFS

Sustainable technology solutions . . .

energy economy environment

RECs & RINS

Collaborators: City of Columbus, SWACO

Feedstocks: City of Columbus biosolids
Organics diverted from landfills

Electricity: Sold to the City of Columbus

Heat: Used on-site

Federal Participation: Public Fueling Station approved to generate RINs under US EPA's Renewable Fuels Standard program.

State Participation: RECs from electricity generated and new initiative to allow RECs from CNG and heat production.

Chevy Bi-Fuel Impala

quasar energy group

www.quasareg.com

Thank You

TANK CONNECTION AFFILIATE GROUP

The Alpha Group

Sustainable technology solutions . . .

energy economy environment