quasar™
energy group

ABOUT quasar energy group

quasar is an Ohio-based renewable energy company.

- Aggregation of the best anaerobic digestion technology available
- Provide complete full service, turnkey anaerobic digestion solutions for our customers
- Produce energy for use as combined heat, power and fuel from organic sources
- Operate laboratory and engineering facilities on OSU-OARDC campus
- Dedicated to building systems based on U.S. components and U.S. suppliers
- More than 40 projects in our current business pipeline
- Seven facilities operating in Ohio and one in Massachusetts

quasar's **Mission … "To produce affordable renewable energy from commercial, municipal and agricultural biomass, while improving the environment."**

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ANAEROBIC Digestion

Anaerobic digestion is a natural process where microorganisms break down organic biomass in the absence of oxygen.

INPUTS

- Agricultural biomass (manure, crop residuals, energy crops)
- Food processing residuals and FOG (fats, oils and grease)
- Municipal wastewater (biosolids)
- Ethanol residuals
- Expired, damaged or off-spec consumer goods

PRODUCTS

- Renewable Energy – Natural Gas, Electricity, Motor Vehicle Fuel (CNG/LNG)
- Animal Bedding, Peat Alternative, and Compost
- Concentrated fertilizer (P) Separation
- Reduced Greenhouse Gas Emissions, Cleaner Water, Soil and Cleaner Air

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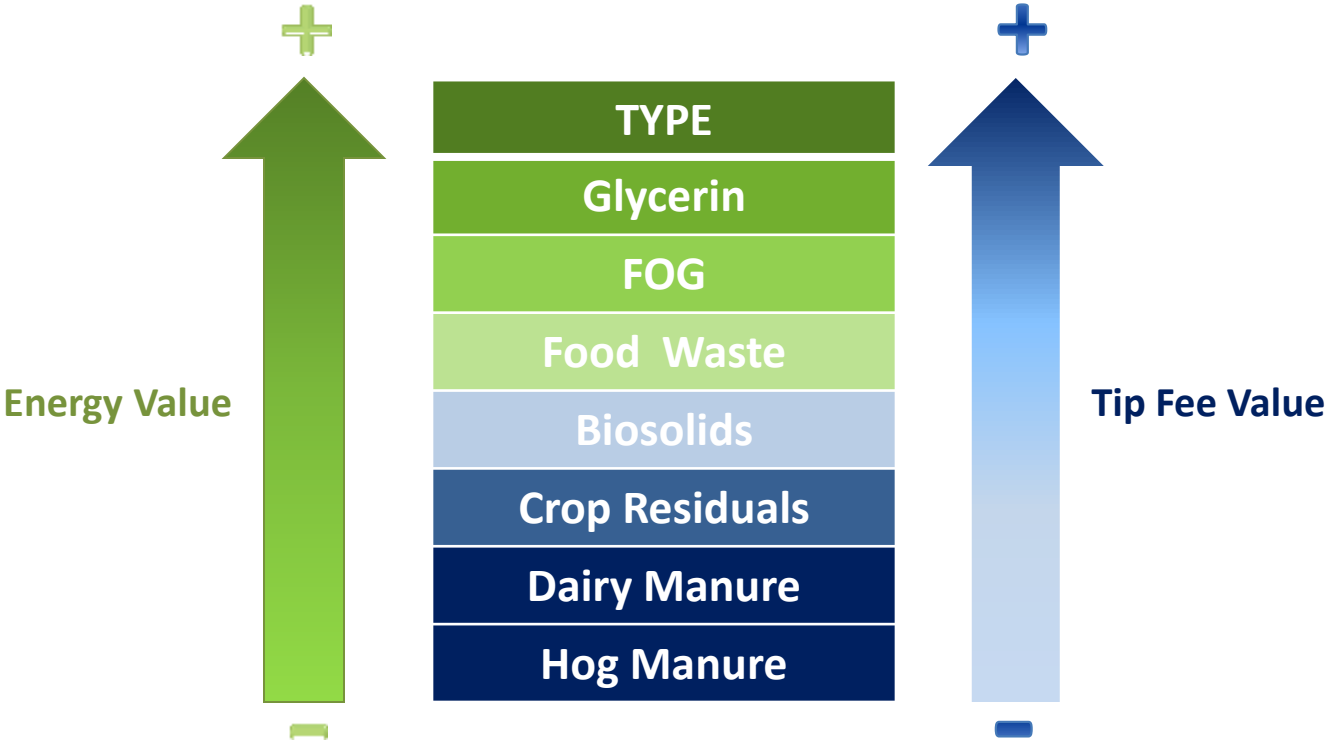
BIOMASS Value For Energy

Which types of biomass are best for a digester?



Biomass recipes will differ based on the type and quantity of feedstock available in the region. quasar's laboratory on the OSU/OARDC campus validates biomass recipes to guarantee a system's energy potential.

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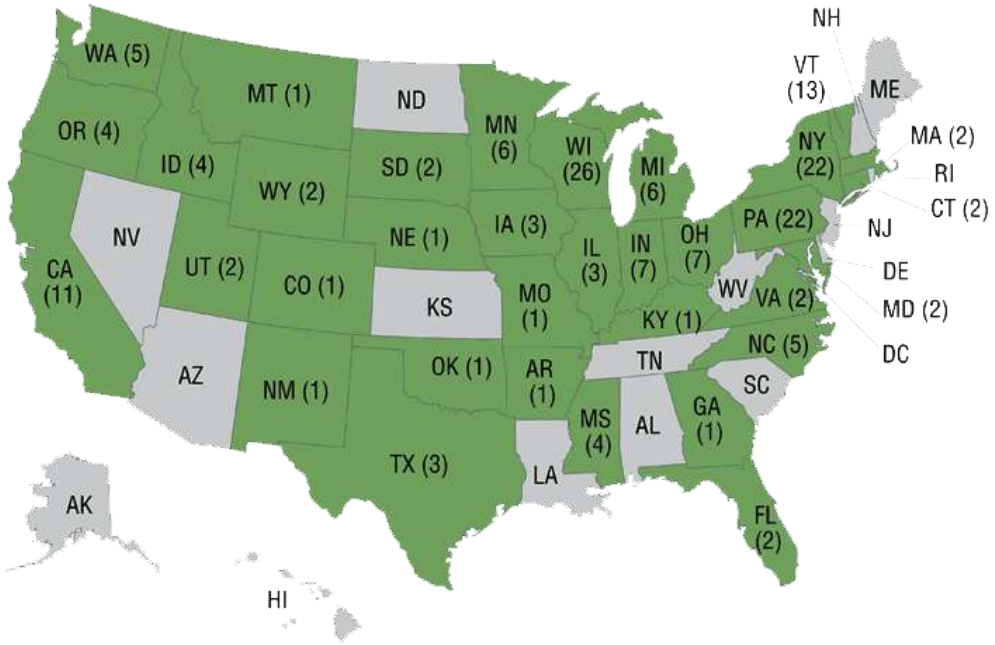
U. S. INDUSTRY



1 AgSTAR Map of Operational Digester Systems

- [1]176 anaerobic digester systems are operating at commercial livestock farms in the United States.
- These systems have the ability to generate 62MW of electricity each hour.
- The average US system creates enough biogas to operate a 350kW rated generator.
- The US AD industry is about **3%** the size of the German industry.

US digesters have the potential to generate 134,136 gge per day of renewable fuel.

REFERENCES:

1. AgSTAR Website: Operating Anaerobic Digestion Projects

Note: The AgSTAR database only tracks agricultural anaerobic digestion projects.

POTENTIAL

A Proven Success Story

Germany's land mass as compared to that of the United States.

Germany, which has the largest installed base of solar and the third largest installed base of wind gets [1]**more renewable energy from organic materials than wind and solar combined.**

In 2010, Germany had approximately 6,000 biogas facilities generating 2,300 MW of electricity. That's the equivalent of [2]**207,300 gge per hour. 1.7 billion gallons of renewable fuel per year!**

Germany is approximately the size of Montana.

REFERENCES:

1. Renewable Energy World: Integrating Anaerobic Digestion into our Culture Part 2
2. Assumptions: 3,412,142 BTU=1MW, Standard Electric Generator Efficiency – 33.2%, 114,000 BTU = 1gge

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ANAEROBIC DIGESTERS in Ohio

Operational Facilities:
- Cleveland
- Columbus
- Haviland
- North Ridgeville
- Wooster
- Zanesville
- Zanesville Expansion - iADs

Ohio Projects Scheduled in 2012:
- Cardington
- Celina
- Cincinnati
- Dayton
- Norton
- Toledo
- Uniontown
- Wooster II

Offices

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quasar FACILITIES

Operational or Commissioning

Operational or commissioning facilities are:

Cleveland, Ohio	1,800 gge per day
Columbus, Ohio	3,600 gge per day
Haviland, Ohio	1,800 gge per day
North Ridgeville, Ohio	1,800 gge per day
Rutland, Mass.	450 gge per day
Wooster, Ohio	825 gge per day
Zanesville, Ohio	1,800 gge per day
Zanesville, Ohio *i***AD***s*	7,750 gge per day

Renewable fuel produced from biomass:

20,000 gasoline gallon equivalents (gge) per day!

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CLEVELAND, OH

Placed in Service: 2012
Annual Tons: 50,000 wet tons
Fuel per day: 1,800 GGE

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COLUMBUS, OH

Placed in Service: 2010
Annual Tons: 90,000 wet tons
Fuel per day: 3,600 GGE

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HAVILAND, OH

Placed in Service: 2012
Annual Tons: 50,000 wet tons
Fuel per day: 1,800 GGE

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FRENCH CREEK, OH

Commissioning: April 2012
Annual Tons: 50,000 wet tons
Fuel per day: 1,800 GGE

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RUTLAND, MA

Placed in Service: 2011
Annual Tons: 15,000 wet tons
Fuel per day: 450 GGE

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WOOSTER, OH

Placed in Service: 2010
Annual Tons: 25,000 wet tons
Fuel per day: 825 GGE

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WOOSTER, OH #2

Partner: City of Wooster WWTP
Planned for Construction: 2012
Annual Tons: 100,000 wet tons
Fuel per Day: 7,200 GGE

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ZANESVILLE, OH

Placed in Service: 2010
Annual Tons: 50,000 wet tons
Fuel per Day: 3,600 GGE

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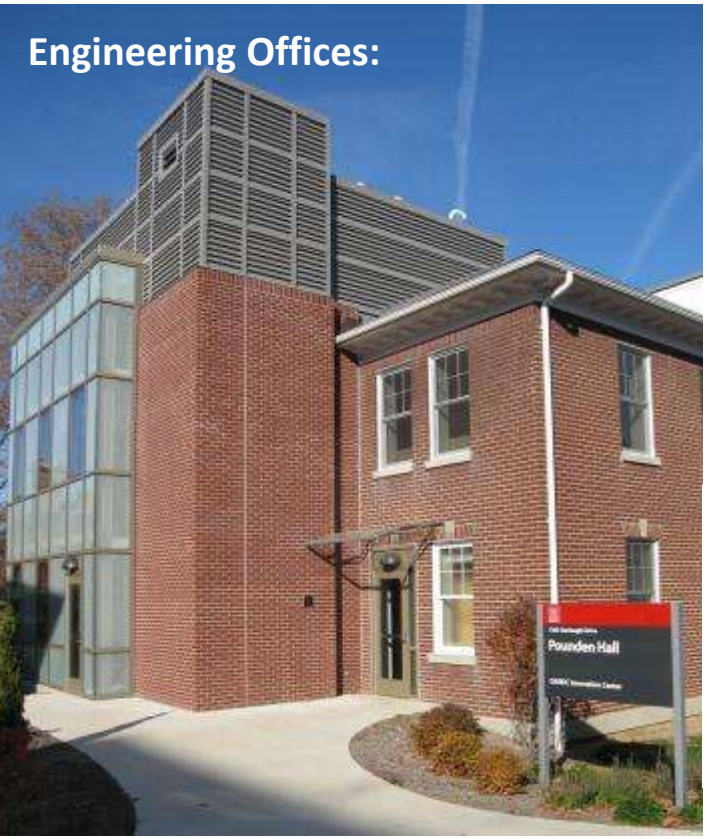
COLLABORATING with The Ohio State University

Engineering Offices:



Laboratory:

Laboratory:

THE OHIO STATE UNIVERSITY OARDC

BioHio Digester:

COLLABORATING with The Ohio State University

- **Laboratory Analysis and Testing:** quasar's OARDC lab benefits from the expertise of the University's renowned faculty and offers internships to ATI students.

- **Developing Renewable Energy Curriculum:** preparing students for jobs in Ohio's growing anaerobic digestion renewable energy industry with classroom training and hands-on experience.

- **By Training the Next Generation of Technicians:** we can be prepared to answer the growth of this industry with a ready and able workforce.

quasar's laboratory is the only anaerobic digestion laboratory of its kind in the United States.

THE OHIO STATE UNIVERSITY OARDC

ZANESVILLE, OH

*i*ADs

Commissioning: Spring 2012
Annual Tons: 8,000 iADs
Plant Expansion Tons: 100,000
Fuel per Day: 7,550 GGE

The Integrated Anaerobic Digestion System (iADs) is patent pending technology developed at The Ohio State University. ***i*ADs** integrates **quasar's** liquid anaerobic digestion with solid state anaerobic digestion, resulting in a technology that can treat and recover energy from feedstocks ranging from 0.5% to 85% total solids content.

ZANESVILLE, OH

*i*AD*s*

DEPACKAGING

Expanding the Opportunity

Depackaging equipment presents a new opportunity to capture organic materials from products with recyclable packaging such as;

- wax-coated cardboard
- glass bottles
- aluminum cans
- plastic bottles, wrappers & containers

Dupps depackaging equipment in Zanesville, Ohio

quasar has been actively conducting depackaging trials at our Wooster and Zanesville anaerobic digestion facilities since 2010.

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quasar natural gas

the future of energy is renewable fuel

quasar has introduced our new brand of alternative motor vehicle fuel – **qng** (or **quasar natural gas**). Fueling stations are already operational at our Columbus, Zanesville and Wooster plants and will be coming soon to Cleveland, North Ridgeville and Haviland.

quasar will continue installing fueling stations at our anaerobic digester systems, helping to build the infrastructure necessary to reduce transportation costs of goods and services to Americans.

quasar natural gas qng

PROPRIETARY Gas Cleaning Technology

quasar has collaborated with **Air Products** to develop proprietary gas cleaning technology.

- Now biogas can be affordably upgraded to biomethane exceeding pipeline quality.
- **Ohio organic residuals represent the equivalent of 1,000,000,000 gallons of renewable fuel annually.**

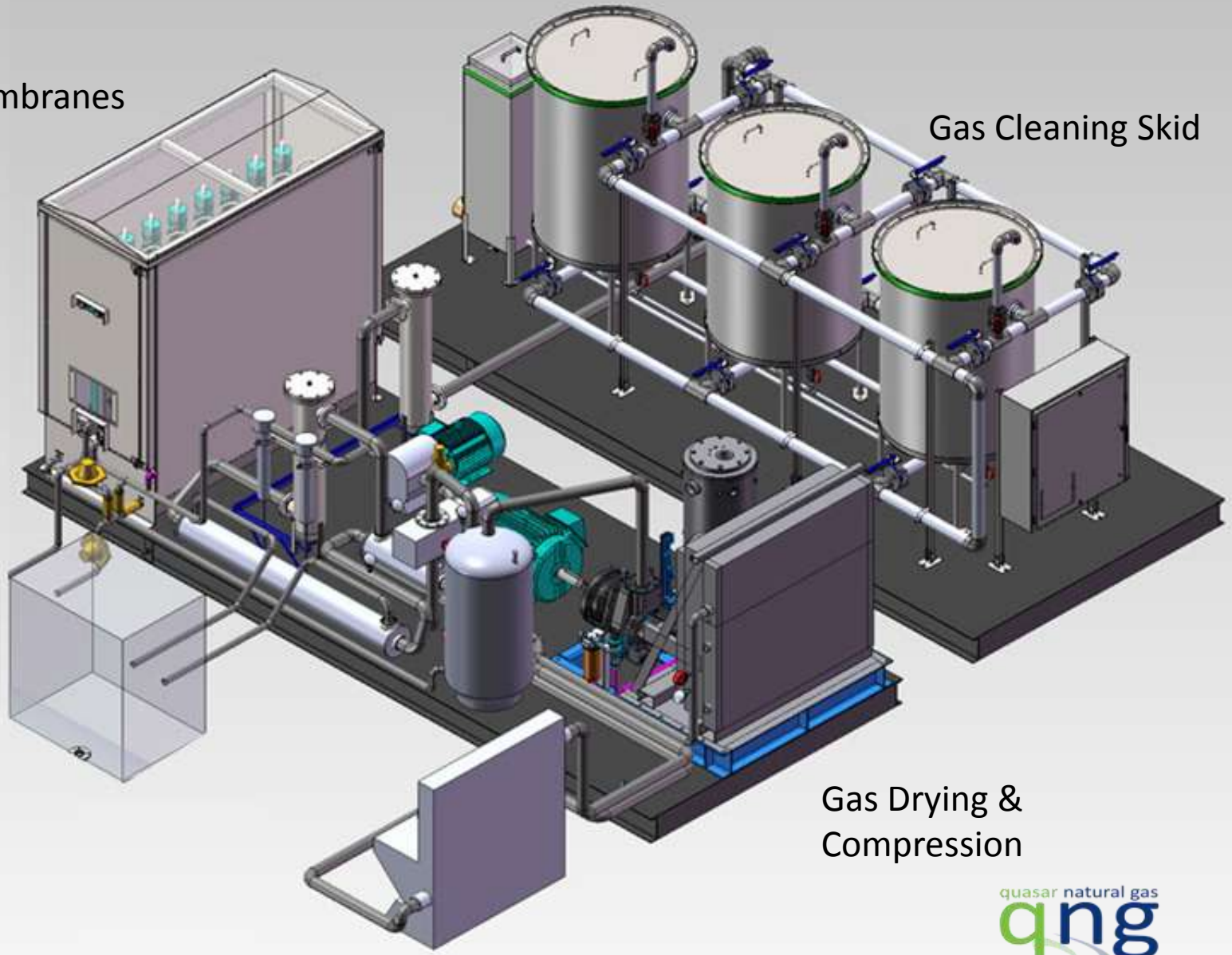
AIR PRODUCTS


Gas Cleaning


Gas Drying & Compression


Gas Separation
Air Products Prism® Membranes

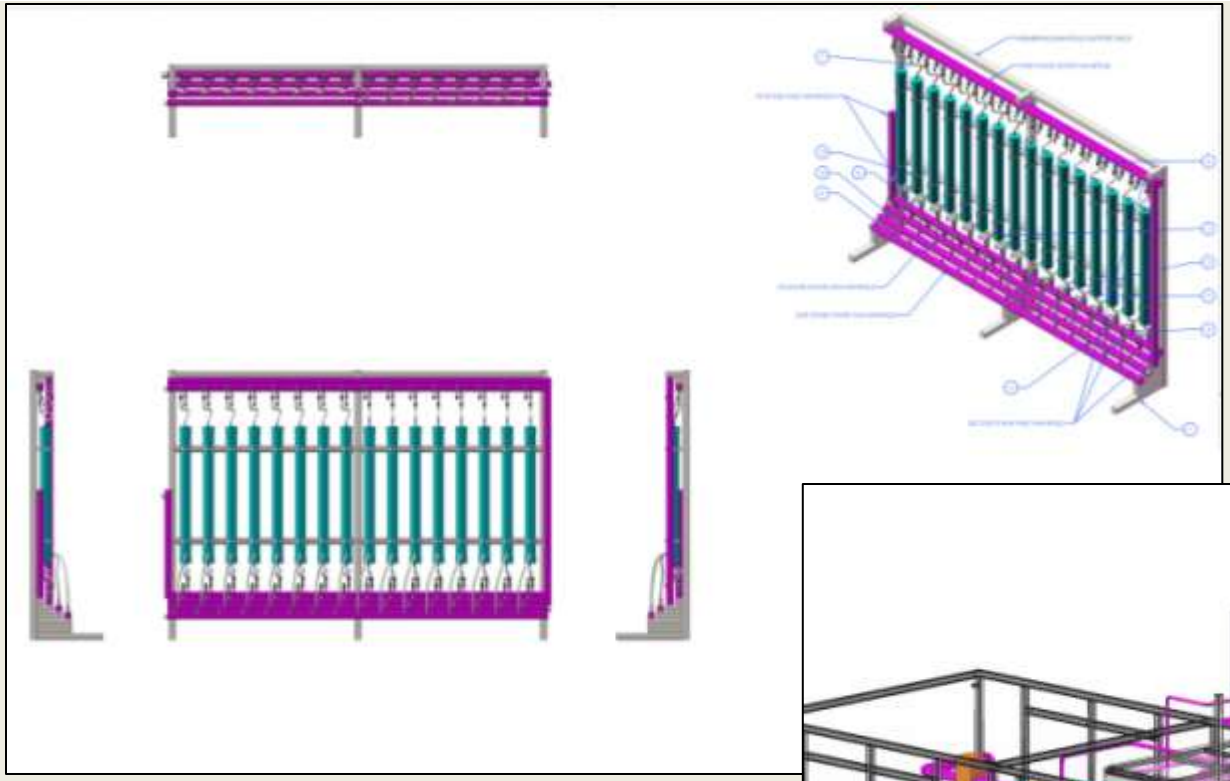
Gas Upgrade Technology



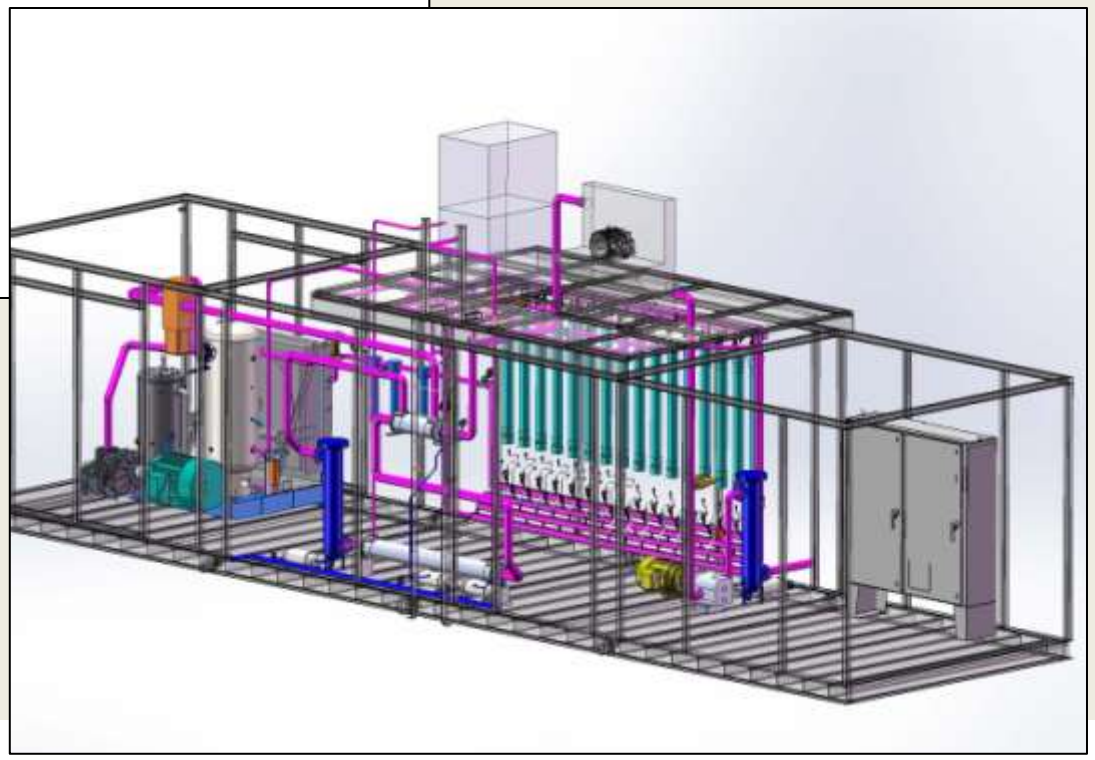
quasar natural gas
qng

OUL CONVERSIONS

Gas Upgrade Units



Membrane Rack Package



Compression Skid Assembly

EMISSIONS

Natural Gas Vehicles

SWACO Truck Fueling in Columbus

Zanesville Station

2012 SWACO Emerald Award

Transit buses equipped with model year 2004 CNG engines compared to model year 2004 diesel engines:

- CNG buses produced 49% lower nitrogen oxides emissions
- CNG buses produced 84% lower particulate matter emissions

In a study of UPS delivery trucks running on CNG compared to diesel trucks of a similar age:

- CNG trucks produced 75% lower carbon monoxide emissions
- CNG Trucks produced 49% lower nitrogen oxides emissions
- CNG trucks produced 95% lower particulate matter emissions

REFERENCES:

1. U.S Department of Energy: UPS CNG Truck Fleet: Final Results

quasar natural gas qng

LIMITATIONS

Natural Gas Vehicles

qng fueling station in Columbus, Ohio

qng fueled semis – **quasar** fleet vehicles

- USEPA should encourage CNG vehicle conversions. State EPA should challenge existing Federal guidelines.
- CNG conversions should be performed by certified installers.
- CNG vehicle emissions should be tested and held to the same standard as the gas/diesel counterparts.
- OE manufacturers have repeatedly delayed CNG vehicle availability and conversions are too expensive.
- Conversion kit providers have also delayed the CNG population because of long lead times. It is a lack of CNG vehicles not fueling stations that stifle the industry's development.

quasar natural gas qng

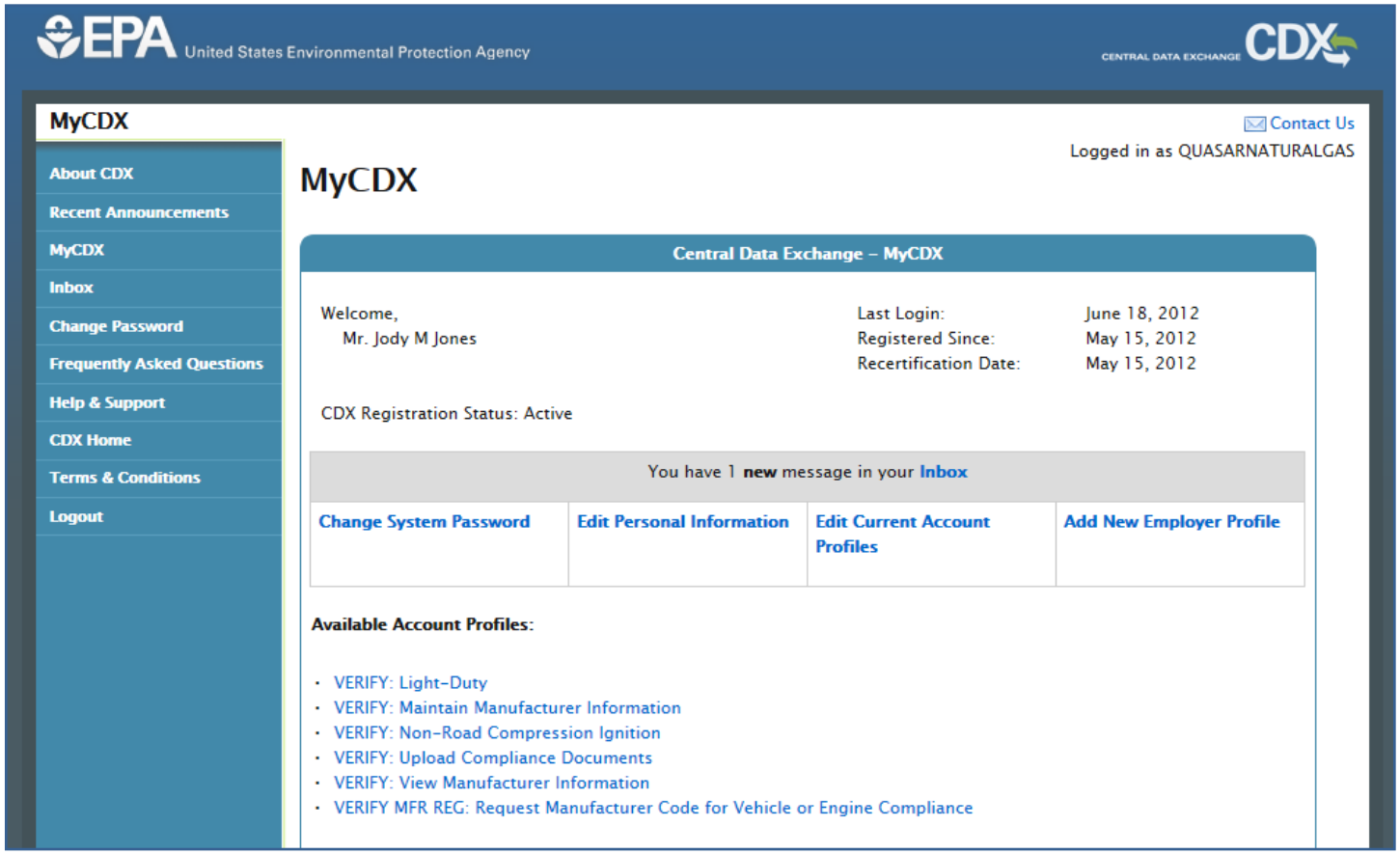
OUL CONVERSIONS By quasar

quasar has invested time & effort into converting OUL (out of useful life) vehicles to run on CNG.

- Converted trucks owned and operated by **quasar** transport biomass and effluent across Ohio – reducing operating expenses and improving the environment.
- By July 15, 2012 **quasar** will have the equipment & personnel in place to perform OUL vehicle conversions for customers and conduct EPA approved testing in our laboratory.
- **Station Open House Events** across Ohio Summer and Fall 2012.

quasar natural gas qng

EPA website for verification of conversions.



CONVERSIONS

CNG vehicles

quasar Truck at Columbus Fueling Station

quasar Vehicles

quasar Conversion of OUL Vehicle

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