



TECHNOLOGY PROVIDER TECHNOLOGY INFORMATION REQUEST

Technology/Service: Biogasclean / Biogas Conditioning

Information by:

Date: May 2, 2018

COMPANY INFORMATION

Company: Biogasclean A/S

Phone: +45 6617 2177

Web Site: <http://www.biogasclean.com/>

Address: Egelundsvej 18

City: Odense S

State: Denmark

Zip Code: DK-5260

TECHNICAL CONTACT

Name: Reza Jan Larsen

Phone: + 45 2031 0968

Email: rjl@biogasclean.com

Address: Egelundsvej 18

City: Odense S

State: NA

Zip Code: DK-5260

DEMONSTRATION SITE

Site Name: Duluth WWTP

Contact: Samidha Junghare

Title: Process Engineer

Phone: +1 218-348-2466

Email: Samidha.junghare@wlssd.com

Address: 2626 Courtland Street

City: Duluth

State: Minnesota

Zip Code: 55806

INITIAL TECHNOLOGY OVERVIEW

This information is to guide in the development of a more specific and detailed Technology Information Request. Please answer the following questions for each Technology or Service Provided.

What is the name of the technology or service you provide?

Biogascleaner QSR: Biological desulphurization units – removal of H₂S from biogas without use of chemicals.

Describe how this technology is used in a larger Nutrient Management System. Please be as detailed as possible.

By removal of H₂S the technology supports the process for converting solid organic waste and high strength wastewater into renewable baseload electricity or renewable fuel.

How many systems do you have installed on dairy farms or other livestock operations?

SYSTEMS	NUMBER OF SITES	SIZE OF INSTALLATIONS
Animal waste	33	0.2 – 3.8 MW Power Generation
Pork	0	
Poultry	0	

What's the smallest and largest farm using your system?

Corresponding to 0.2 – 3.8 MW Power Generation

Does this technology have a 12-month record of reliable performance on at least three dairy farms?

Several years of reliable performance for animal waste

Do you have a preferred region or area for the location of projects?

In Denmark we have the most plants for animal waste

Input and output of your unit/system – do you have a mass balance analysis?

If a mass balance is available, please include below or attach as a separate document.

A mass balance can be prepared, as needed for a project.

In every quotation we inform the gas condition for the input and the output flow.

Input material description and characteristics:

For example: raw manure, digestate, screened digestate, suitable non-farm feedstocks, other.

Raw biogas from the digester or the CO₂ stream, containing the H₂S from Amine upgrading systems.

Does the technology treat the full manure stream for a farm or a fraction of the stream?

The biogas conditioning treats H₂S formed in the anaerobic digester.

Do you consider this a mature system or ongoing farm development?

The gas cleaning system is a mature system and is installed on 33 installations treating animal waste. The system is also used for other organic waste streams with a total of 232 plants worldwide per March 31 2018

Any weather constraints? Yes ☐ No ☒ *If so, please describe.*

Any bedding constraints Yes ☐ No ☒ *If so, please describe.*

Output material description and characteristics:

Please include the % of the total stream for each material, i.e. 10% fiber and 90% screened liquid by weight.

It is possible to clean the biogas to a maximum content at 10 ppm H₂S Due to the QSR-cleaning of packing media we can have 98 % availability.

Do the Outputs of the process have a resale market identified? Yes ☒ No ☐

If so, under what brand name or who is the contract with?

Biogas, once cleaned for H₂S, can be used to generate electricity or Renewable Natural Gas and sold to utility companies or other buyers. Environmental attributes, such as carbon credits, RINs and TECs can be marketed.

Is this process scalable and to what extent (top and bottom limits)? Yes ☒ No ☐ *If so, please describe.*

Depending upon the flow and the content of H₂S in the biogas we can scale the system with the tank dimensions and several tanks.

Do you have a known scaling factor? Yes ☐ No ☒ *If so, please describe.*

Each system is designed according to the specific conditions and design data for the individual project

Does this technology require any air input? Yes ☒ No ☐

A blower is installed in the PTU

What is the preferred air connection? *For example: psi, fitting size, air quality.*

If not distributed by the system, please list each connected device.

At the PTU (Machine room) we have a flange (typically 1.5" to 2.5") for air connection.

Does this technology require any water input? Yes ☒ No ☐ *If so, please describe.*

Soft water can be used or eventual effluent from the digester.

What is the preferred water connection? *For example: psi, fitting size, water quality, gpm.*

If not distributed by the system, please list each connected device.

We have a flange (typically 1" – 1.5") for connection of water.

Does this technology require any electrical input? Yes ☒ No ☒ *If so, please describe.*

The system has a low power consumption which is specified in the quotations.

What is the preferred electrical connection? *For example: phase #, voltage, full load amps.*

If not distributed by the system, please list each connected device.

Standard Connection 3x480V, 60 Hz 16 Amp, typical power consumption from 3 – 9 kWh/h for biogasflow 100 scfm – 700 scfm with 3000 ppm H₂S

Does this technology require any mechanical input? Yes ☐ No ☒ *If so, please describe.*

What is the preferred mechanical connection? *For example: horsepower, connection, rpms.*

If not distributed by the system, please list each connected device.

Does this system require any special plumbing? Yes ☒ No ☐ *If so, please describe what is required.*

Yes, because you must pipe in and out the gas

Does this system require any special foundations or pads? Yes ☒ No ☐ *If so, please describe.*

Concrete foundation. The required length and width will be informed in each project.

Do you consider this technology part of a larger system that you provide? Yes ☐ No ☒ *If so, please describe.*

Does your system require any other components that you do not provide or are not included in your proposal Yes ☒
No ☐ *If so, please describe.*

Additional components can be included. The gas from the desulphurization unit has a relative humidity at 100% and normally the gas shall pass a chiller/dehumidifier to dry the gas before it is conducted to the genset or boiler.

How is the system delivered to the site? *For example: skid mounted, assembled on site, constructed on site.*

The FRP tank can be delivered in a 40' Flat Rack container. The PTU and Packing Media can be delivered in 40' HC containers.

Is this system portable or configured in such a way that it could be easily transported for use in several locations?

Yes ☐ No ☒ *If so, please describe.*

The current systems are not portable

Has your technology been accepted by the NRCS and is it included into a practice standard? Yes ☐ No ☒

If so, please describe if necessary.

Are there any unusable or hazardous byproducts of this process? Yes ☐ No ☒

If so, please describe the product and recommended means of disposal.

What spare parts and redundant components are included with the system?

It can be agreed in the specific project.

How is the system controlled and what are the components and capabilities of the control system?

The system is controlled by a PLC program placed in the PTU. The PTU - Process Technique Unit - is the machine room and contains circulation pumps, air blowers, PLC controller board, etc., installed in a customized housing of reinforced fibreglass (FRP).

The signals from the PLC in the BiogasCleaner can be made available for external communication systems, e.g. in the central control room of the plant.

What is the usable life of the system?

With proper O/M, the system is expected to operate minimum 20 years.

What is the salvage value at the end of the usable life?

N/A

What is the educational and technical level of competence for the operation of the system?

Trained labor should be able to operate the system.

What level of maintenance is required for the system?

Please indicate if rebuilds or major components must be replaced and what the frequency is for these components.

Component parts require maintenance and replacement per maintenance schedule. Operation and Maintenance Manual is provided for each project.

Are consumables used in the process? Yes ☒ No ☐

Please provide the nature and purchase relationship for these consumables. For example: proprietary, special contract, generally available.

If soft water is used, we need to add a small amount of NPK fertilizer. If effluent is used instead of soft water, there is no need for NPK fertilizer.

Which of these NRCS codes would your technology be classified under? *Check all that apply. Add if necessary.*

CODE	NRCS DESCRIPTION (assuming the grinder is part of a manure digester system)	CHECK ALL THAT APPLY
472	Access Control	<input type="checkbox"/>

560	Access Road	<input type="checkbox"/>
309	Agrichemical Handling	<input type="checkbox"/>
371	Air Filtration and Scrubbing	<input checked="" type="checkbox"/>
591	Amendments for the Treatment of Agricultural Waste	<input type="checkbox"/>
366	Anaerobic Digester	<input type="checkbox"/>
672	Building Envelope Improvement	<input type="checkbox"/>
372	Combustion System Improvement	<input type="checkbox"/>
317	Composting Facility	<input type="checkbox"/>
554	Drainage Water Management	<input type="checkbox"/>
375	Dust Control from Animal Activity on Open Lot Surfaces	<input type="checkbox"/>
373	Dust Control on Unpaved Roads and Surfaces	<input type="checkbox"/>
374	Farmstead Energy Improvement	<input type="checkbox"/>
512	Forage and Biomass Planting	<input type="checkbox"/>
561	Heavy Use Area Protection	<input type="checkbox"/>
516	Livestock Pipeline	<input type="checkbox"/>
590	Nutrient Management	<input type="checkbox"/>
521A	Pond Sealing or Lining, Flexible Membrane	<input type="checkbox"/>
533	Pumping Plant	<input type="checkbox"/>
588	Roof Runoff Structure	<input type="checkbox"/>
367	Roofs and Covers	<input type="checkbox"/>
318	Short-Term Storage of Animal Waste and By-Products	<input type="checkbox"/>
570	Stormwater Runoff Control	<input type="checkbox"/>
606	Subsurface Drain	<input type="checkbox"/>
635	Vegetated Treatment Area	<input type="checkbox"/>
601	Vegetative Barrier	<input type="checkbox"/>
360	Waste Facility Closure	<input type="checkbox"/>
632	Waste Separation Facility	<input type="checkbox"/>
313	Waste Storage Facility	<input type="checkbox"/>
634	Waste Transfer	<input type="checkbox"/>
629	Waste Treatment	<input type="checkbox"/>
359	Waste Treatment Lagoon	<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>

Can you provide an estimate of the capital required for the installation of this technology?

Please include all components and designate if provided by you or others.

Capital and O/M estimates are available on a project basis. Will be specified in each quotation.

Can you provide an estimate of the operational costs required for this technology?

Please include all costs and designate if provided by you or others.

Estimates of the operational costs vary based on the system design. The operational costs are specified in each quotation.

Is there financing available for this system? Yes ☐ No ☐ If so, what are the conditions for this financing?

Financing and grant options can be discussed on a project by project basis.

Is the system available for lease? Yes ☐ No ☒ If so, please describe.

The system is not available for lease. However, third party build, own, operate business models can be considered

What sort of warrantee or guarantee do you provide with this technology?

Do you provide any performance guarantees or strictly defects in parts and materials?

We provide performance guarantee for every project.

Explain how this system is unique or transformative and how does it improve upon or go beyond other technologies that are currently available.

It is a proven technology which is installed in more than 200 projects. No use of chemicals and low operating costs compared to other competing technologies. High availability compared to other biological systems due to our QSR cleaning system, where the packing media can be cleaned without emptying the tank.

Would you be willing to provide a location for a site visit by Newtrient? Yes ☒ No ☐ If so, please provide location.

Location to be determined – we have some relatively new plants in Minnesota, for instance in Duluth.

TECHNOLOGY REFERENCES**Please provide customers with whom we can discuss this technology and its performance.**

Include a company name, location, contact name and contact information.

Reference 1**Company Name:**

DULUTH WWTP

Company Location:

Duluth WWTP, 2626
Courtland Street,
Duluth, MN 55806

Contact Name:

Samidha Junghare,
Sr. Process Engineer

Contact Information: +1 218-348-2466

samidha.junghare@wlssd.com

Reference 2**Company Name:**

St. Cloud

Minnesota Waste-
water Treatment
Facility

Company Location:

St Cloud,
525 60th St. South
St. Cloud, MN 56301

Contact Name:

Jacob Ethen

Contact Information: +1 320-650-2979
jacob.ethen@ci.stcloud.mn.us

Reference 3**Company Name:****Company Location:****Contact Name:****Contact Information:**

Reference 4**Company Name:****Company Location:****Contact Name:****Contact Information:**

Are there any other facts about this technology that you feel should be included in this document?