



<b>Technology/Service:</b>	Coaltec Energy – Livestock Manure Gasifier
<b>Information by:</b>	Mike McGolden
<b>Date:</b>	02/23/2019 (Revision)

**COMPANY INFORMATION**

<b>Company:</b>	Coaltec Energy USA		
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<b>Address:</b>	5749 Coal Drive	<b>City:</b>	Carterville
<b>State:</b>	Illinois	<b>Zip Code:</b>	62918

**TECHNICAL CONTACT**

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<b>Address:</b>	5749 Coal Drive
<b>City:</b>	Carterville
<b>State:</b>	Illinois
<b>Zip Code:</b>	62918

**DEMONSTRATION SITE CONTACT**

<b>Site Name:</b>	Ohio Heifer Center
<b>Contact:</b>	Mike McGolden
<b>Title:</b>	President, Coaltec Energy
<b>Phone:</b>	812-455-4568
<b>Email:</b>	Mike@coaltecenergy.com
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<b>City:</b>	Carterville
<b>State:</b>	Illinois
<b>Zip Code:</b>	62918

**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?**

Dairy Manure Gasification and biochar production

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

By drying the manure for bedding and using as gasifier to produce biochar and energy, a dairy operation can reduce its dependency on manure land application and save on bedding costs and potentially bring a new product to the agricultural markets in the form of biochar. The gasifier produces 40 percent more energy than needed to run the manure dryer. The dryer operates 24 hours a day, five days a week—Monday through Friday producing pathogen, odor free bedding for the dairy. In addition, the manure gasifier produces a valuable biochar product with commercial opportunities. Also, the dairy can add biochar to the cattle pens and stalls where it acts like a litter to absorb ammonia.

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

SYSTEMS	NUMBER OF SITES	SIZE OF INSTALLATIONS
Dairy	2	4,500 cows
Poultry	1	800,000 animal units

Swine and poultry

1

Over 5 million animal units

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

The technology can be used on livestock farms in any region of the country

**Location of farm(s)?**

Midwest and Southeast

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

15 to 100 tons/day of manure and bedding

**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 is available for each gasifier project

**Input material description and characteristics:**

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

We are experienced with scrape and vacuum manure collection systems. The manure is collected and hauled to a manure handling facility for storage, daily drying and processing through the gasifier. The gasifier produces commercial quality biochar that can be sold and/or added to the livestock bedding to absorb ammonia. We are also installing a system that will process digestate.

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

The system treats livestock manure and bedding. No flush water. For wetter manures – swine, flush dairies, etc. a solids separation system must be used to concentrate the solids.

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

The technology is mature for on-farm livestock manure management applications.

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

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

Sand bedding requires efficient sand separation but can still be processed.

**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.*

The gasification process produces a high-quality commercial biochar product. Biochar is a fine-grained, highly porous charcoal that helps soils retain nutrients and water. Biochar is a valuable soil amendment with commercial applications in crop production, gardening, landscaping, construction site water runoff filtration and water purification.

**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?*

An on-farm gasifier can generate approximately \$450,000 per year for fully utilized standardized system at \$250 per ton of Biochar.

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

Lower limit is 100 tons/day of livestock manure and bedding. The gasifier system is modular to accommodate larger manure volumes

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

Sizing and scaling factors are not a matter of technology but of economics.

**Does this technology require any air input?** Yes  No

Open air is required for the gasification process. Input is made through a low energy air injection system.

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

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

Outside air without treatment for the gasifier.

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

The gasifier does not require process water. Although we do require some water for dust and temperature control of the biochar as well as for safety reasons

**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.*

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

The gasifier system requires electrical input for controls, pumps and other equipment.

**What is the preferred electrical connection?** *For example: phase #, voltage, full load amps.*  
*If not distributed by the system, please list each connected device.*

Three-phase 480-volt power

**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.*

Per specification of purchased mechanical equipment

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

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

The system has typically been installed on a 6-inch concrete slab. Complete installation with dryer and material handling will have a footprint of approximately ¼ acre. Footers are required for components such as cyclone and stack.

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

The gasifier can be designed as a stand-alone system or can incorporate waste heat recovery, a manure dryer, electric power generation and a biochar bagging operation.

**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 such as a manure dryer, electric power generation and a biochar bagging operation.

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

Delivered ready to assemble on site

**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 gasifier is not a mobile unit. The system can be disassembled and removed.

**Has your technology been accepted by the NRCS and is it included into a practice standard?** Yes  No   
*If so, please describe if necessary.*

It is listed in standard 735. It has also been reviewed by a commission representing the Chesapeake Bay and is listed as an approved device.

**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?**

Spare parts are industry standard and available.

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

The system is automated for 24/7 operation using on-line SCADA and PLC systems.

**What is the usable life of the system?**

With proper O/M the system should operate 20 years or more

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

Main mechanical components have salvage value

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

Trained labor should be able to operate the system. Outsourced O/M contractors are available

**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. Daily walk through inspections and periodic response to system upsets are required.

**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.*

No consumables other than small volumes of natural gas or propane to heat the gasifier from cold start to operating temperature.

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

CODE	NRCS DESCRIPTION	CHECK ALL THAT APPLY
472	Access Control	<input type="checkbox"/>
560	Access Road	<input checked="" type="checkbox"/>
309	Agrichemical Handling	<input checked="" 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 checked="" 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 checked="" type="checkbox"/>
590	Nutrient Management	<input checked="" 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 checked="" 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 checked="" type="checkbox"/>
313	Waste Storage Facility	<input type="checkbox"/>
634	Waste Transfer	<input type="checkbox"/>
629	Waste Treatment	<input checked="" type="checkbox"/>
359	Waste Treatment Lagoon	<input checked="" type="checkbox"/>
22132	Sewage Treatment Facilities	<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 for the Coaltec livestock manure gasification systems are available on a project basis. Typically, a manure gasification system, as a stand-alone unit, is about \$1.25 million. Every project requires some additional equipment to complete the system. This cost varies depending on project requirements. A complete project that is manure drying, steam generation, biochar production or other lower cost applications will be between \$2.5 and \$3.0 million - installed and operating. If there is mechanical dewatering, or electric power production, those costs will increase the total CapEx up to \$5.0 to \$6.0 million.

**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.*

O&M is mostly operating labor. The largest variable is whether the unit runs 5 days or 7 days per week. Typically, if 7 days per week the O&M is about \$400,000 per year. The largest expenses are operating labor, power consumption (average of 75 kw/hr. of usage when operating), repair parts and gas for start-up. The main costs are the first two items.

**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 available for lease. A 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?*

Warranty discussion on a project by project basis.

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

There are many gasification technologies that process woody biomass. There are, however, an extremely limited number of technologies that have experience with gasifying livestock manure. Coaltec has on-farm commercial experience with gasification of poultry, swine and packed bed dairy manure. The economic feasibility of a gasification project is dependent upon several factors, including size of farm, quality of manure, energy needs, current manure management needs, etc. One of the first steps Coaltec does is evaluate these factors to determine the economic feasibility of a project. If the project is feasible Coaltec will provide a quote to the farm that will include design, fabrication, installation, start-up and support for the system.

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

Ohio Heifer Center, South Charleston, Ohio

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## TECHNOLOGY REFERENCES

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**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

<b>Company Name:</b>	References available upon request.
<b>Company Location:</b>	
<b>Contact Name:</b>	
<b>Contact Information:</b>	

### Reference 2

<b>Company Name:</b>	
<b>Company Location:</b>	
<b>Contact Name:</b>	
<b>Contact Information:</b>	

### Reference 3

<b>Company Name:</b>	
<b>Company Location:</b>	
<b>Contact Name:</b>	
<b>Contact Information:</b>	

### Reference 4

<b>Company Name:</b>	
<b>Company Location:</b>	
<b>Contact Name:</b>	
<b>Contact Information:</b>	

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