



Technology/Service: Phosphorus Recovery System

Information by: Craig Frear

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COMPANY INFORMATION

Company Name: DVO, Incorporated

Phone: 920-849-9797

Web Site: http://www.dvoinc.com

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State: WI

City: Chilton

Zip Code: 53014

TECHNICAL CONTACT

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Address: 820 W. Main Street

City: Chilton

State: WI

Zip Code: 53014

DEMONSTRATION SITE CONTACT

Site Name:

Contact:

Title:

Phone:

Email:

Address:

City:

State:

Zip Code:

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?

Phosphorus Recovery (PR) System

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

This unit is tailored to fit after use of suitable anaerobic digestion and subsequent fibrous solids separation. It is designed as an additional add-on unit after these initial units for projects desiring a greater level of suspended solids and phosphorus (as well as more nitrogen) management. The unit is capable of treatment of dairy manure digestate as well as other manure and co-digestion digestates while also conceivable for non-digestates, although modifications to flows and chemical inputs will be required.

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

	Number of Sites	Size of Installations
Dairy	3	2,000-5,000+ cows
Pork	1	30,000+ "farrow-to-finish"
Poultry	1	2 million layers

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

The Technology is ideal for any region, area or climate.

Location of farm(s)?

Anywhere

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

Present projects are in the range of 2,000-5,000+ cows, although it is a relatively new technology with future sales at any scale, given project economics.

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

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

Inputs: Feed stream, DAF whitewater air, polymer mix

Outputs: Treated wastewater and separated fine solids

Mass Balance: For dairy manure-only, results are showing approximately 98% reduction in total suspended solids, 80-95% reduction in total phosphorus, and approximately 35% reduction in nitrogen. An approximate 25% total solids, stackable pile of separated fine solids is produced at a rough rate of 0.8 MT dried solids per cow per year

Input material description/characteristics:

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

Input to the preferred system is the effluent from the fibrous solids separation although on a project by project basis, the system can be tweaked and optimized to both project and end product needs.

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

The system is designed to treat the entire manure stream post fiber separation or per individual project needs.

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

While relatively new, it is considered a mature system with 4 large-scale operations on dairies, poultry and co-digestion facilities now in place for over or near to a year. An installation processing hog waste was commissioned in January 2017.

Any weather constraints? Yes No *Please describe.*

Any bedding constraints? Yes No *Please describe.*

No, but with all digesters, no sand with digested fiber bedding preferred and if sand, up front sand processing steps will be required

Output materials description and characteristics:

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

Available in earlier mass balance (#7).

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?

The main output of the technology is the separated fine solids. They could be marketed as the wet solid or downstream drying could allow for more value-added sales to partnering distributors or end buyers. The nutrient value can vary but for dairy manure systems on a dry value basis it is approximately 2-4% N, 1-3% P and 1-2% K with micro-minerals giving an estimated and THEORETICAL value on just NPK in 2015 of around \$100/dry ton (not adding any additional values for the recycled/renewable aspect of this product, nor for the nutrient management benefits and cost-offsets for the farm).

Is this process scalable and to what extent (top and bottom limits)? *Please describe.*

The process is scalable and only impacted by economics and project needs

Do you have a known scaling factor? *Please describe.*

At present, the scaling cost factor is not exact and use a tentative linear scale costing

Does this technology require any air input? Yes No

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

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

Requires DAF "whitewater" air per manufacturer specifications.

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

Hose connections for regular cleaning of project area as well as filling of polymer tanks for generation of the polymer solution

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.

Normal fittings

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

Yes, the electrical input is to operate the blowers, pumps, valves, etc

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

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

Mechanical systems are utilized throughout the system and are provided per specifications of purchased mechanical equipment.

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

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

None Required

Does this technology require any special plumbing? Yes No *Please describe what is required.*

Plumbing, wiring, etc. is all engineered by DVO and completed by general contractor

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

Yes, the technology preferably rests on concrete pad and has some cover from climate.

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

Yes, DVO supplies a full-system starting with anaerobic digestion and through fiber separation, fine solids separation, and liquid ammonia treatment through various platforms, with ammonia stripping being one of those ammonia treatment platforms. The ammonia stripping system also can integrate a hydrogen sulfide scrubbing unit quite nicely

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.*

No, other than additional downstream drying and processing equipment for value-added sales of product

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

Assembled on site with construction on site as well.

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

Yes No *Please describe.*

Easily moved.

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

Describe if necessary.

It is not a NRCS practice standard

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

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

Material safety and OSHA regulations for the handling/use of compression equipment as well as synthetic and natural polymers

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

DVO would supply operational manual as well as training and O/M servicing/parts replacement plan.

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

The system is placed on electronic operational control for 24/7 automated operation. A daily walk through and check list is required to maintain effective operation.

What is the usable life of the system?

Main components have limited life expectancy such as diffusers but continued planned O/M should allow for a 20-30 year expectancy.

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

Key components such as blowers, valves, meters, diffusers have salvage value.

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

Labor trained for operation of digester, digester systems, fiber screens and DAF systems should be able to operate this additional system as well. Training and hard/working, reliable labor required.

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.

See above, component parts will be on replacement schedule, daily walk through as well as periodic response to system upsets 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.

The main consumable is polymer addition.

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

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

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.

Project by project estimate available on request

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.

Can provide capital and O/M estimates on a project to project basis. Although we are very proud of the system's capabilities to reduce electrical, O/M and polymer requirements as compared to other similar technologies in the category. A rough estimate is 1/4th of a penny (or less) for treatment of 1 gallon of post-fiber separation dairy wastewater.

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

Is the system available for lease? Yes No *Please describe.*

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 discussions 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.

The system is unique in providing a system with highly effective suspended solids and phosphorus (as well as nitrogen) removal at vastly reduced costs in regard to electricity, polymer and labor as has been previously available. The final product is a nice stackable product for easy handling and downstream processing.

Would you be willing to provide a location for a site visit by Newtrient? Yes No

If so, please provide location.

Yes, we will gladly supply a location and tour for site visit.

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:	
Company Location:	
Contact Name:	
Contact Information:	

Reference 2

Company Name:	
Company Location:	
Contact Name:	
Contact Information:	

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?

We believe we have covered it all, but if additional questions are developed or additional information is required please do not hesitate to ask.