TECHNOLOGY PROVIDER

TECHNOLOGY INFORMATION REQUEST

Technology/Service:	Struvite Crystallizer		
Information by:	Craig Frear	**Date:**	10/10/16

COMPANY INFORMATION

Company Name:	MultiForm Harvest		
Phone:	206-920-3557	**Web Site:**	www.multiformharvest.com
Address:	2033 6th Ave. Suite 253	**State:**	WA
City:	Seattle	**Zip Code:**	98121-2580

TECHNICAL CONTACT

Name:	Keith Bowers
Phone:	Same as above
Email:	keith@multiformharvest.com
Address:	Same as above
City:	
State:	
Zip Code:	

DEMONSTRATION SITE CONTACT

Site Name:	Jones Family Farm
Contact:	Sean Jones
Title:	Owner
Phone:	
Email:	
Address:	12667 Massey Rd.
City:	Massey
State:	MD
Zip Code:	21650

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?

Struvite Crystallizer

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

Post-fiber separated diary wastewater is sent through the crystallizer to remove the bulk of phosphorus from waste stream as a solid to be sold off-farm. Remaining liquid is stored and applied to field as usual.

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

	Number of Sites	Size of Installations
Dairy	1	1,800
Pork		
Poultry		

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

This technology is ideal fro any region, area or climate.

Location of farm(s)?

Any locations

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

No limit to scale on technology, only 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: Relatively dilute manure waste water
Outputs: Struvite solids and treated waste water
Mass Balance: Existing site treats 60,000 gallons per day and produces 180 dry tons of struvite 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 dilute waste water as well as electricityto operate system as well as sulfuric acid to lower pH, ammonia to raise pH and magnesium salt to facilitate struvite conversion.

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?

It is a mature technology with this commercial application at the dairy and multiple other sites treating municiple bio-solids.

Any weather constraints? ◯ **Yes** ◉ **No** *Please describe.*

Any bedding constraints? ◉ **Yes** ◯ **No** *Please describe.*

Removal of sand and fibrous solids is needed.

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 numbers

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 output is a near dry strivute product that can be sold as a slow-release fertilizer which is in a form ready for easy delivery wiht existing farm equipment.

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 liniear 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.

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

Hose connection for regular cleaning of project area as well as dilution of chemicals.

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.*

The electrical input is to operate 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 power connection

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

Mechanical systems are utlized throughout

What is the preferred mechanical connection? *For example: horsepower, connection, rpms.*
If not distributed by the system please list each connected device.

Per specifications of purchased mechanical equipment.

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

Plumbing, wiring, etc is all engineers MFH and by general contractor

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

The technology preferabl rests on concrete pad.

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.*

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

Assembld 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.

Are the 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?

No, but are available

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 dialy walk throguh and check list is required to maintain effective oepration.

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 tanks, valves, metes, diffusers have salvage value.

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

Labor trained for operation can be at farm manager level.

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 part 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 chemicals.

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.

Capital costs are on the order of $150-200 per cow and O/M are $80-100/cow/year

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.

Project by project estimate available on request

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 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.

The system is unique in recovering roughly 70-90% of phosphorus from the waste water while producing a ready for sales/application fertilizer.

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

Please contact us for more details.

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:	Available upon request
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 equired please do not hesitate to ask.