



Technology/Service:	Membrane Process		
Information by:	Rob Plank	Date:	3/16/17

COMPANY INFORMATION

Company:	McLanahan Corporation		
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State:	PA	Zip Code:	16648

TECHNICAL CONTACT

DEMONSTRATION SITE CONTACT

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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?

Membrane Treatment Processes

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

This TIR focuses on the membrane processes of ultrafiltration (UF) and reverse osmosis (RO). UF can be used as a stand-alone process to produce an effluent devoid of suspended solids with very low concentrations of phosphorus and organic nitrogen (they partition with fine solids which are precluded from passing through the UF membrane). The UF membrane acts as a barrier that precludes the passage of suspended solids but allows water and dissolved solids to permeate. The filtered liquid is referred to as permeate or “tea water” and, in addition to water, contains dissolved constituents, most notably ammonium and potassium. The reject (material that does not permeate through the membrane) is rich in phosphorus and organic nitrogen and is a pumpable fluid with a total solid concentration ranging between 6-7%. If desired, an advanced liquid solid separation process such as a centrifuge can be used to dewater the reject to produce a solid product.

Tea water is ideally suited to further treatment such as RO or air stripping for removal of ammonia-nitrogen (described in a separate TIR). RO produces clean water and a concentrated effluent containing potassium and ammonia-nitrogen. We always precede RO with UF to ensure suspended solids do not irreversibly foul the membrane.

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

SYSTEMS	NUMBER OF SITES	SIZE OF INSTALLATIONS
Dairy	0	
Pork	0	
Poultry	0	

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

North American

Location of farm(s)?

N/A

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

N/A

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.

Please see mass balance

Input material description and characteristics:

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

Screened raw manure or digestate, also suitable for non-farm feedstocks.

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

Full

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

We have 1.5 years of operational data with a demonstration-scale installation.

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.

Please see attached mass balance

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?

In most cases, we anticipate the segregated and concentrated nutrients will be used on the dairy operation in the same fashion the manure was used prior to a treatment system. The major difference being our system creates an opportunity, due to the fact that the nutrients are concentrated, to apply the nutrients where and when they are needed.

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

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

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.

N/A

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

Minimal used for membrane cleaning.

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.

Recommend a 2" water line for filling of cleaning tanks. Also require hot water for some membrane cleaning sequences.

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

Depends on farm size but will require 3 phase, 480 volt service.

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

Depends on farm size but will require 3 phase, 480 volt service

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.

N/A

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

Traditional pipe installation

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

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

The ultrafiltration process can act as a stand-alone process. If a higher level of treatment is required, reverse osmosis can be added. There is also an option to plan an air stripping process between the UF and RO to remove ammonia-nitrogen (under separate TIR). Lastly, a decanter centrifuge is offered to separate the solids from the UF concentrate stream.

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.*

The UF, RO and decanter centrifuge systems are skid mounted.

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.*

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?

All components are off-the-shelf and easy to access. The use of reverse osmosis is challenging due to the scaling/fouling potential of manure-derived wastewater. Cleaning is typically accomplished with high and low pH to remove scale and foulants. However, when the cleaning schedule is compressed, more expensive cleaning agents are used. We provide 100% redundancy in our reverse osmosis system to allow for extended cleaning time. This minimizes the use of expensive cleaning reagents by allowing more reaction time for lower cost and less expensive traditional cleaning reagents.

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

We use Allen Bradley controls with remote access capabilities.

What is the usable life of the system?

We predict the usable life to be on the order of 20 years. The membranes for both the ultrafiltration and reverse osmosis system will be replaced on a routine basis (estimate useful life of 1 year for reverse osmosis membranes and 5 years for ultrafiltration membranes).

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

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

Though someone with an understanding of wastewater science is ideal, the key quality is an individual with time DEDICATED to supporting the process. We can train anyone to support this process.

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.

The primary maintenance associated with membrane systems is regular cleaning and periodic replacement. Though cleaning is largely controlled via an automated clean-in-place system, there is not a substitute for operator oversight. The reverse osmosis system is cleaned every 24-48 hours. The ultrafiltration system is cleaned approximately 2 times per month.

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.

Consistent with the off-the-shelf nature of the components, all consumables are readily available including cleaning chemicals and replacement membranes.

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 type="checkbox"/>
309	Agrichemical Handling	<input type="checkbox"/>
371	Air Filtration and Scrubbing	<input 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 checked="" 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.

UF = \$320-350/cow (provided by McLanahan)
 RO = \$140-180/cow (provided by McLanahan)
 Decanter centrifuge = \$220-250/cow (provided by McLanahan)

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.

Example operating costs are consistent with 3,000 cows

Ultrafiltration

Electricity	110,788
Electricity, kW-hrs	1,582,689
Membrane replacement	41,380
Maintenance	8,361
chemicals (cleaning)	7,000
Total UF	\$ 167,529

Reverse Osmosis

Electricity	27,176
Electricity, kW-hrs	368,813
Membrane replacement	30,089
Maintenance	4,065
Chemicals (cleaning)	22,814
Total RO	\$ 84,144

Centrifuge

Electricity	23,902
Electricity, kW-hrs	341,452
Maintenance	24,000
Total Centrifuge	\$ 47,902

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 If so, please describe.

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

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

A money back guarantee is provided based on an upfront contract tied to performance criteria.

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

This system is unique because it can produce a high concentrate phosphorus and organic nitrogen fertilizer (solid product) without the use of chemicals, thus opening the door for marketing as an organic product. In addition, we developed an operational strategy that minimizes UF system downtime and only requires chemical cleaning 2 times per month.

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

N/A

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?