



TECHNOLOGY PROVIDER
TECHNOLOGY INFORMATION
REQUEST

Technology/Service: Parker Momentus, a Mechanical Separation Technology

Information by:

Date: 10/19/2016

COMPANY INFORMATION

Company Name: Parker Hannifin Renewable Resources

Phone: 614-279-7070

Web Site: www.parker.com/tfd

Address: 3885 Gateway Blvd

State: Ohio

City: Columbus

Zip Code: 43228

TECHNICAL CONTACT

Name: Alison Allwes and Robert Norris

Phone: 614-324-8250, 614-324-8297

Email: alison.allwes@parker.com, robert.norris@pa

Address: 3885 Gateway Blvd

City: Columbus

State: Ohio

Zip Code: 43228

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?

Parker Momentus, a Clean Water Solution using Mechanical Separation Technology.

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

Parker Momentus serves a variety of markets where suspended and dissolved solids are a concern as it provides greater throughput and better fouling resistance than alternative separation solutions. The Momentus technology can replace existing separation technology or be used to enhance current separation process such as biological process, centrifuges, clarifiers, evaporators or pressure filters.

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

| | Number of Sites | Size of Installations |
|---------|-----------------|-----------------------|
| Dairy | NA | |
| Pork | | |
| Poultry | | |
| | | |

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

North America

Location of farm(s)?

NA

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

NA

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.

As Momentus is a membrane based solution using membranes ranging from Microfiltration to Reverse Osmosis, flux and rejection rates will be application specific, and a generic mass balance would be inappropriate.

Input material description/characteristics:

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

Raw manure, digestate, screened digestate, suitable non-farm feedstocks, etc.

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

Momentum can be used to treat entire manure stream onsite, but may also be used as a side-stream treatment for AD digestate treatment.

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

Mature system

Any weather constraints? Yes No *Please describe.*

The minimum protection required is a canopy roof with walls to protect from rain, wind, UV, extreme temperatures, humidity.

Any bedding constraints? Yes No *Please describe.*

NA

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.

As Momentum is a membrane based solution using membranes ranging from Microfiltration to Reverse Osmosis, the answer to this question will depend upon the goals of the customer. On the microfiltration end, the system works more like a dewatering process, and with a

Reverse Osmosis system nearly all solids (dissolved and suspended) will be rejected.

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?

Could be set up based on geographic location.

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

A reasonable treatment range for Momentum would be between 5,000 gallons per day on the low end to an upper range of about 200,000 gallons per day.

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

No, each system quote will be unique.

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.*

Compressor, 3/8" female NPT, inlet air pressure 80-90 psi, supplied air must be dry.

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

Depends on the application but generally no.

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.*

NA

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

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

The Momentum system has both three-phase and single phase power requirements.
480V- Three-phase – 72 amps
120V- single phase – 13 amps
Please note this is for a single module system, and will scale as more membrane area is added to the system.

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.*

NA

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

Yes, piping is required between the application process and the Momentus system tanks.

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

Yes, the Momentus system requires a level floor under the drive system and other skid-mounted components to prevent leaning and mechanical wear and tear. Preferable the elevation should change less than 1/8" over four feet.

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.*

Depends on the application.

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

All Momentus systems are shipped in wooden crates. Some of the Momentus components are skid-mounted while others will need to be assembled 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 *Please describe.*

Yes, the unit could be mobile.

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

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?

First Momentus system comes with cleaning chemicals.

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

The system is controlled locally by the PLC and HMI.

What is the usable life of the system?

Depends on the application.

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

NA

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

During commissioning, training is provided to learn how to operate the system. An easy to understand installation and operations manual is also provided.

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.

Little to no daily maintenance is required. Chemical cleaning frequency depends on feed characteristics/application.

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.

Cleaning chemicals (see above for more details). Membrane Filter packs have a replacement of every 3 years.

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 | ✓ |
| | | |
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| | | |
| | | |
| | | |

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.

The number of Momentus drive systems required to manage the waste stream (which determines cost) depends on the application and feed characteristics.

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.

When calculating OpEx costs, we take into account the number of Momentus drive systems, power consumption, chemical cleaning costs, and filter pack replacement costs. All of this is dependent on the application and feed characteristics.

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

Yes, financing options are available. Please contact Parker for more details.

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?

As flux performance of any membrane system will vary greatly with changes in feed composition, we can offer a performance guarantee, however we will generally specify more membrane surface area (safety margin) to ensure we hit our targets in these cases.

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

The Parker Momentus redefines separation technology. It features a membrane vibration technology to quickly and efficiently meet your clean water needs and allows membranes to be used in applications where they previously could not be. Compared to other technologies it offers a unique solution in terms of system performance and reliability, membrane flexibility, ease of service, and design efficiency. The unique shearing effect eliminates build up on the membrane surface which resists scaling and fouling and creates high permeate flux rates. The fully automated processing streamlines your operation processes and reduces downtime. Because of the system's service-oriented

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

If so, please provide location.

Possibly

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: | If interested, please contact Parker for more details. |
| Company Location: | |
| Contact Name: | |
| Contact Information: | |

Reference 2

| | |
|-----------------------------|--|
| Company Name: | If interested, please contact Parker for more details. |
| 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?

If interested, please contact Parker for more details.