NEWTRIENT™
INNOVATIVE SOLUTIONS IN RESOURCE RECOVERY

Technology/Service:	BIDA® System		
Information by:	Mai Ann Healy	Date:	July 19, 2017

COMPANY INFORMATION

Company:	BioFiltro USA Inc.		
Phone:	559 278 4542	Web Site:	www.biofiltro.com
Address:	1959 5th Street, Suite 101	City:	Davis
State:	CA	Zip Code:	95616

TECHNICAL CONTACT		DEMONSTRATION SITE CONTACT	
Name:	Matias Sjogren	Site Name:	Royal Dairy
Phone:	559 289 5857	Contact:	Matias Sjogren/Austin Allred
Email:	msjogren@biofiltro.com	Title:	Austin- Owner of Royal Dairy
Address:	1949 5th Street, Suite 101	Phone:	**(509) 346 1388**
City:	Davis	Email:	Allred11austin@gmail.com
State:	CA	Address:	11792 Road 125 SW
Zip Code:	95616	City:	Royal City
		State:	WA
		Zip Code:	99357

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?

BIDA® System

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

BioFiltro's BIDA® System is utilized to treat liquid waste and currently has 142 plants installed worldwide servicing a variety of industries such as dairies, livestock operations, slaughterhouses, food processors, wineries, and domestic wastewater. For nutrient management systems at dairies, BioFiltro engineers design and install systems to target removal of Total Suspend Solids, Total Phosphorus, and Total Kjeldahl Nitrogen, and averages 85% - 95% removal in those nutrients within a 4 hour process. The BIDA® System as a stand-alone system provides secondary biological filtration for liquid waste. The system is housed in a contained open top tank approximately 5' in height with a chevron base. From top to bottom, the system is filled with drainage basins, geotextiles, river cobble, and wood shavings. Across the top of the wood shavings runs an irrigation system that serves to disperse the wastewater evenly across the entire system surface. As wastewater flows from the production facility, it is accumulated in either a pre-existing lagoon or a holding tank. The irrigation system is then set to irrigate every few minutes and is controlled and monitored by a telemetry system which tracks flow, GPD, psi, and pH (BIDA® System requires influent pH to be 5.5 – 8.5). As the water percolates down through the system medias, it is not only physically filtered, but also biologically. The biological aspect comes from the fact that BioFiltro has inoculated the system with an industry specific mix of worms, microbes, and bacteria that work symbiotically and beneficially together to form a robust and dynamic biofilm. As the wood shavings, encased in biofilm, absorb and release wastewater, the biofilm captures, retains, and digests contaminants. Within four hours of starting the process, treated water flows out via exit pipes at the system base and can be directed to storage lagoons, crops, etc.

At dairies, a solid separation system is typically required upstream of the holding tank. The equipment selected varies and is determined primarily by strength of TSS. Typical flow design will be production facility -> rotary screen (180 – 300 microns) then after, if TSS is a) greater than 5,000 mg/l it will go to a DAF (dissolved air flotation system) b) between 1,500 – 4,999 mg/l to a wood shavings filter or c) less than 1,499 mg/l direct to the BIDA® System.

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

SYSTEMS	NUMBER OF SITES	SIZE OF INSTALLATIONS
Dairy	8	10,000 GPD – 200,000 GPD (5,000 – 81,000 Sq Ft)
Pork	1	100,000 GPD (1 Acre)
Poultry		

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

No

Location of farm(s)?

Washington State, California, New Zealand, and Chile.

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

Smallest livestock facility is a 2,000 GPD in Colico, Chile. Largest is a 200,000 GPD dairy farm at Royal Dairy in Royal City, WA USA.

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.

Data has been attached in a separate document

Input material description and characteristics:
For example: raw manure, digestate, screened digestate, suitable non-farm feedstocks, other.

Liquid manure waste after it has passed through a solid separator. Typically at TSS levels less than 1,500 mg/L.

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

100% of the liquid waste, but not dry solids.

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

Mature

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

The BIDA® System is operating on Antarctica and in the Atacama Desert. In extreme hot climates, a geotextile should be used as a sunshade and hung along the top of the system. In extreme cold climates with average annual snowfall greater than 8 feet, the BIDA® System should be housed within an unheated shed. In extreme cold climates that do not require a shed, protocols are in place to evade frozen pumps and pipes.

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.

100% screened liquid

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 byproduct of the BIDA® System are castings, or worm excrement. Once approximately every ~15 months system maintenance requires for the removal of the top 6 – 10" of the system medias. The media being removed is castings which, after a screening process, can be resold as a highly nutritious soil amendment rich in NPK values as well as microbial plate count.

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

The BIDA® System is custom designed and built for each client and its size is determined by gallons per day to be treated as well as pounds of TKN and TSS to be removed each day.

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

The surface area required by our system for dairies can be approximated by taking total gallons per day to be treated and dividing that by 2.5 or SYSTEM SURFACE = TOTAL GALLONS PER DAY/2.5 i.e. 200,000 GPD/2.5 = 80,000 Square Feet of BIDA® System. The hydraulic loading rate of 2.5 gallons per square foot may vary depending on influent solids and nitrogen levels, 2.5g/square foot considers TSS between 10,000 – 30,0000 mg/l and TKN 1,000 – 2,5000 mg/l.

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.*

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.

The BIDA System is irrigated by a pump station which, at Royal Dairy, consists of three 7 HP pumps assuming 170 GPM and 15 PSI.

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

22HP requirement

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

3 Phase 480V

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.

3 Phrase 480V

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.*

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

BioFiltro engineers also take into consideration primary solid separation and will design/custom order necessary rotary screens, centrifuges, DAFs, etc to best fit the client's needs and demands.

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.*

Assembled and constructed 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.*

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

Our BIDA® System at Fanelli Dairy (Hilmar, CA) was funded by the USDA NRCS and underwent an intensive 2 year study conducted by UC Davis (Dr. Frank Mitloehner), California Polytechnic Institute San Luis Obispo (Dr. Sean Hurley), and Denele Analytical Laboratories (Joe Mullinax)

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?

Pump Station will have multiple pumps installed for redundancy. Holding tank/irrigation system is on a timer monitoring/controlled by a telemetry system but a float switch in the tank can bypass it automatically during emergencies.

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

A telemetry system is installed which tracks, monitors, and controls the flow meter, irrigation system timer, and pH sensor.

What is the usable life of the system?

Determined by life of concrete structure which varies between 25-50 years.

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

Depends on the client and the business model that they pursue.

In our main business/financial model "Wastewater as a Service" (WAS), and working with our financial partners, the average contract duration is 10 years. The technology will then transfer to the client. Since the WAS model is predominantly treated as an Operating Lease (True Lease), and BioFiltro is the owner of the asset for the duration of the contract, BioFiltro and the financial partner will take advantage of the depreciation of the asset, and the client will take advantage of fully deducting the monthly fees (including CapEx & OpEx) for tax purposes reducing the client liability on the client's income tax. The depreciation will be based on the original CapEx and most likely will have depreciated completely within the 10 year contract. For that reason, it will not have a salvage value.

In our other business model where the client purchases and owns the asset, the salvage value will be determined by the type of depreciation method the client's accountant will apply to the asset including Section 179 (Straight Depreciating Limit). Subsequently, the accountant/controller may decide to use 5% to 10% salvage value, but this will be based on the needs of the company annual tax liabilities

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

Basic understanding of pumps, sprinkler heads, and rototiller.

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.

Daily maintenance is nominal – clients are asked to conduct visual inspection of the system surface to check for puddling debris, or plant growth. The latter two may simply be removed while puddling, if prominent, requires a quick tilling of the system surface. Clients are also asked to monitor for clogged sprinkler heads or pumps, simple cleaning may be required of those equipment(s).

Monthly maintenance – BioFiltro provides this service, but the system surface may have to be tilled once every few months to enable proper percolation.

Major Maintenance – Once every ~15 months for dairies, the top 6-10" of the system media must be removed from the BIDA® System. This media is worm castings (excrement) which needs to be filtered before it is apt for use on soil/crops. This operation is done by zones and does not interrupt overall performance of the plant nor does it require any operational downtown.

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.

Proprietary intellectual property for biofilm formation and bioremediation in addition to generally available materials such as wood shavings, rocks, drainage basins, geotextiles, concrete, PVC piping, pumps, screens.

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	☐
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	X
554	Drainage Water Management	X
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	X
521A	Pond Sealing or Lining, Flexible Membrane	☐
533	Pumping Plant	☐
588	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	X
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.

BioFiltro has funds available which enables clients to elect a per gallon fee, thereby avoiding any upfront capital outlay. Under this model, BioFiltro assumes all the risk, large maintenance tasks, and provides a performance guarantee by not charging the client for days when water quality is out of the designed targeted effluent range.

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.

Energy is $0.0007 kWh/gallon treated. Labor requires 4-6 hours per week on average.

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

BioFiltro's Wastewater as a Service (WAS) model enables clients to pay a per gallon fee without any upfront capital outlay. In a model similar to infrastructure leasing (solar), the client enters a 10 year contract (with buyout option after 4 years) while BioFiltro shoulders upfront cost.

Is the system available for lease?   Yes ☑   No ☐   *If so, please describe.*

WAS Model described above.

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?

Under the WAS model, BioFiltro will not charge client for gallons treated when the effluent does not achieve the target design quality. Furthermore, BioFiltro does not charge the client for any equipment/media repair/replacement nor labour incurred by BioFiltro technicians to execute scheduled tasks or system improvements to bring effluent back into target range.

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

BioFiltro's BIDA® System is, as a stand alone secondary treatment process, a chemical free system that combines biological and physical filtration. Catalyzing the digestive power of worms and microbes, the BIDA® System cultivates growth of billions of microbes and bacteria and worms, enabling a dynamic biofilm to form across system medias which consist of wood shavings, river cobble, and drainage basin. An irrigation system runs across the system surface and intermittently applies wastewater every few minutes. Within four hours of starting the process, treated water flows out with an average removal of 85-95% in TKN, TSS, and TP.

This rapid treatment time enables the BIDA® System to tackle another sensitive issue for the dairy industry – emissions. A 2 year UC Davis study was conducted at our facility at Fanelli Dairy in Hilmar, CA and showed reduction of up to 91% of green house gas emissions and demonstrated the nitrification/denitrification capability of our system.

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

Royal Dairy, 11792 Road 125 SW, Royal City, WA 99357

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:	Royal Dairy
Company Location:	Royal City, WA
Contact Name:	Austin Allred
Contact Information:	allred11austin@gmail.com

Reference 2

Company Name:	DeRuyter Dairy
Company Location:	Sunnyside, WA
Contact Name:	Dan DeRuyter
Contact Information:	danderuyter@gmail.com

Reference 3

Company Name:	Fanelli Dairy
Company Location:	Hilmar, CA
Contact Name:	Vic Fanelli
Contact Information:	vicfanelli@aol.com

Reference 4

Company Name:	DeRuyter Bros Dairy
Company Location:	Sunnyside, WA
Contact Name:	Jake DeRuyter
Contact Information:	deruyter@embarqmail.com

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