

Vendor:

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Industry:

Trident Processes is a leading provider of wastewater treatment, biosolids dewatering and nutrient recovery solutions for the agricultural, municipal, industrial sectors.

Project Type:

Trident manure fiber recovery system installed on the Windy Ridge Dairy in Indiana. The system processes anaerobically digested manure from 7,000 cows to make manure solids bedding to increase cow comfort and hygiene while reducing the cost of bedding.

Project Goal:

- Evaluate manure fiber bedding technology to replace an older roller press system.
- Increase cow comfort and hygiene.
- Reduce cost and take control of the bedding supply.

Study Prepared by:

Mark Stoermann, Newtrient Technology Advancement Team

Date of Case Study:

September 2018

Milk Quality Increases at Windy Ridge Dairy from Better Manure Bedding Control

Windy Ridge Dairy, Fair Oaks, Indiana

OVERVIEW

Windy Ridge Dairy is owned and operated by Steve Bos and his wife. The dairy, located in Fair Oaks, Indiana, milks about 7,000 cows, and processed the manure from an additional 400 young stock. Steve's grandfather started dairy farming in the 1930s in California where Steve grew up. In 1991, his father moved his dairy operation to El Paso, Texas. Steve became a partner, then moved to Indiana to start his own dairy in 1999. Steve's entire family is involved in the dairy business, operating several dairies in the Fair Oaks area and members of the Select Milk Producers Cooperative. At full capacity, Windy Ridge produces about 25,000 gallons of milk per day.

Steve freely admits manure management is one of the biggest challenge on his farm and was easier to manage in Texas, because it dries quicker, making it easier to manage. "I've learned a lot" he said. "We've researched how to dry it quicker and remove the water from it." Approximately 300,000 gallons/day of manure slurry is collected, digested and processed. The digested manure is processed through a Trident Bedding Recovery system to produce high-quality bedding that is drier than what the previous system could produce. All remaining material is spread on approximately 7,000 acres of crop fields.

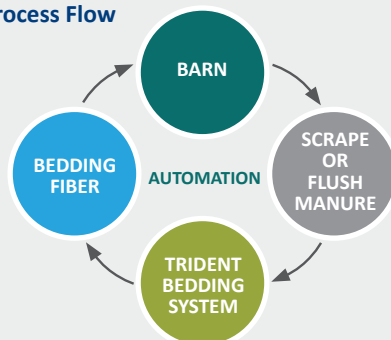
BACKGROUND

"We are very happy with the performance of the Trident system. It produces consistent, high quality bedding and we hope it will help us reduce our operational costs." Jason Dykstra, Manager, Windy Ridge Dairy Farm

After years of using sand as cow bedding, Windy Ridge Dairy converted to the uses of manure fiber in 2005. The farm's initial bedding

recovery system was based on roller press equipment but by 2016 was wearing out. This created challenges maintaining enough fiber and bedding quality for the animals. In 2016, Jason Dykstra, Farm Manager, contacted Trident to help analyze the farm's manure management system. Trident recommended two different equipment configurations for a test period to ensure the best solution was implemented. After evaluating the technologies for bedding

Trident Process Flow



Rotary Drums and Screw Presses



recovery, the dairy selected a Trident Rotary Screen and Screw Press integrated system. The system includes a customized stainless-steel platform with a full automatization package. The system consistently meets design specifications with reliable performance, producing a very comfortable bedding that is drier than the previous system.

The Trident system processes 275,000 gallons/day of digested manure, which was collected using vacuum tankers, delivered to a central receiving pit and pumped into the farm's anaerobic digester. The digestate is then piped to five sets of rotary screen and screw press units to extract and dewater fiber for bedding. The rotary screens were specifically selected to condition the manure to allow for more efficient removal of the manure fibers. The fibers are then processed through Trident Screw Presses, which are operated at a controlled flow rate to remove excess liquid, producing a consistent 33-34% dry solids bedding product, ready for immediate use in the barn. The excess liquid separated from the fiber is pumped to long-term storage for future application on 7,000 acres of crop lands.

KEY LEARNINGS

Windy Ridge Dairy found a new bedding solution with the desirable characteristics the dairy was looking for.

The challenge — The dairy operators had been using roller press equipment and as the presses wore out, it became more and more difficult to maintain an adequate bedding quality for their animals. To address the challenge the team at Trident and the farm operators connected to analyze the farm's manure management process. During this process different capacity scenarios were evaluated.



Feed tank and conveyor.

Trident's approach — To ensure optimal long-term performance of the new equipment, Trident provided two different configurations for testing. After the evaluation of the test results was completed, the old presses were replaced by five Trident Rotary Screen Conditioners and Screw Presses. The system was installed including stainless steel platforms, automation package, and included several custom safety and maintenance provisions.

What it looks like today — A feature of the Trident bedding recovery system is that it extracts specifically the larger manure fibers, this is key for a high-quality bedding. The effluent water including the smaller particles and dissolved solids can be diverted to storage or to a downstream treatment process for nutrient extraction. The fully automated bedding recovery system produces consistent fiber with about 34% dry matter.

What we learned — Windy Ridge Dairy learned there is a significant difference in the Trident bedding verses the dried/pressed manure solids bedding they were using.

- The new equipment first conditions the manure solids feedstock that allows effective separation of the larger fibers which provide excellent drainage characteristics and uniform support for resting cows.
- The automated bedding recovery process offers more diligence and quality control than the previous system to ensure bedding material is the proper consistency and dry enough before it is put back in the barn.
- As a result, dry matter is more than 33% coming off the system and the bedding has larger fiber material that contain air pockets for added bedding comfort and animal hygiene.



Solids dropping on conveyor.

Key Benefits & Results:

"The higher dry matter of this bedding and the resulting lower SCC and mastitis is the key for our operation."

Steve Bos, September 2018



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KEY BENEFITS

Maximum cow comfort – The fluffy consistency of bedding from recycled manure large fiber avoids compacted bedding ensuring the cows receive uniform surface support. Air pockets in the bedding promote better climate regulation close to cows' skin to maximize daily comfort in all weather conditions.

Cost savings for bedding – Because the Trident system is manufactured out of stainless steel and other materials that resist corrosion the expected life of the system is double that of the system it replaced. This and other design considerations means that the system should be low cost and easier to maintain.

Operating Expenses – Maintenance expenses for the screw presses, screens and pumps have not been fully established, but are expected to be in line with that of the previous roller press equipment. The dairy expects to see saving based on the longevity and replacement costs of the new system.

Improved animal health – Smaller particles that are more difficult to dewater and may increase health risk unless removed from the bedding material. The ability to produce a drier and more consistent bedding reduces cow hygiene concerns. "Because we can get better control of the moisture in the bedding we have seen a decline in Somatic Cell Counts (SCC) and Mastitis in our herd" says Steve Bos.



Solids pile.

Secure supply – Fiber bedding makes it easier to manage and control our own bedding supply. 100% of the manure fiber is used for bedding because of the naturally ventilated barns at Windy Ridge, enclosed barns use less, and the unused portion can be sold or applied to the fields to offset fertilizer costs.

Automated bedding recovery – The Trident system requires less time and monitoring than the former bedding system, because it is continuously monitored by a computerized control system. When there is a fault the Windy Ridge team gets a text and the system shuts down rather than walking in on a situation that may have existed for hours.

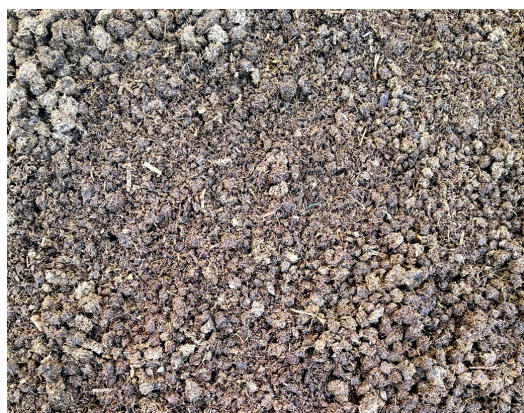
A waste is being recycled – Bedding recovered from manure allows a "waste" to be reused in a beneficial way. From a long-term perspective, this allows Windy Ridge dairy to be self-sufficient in supplying their own bedding and handling their wastes more efficiently.

RESULTS

- Consistent bedding material with 34% dry matter
- Lower SCC
- Lower mastitis
- Better operator interface
- Longer equipment life

CONCLUSION

After years of using sand as cow bedding, Windy Ridge Dairy converted to the uses of manure fiber. After evaluating the technologies for bedding recovery, the dairy selected a Trident Rotary Screen and Screw Press integrated system. The system consistently meets design specifications with reliable performance, producing a very comfortable bedding that is drier than the previous system.



Close-up of solids.

Organizations Involved:

Farm or facility

Windy Ridge Dairy

Electrical Utility

Jasper County REMC

Gas Utility

NIPSCO

Engineers

Trident Processes

Contractor

Trident

Equipment and Technology:

Pre-processing

Anaerobic digestion

Primary treatment

Trident Rotary Screen
Conditioners to maximize long fiber separation

Secondary treatment

Screw Presses to remove liquids and small solids

Tertiary treatment

None, liquids and small solids to lagoon storage for field application



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WINDY RIDGE DAIRY PROJECT BY THE NUMBERS

Location type	Windy Ridge Dairy is a registered dairy operation since 1999, located in Fair Oaks, Indiana
Number of animals	7,000 milking cows
Type of bedding	Manure separated fiber
Manure collection	Vacuum
Daily flow	300,000 gallons/day
System designed by	Trident Processes
Date operational	October 2016
Energy produced/required	Parasitic load of approximately 50 kWh/day
Products produced	Approximately 300 cubic feet per day of 34% dry solids fiber for bedding
Residual materials	250,000 gallons per day effluent to storage
Residual storage	180 days lagoon storage
Residual use	Field application
Ownership structure	Farmer owned

FINANCIAL INFORMATION

Capital Investment	The equipment cost less than \$150 per cow and has an expected life of over 10 years.
Annual operating and maintenance cost	Electricity: 55hp (41KW) @ 9.14¢/kWh = \$30,000/year (at 100% draw) Estimated maintenance: \$3,000/year Estimated Total: \$33,000/year
Revenue	Annual cost savings to the dairy from the Trident system.
Payback period	The payback is expected to be around 6 years based on lower operational and maintenance costs and longer system life.

For more information about Trident Processes, LLC, or to join our mailing list, email info@newtrientllc.com.

Newtrient's mission is to help all dairy farmers reduce the environmental footprint of manure while enhancing their economic opportunities and their social license to operate. The information contained in this case study was developed with the cooperation of the organizations involved and Newtrient has endeavoured to make sure it is accurate and complete as possible.



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