DECLARATION OF ROYAL BURROWS

I, Royal Burrows, declare as follows:

1. I am an individual residing in Greeley, Colorado, USA.

2. I am over the age of 18.

3. I make this declaration on my own information, knowledge, and belief and based on my firsthand knowledge of the facts stated herein.

4. I am the current owner of Burrows Enterprises, LLC ("Burrows"). I have worked at and owned Burrows for the last 45 years.

5. The manure pumps provided by Burrows under the Fisher Pumps brand included a pump housing with two tangential fluid outlets. The purpose of the dual outlet design was to provide efficiency, equalize pressure in the housing to reduce forces on the drive shaft and impeller and eliminate mechanical bearings at the housing level. This dual outlet housing design distributes the fluid forces and equalizes case pressure which helps pump efficiency, pump longevity and durability, and reduces pump maintenance.

6. Burrows placed advertisements for Fisher Pumps in at least Manure Manager as early as September 2009. The document attached hereto as Exhibit A is a true and correct copy of the September/October 2009 issue of the printed publication titled Manure Manager ("Sept./Oct. 2009 Manure Manager Publication"). The Sept./Oct. 2009 Manure Manager Publication was published by

Annex Publishing & Printing Inc., has a copyright date of 2009 (see p. 4) and was made available to subscription holders in Canada and the United States. Page 18 of the Sept./Oct. 2009 Manure Manager Publication includes an advertisement submitted by Burrows on behalf of its Fisher Pumps division that describes, depicts, and offers for sale the Vertical Set Belt Drive Pumps, Vertical Set Direct Drive Pumps, and the Portable Hydraulic Driven Pumps, among other Fisher dual tangential outlet manure pumps, shown in the Sept./Oct. 2009 Manure Manager Publication.

7. As stated in the advertisement in Exhibit A, Burrows attended the World Dairy Expo held from September 29, 2009 to October 3, 2009 in Wisconsin. At Burrows' booth at the 2009 World Dairy Expo, we showed a number of dual outlet Fisher pumps, such as the Portable Hydraulic Driven Pump. During the 2009 World Dairy Expo we handed out literature regarding Fisher Pumps, including the Vertical Set Belt Drive Pump, Vertical Set Direct Drive Pump, and the Portable Hydraulic Driven Pumps. Exhibit C and Exhibit D are true and correct copies of Fisher Pump literature we consistently handed out to trade show attendees, including at the 2009 World Dairy Expo, among other trade shows we attended prior to 2010. As shown in Sept./Oct. 2009 Manure Manager Publication (Exhibit A), the Vertical Set Belt Drive Pump, Vertical Set Direct Drive Pump, and the Portable Hydraulic Driven Pumps, which are described as centrifugal pumps,

included a housing with a fluid inlet and two tangential fluid outlets connected to a combiner that combined the two fluid outlet streams into one fluid stream and then to a fluid conduit. Exhibit A shows they have a drive shaft, and an impeller connected to the drive shaft located within the housing. The drive shaft provided motive power to the impeller to direct the liquid from the inlet to the two fluid outlets. These features are also shown in the pumps depicted in the publications of Exhibit B, Exhibit C, Exhibit D, and Exhibit E, which were all published and publicly distributed before March 2010.

8. The pumps shown in Exhibit A are true and accurate depictions of the Vertical Set Belt Drive Pump, Vertical Set Direct Drive Pump, and the Portable Hydraulic Driven Pumps offered for sale, sold, used, and publicly disclosed by Burrows under the Fisher Pumps brand to customers in the United States and Canada at least as early as the year 2000. The Vertical Set Belt Drive Pump, Vertical Set Direct Drive Pump, and the Portable Hydraulic Driven Pumps shown in Exhibit A were publicly used, offered for sale, and sold to customers in the United States at least as early as the year 2000. The Vertical Set Belt Drive Pump, Vertical Set Direct Drive Pump, and the Portable Hydraulic Driven Pumps shown in Exhibit A were also publicly displayed and used in the United States and Canada prior to 2000, for example at our facility in Greeley Colorado.

9. Attached here to as Exhibit B is the Manure Manager publication from January/February 2010 issue of the printed publication titled Manure Manager Publication ("Jan./Feb. 2010 Manure Manager Publication"). The Jan./Feb. 2010 Manure Manager Publication was published by Annex Publishing & Printing Inc., has a copyright date of 2010 (see p. 4) and was made available to subscription holders in Canada and the United States. Page 33 of the Jan./Feb. 2010 Manure Manager Publication includes an advertisement submitted by Burrows on behalf of its Fisher Pumps division, that describes, depicts, and offers for sale Fisher Pumps that have a dual tangential fluid outlet housing, including the Vertical Set Belt Drive Pump, Vertical Set Direct Drive Pump, and the Portable Hydraulic Driven Pumps. As stated in the advertisement in Exhibit B, Burrows attended the World Ag Expo held from February 9, 2010 to February 11, 2010 in California. At Burrows' booth at the 2010 World Ag Expo, we showed a number of dual outlet Fisher pumps, such as the Portable Hydraulic Driven Pumps and handed out marketing literature, including at least the publications of Exhibit C and Exhibit D.

10. The Vertical Set Belt Drive Pump, Vertical Set Direct Drive Pump, and the Portable Hydraulic Driven Pumps disclosed in Exhibit A and Exhibit B are the same pumps shown in the brochure of Exhibit D and the owner's manual of Exhibit E. Each of these exhibits show a true and accurate depiction of the

Vertical Set Belt Drive Pump, Vertical Set Direct Drive Pump, and the Portable Hydraulic Driven Pumps that were advertised, offered for sale, sold, and in public use and on public display prior to March 2010.

11. The document attached hereto as Exhibit C is a true and correct copy of a published advertisement depicting and describing the Belt Drive Vertical Pump offered for sale and sold by Burrows under the Fisher Pumps brand and provided to customers and potential customers in the United States ("Fisher Pumps Advertisement"). The Fisher Pump Advertisement depicts and describes the same Belt Drive Vertical Pump shown in the Fisher Manure Manager advertisements in Exhibit A and Exhibit B, the marketing brochure of Exhibit D, and the owner's manual of Exhibit E. As can be seen in Exhibit C, the pump housing had two tangential fluid outlets ("Double Discharge Design"), a combiner brining the two discharge tubes together, and an optional slide gate agitation port located above the impeller case where a nozzle with valve were fitted to the pump for manure agitation. The Fisher Pumps Advertisement was published prior to 2000 and it is and has been publicly available to this day. It has been distributed to hundreds of customers and potential customers in the United States and Canada and was publicly distributed to trade show attendees at, for example, the World Ag Expo and the World Dairy Expo in 2009 and February 2010.

12. The two page marketing brochure attached hereto as Exhibit D is a true and correct copy of a published advertisement depicting and describing the Direct Drive Vertical Pump, Belt Drive Vertical Pump, and the Portable Hydraulic Pump, among other pumps, offered for sale and sold by Burrows under the Fisher Pumps brand and provided to customers and potential customers in the United States and Canada ("Fisher Pumps Brochure") well before March 2010. The Fisher Pump Brochure depicts and describes the same Direct Drive Vertical Pump, Belt Drive Vertical Pump, and the Portable Hydraulic Pump shown in the Manure Manager advertisements of Exhibit A, Exhibit B, and the operator's manual of Exhibit E. The Fisher Pumps Brochure was published well before 2005 and is and has been publicly available from 2003 to this day. It has been distributed to hundreds of customers and potential customers in the United States and Canada and was publicly and freely distributed to trade show attendees at various trade shows prior to March 2010, including, for example, the World Dairy Expo in 2009 and the World Ag Expo in February 2010.

13. The document attached hereto as Exhibit E is a true and correct copy of an Owner's Manual dated September 1, 2007, that depicts and describes the Direct Drive Vertical Pump, Belt Drive Vertical Pump, and the Portable Hydraulic Pump, offered for sale and sold by Burrows under the Fisher Pumps brand from at least the year 2000 to today ("Fisher Pumps Owner's Manual"). The Fisher Pumps

Owner's Manual was distributed to Burrows' customers in the United States and Canada in connection with the sale of the Direct Drive Vertical Pump, Belt Drive Vertical Pump, and the Portable Hydraulic Pump, at least as early as September 2007. Burrows sold hundreds of these pumps prior to 2010. Every purchaser of those pumps would have received Exhibit E. The Fisher Pumps Owner's Manual was also freely accessible to customers and potential customers who requested one prior to 2010, and later. The Fisher Pump Owner's Manual depicts and describes the same Direct Drive Vertical Pump, Belt Drive Vertical Pump, and the Portable Hydraulic Pump depicted and described in the Manure Manger advertisements of Exhibit A and Exhibit B, the brochure of Exhibit D, and of the advertisement of the Direct Drive Vertical Pump shown in Exhibit C.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on June 21, 2023

Royal Burrows
Burrows Enterprises, LLC

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EXHIBIT A

MANURE Manager

SEPTEMBER/OCTOBER 2009



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Randy Wallet - Harley, Ont.



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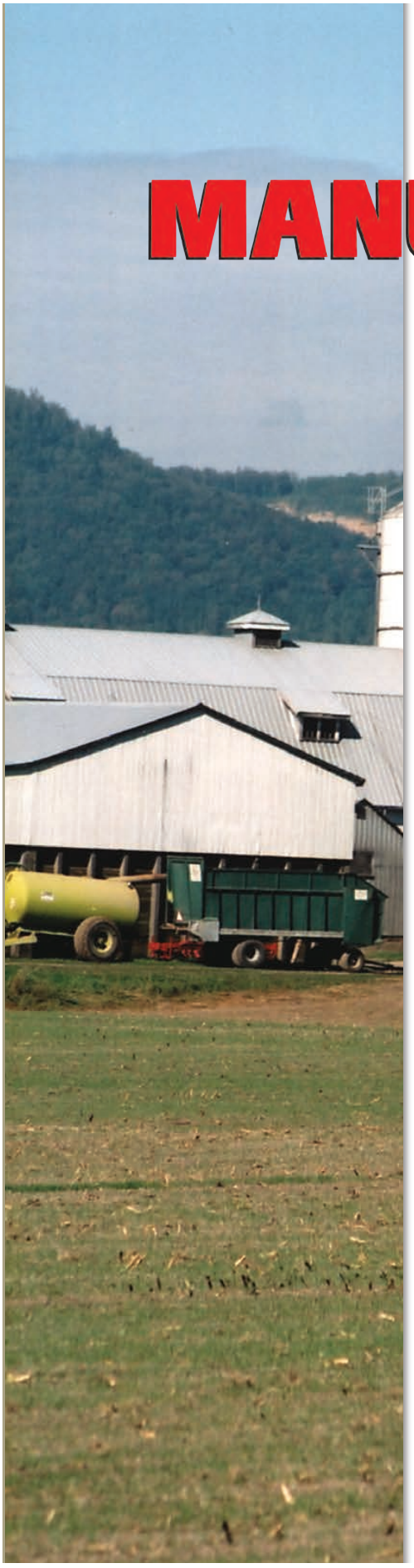
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Website: www.manuremanager.com



By Margaret Land

Getting real about the high price of bias

During the past month or so, the agricultural community has been abuzz with concern and criticism of Time magazine's recent cover story, Getting Real About the High Price of Cheap Food, penned by Bryan Walsh.

I'm hesitant to call the Time tirade an article as Walsh's more than 3,000-word horror story reads more like an opinion piece, and a rather misinformed one at that.

Back in the day when I had less grey hair and a lot more energy, I left the family farm and toddled off to college where I was taught that journalism involved writing a BALANCED article, including both sides of an issue or story. If you wanted to spout off about your opinions or feelings, you became a columnist. Or an editor.

Of course, back then, Time used to have journalistic integrity and was considered a news magazine, not a vehicle for pushing writers' opinions and agendas. That obviously isn't the case now.

"It's ultimately the story we decided to do and this is the angle we've been taking," Walsh explained in a recent interview with Mike Adams, host of AgriTalk. "Time (magazine) is trying to say rather than do a story where you do 50 percent on one side and 50 percent on another, you allow the writer to look at it and make some of his own judgments. That's why the story came out in many ways the way it does. Coming from my perspective, it was the information I saw and I thought this is the angle I'd like to take."

Well, I've looked at it, made some of my own judgments based on the information I've seen and this is the angle I've decided to take – Bryan Walsh should be ashamed to call himself a journalist; he's more of a fiction writer.

In his story, he talks of manure management systems on larger hog farms receiving "little oversight." Really? It's quite apparent he didn't bother to speak to a hog farmer about manure management plans, National Pollutant Discharge Elimination System (NPDES) permitting, plus many of the regulations farms must meet at the state and county level. None of it is mentioned in his story. Instead, he talks of "that mess" being disposed of in "open-air lagoons, which can overflow in heavy rains and contaminate nearby streams and rivers." Really? He obviously didn't bother to learn about the many regulations farmers face around constructing manure lagoons or the many hours of monitoring and record keeping that go into maintaining the structures. None of that information is contained in his story either.

According to National Pork Board (NPB) president Tim Bierman, a hog producer based in Iowa, Walsh didn't even bother to contact the NPB for input. If he had, "he quickly would have learned how pork producers – through their own programs as well as through governmental regulation – have made environmental stewardship a way of life," Bierman said in a National Hog Farmer article.

Chuck Jolley with the Cattle Network stated that Walsh was introduced to several people within the U.S. beef cattle industry but used none of the information he was provided with in his article.

"He only managed to wedge in one quote," Jolley said in his online blog – a quote that had to do with antibiotic use.

There's an old saying in agriculture that goes something like this: If it looks like crap and smells like crap, it's probably crap. And Bryan Walsh's "Getting Real" story is definitely that – crap. MM

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WEB EXCLUSIVE

Workshops encourage farmers to try water-friendly practices says study

Minnesota farmers and producers who participated in University of Minnesota-sponsored small group manure management workshops are likely to adopt water-friendly practices that also save them money, according to a survey by the university's Water Resources Center.

During the winter of 2008-2009, Water Resources Center researchers held "Value of Manure" small group workshops in 22 counties across the state. The 267 workshop participants – 87 percent of who were agricultural producers – learned to use a university-developed spreadsheet program to compare costs and returns from alternative manure management practices on their own farms.

As a result of the workshop and spreadsheet findings, 74 percent of workshop attendees said they would change their application rates and timings. And between one-quarter and one-third of all attendees who weren't already testing, calibrating and keeping a record of their manure applications said they would start as a result of the workshops.

Read the full story at www.manuremanager.com

NEW PRODUCTS

Instinct™ Nitrogen Stabilizer protects liquid manure applications

Dow AgroSciences recently announced that federal registration had been received for Instinct™ nitrogen stabilizer for use with UAN and liquid manure. According to Dow, Instinct protects nitrogen at the plant root zone, keeping it easily available to corn during key yield-determining growth stages. Studies also show that nitrapyrin, the active ingredient in Instinct, optimizes the yield potential of corn by increasing grain protein, improving standability, reducing the risk of stalk rot and enabling faster crop drydown. Under a 24(c) Special Local Needs Registration in Iowa in 2008, on-farm field trials showed that fields treated with Instinct out-yielded nontreated fields by an average of five bushels per acre.

Kuhn Knight launches new line of box spreaders

Kuhn North America, Inc., of Brodhead, WI, recently introduced the new PSC Series ProSpread Commercial apron box spreaders. The truck and trailer models are designed for operators who need a high-capacity, heavy-duty machine to spread the toughest solid materials. They provide consistent performance and long life with their sturdy all-welded construction, friction-resistant poly floor and innovative split-apron drive. A hydraulically-controlled, variable-speed apron allows even spreading of pen pack, feedlot and dairy manure, and many other solid materials.

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No weeping over this system

By Diane Mettler

Sierra Dairy of Dublin, Texas, realizes multiple benefits from its weeping wall waste management system

The downstream end of the primary weeping wall system. The effluent leaving the system is conveyed to a concrete tank where a pump conveys the effluent to the secondary weeping wall system for further treatment. Photos by Deanne Meyer

The Sierra Dairy, in Dublin, Texas, underwent an extensive expansion from 2005 to 2008. The farm's owners, the VanderHorst family — Alan, his wife Becca and their five children — transformed the 1980's era 1,000-head, open stall barn dairy into a 3,500-head free stall barn facility. The dairy now boasts a 60-cow rotary parlor, a flush system and an economical and innovative weeping wall waste separation system.

The dairy was already familiar with weeping wall systems. They had a smaller-scale system at another dairy and believed a larger version would work well for Sierra.

"One of the things we really like about the weeping wall system is that it uses gravity over any kind of electrical power," says Lance Reeves, operations manager at Sierra Dairy. "So, it requires little maintenance."

A flush system for 3,500 cows equates to roughly 250,000 to 300,000 gallons of water flushed per day. To handle that kind of volume, the dairy turned to Agricultural Engineering Associates (AEA) to design a state-of-the-art system.

Achieving goals

While designing the system, AEA were mindful of the Sierra Dairy's goals. First was to recycle as much sand as possible for bedding.

"We were also looking for economy, ease of construction as well as the ability to lower the moisture content of the settled manure solids so that the solids could be easily loaded out," says Jeff Murphy, staff engineer at AEA.

The design AEA developed allows the dairy to:

- Recycle up to 75 percent of the sand.
- Reuse the flush water.
- Economically separate solids and liquids for spreading and irrigation.
- Separate most of the phosphorous in the form of manure solids, so it can be spread farther from the dairy.
- Spend less time on maintenance compared to a mechanical separation system.

Sand settling basin

The system is primarily gravity fed. The water is flushed through the free stall barns four times a day and travels first through a sand-settling channel.

"It is sized with the right width and slope to bring the effluent flow to the right velocities to allow settling of sand, but keeps manure solid in suspension," says Murphy. "They clean the sand out of the channel with the loader, spread it out, and allow ultraviolet radiation to reduce bacterial counts. Then they reuse it for bedding in the stalls."

Dr. Saqib Mukhtar, a PhD and associate professor of Biological and Agricultural Engineering with Texas AgriLife Extension, has been out to do studies on the system and is impressed. "This is one of the very few dairies where I have seen a nicely, properly designed shallow, but narrow, long and effective, sand settling basin," he says.

Solid settling channel

The effluent travels to two of the four primary cells or basins. Each cell is 40-feet x 300 feet x 8 feet deep, with a capacity of approximately 718,000 gallons. (Combined, the four cells hold approximately 2.9 million gallons.) Inside the cells, the water "weeps" from the

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vertical slots in the walls, separating the water and solids via gravity. What makes these cells unique is that they are some of the first to have holes at the bottom to allow even more liquids to escape.

"Having multiple basins allows you to alternate which ones you're filling," says Murphy. "So while you're filling one, the other one that's just been filled can be dried and cleaned out and be ready to be filled again."

Once the water seeps from the first cells it's then pumped to a set of secondary cells, which are identical to the primary, just smaller.

Normally the secondary cells would be gravity fed. "But in this case, the footprint of these two systems is so large that they couldn't build a secondary system downstream from the primary," explains Mukhtar. "So they have to expend this extra energy."



Dr. Saqib Mukhtar points out the weeping wall features to the attendees of the Southwest Dairy Day at the Alan VanderHorst dairy near Dublin, Texas.



Looking upstream at the primary weeping wall. The sand settling lane runs along this weeping wall. The ramp to remove settled sand from the channel, and the recovered sand (foreground) and the stockpiled dried sand to be recycled as free-stall bedding are visible in this picture.

The key component

The water that weeps from these secondary chambers is either pumped back up to tanks on top of the barn, where it will be used for flushing out the stalls, or gravity fed to liquid manure storage ponds (also referred to as lagoons), where the water will be used for irrigation.

"The key factor that makes this system work well and really makes it user friendly, is that we don't bring any water back from the lagoons," says Reeves. "Once our excess flush water leaves the secondary and goes to the lagoon it never comes back."

He adds, "The benefit of that is we don't have to keep our lagoons full so we can get good flush water. We can basically pump them dry and it doesn't affect us. It really opens up the possibilities and really doesn't tie you to managing your lagoons to your flush systems"

The flush water stored in the storage ponds is used to water crops during the growing season. "We cut fresh grass off our fields daily during the growing season and bring it back in here as feed," says Reeves. "And we have five lagoons – the largest being 82 acre-feet – so we've got a lot of storage."

The water recycling system is so efficient that the only fresh water that's added comes from the natural process water from the parlor.

Removing the solids

It takes approximately 60 to 90 days to fill two primary basins. Once they're full, the system switches to the other two primary basins and the solids in the first two are allowed to dry out for another 60 days.

Dr. Mukhtar says that the separated material, once dried, is normally at about 30 to 35 percent solids and about 65 to 70 percent moisture. At that consistency, liquid is no longer running out freely.

When the solids are dry enough to remove, the end walls of the basins are removed – lifted out with the loader and set to the side. This allows dozers and skid steers to drive directly into the basin to clean it out.

Although the walls are also a unique feature of this system, it's one thing the dairy wouldn't do again. "We would make it a ramp system," says Reeves. "The removable walls have probably been the Achilles heel of the whole thing. They tend to break and just moving them in and out is labor intensive – plus they're very fragile. They're not really made to be moved."

As for the spreading of the solids, Sierra Dairy hires a custom spreader to apply the solids to the dry land fields.

In fact, one of the highlights of the project has been the dryness of the product, says Reeves. "It's very easily handled and loaded in trucks. Since it's a

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drier product, versus the Honey Vac that we used before the expansion, we're able to truck it farther distances to some of our other fields. It's a lot less expensive because we're not hauling water."

Although there aren't likely to be odor complaints near a dairy town like Dublin, they have been lessened. "The odors are reduced by separating the solids from liquids and taking the liquids to the storage pond where they're diluted," says Dr. Mukhtar. "The odors are reduced because you are also removing some of the volatile compounds with the separated solids in the weeping wall basins and storing them. And also being drained and dried, the lesser the moisture, the better the aerobic conditions, and lesser the odors."



Final effluent leaving the chambers of the secondary weeping wall. This liquid is conveyed to lagoons for storage and treatment. Lagoon liquid is then used for flushing the manure alleys in free-stalls.

Planning for a system

Dr. Mukhtar says the weeping wall system isn't for every dairy. Anyone planning a new waste management system or treatment system needs to look at the entire picture. "They need to ask themselves, 'What is the objective? Is there enough land? Are they going to add some value by separating solids? Should I use those solids for composting? Would there be a market for that?'"

He adds, "For example, you can compost, and properly composted manure is an excellent source of fertilizer and organic matter, but if you can't utilized on your cropland and there is no one living within 30 miles and no one is willing to come in and pick it up (hopefully buy it), you're adding another stream of labor intensive manure that you then need to tackle."

In this case, the weeping wall system has been an ideal solution and Reeves believes it's something farms should look into. For Sierra Dairy, the system is paying for itself — in part it's able to recycle much of its bedding.

"Not a lot of people are pushing it because there are no replacement parts to sell and no service to sell," says Reeves. "Not everyone wants to hear that. But the manufacturers generally try to push things that are going to make them money in the long term. And this isn't one of those systems because it's an up front investment. And there's not a lot of money or maintenance to be spent on it down the road."

Dr. Mukhtar presented his findings on the efficacy of the Sierra Dairy weeping wall as a solid-liquid separation system at the Texas Animal Manure Management Issues (TAMMI) Conference held Sept. 29 and 30, 2009 at the Austin Marriott North in Round Rock, Texas.

The TAMMI Conference provided education and information on proper animal manure management for environmental protection and a thriving animal industry in Texas, in the context of evolving regulatory and public relations environment. Continuing education units will be available to participants. For more information, see the TAMMI website at http://grovesite.com/tamu/tammi. MM

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Study shows nitrous oxide now top ozone-depleting emission

Nitrous oxide has now become the largest ozone-depleting substance emitted through human activities, according to scientists with the National Oceanic and Atmospheric Administration (NOAA).

A study by the NOAA evaluated nitrous oxide emissions from human activities in terms of their potential impact on Earth's ozone layer. As chlorofluorocarbons (CFCs), which have been phased out by international agreement, ebb in the atmosphere, nitrous oxide will remain a significant ozone-destroyer, the study found. Today, nitrous oxide emissions from human activities are more than twice as high as the next leading ozone-depleting gas.

Nitrous oxide is emitted from natural sources and as a byproduct of agricultural fertilization. In addition to soil fertilization, nitrous oxide is emitted from livestock manure, sewage treatment, combustion and certain other industrial processes.

The study was authored by A.R. Ravishankara, J.S. Daniel and Robert W. Portmann with NOAA's Earth System Research Laboratory (ESRL) chemical sciences division.

"The dramatic reduction in CFCs over the last 20 years is an environmental success story. But manmade nitrous oxide is now the elephant in the room among ozone-depleting substances," said Ravishankara, lead author of the study and director of the ESRL Chemical Sciences Division in Boulder, Colo.

Though the role of nitrous oxide in ozone depletion has been known for several decades, the NOAA study is the first to calculate that role using the same measures that have been applied to CFCs, halons and other chlorine- and bromine-containing ozone-depleting substances.

In nature, bacteria in soil and the oceans break down nitrogen-containing compounds, releasing nitrous oxide. About one-third of global nitrous oxide emissions are from human activities. Nitrous oxide, like CFCs, is stable when emitted at ground level, but breaks down when it reaches the stratosphere to form other gases, called nitrogen oxides, which trigger ozone-destroying reactions.

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AN OLDIE BUT A GOODIE

By Tony Kryzanowski

California plug flow anaerobic digester was one of the first installed in North America



Solid compost by-product accumulates after processing through the Sweco Vibroscreen separator. Almost half is used as free-stall bedding, while the other half is sold to nurseries and landscapers. Submitted photos

Dairy owners, Leo and Linda Langerwerf know how it feels to be a lightning rod for the well-funded and star-studded environmental activist crowd in California, but they have no regrets about their decision back in 1982 to be among the first to adopt anaerobic digestion as their primary manure management method.

"As a dairy farmer, you have a heck of a lot of crap to deal with and do you need that extra job? Probably not," says Leo. "But if you are having some environmental or regulatory concerns, it is one way to combat some of that stuff."

He adds that in any situation where there are a lot of animals being managed in a confined area, "it just doesn't make any sense why people wouldn't do something like this. I sell more power than I use, so why wouldn't anybody else want to do that?"

One published estimate says that the entire methane recovery system at the Langerwerf dairy adds about $68,000 per year to their revenues.

In terms of return on investment, Leo says that it is likely that farms would build a manure collection, anaerobic digestion, and by-product disposal system comparable to the amount of manure that they generate. So a reasonably priced system could be designed depending on the circumstances.

In addition to providing a new income source, installing an anaerobic digester does benefit the environment.

"It makes you handle your manure on a daily basis," Leo says. "It helps to keep your farm cleaned up of all your manure because you need that manure to put in the digester so that it's digested down and creates gas. So, to keep that steady flow of gas, you have to take care of it. You have to be a better manager of your manure than you used to be."

The need for hands-on involvement to properly manage the anaerobic digester is nothing new for dairy farmers.

"Whoever is doing this is going to have animals," says Leo, "and it is just an extension of the animal. You have to take care of it every day, just like you do the animal every day, seven days a week, and there is no getting around it."

Methane recovery from manure digestion to generate power is only one income stream. There are also the benefits of using the nutrient-rich liquid by-product for crop fertilizer, and the dry compost by-product for free stall animal bedding. It is also a marketable, weed free and pathogen free compost product that can be sold to landscapers and other dairy operations. The compost is weed free because the seeds germinate in the digester's high temperature environment, but there is no oxygen. So the seeds die.

Once the methane is extracted and the nutrients broken down into a finer material through the anaerobic digestion process, Langerwerf believes it is a better crop fertilizer because it takes a lot less time for the soil to absorb that fine material versus application of a raw manure slurry. Then, there are the intangibles.

"It helps a great deal in fly control and smell," says Langerwerf. "In fact, we hardly have flies at all like we used to prior to the digester."

The Langerwerfs operate an 800-cow dairy on about 130 acres north of Sacramento and were among the first in North America to install a plug flow anaerobic digester for manure disposal. It measures 14 feet deep, 25 feet wide and

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125 feet long. Of those early pioneers, the Langerwerf digester is the only one still operating in California. The dairy uses between a quarter and a third of the power it generates for its own operations and the rest is sold under contract to power utility Pacific Gas and Electric (PG&E). A study conducted in 1998 by RCM Digesters indicates that the farm saved $850 in one month alone from the electricity generated from burning the digester biogas.

The Langerwerf milking parlors are all concrete and the raw manure is scraped with a tractor and scraper into a collection tank, where it is mixed with water to achieve the proper consistency of about 14 percent solids and then pumped into a preheat tank.

"You never see it once you get it scraped," says Leo.

The manure is warmed in the preheat tank with hot water coming off the methane-powered Cat 3306 engine. Then the slurry is pumped into the RCM Digesters plug flow digester where it is retained for 30 days at 97 degrees Fahrenheit. The water used to heat the slurry in the preheat tank is re-circulated to cool the engine so that the radiator fan isn't running all the time.

As the manure digests, the gas collects in a gas bag and the weed-free slurry by-product discharged from the digester is processed through a Sweco Vibroscreen separator. The solid stream is collected and used as free stall bedding or sold, while the nutrient-rich liquid stream is collected in a lagoon and diluted with fresh water before being used to irrigate 120 acres of cropland. Langerwerf says he uses about 40 percent of the solid compost for bedding and sells the rest, usually without too much trouble.

During irrigation, the lagoon water is pumped at 200 gallons per minute and blended with irrigation water flowing at 5000 gallons per minute.

The biogas is suctioned through an underground pipeline from the gas bag to the 3306 Caterpillar engine. The engine generates about 40 kilowatts per day, and about 30,000 cubic feet per day of biogas is recovered.

Langerwerf has high praise for RCM Digesters as his anaerobic digester supplier.

"Mark Moser, the general manager at RCM, is a brilliant guy," says Langerwerf. "He can tell you just about anything about a digester, when it's happening, before it happens and after it happens. He has a track record in the United States and outside the United States. They are the only game in town, in my opinion, no matter where you are."

RCM Digesters was involved in a study and refurbishment project that essentially dissected and rehabilitated the Langerwerf anaerobic digester in the late 1990s. It provided the company with an opportunity to determine what withstood the test of time over a 16-year period.

What they discovered is that while annual digester maintenance to that point had been estimated at about eight percent of capital cost, the annual digester maintenance costs based on this study was less than one percent.

Another interesting discovery is that the plug flow digester appeared to accumulate only about one percent of the volume of solids that would be expected in an anaerobic lagoon. More specifically, over a 16-year period, about 740 cubic yards of material accumulated in the plug flow digester, versus 85,000 cubic yards that would typically accumulate in a lagoon. In tangible terms, it would take 74 loads of a 10-yard dump truck to remove the solids from a



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digester versus between 5000 and 8000 truckloads from a lagoon.

"Eventually, the farm with the lagoon will have to manage 5000 to 8000 dump truck loads of sludge that a digester does not accumulate," says RCM in its project report posted on the U.S. Environmental Protection Agency's AgSTAR website.

The hypalon gas bag attached to the Langerwerf digester had degraded, largely through exposure to ultraviolet rays, but as a wear item that would need to be replaced over time, it is not a significant cost. There was only minor corrosion of concrete and steel.

Langerwerf believes anaerobic digestion is a viable option for many intensive farm operations – although this is one area where California may not be a forerunner as far as environmental leadership is concerned.

In his view, the "environmentalism gone wild" attitude within California and red tape are actually working against dairy farms in the state from moving in the direction of installing more anaerobic digesters, and some have as many as 6000 cows.

"The small handful of actors and people that have nothing better to do with their time but screw with somebody else's livelihood are the ones that are swaying the vote because the squeaky wheel gets the grease," Leo says. "As farmers, we don't have time to go to every meeting to try to influence people on what's going on."



A new gas bag was installed over the Langerwerf dairy plug flow anaerobic digester in the late 1990s, and that in turn was covered by a greenhouse enclosure.

One other legislative wrinkle that ticks Langerwerf off is that he can not profit from marketing greenhouse gas emission credits from his anaerobic digester because it was built before 1999.

"This is BS," he says, "because my green credits are worth just as much as anyone putting in an anaerobic digester tomorrow. I don't need to be better than anybody else, but I sure as heck don't need to be less than somebody else, and that is what they are doing to me." MM

This idea doesn't stink: Technology cuts odors, pollutants

A North Carolina State University researcher has devised a new technology that really does not stink. In fact, it could be the key to eliminating foul odors and air pollutants emitted by industrial chicken rendering facilities and – ultimately – large-scale swine feedlots.

Praveen Kolar, assistant professor of biological and agricultural engineering at NC State, has developed an inexpensive treatment process that significantly mitigates odors from poultry rendering operations. Rendering facilities take animal byproducts (e.g., skin, bones, feathers) and process them into useful products such as fertilizer. However, the rendering process produces extremely foul odors.

While the emissions are not currently regulated by government, the smell can be extremely disruptive to a facility's community. The industry currently uses chemical "scrubbers" to remove odor-causing agents, but this technique is not very effective, Kolar says. Furthermore, some of the odor-causing compounds are aldehydes, which can combine with other atmospheric compounds to form ozone – triggering asthma attacks and causing other adverse respiratory health effects.

Kolar, working with his co-author James Kastner at the University of Georgia, has designed an effective filtration system that takes advantage of catalytic oxidation to remove these odor-causing pollutants. Specifically, the researchers use ozone and specially designed catalysts to break down the odor-causing compounds. This process takes place at room temperature, so there are no energy costs, and results in only two byproducts: carbon dioxide and pure water.

The researchers developed the catalysts by coating structures made of activated carbon with a nanoscale film made of cobalt or nickel oxides, Kolar says.

"We used activated carbon because its porous structure gives it an extremely large surface area," Kolar says, "meaning that there is more area that can be exposed to the odorous agents." The cobalt and nickel oxide nanofilms make excellent catalysts, Kolar explains, "because they increase the rate of the chemical reaction between the odor-causing compounds and the ozone, making the process more efficient. They are also metals that are both readily available and relatively inexpensive."

Kolar says his next goal is to apply this research to industrial hog farms.

"This technology could be applied to swine operations to address odors and ammonia emissions," Kolar says. "My next step is to try to pursue this research on a large scale."

The research, "Room-Temperature Oxidation of Propanal Using Catalysts Synthesized By Electrochemical Deposition," is published in the August 2009 issue of Transactions of the American Society of Agricultural and Biological Engineers (ASABE).

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Methane gas is captured from the biodigester and used to run a generator that produces energy that is fed into the main grid. Submitted photos

Finding COMMON GROUND

By James Careless

Qualco Biogas Project brings together farmers, natives while helping the salmon

Historically, dairy farmers and members of the Tulalip Tribes in Washington's Tualco Valley have been at loggerheads. The farmers are pushing ahead with herd growth, thus increasing the risk of manure run-off into the Snohomish River. This run-off could seriously hurt the river's ability to support salmon, an important resource for the Tulalip Tribes. Add local environmentalists, who are trying to preserve the Snohomish and the stage has been set for confrontation. So why are these groups now working together, when they used to be fighting? One word: Biogas.

In a creative solution to the potential problem, local farmers belonging to the Sno/Sky Agricultural Alliance, Native Americans from the Tulalip Tribe and a representative from the Northwest Chinook Recovery environmental group have banded together to form Qualco Energy. Qualco is a nonprofit group that runs a biogas electricity generator in the area. Currently, Qualco's biodigester is handling manure from 1,100 local cows, with capacity for double that, and 450 kilowatt/hours of electricity is being generated by Qualco regularly since it began generating in December 2008. That's enough to power 300 homes.

"Qualco Energy shows what can be done when people come together to solve problems to everyone's benefit," says Dale Reiner, Qualco's president. "It is truly a win-win for everyone affected – including the fish."

When he's not running Qualco, Reiner is managing his dairy herd on his 300-acre farm. It's been in the family for three generations, with frontage on the Snohomish River.

"Eight years ago, my brother and I had finished doing some waterfront restoration on our property, to help the local salmon population," he tells Manure Manager. "The fact that the Tulalip Tribes were doing the same kind of work got us to thinking: What if we could find a way to work together to restore the salmon, and deal with the potential run-off problem at the same time?"

Reiner kicked the idea around with local dairy farmers. They liked it, and he decided to approach the Tulalip Tribes. "We had to keep our meetings pretty hush-hush," Reiner says. "In those days, neither side trusted each other."

As people talked with each other, the distrust eased. Eventually the Sno/Sky Agricultural Alliance, Tulalip Tribes, and Northwest Chinook Recovery agreed to establish a biodigester in the area.

The suggested site was the former prison dairy known as the Monroe Honor Farm. Operated by the State of Washington from 1929 until 2001, the 277 acre farm is located close to local dairy farms, yet far enough away from subdivisions and other forms of housing that running a bio-gas facility wouldn't disturb anyone.

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Working together, the three member groups of Qualco Energy received $250,000 from the 2003 Agriculture Appropriations bill to fund a feasibility study into the biogas facility. Once it was completed and their concept had been approved, Qualco had the basis to seek funding from the federal Biomass Research and Development program. As a result, a USDA grant amounting to $500,000 was received and used along with more than $2.9 million in acquired loans to fund the biogas project. Lobbying at the state level persuaded the legislature to give the farm to the Qualco Energy group. From that point, work on the biodigester began until it started operation late last year.

"It took a lot of hard work on everybody's part to get to this point, but we did it," says Reiner.



Methane gas is piped through to run the generator.

The system

The heart of Qualco Energy's biodigester is a large concrete digester tank. Located at the Monroe Honor Farm, the concrete covered tank is 198-feet long, 80-feet wide, and 17-feet deep. It has enough capacity to process waste from 2,200 cows at a time. The tank is equipped with heaters to ensure that the fluidized manure inside stays warm enough to support anaerobic bacteria; meaning that the temperature has to be maintained at 99 to 100 degrees Fahrenheit at all times. "It took us a while to get up to that temperature when we started the operation in winter," Reiner says. "Sometimes you've got to expend some energy to create some."

The anaerobic bacteria within the manure grow within this environment, digesting the most toxic elements of the manure, releasing methane gas as a



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byproduct. This methane gas is captured from the tank, and then used to run a generator that produces electricity that is fed into the main grid. Meanwhile, the remaining processed manure is nearly odor-free. It has become nutrient-rich compost that is perfect for gardens and farms (as is the grey water left from the process).

"This is truly advanced recycling," Reiner says. "What used to be left in the fields to decompose – with a potential to overload the local water table with excess nutrients – is now creating clean electricity and natural fertilizer that lacks the pungent manure smell that people complain about. Meanwhile, the river is protected from the possibility of receiving excess dairy nutrients. This helps protect not just salmon, but the entire eco-system."



The heart of Qualco Energy's biodigester is a large concrete digester tank large enough to process waste from 2,200 cows at one time.



The biodigester is currently receiving manure from one local dairy while another has constructed pipelines to the facility.

Challenges

Currently, Qualco Energy's biodigester is operating at half capacity, with manure only coming from the nearby Werkhoven Dairy Farm. "Two farms have built pipelines to our site," says Reiner. "The first, owned by Werkhoven Dairy, is in operation. The second hasn't started production yet."

Why haven't other farmers started hauling manure to Qualco, at the very least? "It is a problem of economics," says Dale Reiner. "They want to use our facility, but they are having trouble affording to. Milk prices are down, while fuel prices are up. Combined, they make it expensive to haul manure to our site."

Even when the biodigester gets up to full capacity, other units will have to be built to make a real dent on local manure production. This will likely require more government assistance. However, given how completely biodigestion can reduce manure run-off, such funding should be politically popular with farmers, natives and environmentalists. Dale Reiner is adamant that biodigestion is a much smarter way for dairy farms to handle manure, in contrast to other environmental methods. "All dairy farms are required to operate under a nutrient management plan designed with the help of the local conservation district approved by the State Department of Agriculture with oversight by the federal Environmental Protection Agency to assure that no contamination currently results from the farm's waste disposal practices," he explains. "The benefit of the biogas digester system that we have installed, is that it allows the dairy farmer to increase his herd size based on a business management and financial plan rather than a plan based on the number of cows per available acre. This is accomplished by creating a system that allows excess nutrients not required by the dairy farmer for his fertilization to be transported to other farm or garden sources outside his local area; thereby, in affect increasing the size of his nutrient disposal area."

Speaking in broader terms, Reiner cites biodigestion as a technological solution that can reconcile the needs of farmers, natives and environmentalists. "Qualco Energy is about more than dealing with manure constructively, although it is a big step in that direction," he says. "It is about bringing together conflicting interests in a positive way that really makes a difference. This is why the members of our company – the Sno/Sky Agricultural Alliance, the Tulalip Tribes and Northwest Chinook Recovery – are so committed to this solution, and willing to keep at it until we have realized our collective dream. We all want farming to succeed here, because otherwise the land might end up being overtaken by condos. We all want the salmon to thrive, and we want to tackle the energy shortage in a clean, green manner."

"Biogas and biodigestion does all of these things," he concludes. "Everyone truly does win with this approach." MM

Qualco Energy can be found on the web at www.qualcoenergy.com.

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Less liquid

By Tony Kryzanowski

B.C. compost designer focuses on water evaporation to better manage nutrients

A major challenge in manure management is often the sheer volume and health risks posed by raw manure, and the need to safely dispose of this resource as it accumulates.

Excessive buildup of phosphorus-based nutrients in farmland where too much manure is applied over time is also a problem in some areas.

Imagine what a stress relief it would be if the water content could be removed from hog or dairy manure, for example, and the remaining solids were converted to pathogen-free compost? Compost represents a valuable commodity to such industry sectors as landscapers, nurseries, and garden centers, and it is also a valuable commodity on the farm. Compost can play an important role in revitalizing farmland, according to Dr. John Paul, a PhD in soil microbiology and biochemistry who also worked with Agriculture and Agri-Food Canada for seven years. Canada has lost 30 to 50 percent of the organic matter in its soils already, he says, and this percentage is higher in other parts of the world. Applying compost is a good way to revitalize soil.



By heating the air above raw manure, including liquid manure, Transform Compost Systems is developing technology to evaporate the liquid and leave high value, pathogen-free compost behind. Submitted photos

The concept of composting has been around for a long time, typically on a smaller scale with individuals composting organic material in their backyards. Given the trend toward more intensive agriculture operations, Dr. Paul's company, Transform Compost Systems, sensed a trend in agriculture back in 1998 where there would be a strong need to economically recycle nutrients generated from farms in many parts of the world.

"Many farms are net importers of nutrients like feed and other commodities," says Dr. Paul.

He describes his Abbotsford, B.C.-based company as a provider of design for composting systems, operator training courses for compost facilities, and retailer of composting

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equipment. The company hasn't limited its horizons. Its list of projects includes installations throughout North America.

Transform Compost Systems also provided the design, construction manuals, and equipment for a 200 ton per day organic waste composting facility in Qingdao, China, and the design and equipment for a biosolids and chicken manure composting facility in Australia.

Of particular note, the company was involved in the safe composting of diseased chickens in B.C. during the avian flu outbreak in 2004. The company managed the composting of 1.3 million chickens at a central B.C. location, and implemented safe and cost-effective protocols for on-farm composting of poultry litter for 20 different farms.

Because compost can be generated from all organic material, the company caters to both agricultural and non-agricultural clients.

Transform Compost Systems is working on a project using the heat energy that can be generated in the composting process to evaporate the water from liquid manure typically destined for storage lagoons, leaving behind a much smaller volume of pathogen-free compost. Dr. Paul has been working to advance this research since 1994. He notes that every ton of manure has over two million BTUs of potential heat available. The company's system has much wider potential application than just hog or dairy operations. It is already being applied successfully in a chicken manure composting system.

"We are working with some producers in North America to extract heat out of the composting process," says Dr. Paul. "Not necessarily to process liquid manure and recycle the heat that way, but in one particular case, to heat poultry barns in the winter months."

Capturing excess heat from composting chicken manure has added benefits over composting liquid hog manure because – in the case of hog manure – all of the generated heat needs to be used to evaporate the water. With poultry manure, there is a lot less liquid, so the generated heat can be used in other ways, like saving on heating costs.

According to Dr. Paul, when the issue of greenhouse gas emissions began to percolate about 1994, this fueled increased interest in anaerobic digestion of organic waste products. As part of the research involving anaerobic digestion of manure, microbiologists were able to calculate how much energy potential was in manure.

"The problem with anaerobic digestion is that we don't solve any of our problems, which are too much liquid and too many nutrients," says Dr. Paul. With anaerobic digestion, even though capturing methane is a valuable commodity for use in power generation, there is still the liquid stream that must be economically disposed of in some way.

Faced with these issues, he says researchers like him thought of turning that potential energy in manure to heat energy, using it to evaporate the water and leaving behind a composted, stable volume of solid nutrients, which can then be marketed or used on farmland as organic fertilizer.

Transform Compost Systems has actually designed a system consisting of an aerated channel system, a stainless steel mixing system, a heat recovery and reuse system, and process optimization. The company is in the process of working with a commercial hog producer to put science into practice. It has built a composting installation, which includes a 30-foot-wide by 250-foot-long composting greenhouse to generate external heat. However, the project was sidelined recently by poor hog prices,



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Liquid manure is added to the composting material as it mixes in a process that Transform Compost Systems has developed to evaporate the water from the raw liquid manure and leave a solid compost byproduct behind.



The higher the temperature in the compost pile, the higher the evaporation potential, according to B.C.-based Transform Compost Systems.

which forced the producer to sell his hogs. He is now raising hogs on contract, so Transform Compost Systems intends to restart its project this summer and demonstrate its effectiveness in a commercial setting. This research has been funded in part by the Pork Industry Development Fund, the Greenhouse Gas Initiative and the B.C. Agricultural Council.

"The proposed treatment is to take that liquid manure as soon as possible when it is out of the barn," says Dr. Paul, "and blend it with a solid matrix to create the composting environment so that we can get the heat to evaporate the water." Grain straw works well as a solid matrix and it is plentiful in areas where intensive livestock operations are abundant, but use of a variety of materials is possible.

By now, it's obvious that a critical element for the composting process to work as designed is the ability to generate heat above the liquid manure to both evaporate the water and trigger composting of the remaining solids. Unfortunately, heat is in short supply through a lot of the year in colder climates where a lot of hog production takes place.

"The temperature of the air above the composting material is actually the most critical factor in the whole process," says Dr. Paul. "As you can imagine, if it is minus 40 (Celsius), getting that

Continued on page 32



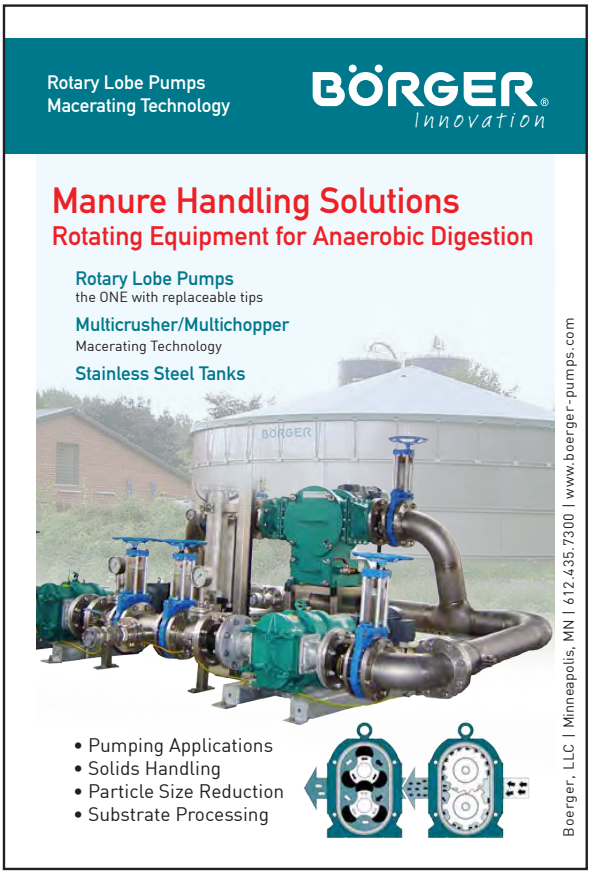


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A TOP 10 LIST ON PREPARING FOR FALL MANURE APPLICATION

By Angela Rieck-Hinz

1 Review manure management plans. Prior to land application, review your manure, nutrient, or comprehensive nutrient management plan, make any necessary updates such as adding new fields. Review the plan, application methods and separation distances with employees and/or commercial manure applicators. Also consider evaluating fields for application. Because winter application of manure is prohibited for confinement feeding operations with liquid manure, plan ahead in the event you may have to apply manure under emergency situations in the winter. Save fields with the flattest slopes and P-Index ratings of two or less for emergency application.

2 Know and follow land application separation distances. Confinement site operators are subject to land application separation distances to neighbors and public use areas, but all animal feeding operations, regardless of size, are subject to separation distances from designated areas (water sources).

Get a copy of an aerial photograph of your fields and the neighbors' field to which you apply manure. Map out neighbors' houses, churches, businesses, school, cemeteries and other public use areas as well as all designated areas such as sinkholes, wells, including abandoned wells, cisterns, designated wetland, water sources, high quality water resources, agriculture drainage wells, and tile inlets to agriculture drainage well. Identify all other sources of concern for manure application. Sketch out separation distances. Train your employees to read the maps and stay away from areas where manure application is not allowed. If needed, flag out the areas in the field. Share copies of the maps with your commercial applicator. Make sure you understand the definitions for incorporated and injected manure. Make sure you understand separation distances for designated areas (water sources) must have the manure injected or incorporated on the same date it was applied.

3 Make sure your manure applicator certification is current. If you are required by law to be certified to handle, haul, transport or land-apply manure make sure you certification status is current.

4 Develop an emergency action plan. Manure spills happen, so plan accordingly. Train employees in manure spill response. Ask your commercial manure applicator if they have a plan of action in the event of a spill. If they don't have a plan, demand it. Keep important phone numbers and contact information for excavators, neighbors with pumps and tractors, and local officials and emergency response units up-to-date and posted where everyone knows where to find them. Be aware of safety issues regarding gases when pumping and agitating manure. NEVER enter a building or manure storage when pumping or agitating manure.

5 Take manure samples. Taking manure samples prior to land application will give you nutrient analysis results

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for planning application rates this fall. Sampling during land application or manure agitation may provide better results to use in future planning, but will not provide nutrient analysis results to use in planning application rates for this fall. It is important to build a history of nutrient analyses for manure sampling to help better manage the nutrients in manure for crop production.

6 Sample soil. Will you need to update an MMP in the next year or two where you need soil samples to re-do your P-index? If so, taking the required soil samples this fall will keep you from getting caught needing to update the MMP at a time you can't get soil samples taken. Samples should be taken prior to manure application. For a MMP, one soil sample can't represent more than 10 acres unless you are updating an existing P-index and have been applying manure at less than the P removal rate of the crop, then one soil sample can be taken for up to 20 acres.

7 Calibrate your application equipment. When the co-op applies fertilizer for crop production, do they know how much they are spreading? Yes! Why not do the same for your manure nutrient source? Calibrating manure application equipment takes a little time, but in the long run it will help you meet the correct application rate and make better use of your manure nutrients.

8 Think timing, timing, and timing. A new law has been passed in Iowa prohibiting the application of liquid manure from confinement facilities on snow-covered or frozen ground during certain times of the year. However, regardless of the source of manure, or the size of operation, application of manure under these conditions is not recommended due to the increased risk of nutrient loss and movement to surface waters.

9 Consider the neighbors. There is no doubt about it, the number one complaint about manure application is the odor. Right or wrong there is a perception of "if I can smell it, someone must be doing something wrong." Work with your neighbors to let them know about your manure application plans. If possible, tell them how long it might take, how you plan to apply the manure, and how long they might expect to smell the manure. Inquire about any outdoor events in the neighborhood such as weddings, Friday night football games, cookouts and such to avoid manure application prior to those events. Good communication is the key.

10 Be safe. Fall is a busy time of year for farmers and commercial manure applicators. Many manure spills happen because people are in a hurry or are tired from long hours of application work. Get plenty of rest, take breaks and slow down. Take time to inspect equipment. This will help protect employees and reduce the chances of equipment malfunction. Observe all laws of the road and watch out for the "other driver". They may not realize you are moving at a much slower rate of speed or how long your tractor and tank wagon are when they go to pass you on the road. Check "slow moving vehicle signs" and replace as needed. Check lights to make sure they are working and are visible. Install additional lights as needed to improve your visibility and to help people see you. MM

Angela Rieck-Hinz is with the department of agronomy at Iowa State University.

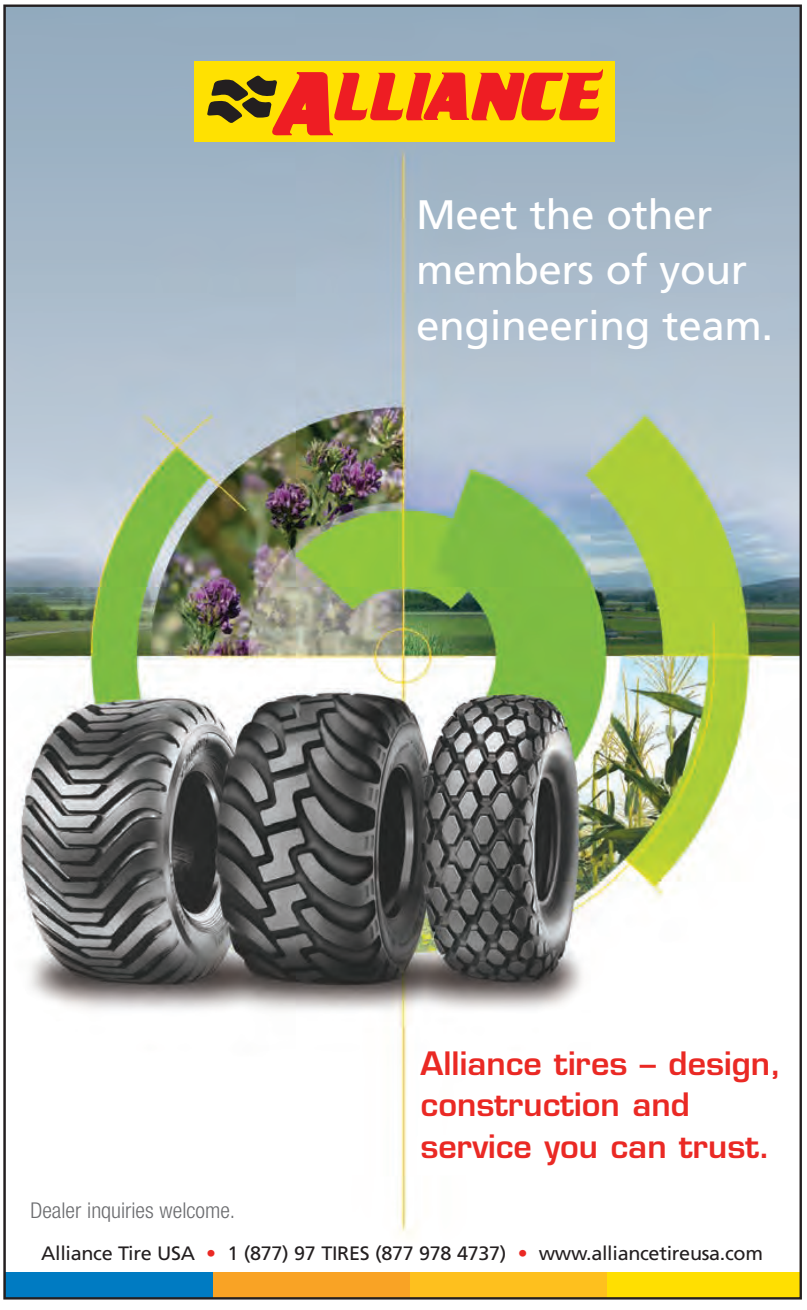


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ON TRACK

New Holland adds two new box spreaders



New Holland has added two new high-capacity models to its box spreader line.

Featuring a heaped capacity of 524 cu. ft. (M2080 model) and 628 cu.ft. (M2090 model), the pair of box spreaders can spread huge amounts of manure, requiring fewer trips to the field.

The New Holland box spreaders consist of a solid poly floor and poly-bonded plywood sides, front and end gate that will hold up under harsh conditions. These materials are corrosion-resistant plus smooth and slippery so heavy loads can be moved to the back of the spreader with less torque.

The double apron system uses heavy T-Bar chains to handle the heavy loads of dense, packed material. Steel alloy idler slides for the apron chains at the front of the spreader prevent the apron chain from jumping off the idler sprocket. The speed of the apron chains can be hydraulically adjusted independently of the PTO-driven beaters using the electronic control in the cab.

New Holland's M2080 and M2090 spreaders use an upper and lower beater to ensure that large pieces are broken up for more even spreading. Eighteen replaceable beater paddles, constructed of high-strength steel, are bolted to the beater shafts. Their symmetrical, rooster-comb design delivers knife-like cutting and shredding action and creates a wide, fine spreading pattern.

The hitch of the M2080 and M2090 spreaders is attached to the heavy-duty, channel-iron frame that extends under the box of the spreader. The high-strength tandem walking beam axles provide a smoother ride and feature generous axle pivots.

www.newholland.com/na

EnviTec Biogas bearing fruit

Eastern Europe is beginning to discover the benefits of biogas as an environmentally compatible source of energy as EnviTec Biogas recently signed contracts with a combined volume of approx. EUR 10 million in Slovakia and Latvia.

The Latvian contract has been awarded to a swine farm operator, who has ordered two plants with a rated electrical output of 1 MW each. The biogas plants are to be erected on the farm near Liepaja. The agricultural company will use liquid manure and renewable resources as input materials. The heat produced in the process will be used to heat the pigsties.

EnviTec will also build two biogas plants in Slovakia. The plants, with an electric output of 1 MW each, have been ordered by an investor and will be erected near Vrbina and Novy Dvor. Construction is scheduled to start before the end of August. Liquid manure and energy maize will be used as input materials. A compensation of 15 Euro cents per KWh makes biogas an attractive alternative also in Slovakia.

www.envitec-biogas.de

Kuhn Knight launches new line of box spreaders

Kuhn North America, Inc., of Brodhead, Wis., recently introduced the new PSC Series ProSpread Commercial apron box spreaders.

The truck and trailer models are designed for operators who need a high-capacity, heavy-duty machine to spread the toughest solid materials.

They provide consistent performance and long life with their sturdy all-welded construction, friction-resistant poly floor and innovative split-apron drive. A hydraulically-controlled, variable-speed apron allows even spreading of pen pack, feedlot and dairy manure, and many other solid materials.

The spreaders can accommodate horizontal and vertical beaters, and include three models with capacities of 610, 710 and 810 heaped cubic feet. Operators can save on fertilizer costs by combining vertical beaters, with their wide, consistent 25 to 30 foot spread pattern, and an optional scale system to monitor application quantities and take maximum advantage of the nutrient value of manure.

www.kuhnnorthamerica.com

New Holland's new Rustler™ utility vehicle



New Holland recently announced a new product for the hardworking rancher and farmer: the Rustler utility vehicle.

The Rustler utility vehicle combines rugged performance with an ultra-smooth ride for "go-anywhere, do-anything" confidence.

Whether hauling supplies, pulling trailers or transporting people and gear, Rustler UVs can be configured to meet the need: they are offered in two-passenger or four-passenger versions, with gas or diesel engines, 4x2 or 4x4 axles, and with a wide variety of options and accessories.

The frames of the 120 and 125 Rustler UV models are constructed of the same grade of rustproof, corrosion-resistant, lightweight aluminum used in jet fighters, while the 115 features rugged steel frame and box construction. The vehicles are backed by a two-year/2,000 hour warranty.

With total vehicle capacities of 900 to 1,600 pounds, Rustler utility vehicles can handle big loads. Independent front and rear suspension (rear only on the 115) and a high ground clearance provide a smooth and stable ride.

New Holland offers Rustler UVs with 4x2 or 4x4 axles. For extra traction on the 14-hp, 4x4, 115 (gas) model, simply engage the shift-on-demand four-wheel drive, while the larger models

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engage four-wheel drive automatically. The 20-hp 120 (diesel) and 23-hp 125 (gas) models feature an automatic, all-wheel-drive system.

Rustler UVs can be equipped with a choice of bench seats or high-back bucket seats with 13-position driver seat adjustment. (Bench seat only on the 115.) For safety, passengers are surrounded by certified rollover protection system (ROPS) and retractable safety belts for all seat positions.

A wide variety of factory and dealer-installed options and accessories – from an optional powered cargo dump box, to cab enclosures, special lighting packages, and attachments – are available to customize Rustler UVs. A hydraulic-powered, quick-change tool attachment system is built in. Attachments easily connect to a front mounting plate, and are controlled with a joystick from the driver's seat.

www.newholland.com/na

New crop residue tool released by Horsch Anderson

It's called the Joker but there's not much funny about this serious new tillage tool released recently by Horsch Anderson of South Dakota.

Hailed as the "ultimate machine for residue management and seedbed preparation," the Joker is advertised as an alternative to manure incorporation, vertical tillage, seedbed preparation, stubble cultivation, shallow tillage and furrow leveling. It features a short frame depth and smaller discs that are reported to achieve consistent depth at high speeds. The 18-inch notched blades turn faster for better soil mixing and are mounted in pairs on a single arm torsion bar for independent action in rocky and varying terrain.

The Joker does not have a single axle gang, instead relying on a rubber torsion bar system for movement and clearance. The system ensures clearance for rocks, ground following ability and maintains a consistent blade angle, ultimately creating a high residue throughput capacity.

The Roll Flex system on the Joker combines the benefit of consolidation while leaving behind a smooth field. Four evenly spaced ring packers with leveling tines in between provide performance in variable field conditions. The packers can "flex" for self-cleaning.

Spade discs are located on the outer ends of the disc section of the Joker, ensuring level conditions and eliminating soil ridging.

The Joker is available in both CT and RT models.

www.horschanderson.com

Geomembrane Technologies Inc. introduces new biogas cover

Geomembrane Technologies Inc. (GTI) of Fredericton, New Brunswick, recently announced it has developed a new, state-of-the-art, structurally supported geomembrane cover system for use in capturing biogas for round tanks.

GTI's new innovation has just been implemented on a project in Delaware County, near Columbus, Ohio. The new design covers two 65-foot diameter round tanks, which can be easily retracted for access to the tank interior, simplifying inspection and maintenance.

The structurally supported cover system is part of an overall wastewater treatment system that effectively streamlines aeration gas (off-gases) collection and improves odor control.

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Inspecting



Participants had an opportunity to get up-close and personal with many of the liquid manure injection systems both before and after they were demonstrated.

By Margaret Land

Manure applicators and livestock producers take part in the Upper Midwest Manure Handling Expo in Boone, Iowa

They came, they saw, they learned more about spreading it around.

About 1000 custom manure applicators, livestock producers, equipment manufacturers and others involved in the nutrient application industry descended on Boone, Iowa, this past August to take part in the 2009 Upper Midwest Manure Handling Expo. Held at the Central Iowa Expo site, attendees from more than 14 states and six Canadian provinces took part in educational seminars, both liquid and solid manure field application demonstrations, ride and drive opportunities, and visited with the more than 55 equipment and service exhibitors on hand.

This is the first time that Iowa has hosted the annual event, which rotates between various states in the Upper Midwest and Great Lake regions of the U.S. And, according to event planners and managers, it was a great success.

"Fourteen manufacturers demonstrated their equipment in front of a large crowd of interested expo attendees under field-like conditions," said Ross Muhlbauer, a member of the expo planning committee and the event's field demo emcee. "The demonstrations generated good response from the crowd, resulting in more exhibitor-customer interaction."



The crowd checks out the injection paths and depths following the liquid manure injection field demonstrations at the manure handling expo.



A Backhus compost turner shows what it can do during the field demonstrations.

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injecting

Solid manure spreaders from JBS, Kuhn, Meyer, Roda, AgChem and Sioux Automation were showcased along with liquid manure systems by Houle, Jamesway, Hydro Engineering, AgChem, Bazooka Farmstar, Sioux Automation, Balzer, Dietrich, Puck Custom Enterprises (PCE), and Mole Incorporation. A proto-type subsurface poultry litter injector developed by the U.S. Department of Agriculture researchers at Auburn, Alabama, was also demonstrated along with a Backhus compost turner.

A lot of interest was also expressed by expo participants in the equipment ride and drive opportunity, held at the end of the day's events.

Attendees also took part in several educational sessions, which covered everything from Iowa CAFO regulations to biosecurity during manure pump outs.

"The educational sessions were very well attended," added event coordinator Dr. Robert Burns, a professor at Iowa State University. "They provided the most up-to-date information on several topics of interest to manure applicators and animal feeding operation owners and operators."

The expo was co-hosted by Iowa State University Extension and the Iowa Commercial Nutrient Applicators Association (ICNAA) with the planning committee consisting of ISU's Agricultural Waste Management Team and board members from the ICNAA.

Next year's manure expo – the 2010 Great Lakes Manure Handling Expo – is scheduled for July 15, 2010 at the 55-acre Penn State Ag Progress Days site near State College, Pennsylvania. The event, themed Balancing Production and Conservation, is being hosted by Pennsylvania State University and will feature commercial exhibits, educational seminars and equipment demonstrations. More information can be found at http://das.psu.edu/manure-expo. MM



There was a lot of crowd interest in The Mole, a liquid manure injection system developed by Schafer Welding in Corning, Iowa.



A solid manure spreader from JBS was one of several systems showcased in the solid manure application field demonstration.





About 1,000 people attended the one-day show and had opportunities to view equipment demonstrations and displays.



An opportunity to view and "kick the tires" of the manure handling and incorporation equipment was a draw for the show.

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In the NEWS






Huckabay Ridge energy purchase announced

Environmental Power Corporation's wholly owned subsidiary, Microgy, Inc. and Alcor Energy Solutions recently announced they have entered into a long-term energy purchase agreement for electrical and thermal energy, for use at Microgy's Huckabay Ridge facility in Stephenville, Texas.

Microgy has entered into a multi-year, fixed price energy purchase agreement with Alcor for supplying the Huckabay Ridge facility's electrical power and thermal energy needs utilizing a combined heat and power (CHP) process. The on-site system will be capable of providing all of the Huckabay Ridge facility's electrical and thermal energy needs with the necessary back-up systems on-site so as to ensure that power and thermal energy will be reliably delivered on a continuous basis. The CHP facility is expected to be in operation during the first quarter of 2010.

"This CHP solution allows us to eliminate parasitic consumption of our product, utilizing an efficient source of energy," said Rich Kessel, president and CEO of Environmental Power Corporation. "The net effect will be an increase in operating margins, as we now anticipate producing sales of 782,000 MMBtus per year. Alcor's solution will allow us to continue to utilize waste heat or renewable energy for plant processes, maintaining the energy efficient/renewable aspect of our Huckabay Ridge facility."

For Microgy, Alcor brings a new turnkey process for supplying both power and thermal energy. Alcor's suite of automation packages, turn-key operation and experience will allow operation of the CHP process to track increasing or decreasing facility loads either on-site or remotely. All system operations and component status can be monitored and managed from anywhere in the world.

The Huckabay Ridge facility is the largest anaerobic digester operation in the world, producing a renewable natural gas (RNG) product for pipeline sales. Targeted production of 782,000 MMbtus per year translates into enough RNG to heat more than 13,500 Midwest homes annually. Using animal waste from local dairy farms, as well as other organic waste products, the digestion process produces biogas, which is captured and further refined to pipeline quality Renewable Natural Gas. Considered carbon neutral, RNG is purchased by any number of customers to address their various renewable energy portfolio requirements and assist in their efforts to reduce carbon emissions.

Carolina utilities seek extension on manure mandate

North Carolina's electricity providers say poop-to-power isn't ready for prime time.

Progress Energy, Duke Energy and other providers have asked state regulators to delay and modify a 2007 state law that requires them to generate a minimum amount of energy from pig or chicken waste.

The law, designed to promote renewable energy and efficiency, requires utilities to begin getting some energy from pig and chicken litter by 2012.

The providers are seeking a one-year delay from the N.C. Utilities Commission. They're also asking to cut the minimum energy requirement from poultry waste starting in 2014 by a third.

North Carolina is a leading producer of pork and poultry, but disposing of waste presents major environmental challenges. Turning some of that waste into electricity holds promise, but also has raised worries about cost and pollution.

The utilities have been seeking proposals for waste-to-energy projects, but say they've received only limited and expensive bids.

Progress hasn't received "a single viable swine proposal" so far, and the only poultry project would be so expensive, it would reduce the amount of money the company is able to spend on solar and other green energy, Hughes said.

That project is from Fibrowatt, a Pennsylvania company that wants to build three plants to turn chicken droppings into power in Montgomery, Surry and Sampson counties. But those plants have run into opposition from critics who worry about lax pollution controls.

Fibrowatt officials are reviewing the electric utilities' petition, but want to move ahead on the proposed plants without delay, said spokesman Terry Walmsley. The company has lined up chicken farmers eager to supply fuel.

"There is a great need for this important renewable resource," he said. "We see a lot of opportunity in North Carolina."

GE Energy helps dairy farmers reduce emissions

As lawmakers in Washington, D.C., debate new federal climate-change legislation, Wisconsin's dairy industry is leading the way in demonstrating the benefits of using cow manure methane digester biogas.

In the last several years, a growing number of dairy farms in Wisconsin have installed GE Energy's Jenbacher biogas engines to generate renewable electricity for onsite power and the local grid.

GE's newly installed biogas engine technology is generating 633 kilowatts (kW) in renewable energy at the Crave Brothers Farm, LLC in Waterloo, Wis.

Crave Brothers is a 29-year-old, family run dairy farm and on-site cheese plant that is nationally known for its progressive use of technologies to reduce the environmental impacts of its operations. The 1,700-acre farm currently has nearly 1,000 milk cows and 700 heifers.

By converting the manure to methane biogas and using it to generate electricity in the Jenbacher unit, less greenhouse gas is able to escape into the atmosphere. The system is also helping Crave Brothers lower its operational costs, including through the sale of energy to the regional grid and more cost-effective manure management.

Crave Brothers originally had operated an older biogas system to support some

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of the farm's electricity requirements. However, the owners later installed the GE technology after deciding they could be generating even more electricity with a more powerful engine, Crave said.

Renewable energy developer Clear Horizons, which built and owns the digester biogas plant at the Crave Brothers site, is supplying the engine's electricity to regional grid operator WE Energies, the trade name of Wisconsin Electric Power Co. and Wisconsin Gas LLC, the principal utility subsidiaries of Wisconsin Energy Corporation.

Vermont PSB approves renewable spending plans

The Vermont Public Service Board (PSB) has approved spending on a series of renewable energy projects and studies proposed by Central Vermont Public Service.

The CVPS proposals, filed with the PSB in July include seven renewable projects and studies at a total cost of about $350,000. The three studies are intended to help CVPS expand its popular Cow Power program, learn about the potential for algae as an energy source, and possibly expand production at an existing Rutland County hydroelectric facility.

A $10,000 Essex Partnership study will evaluate a new Cow Power model of collecting methane gas from a group of smaller farms and using it to generate electricity at a central facility.

A second study is under way by Algepower Inc., which has developed Algeponics™, a patented photo-bioreactor, an enclosed farm system for growing algae, which could be used as a fuel or food source. The first prototype has been linked to a CVPS Cow Power™ digester on the Blue Spruce Farm in Bridport. CVPS's $50,000 grant to Algepower, now approved by the PSB, will help fund development and operation of the pilot prototype.

The third study, at a cost of $25,000, will examine the potential to increase generation at CVPS's Carver Falls hydroelectric station in Poultney. The plant has peak generation of 1.9 megawatts, and has produced an average of 7,340,000 kilowatt-hours of energy annually over the past decade.

"CVPS was the first utility in the world to put wind-generated power on the grid and the first to develop a customer-driven, manure-based energy product," said CVPS spokesman Steve Costello. "These studies will help us remain on the cutting edge of new generation potential, and support ideas with tremendous potential to benefit Vermont."

Study shows manure no worse for water in tiled fields

Applying manure to a tiled field doesn't have a negative effect on nearby water – in terms of carbon – when compared to other fertilizer systems, according to a Purdue University study.

Using six years of drainage data, Ron Turco and Sylvie Brouder, both professors of agronomy, found that the use of swine manure lagoon effluent in a tiled agricultural field did not increase carbon getting into nearby waterways. The results of their study were detailed in a recent issue of the Journal of Environmental Quality.

"It was surprising in a way that carbon loads were relatively low at the discharge points," Brouder said. "The assumption was that manure was adding significantly."

Tiles set below the surface of agricultural fields direct the excess water out of the soil and, eventually, into nearby streams. There has been concern that tiles flush manure, manure components such as dissolved carbon, or other soil nutrients into water systems faster, damaging water quality.

Carbon is a concern because bacteria, such as *E. coli,* consume carbon. Adding carbon to a stream could improve conditions for microbial growth, including harmful bacteria. Manure lagoon effluent, the liquid formed used as fertilizer after manure is stored in lagoons, contains a high amount of carbon.

"In general, we didn't see more carbon in manure systems, but rainfall near an application event did promote some movement," Turco said. "However, we didn't see a huge fluctuation out of any of these agricultural systems, but we are still looking at the nitrogen data."

Turco and Brouder, along with former graduate student Matt Ruark, measured the carbon emissions from 1999 to 2004 at the Purdue Water Quality Field Station. The study included four blocks of 12 plots each with different crop rotations and varied fertilizer-application practices.

Carbon emission into the streams was the same in tiled fields fertilized with manure as in tiled fields using other sources of fertilizer. The amount of carbon reaching waterways increased in all fields during years with higher rainfall totals.

"We saw a few blips, things where there was a heavy rain after a manure application, but nothing that was statistically significant," Turco said.

They said the next step is to evaluate how antibiotics and hormones from manure are transferred to streams through tiled fields. MM

Continued from page 23

air to plus 50 (Celsius) right above the compost is going to be the challenge." In that case, he says the solution could be to store the liquid manure in winter, and operate the composting process on a seasonal basis, which would still result in having to dispose of a lot less waste material and creation of a valuable compost byproduct.

Transform Compost Systems not only designs systems, it also designs and provides the equipment according to the needs of individual clients.

"There are so many options and ways to skin the cat," says Dr. Paul. "It's an ongoing, unfolding of expertise and equipment development and we're fortunate enough to have some very practical farmers in our network who give us very quick and effective feedback on various pieces of equipment, and how they work or don't work."

The company believes that in addition to regular turning, aeration is also critical to achieve high quality compost.

"Forced aeration really does keep the pile composting properly," he says, "because the aerobic bacteria need oxygen, and they will operate orders of magnitude more efficiently than anaerobic bacteria." Anaerobic bacteria break down organic material to produce methane in anaerobic digesters, which is an oxygen-free environment.

Dr. Paul says over the past decade, recognition of the value of compost has often depended on the agriculture sector and the basic philosophy of the growers themselves. In some cases, it is just more cost-effective to continue to use inorganic or chemical fertilizers, but there are also instances where growers recognize the value of compost beyond its nutrients.

"We sell some product to the organic sector," says Dr. Paul, "but there are some large, non-organic farmers that really realize the benefits of improving the soil's organic matter and the potential disease suppression effects of the compost."

At the same time, many farms continue to need to economically transport nutrients away from the farm. Composting offers that opportunity, while creating an additional income stream with the creation of a value-added product. MM

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INNOVATIONS

ANAEROBIC DIGESTERS

CST Wastewater Solutions

A new treatment system for organic residues has been launched by CST Wastewater Solutions, promising to convert almost any organic residue or energy crop into biogas, valuable electricity or heat.

CST Wastewater Solutions has partnered with Global Water Engineering (GWE) to supply the Rapid Treatment of Organic Residues (RAPTOR) system, a powerful liquid-state anaerobic digestion process that consists of enhanced pre-treatment followed by multi-step biological fermentation.

A wide range of organic residue types can be processed, resulting in an efficient and rapid conversion of the material to agricultural fertilizer and biogas.

The diversity of the material to be processed means a range of different RAPTOR pre-treatments are available, to allow the highest possible conversion efficiency.

In the RAPTOR process, the pre-treated and blended substrate slurry is transferred into a mixed digester that uses energy efficient and low maintenance mechanical mixing. The digester tank comes in sizes up to 12,000 m3. Optional extras include a foam breaker fan, a scum buster system and a bottom grit trap.

The digester tank is fully insulated, heated by recycling the digester content through a special heat exchanger.

www.cstwastewater.com

Global Water Engineering Ltd.

Global Water Engineering Limited (GWE) recently announced the creation of a North American joint venture with GLV Inc. to market its anaerobic digestion processes and its energy production technology using the biogas generated by the digestion of organic waste.

GWE is made up of a group of companies specializing in wastewater treatment, digestion of biomass, sludges and slurries, plus biogas production and reuse. It has more than 200 operating plants in more than 30 countries around the world.

GLV Inc. is a global provider of technological solutions used in water treatment, recycling and purification.

The new joint venture, named Global Water & Energy (GW&E) is 30 percent owned by GWE and 70 percent by GLV Inc.

GW&E will be based in Austin, Texas.

L.J. Star

L.J. Star has introduced a new sight glass specifically designed for installation in digester tanks used for biogas production.

The RD300 sight window has an expanding gasket that conforms to irregularities in the cement walls and ports used in digester tank construction, creating a gas-tight seal. The tubular rubber gasket is sandwiched between high-grade stainless steel rings. As the mounting screws are tightened, the inner and outer rings draw together and force the gasket to expand.

The sight glass also includes three angled mounting brackets that are long enough to accommodate the depth of the container wall.

The RD300 window can be ordered with an optional motorized wiper, a manual wiper and a washer assembly. By turning a valve, operators can direct water spray on the interior of the glass.

Other options, including a Lumiglass light and video camera, are also available.

A growing interest in alternative energy is fueling the construction of biogas facilities. Sight glasses are required at tank work platforms where operators set mixing devices at optimum positions. A gas-tight seal is required to meet safety standards.

www.ljstar.com

Paradigm Environmental Technologies

Paradigm Environmental Technologies, the makers of the MicroSludge WAS pre-treatment technology, will launch a portable pilot version of their technology in 2010.

The pilot will consist of the MicroSludge pre-treatment unit and a batch of 400-gallon digesters. The system will be fully automated and require minimal operator time. The digesters are equipped with temperature control and gas measurement, and the system also features automatic daily collection of sludge feed and effluent samples for convenient testing. The digesters can also be configured to test different operating conditions, such as acid phase and thermophilic digestion.

www.paradigmenvironmental.com

PlanET Biogas Solutions

PlanET (Planning and Application of Energy Technology) Biogas Solutions (PBS) is a joint venture between Martin Lensink and PlanET Joint Venture, which also operates PlanET Biogastechnik GmbH in Vreden, Germany.

PlanET specializes in the design, construction, and service of advanced biogas plants and currently has about 120 operating biogas plants around the world.

Features of the PlanET technology include:

- A continuously mixed reactor. The bacterial action is constant with organic input being fed every two hours and mixing is continuously to release biogas from the liquid slurry.
- A dry feeder. PlanET started designing dry feeders 10 years ago, and has been at the forefront of dry feeder design in Germany. They design and build a wide variety of dry feeders, not only for PlanET systems, but also for other biogas suppliers in the European market.
- Modern control systems, allowing PBS and PlanET in Germany to provide outstanding on-line support via remote, Internet-based monitoring.
- Mesophylic operation. The company's heating systems ensure that the process occurs at 38°C +/- 5°C. Although PlanET has some experience with thermophylic operation (56°C), mesophylic operation provides more flexibility on operating temperature and a variety of input menus.

PBS serves biogas customers throughout Canada and selected projects in the U.S.

www.planet-biogas.ca

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Coming Events

October 15, 2009
Arizona Dairy Production Conference, Hilton Garden Inn, Phoenix, Arizona. Call 520-626-1754.

October 16, 2009
Pasture Management for Water Quality, an on-line webcast hosted by the Livestock & Poultry Environmental Learning Center. Visit *www.extension.org/pages/Live_Webcast_Information.*

November 18-19, 2009
Sand Solutions Conference, Lancaster Host Resort & Conference Center, Lancaster, Pennsylvania. Visit *www.sandmanuresolutions.com.*

November 20, 2009
Air Quality Program, an on-line webcast hosted by the Livestock & Poultry Environmental Learning Center. Visit *www.extension.org/pages/Live_Webcast_Information.*

December 9-10, 2009
Alberta Pork Annual general Meeting, Radisson Hotel, Edmonton, Alberta, Canada. Visit *www.albertapork.com.*

January 7-8, 2010
South Dakota Pork Congress, Ramkota Exhibit Hall, Sioux Falls, South Dakota. Visit *www.sdppc.org.*

January 10-12, 2010
Agricultural Equipment Technology Conference, Orlando, Florida. Held in conjunction with 2010 Ag Connect. Visit *www.asabe.org.meetings.*

January 13-15, 2010
2010 Ag Connect Expo, Orange County Convention Center, Orlando, Florida. Visit *www.agconnect.com.*

January 19-22, 2010
Banff Pork Seminar, the Banff centre, Banff, Alberta, Canada. Visit *www.banffpork.ca.*

January 20-21, 2010
Minnesota Pork Congress 2010, Minneapolis Convention Center, Minneapolis, Minnesota. Visit *www.mnpork.com/porkcongress.*

January 22-23, 2010
Kentucky Pork Convention, Bowling Green, Kentucky.

January 27-28, 2010
Iowa Pork Congress, Hy-Vee Hall, Iowa Events Center, Des Moines, Iowa. Visit *www.iowaporkcongress.org.*

February 9-11, 2010
2010 World Ag Expo, International Agri-Center, Tulare, California. Visit *www.worldagexpo.com.*

February 17-19, 2010
Canadian International farm Show, International Centre, Toronto, Ontario, Canada. Visit *www.masterpromotions.ca/canadian-farm-show.asp.*

February 18-19, 2010
USDA 2010 Agricultural Outlook Forum, Crystal Gateway Marriott, Arlington, Virginia. Visit *www.usda.gov/oce/forum.*

February 23, 2010
Keystone Pork Expo, New Holland, Pennsylvania.



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Composted dairy manure in FOLIAGE PLANT PRODUCTION

Manure being tested as environmental, economical alternative to peat



Researchers show off dumb cane plants grown in cowpeat at the MREC shadehouse. Submitted photo

Peat has been a major component of substrates used in container plant production since the 1960s. Highly porous with the capacity to hold water, peat makes an ideal rooting and growing medium for potted plants.

But harvesting peat (and draining valuable peatlands in the process) releases the carbon stored in peat into the atmosphere as carbon dioxide. And because peat plays an important role in wetland ecosystems — peat bogs improve groundwater quality and are unique habitats for wild plants and animals — the use of peat has been challenged and peat mining is increasingly regulated.

Researchers have worked for years to find alternative organic materials that can be used as partial or complete substitutes for peat. Composted biosolids, municipal solid waste, and yard trimmings have all been investigated as possible components for use in bedding, landscape and foliage plant production. Now, composted dairy manure is being tested as an economical and environmentally sound alternative to peat.

Scientists Qiansheng Li, Jianjun Chen, Russell D. Caldwell, and Min Deng from the Department of Environmental Horticulture and Mid-Florida Research and Education Center (MREC) at the University of Florida's Institute of Food and Agricultural Sciences, published a research report in HortTechnology that evaluated the potential for using cowpeat, a composted dairy manure, as a component of container substrates for foliage plant propagation.

For the study, a commercial formulation (20 percent perlite and 20 percent vermiculite with 60 percent Canadian or Florida peat based on volume) was used as control, and peat was replaced by cowpeat at 10 percent increments up to 60 percent, which produced 14 substrates. The 14 substrates were used for rooting single-node cuttings of golden pothos (*Epipremnum aureum*) and heartleaf philodendron (*Philodendron scandens ssp. Oxycardium*) and three-node cuttings of Florida Spire fig (*Ficus benjamina*) and germinating seeds of sprenger asparagus (*Asparagus densiflorus*) in a shaded greenhouse.

The research showed that container substrates formulated by incorporating 10 to 60 percent cowpeat had physical and chemical properties similar to the commercial Canadian and Florida peat-based substrates. Biological testing also demonstrated that all tested cuttings rooted and seed germination rates of cowpeat substituted substrates were greater than or comparable to those of control substrates.

The researchers observed that the promising results of the study suggest that there is a potential for using cowpeat for foliage plant propagation and probably for foliage plant production.

"The use of cowpeat will provide the containerized plant industry with an alternative to peat, which in turn reduces peat mining and encourages composting of dairy manure, thus contributing to the well-being of our environment," Chen concluded. MM

The complete study and abstract are available on the ASHS HortTechnology electronic journal website: http://horttech.ashspublications.org/cgi/content/abstract/19/2/340.

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Capitalizing on CARBON CREDITS

By Marcus Krembs and Ross Stegemoeller

Among the myriad of challenges livestock producers face on a day-to-day basis, there is at least one constant – the issue of manure management, including capturing its full value.

Livestock operators and managers considering advanced manure management techniques, specifically the adoption of anaerobic bio-digester systems, frequently partner with carbon credit management firms to both evaluate project feasibility and commercialize the "carbon credits" on behalf of the farms.

Due to recent federal climate change legislation (see American Clean Energy and Security Act of 2009, H.R. 2454, Waxman-Markey Bill), attention is now focused more than ever on the agricultural sector in the United States to play a critical role in assisting regulated entities to achieve compliance with greenhouse gas (GHG) emission reduction targets. Also, in advance of federal GHG regulation, voluntary and pre-compliance markets have emerged facilitating demand for GHG emission reductions from livestock operations. Specifically, farms that host advanced manure management systems may be eligible to generate carbon credits from the installation of anaerobic bio-digesters. Because U.S. bio-digester systems, including those planned or in construction, cover less than three percent of dairy operations and less than one percent of swine farms, opportunities to capitalize on carbon credits will exist for many years.

Carbon credits are a tradable environmental commodity that represents a reduction of one metric ton of carbon dioxide, or carbon dioxide equivalent. Carbon credits are also known by several other names, including carbon offsets, verified emission reductions (VERs) and GHG credits and are valued utilizing each carbon credits' full set of attributes, including location, date of generation, emission reduction technology and verification standard. Carbon credits are used by both voluntary and compliance market participants to fulfill demand for environmental claims and regulatory compliance associated with GHG emission reduction targets, respectively.

In order for bio-digester projects to qualify to create carbon credits, and therefore create a new revenue stream, each project is independently evaluated and must meet certain baseline emissions characteristics. The baseline manure management practice that has the most potential to reduce GHG emissions is anaerobic lagoon manure waste treatment and storage. Farms that manage their waste in this manor are eligible to earn carbon credits by installing biogas control systems that capture and destroy methane gas that would have otherwise been emitted into the atmosphere – provided that there are no state or federal regulations, or local agency ordinances or rulings requiring the installation of the system. If regulations or requirements to manage biogas do exist, although the project reduces GHG emissions, it will not qualify for carbon credits do to voluntary and compliance market standards requiring each project to be regulatory surplus, or beyond business-as-usual. The digesters can range from simple covered systems that prevent oxygen from entering the system to complete digesters with circulation, heating, and manure monitoring systems. The digester is designed to mimic natural processes in which bacteria decomposes the organic material and emits methane gas in the process, a greenhouse gas 21 times more potent than carbon dioxide. The cover or more complex digester systems simply helps capture, concentrate, and increase the amount of methane captured. Application of the various technologies is dependent upon the use of the biogas or destruction process.

In the lagoon retrofit, manure will continue to be scraped and/or flushed, but will now be diverted to an anaerobic digestion system. Following the bio-digester, the manure will flow to uncovered lagoon systems for further waste management. Following the entire process, the manure will continue to be spread on nearby fields for fertilizing needs. Some studies have actually found that the manure following digesters is actually more affective as a fertilizer than simply treated through open lagoons. This is based on the fact that the nutrients are more concentrated and, in the absence of organics, help make the nutrients more readily available.

Provided your operations currently manage manure aerobically and a biogas control system would be regulatory surplus, additional characteristics should be considered in order to create ideal conditions for a project. First, farms in warmer climates typically have a higher GHG emissions baseline, due to the fact that higher temperatures equal more bacterial activity, so there's more potential for GHG emissions reductions, and carbon credits. Second, ideal sizes for (a) dairy farm projects are greater than 2,000 head and (b) swine farm projects are greater than 20,000 head. When performing financial due diligence on a biogas project, carbon credit revenue is one of several factors that are considered to determine feasibility, usually representing between five to 50 percent of the expected financial return over the project lifetime.

Methane utilization should also be evaluated as dairy farms typically consume more electricity than gas, therefore power production is usually more economic. However, combined heat and power (CHP) projects are also attractive and are often evaluated to offset onsite electricity and gas demand. Although farms that utilize the energy component of biogas projects typically make more economic sense, farms that only flare the methane typically need various types of financial assistance of various sorts (i.e., grants) or carbon credit revenue to support acceptable economic returns. Captured methane will primarily be used as a fuel for electricity generation and excess gas can be flared. Electricity can also be sold under a long-term purchase contract to local utilities.

Bio-digester projects can serve an excellent function for farms seeking a combined sanitation and energy solution – and carbon credits can help play a significant role in financing. Given the opportunities present to reduce GHG emissions at livestock operations, manure managers can play a key role in mitigating local environmental challenges and help fight global climate change.

For additional information, visit the U.S. EPA AgSTAR Program (www.epa.gov/agstar/index.html) and Element Markets (www.elementmarkets.com). MM

Marcus Krembs and Ross Stegemoeller are with Element Markets LLC.

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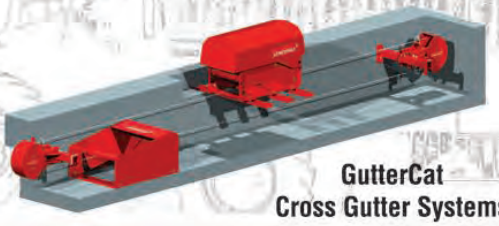
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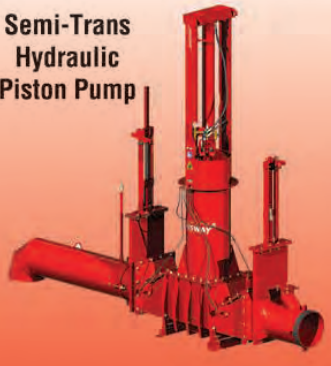
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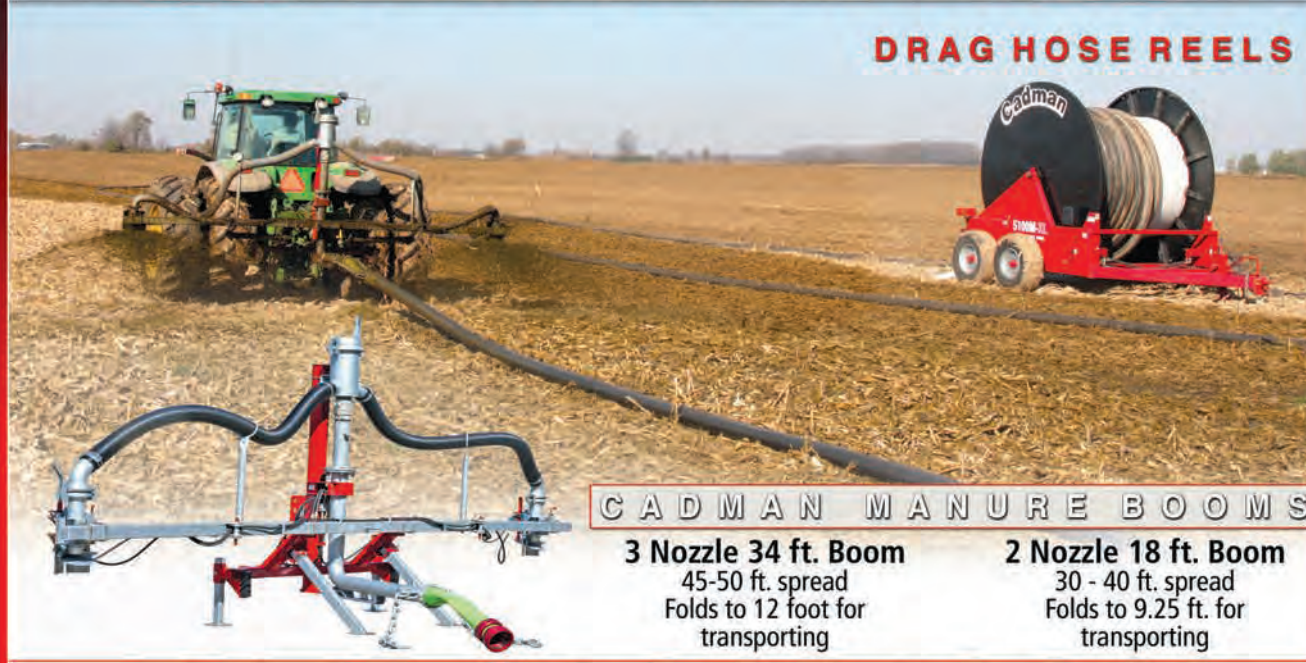


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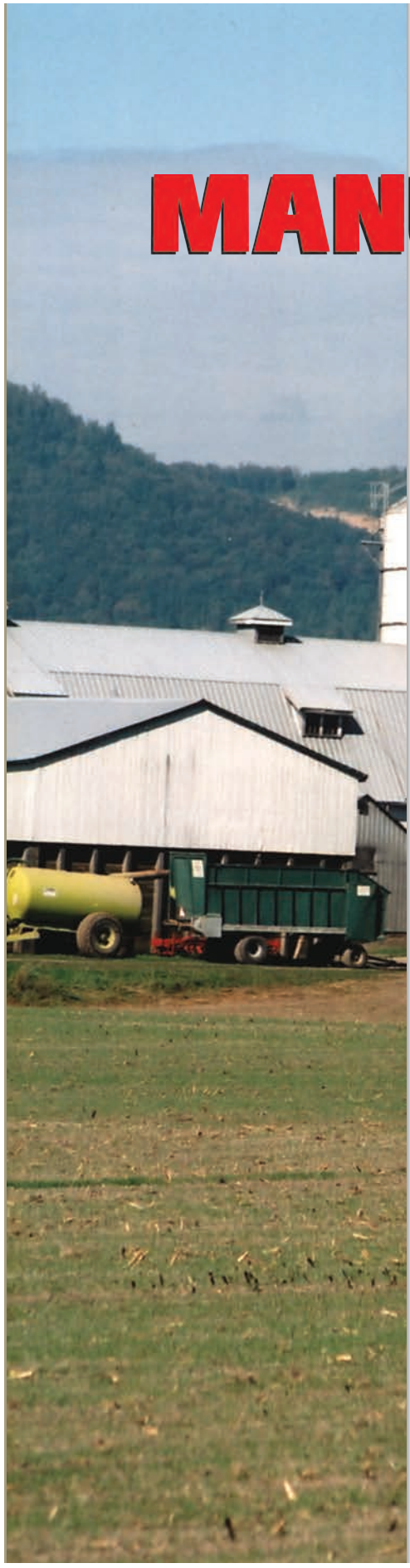
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Cover: Researchers at Iowa State University have been investigating grazing management as a way of protecting water quality.

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By Margaret Land

Poultry poop police plot thickens

As you may recall, in the last issue of Manure Manager (Novemeber/December 2009) I told readers about a volunteer service that flies over the Delmarva Peninsula snapping pictures of suspected piles of chicken litter and marking GPS coordinates so volunteers can do ground visits later to take water samples.

I ended the editorial with the observation that:

"By concentrating just on poultry operations, they are handpicking the evidence needed to prove their hypothesis. In the rush to persecute (and prosecute), they just might be missing the truth."

Well, it appears I wasn't far off.

Not long after that editorial was printed, I received a news brief stating that the Assateague Coastkeeper and the Waterkeeper Alliance had filed notice to sue Perdue Farms and a Berlin, MD, poultry farm. The threatened lawsuit involved a suspected mound of poultry litter located on the Hudson Farm that the environmental groups allege was discharging runoff into drainage ditches. Those ditches ultimately feed into Chesapeake Bay. The pile had been spotted and photographed during an aerial scouting mission. After photographing the pile, group members visited the area, taking water samples that they report were "100 times their normal levels."

"With the counts we've been getting for arsenic and ammonia and things like that, it's obvious it's not dirt," stated Assateague Coastkeeper Kathy Phillips in the Daily Times.

No, the pile wasn't dirt. And it wasn't poultry litter either. It appears that mound was actually a pile of Class A, intensively treated biosolids received from the Ocean City wastewater treatment plant. According to news reports, the treatment facility gives the stuff away to local farmers for free for use as crop fertilizer.

Perdue Inc. is now steaming mad and weighing "all legal options" against the involved environmental groups, describing the allegations they made as "reckless and irresponsible."

According to a statement from Perdue published on Americanfarm.com:

"The Waterkeepers first said they had found piles of poultry litter on a private farm and blamed Perdue for putting it there. The Maryland Department of the Environment proved them wrong. Now they say Perdue put 'human sewage' onto that same farm. Their statements are ludicrous."

Meanwhile, Assateague Coastkeeper and the Waterkeeper Alliance are scrambling to save their lawsuit, filing Public Information Act requests with the MDE to obtain a copy of the farm's nutrient management plan and determine what the state officials knew about the poultry operation. As a result of all this wrangling and lawsuit threatening, Ocean City has stopped providing its biosolids to area farmers, choosing instead to truck them to a local landfill for a disposal cost of $65 per ton. According to the director of Public Works for the city, they decided it would be "prudent" not to distribute the free fertilizer anymore.

Well Delmarva farmers, you can always fertilize your crops with poultry litter. That is, until the next airplane flies over. MM

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Grass gets greener

By Margaret Land



Using grazing management to protect water quality

When farmers and livestock producers think of nutrient loading of ponds and streams or runoff, many probably imagine fertilizer or manure being washed away from cultivated fields or draining from barnyard areas or even seeping from mismanaged lagoons.

According to Iowa State University researcher Tom Isenhart, new research data is showing that 37 percent of phosphorous contamination in ponds, streams and rivers is actually coming from pasture and rangeland.

"Increasingly, we are seeing some impact from pasture," he explained during a recent webinar hosted by the Livestock and Poultry Environmental Learning Center (LPELC). "An increase in pastureland can have a significant impact on the transport of sediments and the nutrients phosphorous and nitrogen."

In light of this, researchers at ISU have been examining different grazing management methods in a bid to minimize pollution to pasture streams or ponds.

Jim Russell, a professor with ISU's department of animal science, has been conducting research for several years on forage quality and beef cattle grazing, including examining the improvement of environmental quality through grazing management.

"We have found in our research that the percent of defecations or urinations … near a stream is directly related to the percentage of time the cattle are within that zone of the pasture," he said, adding "the zone" is defined as within about 100 to 110 feet of the stream or pond.

When the researchers examined pastures at five farms in southern Iowa, they discovered the probability of the cattle being within 100 feet of a stream or pond varied from one percent to 40 percent, depending on the time of month and the temperature.

"While attempting to determine the reasons for this variation, we found that in these pastures the differences in distribution were not related to the percentage of tall fescues in the pastures or to the shade distribution in the pastures," said Russell. "Rather, the most significant variable affecting cattle distribution was the percentage of pasture within 100 feet of the stream. In other words, if cattle have no choice but to be near a stream, that's where they'll be."

Russell believes these findings may have important implications relative to further research and policy.

"It implies that all research investigating the use of grazing management to control non point source pollution should be evaluated in regards to pasture shape and size," he said. "The treatments that appear to control non point source pollution seem likely to be most effective on small and/or narrow pastures than on large, wide pastures.

"It would certainly be nice to have more research on this hypothesis before implementing it but certainly our data appears to support that conclusion."

To further investigate the issue, Russell and his research team decided to examine what effect different grazing management methods would have on cattle distribution and non point source pollution of pasture ponds and streams. An experiment was set up involving different 30-acre pastures, each bisected by a stream with a 463-foot reach. Global positioning (GPS) collars were mounted

When researchers examined pastures at five farms in southern Iowa, they discovered the probability of the cattle being within 100 feet of a stream or pond varied from one percent to 40 percent, depending on the time of month and the temperature.

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Top: According to Iowa State University researcher Tom Isenhart, new research data is showing that 37 percent of phosphorous contamination in ponds, streams and rivers is actually coming from pasture and rangeland. Bottom: Providing an off-stream water source for cattle can help keep the herd away from stream banks and ponds but only if the temperature/humidity index is 72 Fahrenheit or less, according to Georgia research.

on the cattle to track their movements.

"We found that over a two-week period, the percentage of time the cattle were in a stream ranged from 0.2 percent in September to 2.3 percent in July and the percentage of time the cattle were within 110 feet of the stream ranged from 7 percent in August to nearly 14 percent in May, when offered unrestricted access to the stream."

When researchers restricted the cattle's access to the stream to a stabilized crossing with riparian buffers on either side, the percentage of time the cattle were either in or near the stream was "significantly reduced," said Russell. "Restricting stream access by rotational stocking reduced the percentage of time the cattle were in the stream to essentially zero percent."

Researchers also examined the use of an off-stream water source as a way to reduce the congregation of cattle near streams. While results from studies in Virginia and Oregon showed favorable results, studies in Georgia, Kentucky and North Carolina showed the different water source had no effect. Russell also utilized off-stream watering in his experiment pastures, placing them a minimum of 700 feet from the pasture stream.

"In 2006 and 2007, we found that off-stream water significantly reduced the percentage of time the cattle were within 110 feet of the pasture stream, if provided unrestricted stream access," he said. "However, in 2008 the presence of off-stream water did not significantly affect cattle distribution in regards to the stream."

According to Russell, it's believed the difference in response to off-stream water in 2008 was likely caused by a large amount of precipitation that fell that season, resulting in a large number of natural off-stream sources.

Another issue affecting the usefulness of off-stream water could be temperature. According to Russell, research from Georgia shows that off-stream water could reduce the percentage of time cattle were within a riparian area as long as the temperature/humidity index was less than 72 Fahrenheit. "But if the temperature/humidity index is greater than 72 degrees, they found off-stream water to be ineffective," he added.

Shade distribution may also have an effect, said Russell. "While shade distribution was not a significant variable affecting the distribution of cattle in pastures in southern Iowa, we believe this may have resulted from the large effects of pasture shape and size and the fact that the pastures were well

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shaded in both riparian and non-riparian areas. Because cattle will seek shade, particularly at temperatures of greater than 20 Celsius, shade distribution may still be effective in altering cattle distribution in a pasture."

While Russell's research has shown that grazing management does affect cattle distribution, there is some question as to whether it has a direct effect on water pollution. "We found no relationship between net annual stream bank erosion and the annual stocking rate of a pasture on streams in 13 pastures in southern Iowa," he said.

"It would appear that stream bank erosion was more related to stream hydrology and stage of evolution than to grazing. We found no relationship between grazing and the concentration of fecal coliforms in water samples taken at upstream and downstream sites in these pastures. In fact, we sometimes had higher concentrations in upstream than downstream samples, even when the stream flows were coming from un-grazed land above the pastures we were testing. The coliforms appear to be coming from a number of hosts, which could be wildlife or humans as well as cattle."

Even so, Russell believes grazing management can have an effect on water pollution, particularly if the management prevents the land within 110 feet of the stream bank from becoming bare. His research has found that allowing uncontrolled access to the stream banks increases the percentage of bare land adjacent to the stream and increases the percentage of land covered in manure, ultimately "increasing the risk of nutrient pathogen loading in precipitation runoff."

During rainfall simulations on bare or vegetated areas on banks, "we found greater runoff, sediment loss and phosphorous loss from bare areas than vegetated areas, regardless of grazing management," said Russell. "If we can control the percentage of bare areas by reducing the congregation of cattle near pasture streams through grazing management, we should be able to minimize non point source pollution."

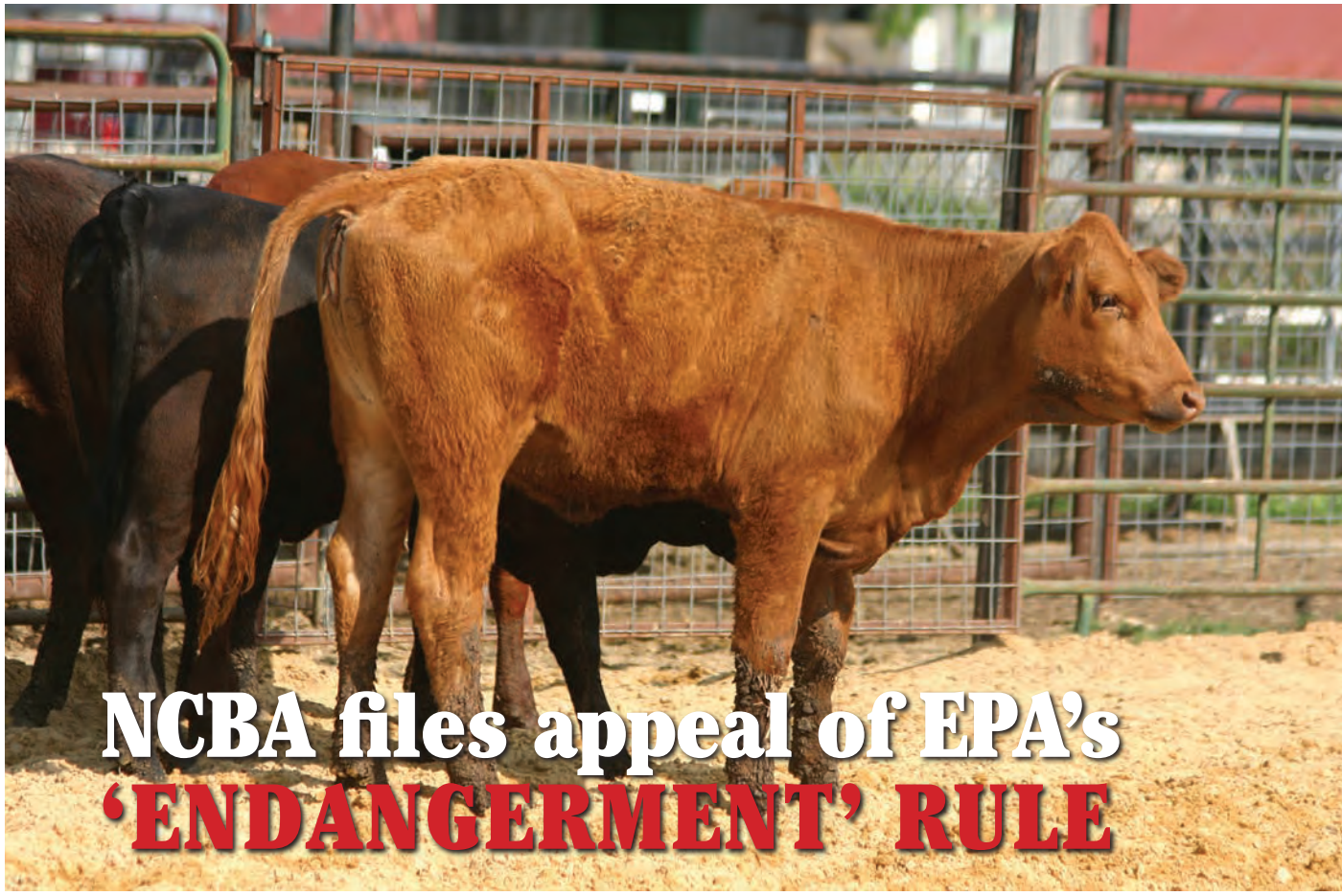
That would be good news to the U.S. Environmental Protection Agency (EPA), which recently released the first-ever baseline study of U.S. lakes. Of the 1,028 lakes randomly sampled in 2007, more than 40 percent were considered fair or poor with 20 percent showing high levels of nitrogen and phosphorous. According to the EPA, sampling of U.S. streams and rivers is currently underway. The results of that two-year study are expected in 2011. MM





Top: Restricting cattle access to a pasture stream to a stabilized crossing can significantly reduce the percentage of time the cattle are either in or near the stream.
Bottom: Researchers believe livestock owners can minimize non-source pollution to pasture streams and rivers by reducing the congregation of cattle near the water source, thus reducing the percentage of bare areas.

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NCBA files appeal of EPA's 'ENDANGERMENT' RULE

The National Cattlemen's Beef Association (NCBA) filed a petition in late December 2009 in the DC Circuit Court of Appeals challenging the Environmental Protection Agency's (EPA) recent greenhouse gas (GHG) "endangerment finding" rule.

"EPA's finding is not based on a rigorous scientific analysis; yet it would trigger a cascade of future greenhouse gas regulations with sweeping impacts across the entire U.S. economy," said Tamara Thies, chief environmental counsel with NCBA. "Why the administration decided to move forward on this type of rule when there's so much uncertainty surrounding humans' contribution to climate change is perplexing."

According to the NCBA, the endangerment finding does not in and of itself regulate GHGs, but is a step in the process toward GHG regulation under the Clean Air Act (CAA). The association believes the rule provides a foundation for the EPA to regulate GHGs from small and large sources throughout the economy, including farms. The NCBA believes that because of this rule, the EPA will be able to tell farmers they can only emit a certain level of GHGs and that if they go over that amount, they can incur severe penalties and be forced to curtail production. The association also believes the rule sets the stage for citizen suits against large and small businesses, adding that increased energy costs associated with the ruling will be devastating for agriculture and the public as a whole.

"Instead of letting the issue of climate change, and man's alleged contribution to it, be addressed through the proper democratic legislative process, (the) EPA has decided to trump Congress and mandate greenhouse gas regulation under the Clean Air Act," said Thies. "The act is ill-equipped to address climate change, and Congress never intended for it to be used for that purpose."

Under the rule, the EPA defined air pollution to include six greenhouse gases, and stated that manmade greenhouse gases endanger public health and the environment.

"As was evident during difficult negotiations … in Copenhagen, other countries around the world – like China and India – are unwilling to tie the hands of their economic engines and impose these kinds of costs on their citizens," said Thies. "This unilateral move by the EPA jeopardizes our ability to remain competitive in the global marketplace."

The petition the NCBA filed is the first step for the organization in asking the DC Circuit Court of Appeals to overturn the EPA's rule due to a lack of sound or adequate basis for making the finding of endangerment from anthropogenic GHGs.

"'Climategate' revealed that the data on which the EPA relied to make this finding is questionable and may have been manipulated to tell a story that global warming alarmists wanted to tell," said Thies. "The fact that the EPA is ignoring this scandal is not going to make it go away."

According to the EPA, GHG emissions from the entire U.S. agriculture sector in 2007 represented less than 6 percent of total U.S. GHG emissions, and the livestock industry emitted only 2.8 percent. At the same time, land use, land use change, and forestry activities resulted in a net carbon sequestration of approximately 17.4 percent of total U.S. carbon dioxide emissions, or 14.9 percent of total U.S. greenhouse gas emissions. MM

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Precision Pumping

By Tony Kryzanowski



It's more than just a name for Illinois custom manure applicator

Quincy, Illinois-based custom manure applicator, Precision Pumping Inc. is using new technology and a high level of customer service to reassure its customers that they are getting exactly what they are paying for when it comes to manure application.

It starts with the use of a drag hose system that will typically deliver manure from hog or dairy lagoons or pits up to three miles for application on farmland. They use auto-track John Deere tractors so that the tractor pulling the hose is propelled at a constant speed in a straight line, with liquid manure flow from the toolbar monitored from the cab, ensuring they never miss spots on the field. They also use a GPS in each tractor. The GPS card is removed from the tractor after each application, a map is generated and it is included with the invoice sent to customers. The detailed map shows exactly where the manure was applied, as well as setbacks in relation to sensitive areas such as bodies of water, roads, and houses. Customers have the ability to take the data from the GPS and apply it to their commercial fertilizer spreader to automatically change fertilizer application rates where manure was applied.

Managers at Precision Pumping Inc. also do considerable leg work in the off-season to meet with customers, select fields for application, and determine the application rate per acre based on the analysis of manure pit or lagoon nutrients.

"We try and make everything as accurate as possible and do as good a job as we can for our customers," says Precision Pumping co-owner, Jered Peter. "Manure is worth a lot of money now and it needs to be treated like fertilizer and not manure. We are learning new things every year to try to make things better and do things differently."

Jered, 24, owns the business with his parents, Randy and Debbie Peter, and brother, Derek, who is 27. They started out by operating a drag hose system to manage manure generated on Randy's hog farm, applying the manure where they also grow about 800 acres of corn.

In 2005, they expanded the business from one crew to two so that Derek and Jered could each have their own operation. In 2008, the company applied 104 million gallons of manure with two crews. In early 2009, the company expanded to three crews, with Daniel Mowen, crew manager, in charge of that operation. Precision Pumping expects to achieve 50 million gallons per crew per year in the future. It has a total of 10 employees, including the owners, who are actively involved in day-to-day business operations.

With its location in west central Illinois, Precision Pumping is able to service customers in western Illinois, northeast Missouri, and southeast Iowa. Among its biggest customers are farmers raising hogs for large commercial hog producers. Because of bio-security requirements for managing these operations, Precision Pumping takes extreme precautions to minimize the potential of transferring pathogens from one farm to another. The company has just constructed a new wash facility and shop on the family farm, making it even easier to wash and disinfect equipment between jobs and monitor the quality of the work. If

Illinois-based Precision Pumping has invested about $1.5 million in drag hose custom manure application equipment, primarily from equipment manufacturer, Hydro Engineering. The business is experiencing considerable growth from one year to the next.

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they are working several hours from home, each mobile crew has pressure washing and disinfecting capabilities included on their pump trailers.

Drag hose manure application system manufacturer Hydro Engineering is a major equipment supplier to Precision Pumping. They assisted with the design and equipping of the company's four pump trailers that house low emission and fuel efficient John Deere engines as the primary power source to pump the manure from the storage facility. The pump trailer is equipped with a hydraulic boom, which reaches out 42 feet and places a hydraulically driven pump into the 8- to 12-foot deep pit or lagoon. The pump force-feeds the main pump, keeping the flow constant to the field. This is one of the many things that keeps this business efficient. Because of the lagoon pumping method employed by Precision Pumping, Peter says they can get by with two engines at the lagoon site, one pumping and one agitating.

The manure flows through a 17-inch Pioneer pump, which is powered by the John Deere engine mounted on the trailer. It flows through the connected sections of the 6-inch main line hose until it reaches the field, and then through a drag hose, which is connected to the applicator. An equalizer has cutting edges that chop anything that would block the manure getting through the shanks. The shank delivers the manure about 4 or 5 inches under the soil so that it is completely covered, which reduces odor and the volatilization of the valuable nutrients.

Peter says agitation is another important part of doing a good job. A lagoon agitator or pit agitator is powered from a tractor PTO; it moves to various locations along the lagoon or pit to agitate the manure to keep the solids in suspension and to keep the manure more consistent in the field. The company has three Houle pit agitators and two lagoon agitators in its fleet. The lagoon agitators are 42 feet long and are able to reach out to the centre of the lagoon.



Some of the key employees at Precision Pumping are (from left to right): Ed Obert, Robbie Wellman, Daniel Mowen (crew manager), Jered Peter (owner/business manager), Derek Peter (owner/crew manager), Cutter Duncan, Andy Skirvin and Randy Peter (owner/business manager).

To manage the hose required to transport the manure from the pit to application sites, Precision Pumping owns seven Hydro Engineering hose carts, equipped with hydraulic drives and guides on the back of each cart.

Peter says the company opted for a drag hose system versus hauling manure for field application primarily because they believe it is a more efficient, faster system that results in less soil compaction. He says when pumping to locations close to the pit,



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Top: Precision Pumping has enough hose to apply manure on farmland seven miles away from the lagoon or manure pit. Middle: The backbone of Precision Pumping's custom manure application service is three custom designed mobile trailers with all the equipment a crew needs to get the job done on site. Bottom: Monitors inside the tractor cab provide the operator with immediate information about his/her position on the field and the manure flow rate during application.

they are able to achieve flow of 1600 gallons per minute, and with assistance from booster pumps, can maintain 1300 gallons per minute out as far as five or six miles, although applying the manure over such a long distance is rarely, if ever, done due to the expense. He adds that farm customers appreciate how much less compaction this system creates.

"Our shanks are actually heaving the ground and reducing compaction, whereas with a tank, you have so much weight creating compaction," Peter says. Because they never run empty, there is no driving back and forth on the field or guesswork as to where they may have left off, as is sometimes the case with tankers.

A downside of a drag hose system is the obvious limitation of distance, which is why a tanker or purpose-built mobile manure application system may be the only option for some manure generators. Another disadvantage for some farmers or custom manure applicators may be the cost of a well-equipped drag hose system.

"It costs over $650,000 for a crew and a lot of farms just can't afford that," says Peter, "but in a custom operation, where we are doing 115 to 120 different farms, we can justify it."

Precision Pumping has three applicators that they use on their tractors. Two are 26 feet wide and one is 22 feet wide. The applicators are Hydro Engineering toolbars with Dietrich 60 series slurry direct injectors equipped with eight-inch-wide sweeps and designed for minimum tillage.

"We actually have customers with highly erodable ground where we will go there in the fall, apply manure on 350 acres, and in the spring they come in with no tilling right behind where we put in the manure," says Peter. "You can hardly tell we were out there come spring time. We can apply a full year's worth of fertilizer without anyone knowing we were in the field."

For dragging the hose across the field and applying the manure, Precision Pumping uses identical 230-horsepower, 8330 John Deere tractors, with front wheel assist and auto track and GPS mapping capability. Manure flow is controlled with Krone flow meter systems. It has a display in the cab so that the operator is aware of how many gallons per minute are being applied at all times. The application rate per acre is determined by the speed of the tractor, which is held constant and controlled by an Infinite Variable Transmission (IVT).

For safety, each tractor is also equipped with radio shutdown systems that allow the operator to slow down the pump engine, speed it up, or shut it down completely from the seat of the tractor.

Precision Pumping tries to have at least three crew members per trailer unit, and each trailer is equipped with a Kawasaki four-wheeler so that employees can monitor the hoses and application in the field.

Precision Pumping's busiest times of year are spring and fall, after the crops are removed, with about 75 percent of its customers growing corn exclusively. In those instances, the application rate is about 4000 to 5500 gallons per acre from finishing barns, except if the manure source is from lagoons or pitted sow manure. In that case, the application rate is 10,000 to 14,000 gallons per acre.

Some manure is applied on pasture and wheat crops in summer, and this is one area of the business Precision Pumping is hoping to greatly expand in future. To assist with building that part of the business, the company has constructed a 24-foot pasture applicator called a Gen-til manure applicator that broadcasts manure and aerates the ground at the same time. Peter says customers are extremely happy with the way this toolbar has improved their pastures and hay crop.

Precision Pumping is always looking for ways to satisfy their customers' demands and the proof is in the amount of repeat business and growth that is occurring within the company from one year to the next. MM

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Livestock AIR EMISSION and odor study completed

A recently completed study by Wisconsin's Department of Agriculture, Trade and Consumer Protection and Department of Natural Resources has increased the understanding of air emissions and odors on larger-sized livestock farms, and lays the groundwork for future studies in this important area, officials say.

The multi-year project to study odor and air emissions from Wisconsin dairy and livestock farms was supported by a Conservation Innovation Grant from the USDA Natural Resources Conservation Service (NRCS).

Larger livestock farms volunteered to be part of the study. Five dairy farms and one heifer raising operation were selected. The farms ranged in size from 400 to more than 2,500 head of cattle. Four manure management practices were evaluated: anaerobic manure digesters, an impermeable cover placed over manure lagoons, a permeable manure lagoon cover, and a solids separation and aeration system.

"The project evaluated the air emissions and odor levels from six dairy and livestock operations and then compared the odor levels both before and after the installation of best management practices that were intended to reduce odor or emissions," said Steve Struss, project co-manager with the state agriculture department.

More than 2,000 air samples were collected during the project. The samples measured odors and the airborne concentrations of ammonia and hydrogen sulfide, two compounds most likely to be present on livestock operations.

"Keep in mind that we were not measuring the amount of emissions from entire farms," Struss said. "The samples were collected at the edge of practices such as manure lagoons, sand separation channels or an animal feed lot."

While the number of farms within the study was limited, it appears that impermeable covers significantly reduce ambient concentrations of ammonia and hydrogen sulfide. Not surprising, when stored manure was agitated or pumped, higher concentrations of ammonia and hydrogen sulfide were detected. The project will also provide some valuable data for the existing livestock facility siting rule.



A recently completed study by Wisconsin's Department of Agriculture, Trade and Consumer Protection and Department of Natural Resources has increased the understanding of air emissions and odors on larger-sized livestock farms.

"The siting rule uses a model to predict the amount of odor that might be produced from new or expanding livestock operations. One goal of this project was to compare the levels that the model predicts with actual odor levels measured on farms," Struss said. "The study gives us some real world data that we can consider in evaluating the odor model."

Based on sampling results, it appears that the odor model used in the DATCP siting process accurately predicts the odor from covered manure storage lagoons and the amount of odor from manure lagoons between two and four acres in size. However the model appears to underestimate the amount of odor from small manure lagoons and manure digesters.

The findings of the study suggest options for farmers who wish to reduce odors from their farm, among them:

- Minimize surface agitation of waste storage lagoons to limit exposure to the air including the use of submerged inlet pipes and mixing below the surface of the lagoon.
- If a manure digester is used, maximize the time manure is kept inside the digester to reduce odors from the manure lagoon. A high quality flare with a reliable igniter to burn off gas also avoids unintentional releases of digester gas.
- Installation of new manure storage lagoons would benefit greatly from an impermeable cover, which can reduce odors by 100 percent.
- Existing manure storage lagoons would benefit from a permeable cover, which can reduce odor by about 70 percent.
- Keep stored feed clean and dry. Wet feed produces odors and reduces feed quality.
- A solids separator can be used to produce bedding materials and reduce odor by approximately 25 percent.
- Keep animal densities low on open feedlots as high stocking rates increase odors as well as runoff and erosion.
- Separation distance from neighbors is a simple, but effective tool to reduce odor impacts, place new livestock housing or manure lagoons as far as possible from nearby residents.

The final report and farm specific data is available on the DATCP web site at http://www.datcp.state.wi.us/arm/agriculture/land-water/odor/index.jsp. MM

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CANADIAN BIOGAS CONFERENCE coming soon

Following on the success of its inaugural conference, the 2nd Annual Canadian Farm and Food Biogas Conference is scheduled for March 10 and 11, 2010 in London, Ontario.

Once again, the event will be held in conjunction with the Growing the Margins: Green Energy and Economy for the Farm and Food Sectors Conference, held at the London Convention Centre at the same time. In light of this, several joint plenary sessions will be held involving both biogas and Growing the Margins attendees, including Green Energy Today – Progress Made and Initiatives Underway plus New Frontiers – and What Needs to be Done to Realize Opportunities.

Biogas presentation topics include:

- Biogas new developments
- Energy crops and other plant-based co-substrates
- Food biogas system case studies
- Biogas upgrading and purification
- Genset performance and efficiency
- Farm-based biogas system case studies
- Integrated biogas systems
- Advances in anaerobic digester processes and technologies
- Co-substrates and mixed inputs
- Economics and policy
- Safety

Also of interest to people involved in manure management will be a presentation during Growing the Margins highlighting a preliminary study from Quebec involving biodiesel production for swine manure.

Special attractions added to the conferences include a Biomass Heating Networking Forum being held March 8 at the London Hilton. The forum will include an introduction to building a biogas system and building an on-farm solar PV system. The ever popular technology tours are scheduled for March 9 and will be split into two streams:

Tour 1 – Biogas and Beyond: Several operational, nearly operational and lab-scale biogas systems in the Guelph/Kitchener area.

Tour 2 – Solar and Biomass: On-farm solar installations, a solar panel manufacturing plant, energy crop field trials and biomass utilization systems.

Following Growing the margins and the biogas conference, an all-day workshop on biogas co-substrates for the farm and food sector is being held March 12 at the London Convention Centre. The workshop will cover issues such as supply of co-substrates, potential for expansion in the area plus rules for managing co-substrates.

For more information on these conferences and workshops, visit www.gtmconference.ca or www.biogasconference.ca. MM



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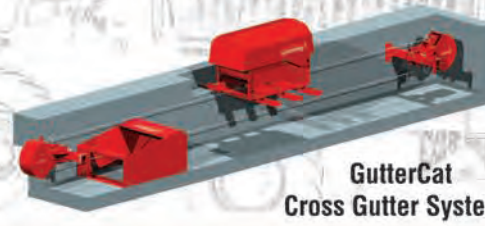
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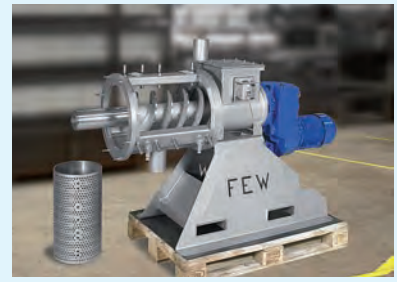












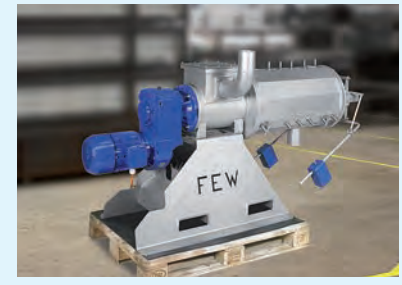
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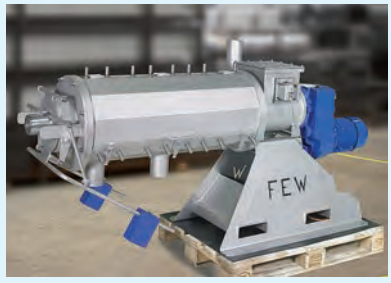
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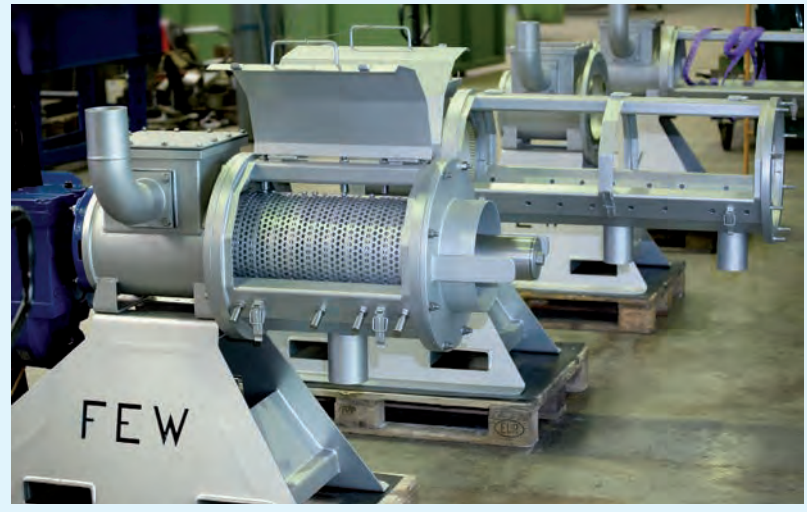
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Wisconsin partnership cashes in on CHICKITY DOO DOO



By Tony Kryzanowski

Chickens do a poor job of processing nutrients, and this has created huge headaches over the years for many egg-laying and poultry operations when land-applying raw poultry manure because of its high phosphorus and nitrogen content.

However, a couple of enterprising businessmen in Lake Mills, Wis., have recognized this as a potential value-added benefit over other sources of raw manure when it comes to producing a superior organic fertilizer.

When former teachers John Weiss and John Nortman discovered a proprietary, patented composting system that would guarantee them at least a five percent nitrogen content in the finished product, all the pieces fell into place for a poultry-based organic fertilizer that could be marketed as better than the run-of-the-mill composting products they intended to compete against. The result was the creation of a product called Chickity Doo Doo, the removal of about 21,000 tons of raw poultry manure from being land-applied, and the production of about 13,000 tons of marketable, composted product for the agriculture, retail and golf course maintenance markets.

"Coming out of the barn, we are at approximately 6 percent nitrogen on chicken layer manure as opposed to a cow, which is probably closer to 1.5 percent nitrogen, or a hog, which is maybe a little bit above that at 2 to 2.5 percent," says Weiss. "It also comes out at a much lower moisture content as opposed to cow manure or hog manure, which makes it easier for us to compost."

He says they are dealing with roughly 55 to 60 percent moisture content, as compared to 80 to 90 percent moisture for raw cow manure and even higher for hogs on a consistent basis, which makes their poultry manure easier to compost.

Furthermore, because the chickens need to create a quality eggshell, they are fed a very high diet of calcium, which means that the producers of Chickity Doo Doo can also guarantee at least a nine percent calcium content in their fertilizer. Research shows that calcium is another important contributor to plant health, says Weiss.

However, with higher nutrient content comes a trade-off and that is an odor issue, more so on the retail side of the business than the agricultural side.

"We do, as part of our composting process, take some of the odor out," says Weiss, "but that is part of the challenge for us. There are products that we are testing now that will be added to reduce odor and that allow us to keep our organic certification, but yes, if you retain a lot of the nitrogen and you retain a lot of the nutrients, the trade-off is odor. That is part of our next challenge."

In 2007, R&J Partnership purchased the composting system that was operating simply as a manure management method at a massive egg-laying operation located between Madison and Milwaukee, Wis., called Creekwood Farms. The system was invented by one of the egg-laying farm's owners. Creekwood Farms managed about one million chickens in its laying operation, and was producing a granulated and pelleted organic fertilizer product that it sold to fertilizer distributors, as well as organic and non-organic farms. Weiss describes their effort as, "dabbling a little bit on the retail side," but he and Nortman saw much more potential in it.

"He [Creekwood's owner] was able to compost and create the high temperature for the pathogen kill and also retain the high level of nutrients," says Weiss. This composting technology, with its ability to produce compost with higher nitrogen content, also presented a solution to the research and development they were already conducting on an organic poultry-based fertilizer product. Up to that point, they could not achieve more than four percent nitrogen content on a consistent basis with the various conversion processes they were experimenting with.

"It was something that we had aspired towards in all of our work," says Weiss, "and when we came across this patented system, we just thought it had too much potential to pass up."

The Chickity Doo Doo brand of organic, poultry-based fertilizer is now marketed coast to coast in the United States. Contributed photo

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Main: R&J Partnership has added a major organic, poultry-based fertilizer operation to its extensive egg-laying enterprises at Lake Mills, Wis. Right: R&J Partnership discovered and purchased a proprietary poultry manure composting system that delivers at least five percent nitrogen content on a consistent basis. Contributed photos.

Since launching the Chickity Doo Doo product line in 2007, sales have doubled every year. The company hopes to achieve about $4 million in annual sales by next year. Distribution has also expanded from retail markets in the Midwest to large lawn and garden distributors on the east and west coasts. The product is registered for use in all 50 states. Sales to the retail and golf course sector have risen from eight percent to 30 percent of sales over that same period. Business is also growing in the agriculture sector, with conventional farmers seeing the value of blending the poultry-based organic fertilizer with their synthetic fertilizers.

"Our product is 30 percent carbon," says Weiss, "so conventional farmers want to return carbon and the microbial cultures to the soil to improve the soil along with using synthetics. So, they are blending it or, in some cases, going to our product solo even though they are a conventional farm."

This has resulted in huge demand for the poultry-based organic fertilizer to the point where R&J Partnership has run out of product at times and is in discussions with numerous other egg-laying operations that are interested in getting out of land spreading. At present there are between five and seven million egg-laying chickens in Wisconsin, which is about 10 percent the size of the industry in the nation's largest egg-producing state, Iowa.

"What we have offered is the ability to come in and solve a problem for them," says Weiss, "where we take the pressure off them from the standpoint of having to land-apply and having to work with state or federal agencies on nutrient management plans."

Weiss brought plenty of commercial egg-laying business experience to the organic fertilizer enterprise because, for 40 years, his father sold day-old chicks to the large layer producers in the industry. After Weiss bought his mother out in 1999, the family business evolved into a pullet supplier and now operates as a cage-free egg production business. That's when he started investigating alternatives to land-applying poultry manure. More stringent regulations on manure land application in Wisconsin were putting that operation in jeopardy. Today, the family farm, Kettle Moraine Egg Ranch, supplies about 1000 tons of raw poultry manure annually to the Chickity Doo Doo side of the business. R&J Partnership underwent a massive expansion in April 2008, when it purchased the Creekwood Farms egg-laying operation in partnership with Daybreak Foods Inc., which now provides the remaining 20,000 tons annually of Chickity Doo Doo's raw manure supply. At the time of purchasing the composting system from Creekwood Farms, R&J Partnership wisely acquired right-of-first-refusal on the purchase of the entire egg-laying business to ensure that they'd still have a consistent raw manure supply to support the organic fertilizer business if the egg-laying operation was ever put up for sale.

"According to Wisconsin Department of Natural Resource officials, we are the first, large concentrated animal feeding operation in the history of the state of Wisconsin that has no land application of raw manure associated with our operation," says Weiss.

Because Creekwood Farms is a caged egg-laying operation, the manure falls onto belts that convey it to a collection site in the barn. R&J Partnership has four Knight manure spreaders to transport the manure from the egg-laying barn to the composting barns. The manure is indoors at all times, avoiding any runoff issues.

The manure is processed using the proprietary system to achieve optimal moisture content, and is normally composted over a two-week period. There are three points in the process where the temperature reaches in excess of 150 F, which works as an inoculation and helps to assuage concerns over such issues as bird flu. The compost is then processed through a Knight auger mixer, which breaks it up before it is pelletized at one of the company's two California Pellet Mill (CPM) units.

The pellets are marketed as the company's commercial organic fertilizer

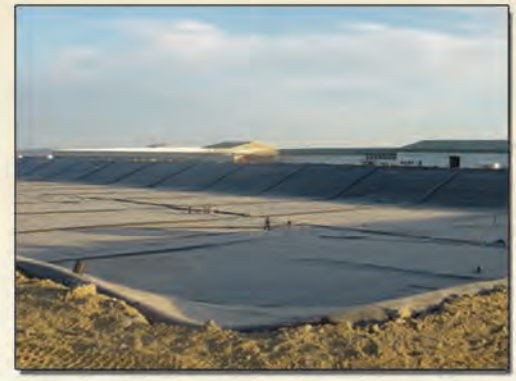
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Top: The R&J Partnership in Wisconsin produces about 13,000 tons of marketable poultry-based organic fertilizer per year. Bottom: The poultry-based organic fertilizer produced by R&J Partnership is so popular that the company is hoping that other egg-laying operations will become suppliers to the business. Contributed photos.

for agriculture operations, but a portion is processed through a cracker crumbler that crumbles the product so that it can be applied easily with a standard lawn fertilizer spreader. This product consistency is bagged and marketed as Chickity Doo Doo, but the process also produces a fine dust. This is collected and marketed as a greens-grade organic fertilizer for golf courses.

Weiss emphasizes that what they are using is 100 percent poultry manure from egg layers, as opposed to poultry litter used in poultry-for-meat operations that is often mixed with sawdust or bedding, two materials that tend to dilute the nutrients in an organic fertilizer product. They also scrape out the manure on a daily basis as opposed to poultry-for-meat operations that typically clean out their barns every eight to nine weeks between flocks, meaning that R&J Partnership is able to keep odor to a minimum.

One of the major challenges the company faces is the issue of phosphorus content in the organic fertilizer. While Wisconsin has given organic fertilizer an exemption from its ban on fertilizers containing phosphorus, the debate continues almost on a state-by-state basis as to whether organic fertilizers should be exempt. Fighting the exemption are chemical producers who claim that this gives organic fertilizer an unfair advantage. Companies like R&J Partnership have argued that the phosphorus from the manure generated on farms still needs to go somewhere and has support from research done at the University of Wisconsin indicating that application of phosphorus in a less concentrated form as part of organic fertilizer is actually part of the overall solution to dealing with phosphorus runoff problems.

"It is important to look at what the science says and the science is on our side," says Weiss. MM

New biogas plant
B.C. farmer plans to convert manure into renewable energy

PlanET Biogas Solutions Inc. recently announced construction has started on a 125,000 GJ per year renewable natural gas (biomethane) plant in Abbotsford, British Columbia, Canada.

The project solves a waste disposal problem for B.C. farmer Chris Bush, founder of Catalyst Power, who plans to turn his cow manure into cash; it also combines the experience and expertise of PlanET Biogas Solutions of St. Catharines, Ontario, Terasan Gas of B.C., and Greenlane Biogas of Stockholm, Sweden.

The plant will be the first farm-based biogas plant in Canada to employ biogas-upgrading technology and the first farm-based biogas plant in B.C. for agriculture.

Phase One of the plant will generate enough renewable natural gas to heat approximately 1000 homes. The plant will feature two anaerobic digesters, one dry feeder system, two pasteurization units, and a biogas upgrading system. It will produce biogas from several organic waste streams, including dairy manure, chicken manure, FOG (fats, oils, and greases), and corn silage.

Construction began in earnest in early January and the plant, designed and being built by PlanET Biogas Solutions, is targeted to begin producing gas by May 2010.

The biogas produced in the anaerobic digesters will be put through an upgrading process that will remove the CO2 and other contaminants from the biogas to produce natural gas pipeline quality methane. The pipeline quality methane is to be sold to the local natural gas utility, Terasen Gas, to reduce overall carbon emissions. The project's gas cleaning technology is being supplied by Greenlane Biogas. This will be their first facility in North America.

Biogas is created as a result of complex microbiological processes. Manure and other agricultural byproducts are broken down by methane-producing bacteria through a four-stage process in an anaerobic (without oxygen) environment. Biogas consists of 50 to 60 percent methane, 40 to 45 percent carbon dioxide, and trace amounts of hydrogen sulfide (H2S). Anaerobic digestion captures the methane and carbon dioxide from the manure, reducing the greenhouse gas emissions of existing nutrient management practices.



PlanET Biogas' Vandermeer plant.

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Coming Events

March 3-4, 2010
Northeast Dairy Producers Conference, Holiday Inn, Liverpool, New York.
Visit: *http://nedpa.org/final/meetings.html*

March 4, 2010
Current Issues in Manure Management, Olmstead County Fairground, Rochester, Minnesota.
Visit: *https://umconnect.umn.edu/rochestercawt/*

March 8-12, 2010
4th Annual Growing the Margins Conference, London Convention Centre, London, Ontario.
Visit: *http://www.gtmconference.ca.*

March 8-12, 2010
2nd Annual Canadian Farm & Food Biogas Conference, London Convention Centre, London, Ontario.
Visit: *http://www.gtmconference.ca/site/index.php/canadian-farm-and-food-biogas.*

March 19, 2010
Current Issues in Manure Management, Four Seasons Building, Upper Level, Steele County Fairgrounds, Owatonna, Minnesota.
Visit: *https://umconnect.umn.edu/owatonnacawt/*

March 24-26, 2010
Farm Pilot Project Coordination Inc's Chesapeake Bay Summit, Annapolis, Maryland.
Visit: *http://www.fppcinc.org.*

April 27-28, 2010
AgSTAR National Conference 2010, Hotel Sierra/KI Convention Center, Green Bay, Wisconsin.
Visit: *http://www.epa.gov/agstar/*

June 9-11, 2010
2010 World Pork Expo, Iowa State Fairgrounds, Des Moines, Iowa.
Visit: *http://www.worldpork.org*

July 15, 2010
2010 Great Lakes Manure Handling Expo, Penn State's Ag Progress Days Site, State College, Pennsylvania.
Visit: *http://das.psu.edu/manure-expo*

September 13-16, 2010
International Symposium on Air Quality and Manure Management for Agriculture, Doubtletree Hotel, Dallas, Texas.
Visit: *http://www.asabe.org/meetings/airwaste2010/index.htm*

September 22-24, 2010
NOSE 2010, Palazzo degli Affari, Florence, Italy.
Visit: *http://www.aidic.it/nose2010*

September 28-October 2, 2010
2010 World Dairy Expo, Alliant Energy Center of Dane County, Madison, Wisconsin.
Visit: *http://www.worlddairyexpo.com*

October 3-8, 2010
Greenhouse Gases and Animal Agriculture Conference, Banff Park Lodge, Banff, Alberta, Canada.
Visit: *http://www.ggaa2010.org*

If you have a coming event that would be of interest to manure management professionals and custom applicators, feel free to forward it to mland@annexweb.com.



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Iowa application law IN PLACE

A new Iowa law limiting the land application of liquid manure on snow-covered ground to only emergency situations went into effect Dec. 21, 2009.

The law does not apply to manure from open feedlots or dry manure. It applies to confinement (totally roofed) facilities with liquid manure that have 500 or more animal units. Generally, 500 animal units would be 1,250 finishing hogs; 5,000 nursery pigs; 500 steers, immature dairy cows or other cattle; or 357 mature dairy cows.

"However, all livestock and poultry producers need to protect water at all costs," said Gene Tinker, Iowa Department of Natural Resources (DNR) coordinator of animal feeding operations. "All producers must prevent pollution as they land apply manure."

The law limits liquid application from Dec. 21 to April 1 if the ground is snow-covered. If manure can be injected or incorporated, there is no limit on land application during this time. Snow-covered ground is defined as soil having one inch or more of snow cover or one half inch or more of ice cover.

"Under those conditions, producers can only apply in emergency situations, defined in the law as unforeseen circumstances beyond the control of the producer, such as natural disaster, unusual weather conditions, or equipment or structural failure," said Tinker. "They need to notify the regional DNR field office before they apply, and they can only apply to fields that are identified for emergency application in their manure management plans and have a Phosphorus Index of 2 or less."

Tinker also said that because they are surface applying, producers and commercial applicators need to observe the separation distances, generally applying at least:

- 750 feet from buildings such as residences, businesses and schools;
- 200 feet from environmentally sensitive areas such as a drinking water wells, lakes, rivers, streams or agriculture drainage wells; and
- 800 feet from high quality water resources.

Tinker recommends that producers who might run out of storage this winter should consider emergency application early in the winter, not late.

"The research shows that the later in the season and the closer to spring snowmelt that you apply, the greater the risk that manure-laden runoff will reach a stream," he said.

"Most important, they should use good common sense, applying on flat land with the least snow cover, located far from a stream," If there are tile intakes downgradient of the application area, they must temporarily block the intake."

Producers must report emergency applications starting Dec. 21 to the local DNR field office. Office locations and phone numbers are available at www.iowadnr.gov/fo/index.html. MM

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In the NEWS






Glycerol improves economics of anaerobic digestion

Researchers at the University of Manitoba have identified a strategy to help North American livestock producers improve the economics of using anaerobic digestion to produce energy.

Research conducted at the university has shown the addition of glycerol to swine manure at one per cent of the total volume will double biogas production during anaerobic digestion without compromising the process.

Master's graduate Oswald Wohlgemut says glycerol is of interest because it's becoming increasingly available and there are few uses for it.

"What we were attempting to do was to simulate an anaerobic digestion process with swine manure and glycerol," said Wohlgemut. "Glycerol is basically a sugar alcohol. It can be produced from several different industrial processes such as being a byproduct in the production of biodiesel.

"It's also of interest because of the anticipated increase in biodiesel production in Manitoba and the expected surplus of glycerol."

Wohlgemut notes, while anaerobic digestion remained stable throughout the experiment with the addition of glycerol at one per cent of total volume, rates of two and four per cent caused failure of the process.

He says the work suggests farmers throughout North America who use anaerobic digestion to produce energy can use glycerol at low doses to enhance methane production and if glycerol is available locally it can be very viable.

Courtesy of University of Manitoba News

New York Dairy Power Summit held

The U.S. dairy industry, with sponsorship from GE Energy, recently held the New York Dairy Power Summit in Syracuse, N.Y.

The summit brought together experts in dairy production, engineering, environmental science, financing, legislation and policy, and green energy business to accelerate opportunities for U.S. dairy farmers to use cow manure methane biogas to generate reliable, cost-effective renewable electricity.

During the conference, GE Energy showcased its Jenbacher biogas engine technology that utilizes digester methane biogas to generate electricity. The power can be used to support the farm's onsite power requirements, as well as the regional grid, while helping to improve local air and water quality.

According to the New York State Department of Agriculture & Markets, the state has 6,200 dairy farms with more than 600,000 dairy cows, but only 10,000 cows are utilized in energy production through the use of 12 methane digesters that generate 1.3 megawatts. Manure from approximately 2,500 cows can produce electrical output of 500kW-enough to power roughly 200 homes.

"The Dairy Power Summit is designed to jumpstart the development of additional digester projects in New York by making a bold commitment to action and establishing an ambitious goal for anaerobic digester biogas-to-energy project development through 2020 and committing to a strategy to reach those targets," said Roger George, general manager of GE Energy's gas engine business for North America. "New York's dairy farmers have an opportunity to tap into a new source of revenue that will simultaneously help the state increase its renewable energy production and lower its greenhouse gas emissions."

Based on what the Innovation Center for U.S. Dairy has learned in New York at the Dairy Power Summit, programs similar to the New York pilot project will be rolled out across the nation.

The dairy industry has committed to reducing greenhouse gas emissions by 25 percent by 2020, which is equivalent to removing 1.25 million passenger cars off the road every year.

USDA & U.S. dairy industry announce agreement

The U.S. Department of Agriculture and the Innovation Center for U.S. Dairy have agreed to work jointly in support of the U.S. dairy industry's goal to reduce greenhouse gas emissions by 25 percent over the next decade.

In the memorandum of understanding (MOU), the USDA and the industry-wide dairy group identified a variety of projects that can help the dairy industry achieve those greenhouse gas reduction goals and increase its financial and environmental sustainability.

Under the agreement, the USDA will take a number of steps to help farmers, including supporting a strategic research plan to help the industry further reduce environmental impacts. Other initiatives would help the industry develop future technologies, advance nutrient management, support renewable energy, and improve energy efficiency.

Potential outcomes of the MOU include accelerating opportunities to adopt livestock manure processing systems that capture methane gas from livestock manure and convert it into electricity, coordinating research information on life cycle assessments, and supporting the industry's efforts in energy audits, feed management and energy conservation.

The MOU between USDA and the Innovation Center may also help accelerate adoption of methane gas digesters for all sizes of dairy farms, making it easier to connect digesters to electricity grids and help digester operators capture potential carbon offset payments. Additional support from the USDA could include research on how feed mixtures affect methane emissions from cows. Opportunities to reduce so-called enteric emissions have been identified by dairy stakeholders in the Innovation Center's industry-wide plan to cut greenhouse gas emissions.

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Perdue wins industry award for innovation

Perdue recently became the eighth company to receive *Poultry* magazine's Jewell award for innovation, and the first to be recognized in the area of environmental leadership.

The award, named for poultry industry pioneer Jesse Jewell, recognizes industry innovators "whose products, processes or overall approach to marketing or management … raised the standard of excellence for the entire poultry industry."

"[Perdue] has a business unit dedicated to converting poultry litter into organic fertilizer, a large-scale poultry grower best-practices partnership with the Environmental Protection Agency and, among other projects, employees committed to volunteering to clean up local waterways," wrote *Poultry* magazine editor-at-large Alicia Karapetian.

Two new projects approved by Manure Initiative

The Manitoba Livestock Manure Management Initiative ('Manure Initiative') board of directors recently approved two new projects that will soon be underway:

- "Dried distillers grains with soluble (DDGS) in poultry diets" and "Dried distillers grains with soluble (DDGS) in poultry diets and manure phosphorus content - implications for feeding strategies to decrease phosphorus loading." – Dr. Rodriguez-Lecompte, Department of Animal Science, University of Manitoba.
- "Development of dispersion-based [odor] setback distance guidelines for Manitoba." – Dr. Qiang Zhang, Department of Biosystems Engineering, University of Manitoba.

Dr. Juan Carlos Rodriguez-Lecompte, an Assistant Professor and Animal Scientist from the University of Manitoba, will head up a project set to examine the extent that including corn- and wheat-based dried distillers grains with solubles (DDGS) in poultry diets will influence manure phosphorus concentrations. DDGS are important Canadian feed resources, but have been documented to contain high and variable phosphorus levels.

As a result, there is potential that DDGS may increase manure-phosphorus content, thus leading to phosphorus loading in soils when this manure is land applied.

The Manure Initiative has partnered with the Manitoba Chicken Producers to fund the project, which piggy-backs onto a larger, more comprehensive study supported by the Canadian Poultry Research Council, the Poultry Industry Council, Canadian Bio-systems Inc. and NSERC focusing on the implications of DDGS inclusion in poultry diets on animal productivity, well being, immunity and food safety. Dr. Rodriguez-Lecompte's project will get underway this month.

Dr. Qiang Zhang, a professor with the Department of Biosystems Engineering at the University of Manitoba, will seek to improve the current guideline for odor-mitigating setback distances from livestock operations.

The project idea evolved from a recommendation made by the Manitoba Clean Environment Commission that a dispersion-based odor setback guideline be established. At present, most existing setback guidelines in the world are based on experience. To establish a dispersion-based odor setback guideline, Dr. Zhang will a) develop odor impact criteria for defining acceptable odor exposure, b) develop models for quantifying odor emission rates from typical livestock operations in Manitoba, c) evaluate and select dispersion models for predicting the odor distribution surrounding livestock operations, and lastly d) combine those findings to form the dispersion-based setback guideline. MM



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ON TRACK

John Deere launches new skid steers



John Deere recently introduced the D-Series skid steer loaders and compact track loaders (CTLs).

The release is the culmination of years of research and a partnership with skid steer owners and operators.

The 318D, 320D, 326D, 328D and 332D are the new skid steer models, joining the existing small-frame, radial lift 313 and 315. For the compact track loader line, the new 319D, 323D, 329D and a 90-hp 333D join the small-frame, radial lift CT315.

One of the differences in the D-Series is the cab. The new cabs feature 24 percent more room than their predecessors and six more inches of headroom. They are also quieter, positively pressurized and easier to get in and out of, due to a larger door opening.

The 50-percent noise reduction in and around the D-Series cab comes from several sources beyond mere sound absorption, including a hydraulic fan drive, an auto idle feature (which also saves fuel) and the new electronically controlled engines.

A high-performance HVAC system includes eight adjustable airflow vents for additional comfort.

Deere's D-Seriesalso contains an auto idle, an optional reversing hydraulic fan, and a V-Plenum cooling system that provides significantly more cooling capacity and performance.

D-Series skid steers and CTLs have electronically controlled Tier 3/interim Tier 4 engines coupled with a new auto idle feature. The optional reversing hydraulic fan is a variable speed unit working with a computer program that monitors engine and hydraulic fluid temperatures to ramp fan speed up or down as needed.

The EH (electro hydraulic) Performance Package includes switchable controls from the ISO to H pattern, the creeper mode in which the operator can set wheel or track speed in 10-percent increments of the unit's top speed, and boom and bucket metering, with three different speed settings: Precision/economy (slow), Utility (medium) and Production (fast).

www.johndeere.com

LWR among Top 10 New Products at World Ag Expo



Livestock Water Recycling's (LWR) manure treatment system has been recognized as one of the top 10 new products at the 2010 World Ag Expo, being held Feb. 9-11.

The process technology involves mechanical and chemical water treatment for the removal of manure contaminants from the discharge water of concentrated animal feeding operations (CAFOs). The system is focused on the reduction of solids, phosphorous, ammonia and nitrogen from livestock facility wastewater. As the waste flows through the system, the solids are removed from the effluent. The water produced from the system is suitable for reuse while other byproducts can be used as fertilizer.

The initial step involves pumping the liquid slurry into an equalization tank that uses a pump to transfer the liquid. The solids are then removed from the effluent stream and stored for later land application or composting. For fine solids removal, the effluent is pumped into a special tank where the fine solids are removed continually and sink to the bottom. After the fine solids separation, the liquid is placed in a second equalization tank and then sent through a media filter to ensure all solids are removed. The water proceeds through a membrane system that separates out salts and large-size microbes. The clean water is then sent back to the barn for reuse or can be used for irrigation. In the final stage, ammonium is concentrated and allows for a concentrated liquid fertilizer to be created through the process.

www.livestockwaterrecycling.com

Pro-Act Biotech introduces SandSmart™

Sand is the preferred bedding material for many dairy farmers as it provides a clean, healthy environment for the cows. Reusing the sand makes a great deal of sense; the problem is cleaning it properly. The quality and quantity of recycled sand are important factors to consider.

Pro-Act Biotech recently introduced SandSmart™, a biological product that allows dairy farmers to reuse their sand bedding after a quick, convenient and effective cleaning.

SandSmart is a biological product designed specifically for sand-bedded dairy farms and is best used in a flush or flush flume manure system. SandSmart works by applying the product periodically to the last lagoon from which dairy draws their flush water.

The key to cleaner sand is cleaner flush water. SandSmart provides the dairy with clean flush water, which cleans the sand with ease. Cleaner sand provides a healthier environment for the cows.

www.proactbiotech.com

New type of ammonia indicator available

The benefits of controlling ammonia levels are acknowledged worldwide. The Litmus Ammonia Indicator (LAI) provides Confined Animal Feeding Operations (CAFO) with a new tool to help raise healthier, heavier animals.

LAIs utilize easy-to-understand colorimetric sensor technology that was developed (and patented) by the

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Innovations in MANURE Manager



Manure Manager's March/April 2010 issue is featuring injection equipment and lagoon agitation and aeration equipment. in its INNOVATION section.

All suppliers of injection equipment and lagoon agitation and aeration equipment are invited to submit a short write-up (200-300 words), describing their product(s) and a high quality image.

Product information and images can be sent via email to mland@annexweb.com.

The deadline for copy and images is
February 12th, 2010

If you have any questions, please don't hesitate to contact Margaret Land at 1-888-599-2228, ext. 269.



While Manure Manager welcomes all submissions, we cannot guarantee publication. In the case of space restrictions, some submissions may only appear on Manure Manager's website (www.manuremanager.com). All submissions must be approved by the Editor.

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U.S. Food and Drug Administration. It is unlike other ammonia measurement devices and provides an average ammonia measurement over four and 24-hour periods.

The benefits of LAI include:

- Providing growers and technicians with more facts by continuous monitoring ammonia levels,
- Using ammonia time weighted average over immediate readings

LAI is available in 25 and 50 ppm levels, average ammonia levels recommended by CAFO industry professionals, trade organizations and scientists.

LAI 25 ppm is designed for:

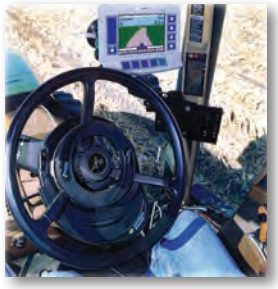
- Use during the early part of a grow out and for preparing poultry houses for chick placements,
- Growers who wish to maintain a maximum healthy environment for their animals throughout the entire grow out period and increase income.

LAI 50 ppm is designed for:

- Use during the later stages of a grow out period, when the animals are mature and less susceptible to ammonia damage.

www.litmusfqi.com

AutoFarm introduces OnTrac2



AutoFarm recently launched a new GPS steering solution for growers who want easy-to-install, hands-free steering on their operation – the OnTrac2™ GPS assisted steering system.

The OnTrac2 helps eliminate skips and overlaps, helps lower fuel consumption, expands the seasonal operating window and reduces operator stress and fatigue.

The split-gear design does not require removal of the steering wheel for installation; OnTrac2 latches on and off for easy transfer across multiple brands and types of vehicles – tractors, sprayers, or spreaders. It has a high-torque, positive gear drive to deliver turning power while eliminating wheel slip typical in motor steering systems. The electro-mechanical drive unit runs quiet when in operation.

OnTrac2 was recently named one of the Top 10 New Products of the 2010 World Ag Expo.

www.gpsfarm.com

Barnyard Supply new distributor for FarmLogic

FarmLogic, developers of web-based software programs for agriculture, recently signed an agreement with Barnyard Supply to represent the FarmLogic product lines to its customers in and around the Ohio area.

The new product line is designed to help agri-business owners and managers become more efficient and productive.

FarmLogic incorporates an easy-to-use mobile FarmPad handheld computer with wireless and cellular Internet connections to sync daily farm operations to the farmer's secure farm headquarters on the web. FarmLogic is designed to provide accurate on-the-go record keeping, field mapping, and reporting.

www.barnyardsupply.com
www.farmlogic.com

J&D Manufacturing's cow crematorium



J&D Manufacturing is the exclusive source for the Biosecure Cow Crematorium, recently announced as one of the Top 10 Honorable Mention Products at the World Ag Expo.

The Biosecure Cow Crematorium operates similar to a convection oven. Once the chamber is filled, the operator can set the timer and walk away. When the temperature inside the chamber reaches the desired level, the burner shuts down, but air is forced into the chamber so the carcass continues to burn.

The crematorium can reduce 100 pounds of flesh to less than one gallon of ash with no unpleasant odors or smoke during the burning process. It uses spiral flame action to increase burn retention for a clean and thorough burn.

The crematorium features a pre-tempered refractory block liner that resists cracking and acts as a burner by reflecting heat and distributing it throughout the unit. When necessary, the end plate and block liner can be removed to replace one or two blocks.

The Biosecure Cow Crematorium is constructed of reinforced steel and has a life expectancy of more than 5000 burn-time hours.

www.jdmfg.com



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McLanahan launches 44 Super Magnum
McLanahan's agricultural division recently launched a new piece of equipment for the dairy industry, the 44 Super Magnum Sand Pump.

Using technology from the mining industry, the result is a high-wear vertical pump that can stand up to sand applications. It was recently named one of the Top 10 New Products at the World Ag Expo.



The 44 Super Magnum is nitrile lined with a vertical shaft and centrifugal pump, designed to withstand the demands of pumping sand and manure with minimal wear on components. The replaceable nitrile linings protect the pump's split casings and the impeller is also nitrile lined, extending the wear life in abrasive environments.

The 44 Super Magnum handles flows from 570 to 2500 litres per minute at up to 45 metres of total head flow. This equates to 150 to 650 gallons per minute at 150 feet of total head. Electric motor sizes range from 7.5 to 30 kw or 10 to 40 hp. The standard length is eight-feet (2.4 meters) but custom lengths are available.
www.sandmanuresolutions.com



John Deere launches new skid steers



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The release is the culmination of years of research and a partnership with skid steer owners and operators.

The 318D, 320D, 326D, 328D and 332D are the new skid steer models, joining the existing small-frame, radial lift 313 and 315. For the compact track loader line, the new 319D, 323D, 329D and a 90-hp 333D join the small-frame, radial lift CT315.

One of the differences in the D-Series is the cab. The new cabs feature 24 percent more room than their predecessors and six more inches of headroom. They are also quieter, positively pressurized and easier to get in and out of, due to a larger door opening.

Deere's D-Seriesalso contains an auto idle, an optional reversing hydraulic fan, and a V-Plenum cooling system that provides significantly more cooling capacity and performance.

D-Series skid steers and CTLs have electronically controlled Tier 3/interim Tier 4 engines coupled with a new auto idle feature. The optional reversing hydraulic fan is a variable speed unit working with a computer program that monitors engine and hydraulic fluid temperatures to ramp fan speed up or down as needed.
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Researchers receive money to study IMPACT ON AIR

By Melynda Harrison

In November 2009, researchers with Colorado State University's College of Agriculture were awarded $1.15 million to study nitrogen and ammonia emissions related to cattle feedlots in Colorado and the High Plains.

This funding will support three projects, all of which are being led by professors from CSU's Institute for Livestock and the Environment and the College of Agriculture.

Recently, the livestock industry on Colorado's eastern slope has been implicated as a primary source of nitrogen emissions, a cause of ecosystem degradation in Rocky Mountain National Park.

Funding from the U.S. Department of Agriculture will help Jay Ham, a professor in the Department of Soil and Crop Science at CSU, and his colleagues determine just how much nitrogen comes from feedlots.

The study aims to measure ammonia and other pollutants from a Greeley-based cattle feedlot and evaluate the influence of factors that govern emissions levels, such as cattle diet, weather, and manure management, on regional patterns of nitrogen and ammonia deposition.

Using this data, the research team will develop a computer model that predicts nitrogen emissions from all feedlots along the Front Range of Northern Colorado and patterns of deposition in the park, and use this to identify opportunities for reducing emissions during key seasons or at key sources.

This project is a multi-disciplinary, collaborative effort. In addition to Ham, Shawn Archibeque from the Department of Animal Science, and Thomas Borch, professor in the Department of Soil and Crop Sciences, will be contributing to this research. The project has received strong support from private feedlot operators in Greeley, who will serve as the primary study sites for the project, and from the National Park Service.

In 2009, the EPA began requiring cattle feedlots greater than 1,000 animals to report ammonia emissions to state and local authorities; however, no verifiable methods have been developed to estimate those emissions on a site-specific basis.



Researchers with Colorado State University's College of Agriculture have been awarded $1.15 million to study nitrogen and ammonia emissions related to cattle feedlots in Colorado and the High Plains.

Working with scientists at the University of Washington, another project being led by Ham, recently funded through an EPA STAR grant, seeks to improve on-site monitoring and reporting of emissions through the development of new tools for measuring actual ammonia emissions on a seasonal, site-specific basis, and an on-line system producers can use to track emissions and predict the outcomes of different management scenarios.

Ham and his colleagues will work with feedlot operators in Colorado and Kansas to develop in-house tools for measuring emissions, and real-world models of how different factors, including livestock nutrition, waste management, climate, and soils, effect emissions. In addition, these same tools can be used to measure and estimate greenhouse gas emissions; something the livestock industry may be required to do under the EPA's proposed Mandatory Greenhouse Gas Reporting Rule, currently under review.

In keeping with Colorado State University's land grant mission of advancing knowledge and serving the needs of the state's citizens, College of Agriculture professors Ham, Archibeque, and Davis are collaborating on a project to provide producers with best management practices for reducing ammonia emissions and also see if the adoption of BMP's changes trends. An NRCS Conservation Innovation Grant, recently awarded to the project team, will support this work.

Best Management Practices, or BMPs, are management and facility practices that can help a producer reduce their environmental impact, while maintaining or improving herd production. Factsheets explaining BMPs for feedlots, dairies, and fertilizer use will be developed by the project team. In addition, an NRCS Technical Manual explaining how to assess ammonia emissions will be produced. Summer field days and winter workshops open to producers throughout the Great Plains will expand the scope of the project.

Working directly with producers, the project team will document implementation of BMPs in real-world settings. Follow-up monitoring and assessments will help determine how effective BMPs are at reducing ammonia emissions and if practices are cost-effective to producers. MM

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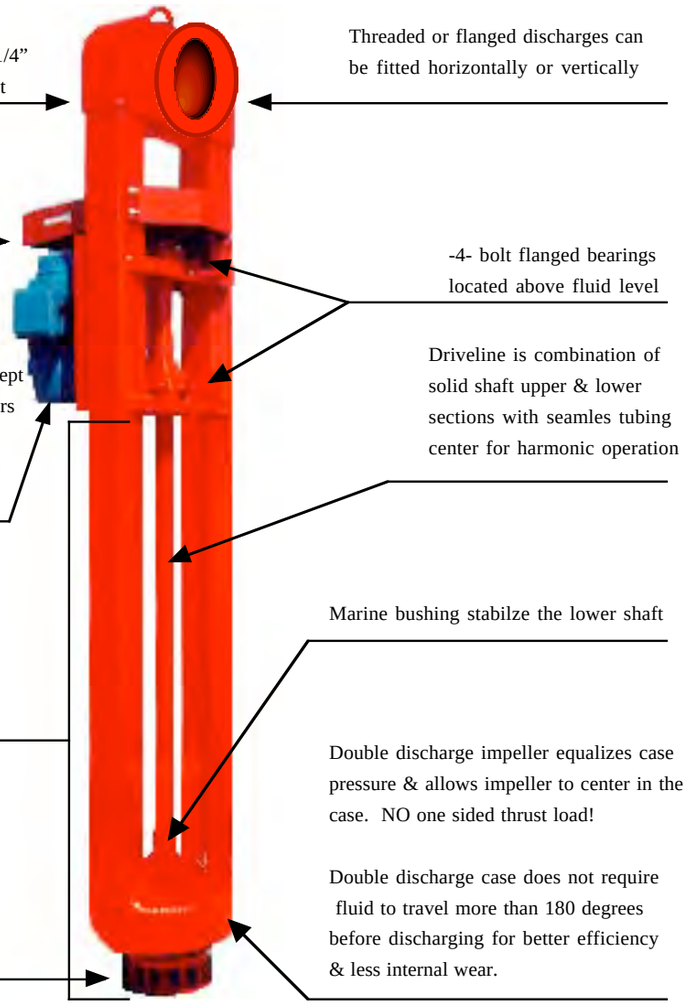
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V-belt drives for easy pump speed changes

-4- bolt flanged bearings located above fluid level

Motor plates can be drilled to accept a wide range of motor sizes. Motors available in single or three phase. Standard NEMA frame, fan cooled motors are used.

Driveline is combination of solid shaft upper & lower sections with seamles tubing center for harmonic operation

Marine bushing stabilze the lower shaft

Pump setting determined from lowest bearing to bottom of pump

Double discharge impeller equalizes case pressure & allows impeller to center in the case. NO one sided thrust load!

Heavy duty rock guard screens out oversized material & supports the pump

Double discharge case does not require fluid to travel more than 180 degrees before discharging for better efficiency & less internal wear.

On site test pit available to insure performance prior to shipment!



4" Direct Drive Pump

FISHER PUMPS



6" Manure Pump with Agitation Gate

Low maintenance, submersible centrifugals for flows to 20,000 GPM ! Available in a variety of pump styles to meet your needs!



2" Direct Drive Floater with Plastic Pontoons



4" Hydraulic with Pontoon Setup



4" Direct Drive Floater with Steel Pontoons

Manufactured by:

Fisher Pumps
2024 E. 8th St.
Greeley, CO. 80631
PH# 970-353-6962
Fax# 970-353-0839
Web Site : www.fisherpumps.com



4" Direct Hydraulic Drive Pump

General Facts About Fisher Pumps

Design

Fisher Pumps are versatile pump units which can provide excellent service life with low maintenance requirements. The **Fisher Pump** is a submersible centrifugal unit that does not require priming, draining or sealing. These pumps are self priming and are not damaged if run dry for short periods of time. **Fisher Pumps** use an exclusive double discharge design which equalizes the pressure within the case. This design also allows restriction of the discharge flow without damage to the pump or power unit. The **Fisher** design does not require placement of a bearing at case level to hold the side load like single discharge pumps.

Construction

Fisher Pumps use a cantilever shaft that allows the bearings to be placed above the fluid level. This bearing placement minimizes bearing exposure to contamination and helps achieve longer bearing service life. These pumps, manufactured with one quarter inch and three eighths inch thick steel plate and heavy walled tubing, utilize a rugged all welded construction. There is no need to be concerned about assembly bolts working loose or seals and gaskets developing leaks.

Capabilities

Due to the design and efficiency of **Fisher Pumps**, they are considered high volume/low pressure units requiring low horsepower requirements. **Fisher Pumps** can pump any fluid that will flow and are used for irrigation, flush tank filling, manure/sewage lagoons, dewatering and other such applications.

Versatility

Fisher Pumps are belt driven and adaptable to various motor sizes. One pump is capable of accepting several motor sizes. Output capacity of pumps can be varied by changing the drive ratio. This adaptability allows one pump to be used for several different applications and to be modified as pumping requirements change. The **Fisher Manure Pump** is capable of pumping rocks, pop cans, hooves and many of the other types of debris that find a way to enter the typical manure pit. The particle size going into the pump is regulated by the openings on the rock guard. The impeller design can better accommodate animal hair, straw, hay, etc., as is commonly found in this type of application. For manure screener applications, the high volume of a **Fisher Manure Pump** allows for some of the volume to be diverted back into the manure pit to be utilized for agitation while still providing enough volume for efficient screening. Back pressure will not adversely effect the pump.

Other Options

Fisher Pumps are manufactured in Greeley, Colorado. In addition to the standard pump sizes offered, custom made pumps can be manufactured to meet the customer's needs. In addition to the standard electric motor drives, **Fisher Pumps** offers PTO and hydraulic drive units. Floating pumps can be used for lagoon aeration, irrigation recovery ponds or flush water for free stalls in dairy applications. Cellar pumps for oilfield drilling fluids are part of the **Fisher Pumps** line also. An inventory of repair parts is kept in stock for shipment when required.

Fisher Pumps offer a (1) year warranty on material and workmanship, subject to conditions, as described in our warranty sheet.

When you need a pump, you owe it to yourself to consider **FISHER PUMPS!**



Fisher Pump Styles

Style & Use	Setting	GPM	Discharge	Feature & Options
DITCH STYLE Vertical setting with belt drive Irrigation water, flood water transfer or manure slurry duty	For fluid depths up to 12 foot	250 GPM up to 20,000 GPM	Up to 18" flanged Up to 8" threaded	**Belt drive allows pump speed changes **Motor plate accepts a wide range of HP sizes Manure Style Options: **Agitation port to provide flow for pit mixing **Optional impeller styles to handle fibrous material **Chopper blade options
FLOATER STYLE Floater setting with belt drive Irrigation & flood water transfer	For unlimited fluid depths	250 GPM up to 20,000 GPM	Up to 12" ringlock Up to 8" threaded Up to 16" OD tube	**Belt drive & motor plate benefits same as above style. **Floating pump units always maintain the proper setting
HYDRAULIC STYLE Direct drive with hydraulic power Handles most fluids based on hydraulic power available	Will work in any fluid depth with proper supply & discharge hose lengths	250 GPM up to 2000 GPM depending on head & hydraulic power available	Up to 8" threaded typical	**Works in any position **Can be reversed if plugging occurs **Discharge volume can be regulated by controlling hydraulic input
DIRECT STYLE Vertical setting with direct coupled drive Manure slurry & drilling mud return pumps	For fluid depths up to 12 foot	250 GPM up to 800 GPM (typical)	Up to 4" threaded typical	**Direct drive design for economical cost **No belts to maintain **Can equip with hydraulic drive for variable flow
TRAILER STYLE Straight or humpback style	All trailer lengths approx. 20 foot	Up to 20,000 GPM depending on head & power available	Up to 18" flanged Up to 12" ringlock	**Direct PTO drive design on humpback ** PTO with belt drive on straight style **Can equip all styles with electric drives

EXHIBIT E

Fisher Pumps

Owners Manual

(Effective 9/1/07)

FOR UNIT SERIAL #_____

---NOTICE TO OWNER---

-READ THE -3- NOTES ON THE NEXT PAGE BEFORE OPERATING THE PUMP-

Fisher Pumps
2024 East 8th Street
Greeley, Colorado 80631
Ph-(970) 353-6962**Fax-(970) 353-0839
****

NOTE:

#1- The bearings on all pumps only have the grease supplied as shipped from the bearing manufacturer. Rotate the shaft by hand and grease the bearings prior to startup.

#2- If pump is equipped with an MDX marine bushing, the bushing must be submerged when the pump is running. Running the bushing out of the fluid will overheat the bushing causing bushing expansion and shaft seizure.

#3 NOTE TO ELECTRICIAN:
If equipped with a TECO motor, the motor may allow for WYE start /DELTA run wiring. Only wire to the START configuration if your motor starter has the capability to automatically switch to RUN mode. The START & RUN options are shown on the wiring decal inside the terminal box cover. WYE start/DELTA run motor starters usually have at least -2- contactors. MOST motors will be Across-The-Line connection for starting & running and this requires wiring to the RUN configuration shown. If you need further clarification, contact TECO motors at PH#1-888-754-5006 or Fisher Pumps at PH# 970-353-6962

****

Fisher Pumps

TO THE OWNER,

Thank you for purchasing a Fisher Pump!

The **Fisher Pump** covered by this manual is rugged and versatile pump unit that is designed to provide low maintenance and efficient operation for your pumping requirements. The following pages contain information for installation, operation and maintenance of this unit. To insure you achieve successful performance of your **Fisher Pump,** we suggest you read through this manual upon receipt and keep this manual handy for future reference. **Fisher Pumps** has a vested interest in seeing that every unit performs to it's capability for the benefit of all of us. If you have any questions or need assistance about anything regarding your **Fisher Pump,** please call or write:

Fisher Pumps

2024 East 8th Street

Greeley, Colorado 80631

Ph-(970) 353-6962 ** Fax-(970) 353-0839

OWNER NAME-_____

ADDRESS-_____CITY-_____

STATE-_____ ZIP-_____PHONE-(____)-_____

PURCHASE DATE-_____DEALER-_____

At the time of order, your pumping requirements were stated as:

GPM req'd=_____ Total Dynamic Head req'd=_____

Other requirements =_____

_____

_____

_____

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Fisher Pumps

Specification Information-

Pump Model & Serial Number-_____

Motor Brand/Size/RPM/Phase-_____

Motor Sheave Size-_____Hub-_____

Pump Sheave Size-_____Hub-_____

Belt Size & Qty-_____Final Pump RPM-_____

Direct Coupler- Element Size-_____ Motor Hub-_____ Pump Hub-_____

Top Bearing-_____Bottom Bearing-_____

Marine Bushing- _____ 2 3/4" ID short style _____ 1 1/2" ID short style

_____ 2 1/2" ID MDX long style _____ 2 1/2" ID Brass long style

Other Options/Modifications-_____

_____

_____

Test Information-

GPM required-_____at_____ft. TDH (TDH = _____PSI)

Maximum Motor Amperage-_____ at 230 Volts & _____at 460 volts

PSI		FT HEAD		GPM FLOW		MOTOR AMP READINGS
____	***	_____	***	_____	***	_____
____	***	_____	***	_____	***	_____
____	***	_____	***	_____	***	_____
____	***	_____	***	_____	***	_____
____	***	_____	***	_____	***	_____
____	***	_____	***	_____	***	_____

Tested By-_____for Fisher Pumps

Fisher Pumps

Direct Drive Vertical Pump Parts Illustration

To aid in ordering replacement parts, find the pump serial number and refer to this illustration to determine the correct part required. Typical serial numbers would be shown as below:

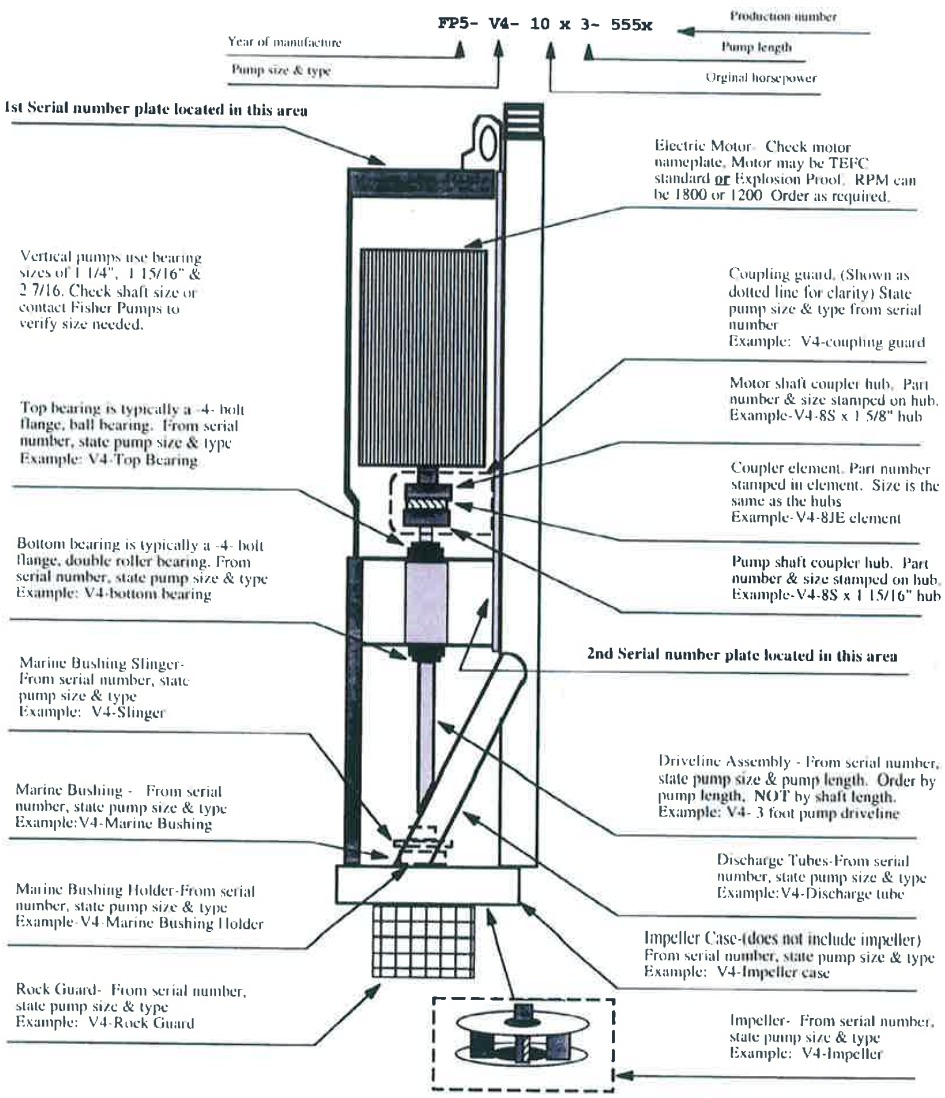
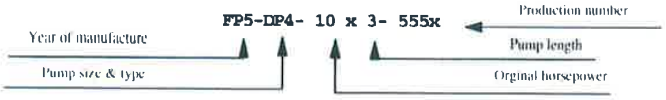


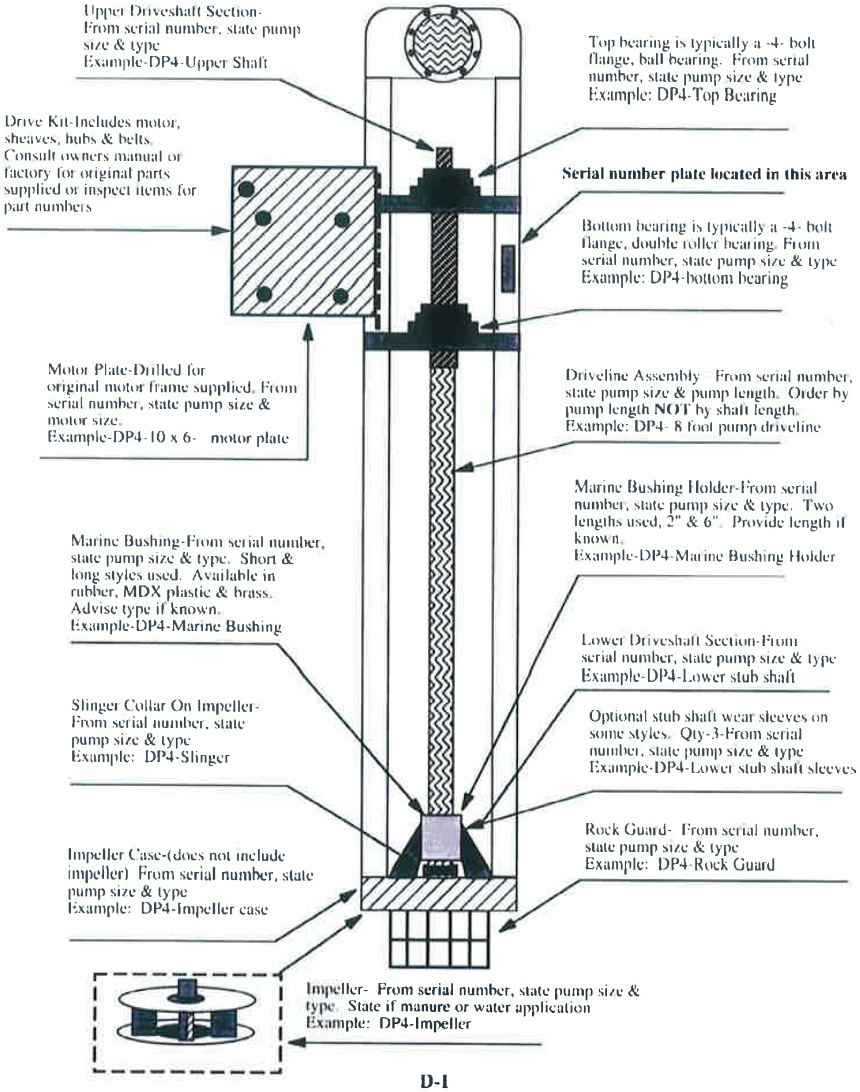
Exhibit 1091
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Fisher Pumps

Belt Drive Vertical Pump Parts Illustration

To aid in ordering replacement parts, find the pump serial number and refer to this illustration to determine the correct part required. Typical serial numbers would be shown as below:





D-1

Fisher Pumps

Portable Hydraulic Pump Parts Illustration

To aid in ordering replacement parts, find the pump serial number and refer to this illustration to determine the correct part required. Typical serial numbers would be shown as below:



