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Evaluate manure technologies before you buy

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It never fails. My phone rings and the caller wants to know if a particular technology is going to fix their manure management problems. Little did the caller know that I was going to launch into a series of questions with associated uncertain replies, because I am skeptical about the promises many of the new technologies make. The conversation would go like this:

"Why does this particular technology interest you? Is it that you recently picked up information from a friend, a neighbor, or a sales person? Or have you been studying this technology for some time?

"What do you expect this technology to do for your dairy? Technologies can treat specific components of manure or they can do nothing at all. Under the worst of scenarios you can spend money on a technology or product and it actually will make matters worse.

Under the worst of scenarios you can spend money on a technology or product and it actually will make matters worse. Before trying a product long term, identify a method and process to evaluate its effectiveness.

"What is your challenge and what are your needs? Does the technology match these? Does it concentrate nutrients (to allow for more economical transportation); does it reduce or remove odor (frequency, intensity, or duration); or does it remove certain components (i.e. precipitate phosphorus out of solution)? Many technologies do one or more tasks, however most technologies do not treat carbon, remove nitrogen and concentrate nutrients.

"What are the resource costs associated with the technology or product? Consider both the initial installation costs as well as the costs associated with operation and maintenance. What are the true labor, land, electricity, and equipment costs associated with the technology or product? Simple needs are often underestimated. For instance, sending someone to monitor it daily. If it takes 30 minutes per day for an employee to evaluate the technology, that's 30 minutes per day that they aren't in another part of the dairy or farming operation.

"What are the regulatory ramifications of using the technology? It's a challenge to think through the domino effect of integrating a new technology or product into the dairy, but it's essential to study well before implementing change.

In a way, this is similar to a chess game. A piece is moved, for evaluation, and the move is not final until the player removes their hand from the piece. Prior to removing their hand from the piece the move is being evaluated and a determination is being made to accept the risk of the move or make a different move."

Many technologies or products set in place for water management can be contrary to air emissions. A product may claim to reduce the amount of nitrogen in the

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water (implying less land needed for manure application); however, if the nitrogen is merely relocated to the atmosphere as anything but N2 gas, this may only increase your air emission problems.

The use of technologies available and what you can expect to obtain

Regardless of the technology it is important to evaluate a few parameters prior to purchase:

Odor control
Energy use/production
Nutrient content
Fertilizer value
Nutrient stability
Total solids
Reliability
Cost (initial and operating)

Additionally, if the technology is hardware and requires servicing you will want to also determine the financial stability of the company (will they be around to help troubleshoot problems?) and if the company has technicians available to assist in the start-up process.

Anerobic digesters

Anaerobic digestion systems can be designed to use slurry material or a covered dairy retention pond. The type of system depends on the method of manure collection (scraping versus flushing). The size of the system is based on the volume of material collected daily multiplied by the number of days material should be retained for digestion.

For liquid systems this size can be considerably large. The volumes of water used to flush free stall lanes increases with decreasing slope of the lanes (less than 2%). It should be noted that the retention pond used as an anaerobic digestion cell is not considered part of the liquid storage capabilities. This pond will be managed at capacity and after it is filled, the daily inflow will equal the daily outflow.

Environmental benefits of anaerobic digestion

Manures that are normally collected into an anaerobic retention pond should yield fewer emissions to the atmosphere if the retention pond is covered and methane is collected and either flared or converted to energy. For manures that are initially left on feed alleys and pushed into corrals there is potentially a net emission of methane if the manure is collected and digested anaerobically. In the original form materials are maintained in an aerobic environment (presence of oxygen).

Since the removal of methane from digested manure is not complete there will be some residual methane in the digester effluent. Once exposed to the atmosphere (post digestion) there is probably off gasing of methane to the atmosphere.

Chemical or biological additives

There is an abundant supply of products available on the market with claims to reduce or eliminate solids and/or odors from manure storage structures. Products may be added to feed, animal facilities, or manure storage facilities. Products can be classified by mode of action. Before agreeing to buy a product you might want to consider the answers to a few questions:

What is the mode of action?

What kind of conditions are necessary for the product to work effectively?

How reliable is the product?

Are there undesirable outcomes from using the product?

Before trying a product long term, identify a method and process to evaluate its effectiveness. Keep in mind that the use of the product will be confounded in time. You will need to determine conditions and normal activities and odors before and after the product is introduced. It is important to select a time period when climate is going to be relatively consistent for the comparison period.

Aeration

The objective of aeration is to add oxygen into a manure storage system to effectively change the microbial population from those that thrive without oxygen to those that use oxygen. Changing the microbial population to aerobic microbes changes the end products of digestion. The end products of anaerobic microbes are methane and volatile organic acids, while the end products of aerobic digestion are carbon dioxide and water.

If you select this technology, be sure to evaluate effectiveness in your operation. Work with a private laboratory to compare ORP (oxidation reduction potential) values before installation of the technology and afterward. Work with someone from your local land grant university to establish a reasonable protocol for ORP evaluation. It is important to sample enough locations and under different circumstances (before technology, after infusion of irrigation water, etc.).

Solids/liquid separation

There are at least four standard methods used to separate solids from a liquid stream:

1. single screen separation
2. double screen separation
3. settling basins
4. weeping wall separation.

The primary objective of separation of solids from liquids in dairy manure is to reduce the volatile solids (VS) loading rate into the lagoon, thereby making the lagoon function more completely. Proper and thorough evaluation of technology effectiveness is important.

What special considerations are needed to have a success with the technology? Any technology will have a learning curve for facility managers and operators. A maintenance schedule will be necessary and at least two people at the facility will need to know the intricate details associated with proper maintenance and operation.

Any changes in distribution of nutrients (from solid to liquid phases or visa versa) must be considered and calculations be made to be sure land available for manure application are still capable of receiving and utilizing all of the nutrients.

Regardless of the technology, it is also important to establish appropriate Occupational Safety and Health Association (OSHA) hazard protocols and training for employees.

What claims does the company make and are they true? Many claims can be made during the marketing of technologies or products: improves nitrogen to phosphorus ratio in lagoon, meets requirements of regulatory agencies, reduction in nitrogen, total solids, or other components, etc.

Are actual data available to substantiate the claims?

Have you contacted the appropriate regulatory authorities to verify the claims and determine what kinds of permitting requirements you will need to complete to implement the technology?

And once implemented, can cease use of the technology without violating a permit?

In summary, dairy producers are hounded by sales people hawking the latest and greatest product or technology to help with the challenge of manure management. Please do your homework before you spend your money!

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