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American Dairymen™

Manure Market ADAPTS TO CHANGE

Lagoon Pumping and Dredging, Inc. Leading the Way

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Things have changed in the manure management industry over the years. From family farms to large CAFO's (concentrated animal feed operations of a 1000 animal units or more), the techniques and equipment have evolved.

In the past there were family farms and the only thing the farmer was concerned about was once or twice a year he would load up his manure spreader and make a few passes on his field. Today there are government regulatory agencies requiring manure management plans and overseeing CAFO manure producers' and manure handling operations.

manure handling HISTORY

As producers began to build larger lagoons and under barn manure pits the need for more advanced manure handling equipment was required. Born were the "honey wagons" and tankers to haul the liquid manure to surface apply to agriculture fields.

As traveling big gun and circle pivots became popular many producers would use their lagoon top water for irrigation. This was a good solution for the liquid effluent but as the solids began to accumulate in the lagoon the nozzles and water turbines begin to plug. It soon became clear that a method of removing lagoon solids was necessary.

Need creates innovation and soon cultivators were adapted to be used with 4.5 inch irrigation soft hoses to supply continuous manure slurry to the injection tractor in the field. Aluminum irrigation supply pipe was used to transport the manure slurry from the lagoon to the edge of the field. Soon Angus, the number one supplier of irrigation hose, started making 6 inch main line supply hose. Then manufacturers like Houle, Balzar and Cornell Pumps soon started making specialized agitators and pumps for liquid manure handling.

These innovators were asked by their neighbors to pump their lagoons and soon the professional pumping industry was created. Today, there is a combination of producer run and dedicated professional pumpers similar to Lagoon Pumping & Dredging, Inc. out of Columbus, Nebraska.

MODERN liquid manure handling

Like most industries, the advancing needs of the agriculture producer along with government regulatory rules and regulations drove the advancement of the industry.

The techniques used today are primarily continuous flow main line hoses with drag line and direct injection of the manure slurry 4 to 6 inches into the ground or large tankers hauling concentrated liquid manure slurry longer distances and again injecting it into the ground. The direct injection of the manure slurry into the ground has eliminated most of the odor problems that are associated with manure handling.

The equipment used today are 6- to 10-inch supply lines running up to several miles from the lagoon. Large and even larger pumps strategically placed to maintain pressure and volume of the manure slurry over these longer distances help continue the flow to the field.

Precise GPS guidance systems in modern tractors help maintain consistent coverage on the field; while Krohn Flow meters precisely measure the flow of the manure slurry thru the hoses. The tractor speed is adjusted based upon the rate of flow to maintain the proper application of N-P-K nutrients at the proper agronomic rate.

When asked about tracking the nutrients in the manure slurry, Aaron Ross, president of Lagoon Pumping & Dredging, Inc. said, "manure slurry samples are taken for each 40 acres and sent to certified labs for analysis. These lab reports are then given to the producer and farmer along with an application map so they know what nutrient level was applied to each field. Then, if necessary, a producer can side dress the field with additional commercial fertilizers so the proper crop fertility can be assured."

The use of liquid manure solids on agriculture land has caused regulatory agencies to require manure slurry samples to be taken and a record of the amount of nutrients being applied. Most states allow agronomic application of manure slurry to satisfy the nitrogen needs on a 2 year crop rotation. Other states work on a phosphorus based application requirement for the first year crop utilization.

REMOVAL OF SOLIDS not just top water

As the producers become more experienced with the manure pumping process they want to be assured the pumper is not just pumping top water effluent but also the manure slurry solids from the lagoon bottom. This is accomplished by proper agitation of the lagoon prior to pumping and maintaining the suspension of the solids by sustained agitation through out the pumping operation.

According to Ross, "Agitation is the most critical aspect of the whole pumping process." Without proper agitation you cannot effectively remove the lagoon solids and you will not get a consistent product in the field.

Proper agitation of the solids accomplishes the two goals of pumping: (1) to remove the solids from the lagoon for the manure producer, and (2) giving the farmer consistent N-P-K nutrients for their crop fertility.

While hog manure slurry usually contains 2-5% solids, dairy and feed lot lagoons can contain 6-7% solids. While some pumpers don't have the equipment to handle heavy solids, Lagoon Pumping & Dredging, Inc. indicated the most solids they ever pumped was 20%. According to Mr. Ross, "We are not afraid of pumping heavy solids, but we do have to charge a little more since heavy solids does require more fuel and creates excessive wear on the pumps and hose."

AGITATION methods

There are several different methods of agitation depending upon the type of lagoon or deep pit you are cleaning out. Some of these are: (1) deep-pit nozzle, (2) deep-pit high flow pump, (3) open lagoon conventional PTO tube with nozzle, (4) open lagoon conventional PTO tube with prop, (5) agitation boat with vertical nozzle agitation. The purpose of each of these agitators is to suspend the solids from the bottom so they can be pumped out.

Some pumpers specialize in cleaning specific types of lagoons or pits and only have agitators suited for that application. Larger pumpers similar to Lagoon Pumping & Dredging, Inc. have all the types of agitators, plus a dredge for specialized situations.

In smaller open lagoons the conventional agitators made by Balzar, Houle and Nuhn are used. These agitators have props and nozzles and move water horizontally in the lagoon. They

are great for washing down lagoon banks and for lagoons up to 3-4 million gallons in size.

Larger open lagoons are best worked with an agitation boat. There are several designs on the market, but the one preferred by Lagoon Pumping & Dredging, Inc. is the PCE boats that create vertical agitation using large Cornell pumps to draw thinner top water and force high volume water through nozzles to wash away the solids on the bottom. This creates a vertical agitation movement that can move islands of sludge that otherwise could not be reached by traditional PTO tube agitators.

Another big issue with proper agitation is moving the agitator around the lagoon so all the sludge or solids become suspended through high velocity water movement. If an agitator is not moved it will only clean out the solids in the area of water movement; failure to move the agitators will leave islands of sludge in the middle of the lagoon. According to Ross, "You have to be versatile and make adjustments to meet the agitations requirements of each situation. Agitation is the key to a successful pumping job."

MANURE SLURRY surface applied or injected?

There are two main methods of liquid manure slurry application: (1) surface application, and (2) injection through either a knife or sweep.

If one surface applies the manure slurry it should be tilled into the ground within 24 hours. As time passes from application to tilling more of the ammonium nitrogen is volatized. In addition, there are odor and fly issues and possible complaints from neighbors. However, if year around application is required, then surface application may be necessary over frozen ground; then it can be tilled into the ground when warmer weather prevails.

One of the best methods of application is direct injection of the manure slurry into the ground. There are many different types of injection shanks, knifes, sweeps, coulter combinations that make various types of application affects. Lagoon Pumping & Dredging, Inc. prefers, in most cases, a sweep as this creates a 6 to 12 inch water pocket under the soil into which manure slurry flows; when the sweep passes the dirt falls back in place and covers the injection path; within a few minutes the nutrients are absorbed into the soil. Injection of the manure slurry places the nutrient in the root zone where it will provide the greatest crop fertility.

An acre inch of water is equal to 27,145 gallons of manure slurry applied to an acre of ground. For arid and dry land application the added water injected into the root zone dramatically helps the crops get a good start.

Injection of manure slurry can be on almost any land including standing grass, between alfalfa cuttings, as well as the traditional fall after harvest fields of corn, sorghum, bean, oats and wheat stubble.

when should a lagoon BE PUMPED?

When to pump a lagoon is determined by regulatory, economic, and the seasonal availability of the land to apply the manure slurry. The critical time to pump is when the lagoon can no longer hold the liquid required by regulations due to the loss of lagoon capacity by the solids.

Regulatory: The EPA and state DEQ are increasingly putting more restrictions on CAFO's on how and where animal waste is stored and disposed of. There is often significant fines levied for manure overflows or spills. These regulations are often the compelling reason to get lagoons pumped sooner rather than later. How long one waits is determined by existing solid levels, availability of land to apply manure slurry to, and the avoidance of regulatory fines.

Economic: The cost of pumping is often a consideration to having a lagoon pumped. Many producers want to postpone the cost until it is mandatory to do something about it. This could be due to lower commodity prices or due to repayment of capital costs.

However, by postponing the pumping one may actually be spending more than taking care of the pumping on a regular or frequent basis. By pumping every year or every few years one can use the nutrient rich manure slurry to offset ones' commercial fertilizer costs. In addition, by pumping some every year the costs are never overwhelming.

If an lagoon operation is a producer of manure slurry but does not have farm land to utilize the economic savings one can export the product and sell it to a local farmer. Neighboring and adjacent land owners are often willing to pay a percentage of the N-P-K value depending upon what they normally would buy through their local co-ops. Lagoon Pumping & Dredging, Inc. indicated they help their customers sell their excess manure slurry to their neighbors. Exporting to nearby farmland sometimes helps alleviate nutrient build-up that often occurs on land where manure slurry is frequently applied.

Seasonal Availability of Land: Application of manure slurry is primarily done on crop land prior to planting or after harvest. Sometimes a farmer has fallowed ground, pasture or dry land that can be used during the normal growing season. If one has the ability to pump during the normal growing season one can save a few dollars in pumping costs.

The smaller dairies and feed lots may only need to pump their lagoons every two or three years. The larger and more progressive producers pump their lagoons on an annual basis and use the manure slurry nutrients as part of their crop fertility.

lagoon mapping of BOTTOM SOLIDS

If a lagoon is not pumped frequently then the question is, "how many solids are in the lagoon?" This often necessitates getting into a small boat and probing for the top of solids. In some states like North Carolina the state regulatory agency requires the lagoons to be "mapped" and this information be available for their permitting process.

Engineering firms often create a 10 foot GPS grid pattern and physically probe for the top of solids. This is manually recorded and they create a color map for city planners and lagoon owners. This is expensive and often outside of the interest and budget of a producer.

Lagoon Pumping & Dredging, Inc. has perfected a sonar mapping system that can record the various depth readings and when processed by their proprietary mapping software can produce a "lake map" showing the contours of the solids in the lagoon. If one has them pump their lagoons they do this free of charge. If one is just curious as to what the solid levels are in the lagoon then there is a modest charge.

The finished mapping report includes a color site map, color contour map of the lagoon, color side view depiction of the solid levels as well as a 3-D color view which graphically shows the high and low areas of solids. The report also includes several pages explaining the pumping process, nutrient value, crop nutrient utilization as well as some nice resource documents that provide greater meaning to the pumping process.

The mapping process does require at least 2 feet of top water over the solids. During lagoon turnover and under heavy floating solids the mapping process is not accurate.

cost savings value OF MANURE NUTRIENTS

Manure and animal waste contains valuable macro and micro nutrients that are easily used to offset or replace the purchase of commercial fertilizers. The cost savings by not having to purchase commercial fertilizer can help offset if not totally cover the pumping costs.

The manure slurry with the most nutrient value is feeder hogs, followed by sows, feed lots, and then dairy. The N-P-K value of your manure slurry is determined by type of animal waste, type of food fed to animals, percentage of solids in the manure slurry and how the manure slurry is utilized (injection vs. surface application).

Liquid manure slurry retains the ammonium nitrogen which is one of the most valuable nutrients in the manure slurry. Dry manure, while still excellent in phosphorus and potassium is harder to get an even application and the fields often need to be side dressed with anhydrous to assure adequate nitrogen supply for crop fertility.

Determining the commercial value of N-P-K is not as easy as it sounds; coops and elevators generally sell their fertilizers as anhydrous or various blends of nutrients. If you are good with math you can reverse calculate the independent values of N, P, and K.

There are several good online spreadsheets made by various university agriculture extension programs. University of Arkansas makes a good "value of manure"

calculator that can be accessed on your mobile device (see page 33). Just go to iTunes or Google Play Store and search for "Manure Valuator"; if using an Apple mobile device, this app requires iOS 7.0 or later.

The cost of N-P-K varies from community to community. In recent months at one elevator location, the N-P-K commercial fertilizer values were: N = 70¢/lb., P = 63¢/lb., and K =47¢/lb. Rumor has it that commercial fertilizer prices are going down by about 15% for the 2014 growing season. For exact N-P-K values one will need to talk to the elevator or coop in the community which the lagoon is located.

AGRONOMIC APPLICATION of manure slurry

Typical dairy manure slurry N-P-K values per 1000 gallons, based on certified lab analysis, are N = 24 lbs., P = 27 lbs, and K = 6.8 lbs. Nitrogen comes in two parts: (1) ammonium nitrogen which is available immediately, and (2) organic nitrogen which is typically available over the first three years.

Some lab reports tell what nutrients are available the first year. In the above example the first year availability per 1000 gallons was: N=13/lbs, P=19 lbs, and K=6 lbs.

To determine the agronomic rate you would consult an agronomist or look at a crop nutrient utilization chart and see what nutrients are needed for the expected crops yield. The manure slurry's first year nitrogen or phosphorous availability, in pounds per 1000 gallons, is divided into the crops fertility needs to determine how many gallons of manure slurry to apply per acre.

If 150 bushel corn in your area requires 185 pounds of nitrogen per acre, then the agronomic rate would be 12,000 gallons per acre (185 lbs N total nutrients needed divided by 13 lbs N first year available per 1000 gallons = suggested 11,530 gallons per acre).

If only using manure slurry as the crops fertility, it is best to use first year availability (always remembering agronomic rates) when applying manure slurry for the crops fertility. EPA and state regulatory agencies usually require one to take soil samples every year or two to determine what residual nutrients are available. In some states, the regulations put limits on phosphorous loading of the soil.

bio-SECURITY

Pumping is done on lagoons of all types, including: commercial, industrial, municipal, and agriculture. Within the agriculture sector there are lagoons from hog producers, dairy producers, feed lots, and poultry producers.

Ross indicated that there is a great concern over the bio-security when moving from one producer's lagoon to another. This is especially true with the hog producers. Equipment has to be power washed then sprayed down with disinfectant and then let set for several days before bringing it onto another hog producers facility. Bio-security is less of an issue with beef and dairy producers. However, equipment is still cleaned before moving from one site to another.

Lagoon Pumping & Dredging, Inc.

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Turning your Waste Lagoons into Green Profits

In the case of hog producers, some larger operations have their own dedicated equipment that is used exclusively for their deep pits and lagoons and left on site until the next pumping event. Custom pumping operators hook up to the producer owned hose that is a specific distance from the facility then the pumper uses their booster pumps, hoses and equipment to pump and apply the manure slurry to agriculture fields.

how pumping IS PRICED

All lagoon pumping is done by quotation and the factors that determine the final cost for pumping are:

- **Mobilization of equipment to the site**
- **Ease of access to the lagoon**
- **The type and amount of agitation required to suspend the solids**
- **Distance and elevation of the fields are from the lagoon**
- **Percentage of solids in the manure slurry**
- **Number of gallons per acre that are being incorporated**
- **Prevailing fuel prices at time of pumping**

The process usually starts with a personal visit from the pumper. They will then discuss the variables of your lagoon including: what the fields the manure slurry is being pumped to, what is an appropriate agronomic application rate, and how many gallons need to be pumped from the lagoon.

After all the variables have been determined a pumper can give you a quotation for their pumping or dredging services. Pumping is done on a first come, first serve basis. The sooner the pumping needs are contracted for, the sooner a pumper can schedule your pumping or accommodate a specific time window for application.

In many of the colder states, the spring pumping happens from frost-out to crop-in; during the fall pumping happens from crop-out to frost-in. There is a small window of opportunity on each side of the growing season; this is the prime pumping time and most pumping is scheduled during this time. ■

LAGOON PUMPING & DREDGING, INC.

Lagoon Pumping & Dredging, Inc. is versatile and adaptable in the type of work they do. They will travel to lagoons throughout the Midwest and Southwest U.S.

They utilize equipment of all types to work on your operation: lagoon and deep-pit agitators, booster pumps, miles of hose, tool bars and injection equipment of various designs, agriculture tractors, dredge, excavators, skid steer, manure wagons, and big-gun manure slurry applicators. They also have a proprietary method to pump or dredge covered lagoons.

Multiple crews that can work on multiple jobs simultaneously. On large jobs they bring in several crews and work 24 hours a day to assure the job is done quickly with less disruption to the producers operation.