

If settled solids are present, agitation is necessary to ensure that all materials can be removed from a manure storage facility.

Slurry systems should be designed so the contents of the manure storage facility can be completely agitated with conventional agitation equipment.

The Importance of Agitation

Agitation is the most critical operation in maintaining available storage in liquid manure systems. Failure to properly agitate will likely result in a continuing buildup of settled solids that are not removed. The result is less and less available storage as time goes by. Agitation of manure re-suspends settled solids and ensures that most or all of the manure will flow to the inlet of the pump or removal device. Additionally, agitation homogenizes the manure mixture and provides a more consistent nutrient analysis as the manure is being removed. The need for agitation may complicate nutrient analysis. Manure samples for nutrient analysis should be obtained after a pit is well agitated. In most cases, the results of such an analysis will not be available before land-applying the manure. In these cases, analysis results from prior pumping events can be used to anticipate the present analysis (and estimate proper application rate), and the present analysis, when available, can be used to calculate the nutrients actually applied.

Agitation of manure storage facilities releases gases that may increase odor levels and present a health hazard. Considerations should be given to weather and wind conditions, time of day, and day of the week to minimize the possibility of odor conflicts while agitating.

Slurry systems

Many types of agitators are available for agitating slurry systems. These include hydraulically or mechanically driven propellers or choppers, bypass devices on manure loading pumps, and others. Careful thought should be given to the design and configuration of slurry manure storage facilities so that they can be adequately agitated. Placement of the agitator (ports, annexes) and the volume to be agitated are important considerations.

Effective agitation at distances greater than 40 to 50 ft from the agitation device may be difficult to achieve in slurry storage facilities. Hence, consideration should be given to limiting “compartment size” to these dimensions, and providing adequate access for pumping and agitating each compartment. A slurry storage may require several hours of agitation before it is sufficiently mixed for pumpout.

Underfloor pits in confinement buildings are particularly susceptible to solids buildup if not properly agitated. Many underfloor pits were not designed for convenient, effective agitation. To minimize solids accumulation and maintain the design storage period, an underfloor pit must be adequately agitated at each pumping event. The type of agitator to be used should be considered in pit design. Some pumps are designed to operate in both agitation and pumping modes. These pumps can provide effective agitation if access to the pit is available as noted above. Experience has shown that underfloor pits with pipes through the pit wall angled to the surface outside the building are difficult to agitate and empty. The practice of removing a load of manure from the pit by vacuum and then “blowing” it back into the pit usually does not provide sufficient agitation to suspend solids.

The agitation and manure pumping system should allow agitation while manure is being loaded or pumped (as with a drag-hose system), as well as prior to pumping.

Most pumping equipment will not remove the “last” few inches of manure from the pit floor. This factor should be considered in designing pit depth and the associated storage period. If the pump intake is located in a sump in the pit floor, more complete emptying is possible. However, sumps can collect rocks and other debris that can cause pump damage.

Lagoon systems

In the past, it was not a common practice to agitate lagoons for pumpdown. The relatively large volume of lagoons and relatively “clean” water on the lagoon surface did not indicate a compelling need to agitate lagoons. However, as many years of experience was gained, the effects of sludge buildup and nutrient accumulation became more obvious and pronounced. Lagoons receiving significant amounts of bedding experienced high rates of sludge buildup. Sludge buildup will eventually displace needed treatment and storage volume if not periodically removed. Additionally, nutrients, particularly phosphorus, tend to concentrate in sludge and may represent a difficult management problem if sludge is allowed to build up over a number of years before it is removed. Sludge buildup in lagoons should be monitored, and sludge should be periodically removed if significant volumes accumulate in the bottom of the lagoon.

Since lagoons are relatively large, agitation can be an imposing problem. Power takeoff (PTO)-driven propeller agitators are the best choice for agitating lagoons. These units are available in lengths up to 40 ft or longer and provide the greatest flow rate of any type of agitator. They also require relatively large power units (100-150 hp) to operate at full capacity. Large lagoons may require two or more of these agitators operating simultaneously at different locations around the lagoon to provide adequate mixing. Extremely large lagoons may require dredging equipment similar to that used in the municipal sector.

Lagoon agitation reduces long-term accumulation of nutrients that could present management problems when the facility is taken out of service.