

Advantages Of Manure Solid-Liquid Separation

Animal waste lagoons and storage ponds are designed to hold large amounts of raw manure and flush water. Managing this waste in an environmentally sound way is easier and more flexible if the manure solids are separated out before they reach the treatment/storage structure.

Advantages to solids separation include the following: reducing the initial size of the lagoon or storage pond, which lowers construction costs; increasing handling flexibility for ultimate disposal and use of animal waste; and for lagoons, extending the time between solids cleanout, which makes treatment more efficient and controls odor.

The main disadvantage is that both solid and liquid waste handling equipment will be needed. Another disadvantage is that solids separation may not be cost effective for small operations.

Pond Volume Reduction

Animal waste lagoon volume needed for proper treatment and storage includes both treatment volume and storage volume for the total amount of wastewater, slurry waste, and runoff going into the pond over the entire storage time period.

Lagoon treatment volume is based on daily volatile solids loading, which is the amount of oxygen-demanding manure solids going into a lagoon on a

daily basis. Separating manure solids from slurry before putting it into a lagoon reduces daily volatile solids loading and lagoon treatment volume by 30 to 50 percent. Solids separation also reduces the total slurry waste storage volume by 6 to 10 percent. Reducing both treatment volume **and** total storage volume can significantly lower construction costs for lagoons. Storage pond volume would be reduced only by the total slurry waste volume reduction of 6 to 10 percent. For more detailed information on lagoon sizing see Extension Circulars ANR-963, "Planning And Managing Lagoons For Dairy Waste Treatment"; ANR-971, "Planning And Managing Lagoons For Poultry Layer Waste"; and ANR-973, "Planning And Managing Lagoons For Swine Waste Treatment."

Flexibility

Separated solids can be handled by conventional manure-solids-handling equipment. These nutrient-rich solids can be spread on distant fields and pastures as fertilizer and soil amendments, or sold for horticultural uses, with or without composting. Removing solids that retain their nutrients can help reduce nutrient loading on nearby fields, which are often irrigated from storage ponds or lagoons during the periodic pumpouts required for proper management.

Solids Cleanout

Lagoon treatment does not break down all solids that enter the lagoon. These nondegradable materials lead to sludge buildup during the treatment period and result in "overloading" of the lagoon. Accumulated solids should be removed by a special pump-out procedure called lagoon renovation. This procedure requires continuous agitation with specially designed propeller or chopper pump agitators. For further information see Extension Circular ANR-953, "Using Irrigation To Renovate Livestock Lagoons."

To extend the time between lagoon renovations, the best management practice is to reduce the amount of solids reaching the treatment facility. This is particularly important for dairy waste. Materials such as fibrous bedding and grit need to be separated before waste and flush water enter the lagoon. In some dairy lagoons a crust forms on the lagoon surface. Both crust formation and sludge interfere with pump-out procedures. Sludge also reduces waste treatment function and causes odor.

Types Of Solids Separation Equipment

Two types of solids separators are mechanical and gravity. Mechanical separators include flat belt separators, roller press separators, vibrating screens, conveyor inclined screens, and sloping stationary screens. Waste

is collected in a sump that is sized to hold from 1/2 up to 3 or 4 days of manure accumulation plus dilution and flush water. A stationary bottom-impeller agitator lift pump or a submersible pump mixes the waste into a slurry and pumps it across the separator where the liquid drains into the lagoon. The resulting solids are dry enough to handle by conventional solids handling equipment. These solids are usually stacked and temporarily stored on sloping concrete slabs for later use.

Vibrating screen separators similar to the one in Figure 1 may separate 56 to 70 percent of total solids from dairy wastes. Centrifugal separators result in



Figure 1. Vibrating screen separator.

35 to 40 percent separation. The conveyor inclined screen in Figure 2 can separate 49 to 68 percent of total solids from dairy waste and 30 to 50 percent from swine.



Figure 2. Conveyor inclined screen separator.

Gravity separation uses a gravity settling basin. Solids are settled and filtered by a shallow basin, consisting of concrete floor and walls, that has a porous dam or a perforated pipe outlet. Installation of gravity separation can cost half that of a mechanical separator while still removing 40 to 60 percent or more of the solids from liquid manure. However, gravity settling basin installations can take

up more room than mechanical separators and may require more labor to manage. Figure 3 shows a typical two-cell settling basin, each cell designed to store at least 1 month of separated solids. Having two cells allows a filled cell to drain and dry while the other cell is filling.



Figure 3. Typical two-cell settling basin.

Conclusion

Owners of animal waste management systems in Alabama should consider the benefits of manure solid-liquid separation: reduced storage and treatment volumes of storage ponds and lagoons, increased waste handling flexibility, and increased time between lagoon renovation. Some systems may be too small for solids separation to be cost effective.