

## Separation System Components

1. a holding tank for agitating slurry after draining slurry from a building pit
2. a gravity screen/roll press combination mechanical separator to remove approximately 30% of the separable solids producing what is referred to as separated slurry
3. a mixing tank for making a polymer premix
4. a mixing tank or an in-line venturi system for adding polymer to the separated slurry
5. a second separator for removing suspended solids producing what is referred to as separated effluent and biosolids. The second separator can be either a gravity screen separator, continuous gravity belt thickener or belt press separator. The gravity screen separator is the least cost separator
6. a holding basin for the separated biosolids or the biosolids can be discharged directly to a slurry wagon or manure spreader
7. a holding tank for the separated effluent. The LUW Team separation system has a separated effluent collection rate of 90+%. Therefore, if one million gallons is separated prior to land application, a 900,000 gallon holding tank for separated effluent is required. To minimize odor of the separated effluent during irrigation it is best to aerate the separated effluent on a continuous basis during storage.



Separated effluent is applied using center pivot irrigation

## Benefits of Separation

Because effective separation can remove up to 90+% of the phosphorus and total solids concentration from slurry, separated effluent can be land applied (irrigated) based on its nitrogen concentration. Studies conducted at the ISU Farm have demonstrated that one million gallons can be land applied to 40 acres to provide the nitrogen requirement for corn production without over applying phosphorus. The cost of separation and land application of separated effluent via center pivot irrigation has been similar to the cost to land apply untreated slurry. For more information visit the Swine Waste Economical, Environmental Treatment Alternatives (SWEETA) website:

[www.sweeta.illinois.edu](http://www.sweeta.illinois.edu)



Separated solids

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## Slurry Separation Getting Started

### Points to consider when choosing a manure management system

Has it been a really wet winter and spring, and liquid manure storage tanks and pits are getting full? Are you are having trouble finding a window of opportunity dry enough to land apply slurry? That has not been a problem for the ISU Farm. If we have a few dry days in a row that allow the soil to dry just a little we can land apply separated effluent (SE) with our center pivot irrigator. Even if the soil is not dry enough for a tractor and slurry wagon to inject liquid manure, it is possible to irrigate because the SE has so little solids and phosphorus concentration neither runoff nor leaching are a risk.

For some operators the cost for land application of liquid manure is reaching prohibitive levels. This may be especially so if slurry must be hauled more than one to two miles for land application. Many fields located near swine facilities where slurry has been land applied for several years have prohibitive phosphorus concentrations making it a necessity to haul slurry further away from the facilities. It costs approximately 1.0¢:gallon:mile to haul slurry. Some producers are logging up to 20,000 miles each year on semi tankers to haul slurry. That's up to \$40,000 that could be utilized for other purposes.



# Using Slurry Separation for Manure Management

Many city wastewater treatment departments use polymer-assisted separation systems that combine the use of chemical flocculants, gravity belt thickeners and belt presses to remove the solids fraction from wastewater. The Livestock and Urban Waste Research (LUW) Team has adapted this technology to economically separate liquid swine manure into its biosolid and liquid fractions. This systems approach allows the biosolids fraction to be composted for ultimate use as either an on-farm or off-farm soil amendment while producing a liquid fraction with low odor, low solids and low phosphorus concentrations that can be irrigated as a nitrogen fertilizer for row crops.

## Issues to Consider in Adopting a Solid-liquid Separation System

- ◆ Volume of raw (untreated) slurry produced annually
- ◆ Current storage capacity, including building pit capacity and storage tank or lagoon capacity
- ◆ Type of slurry storage - building pit storage or external storage such as a lagoon or SlurryStore®
- ◆ Current slurry treatment, if any - this may include a 2 or 3 stage lagoon settling system
- ◆ Current cost of land applying slurry, including agitation, pumping, injection and hauling costs



Separable solids are removed using a gravity screen-rollpress separator

## Important Points

- ◆ The current costs for land applying slurry should be calculated as annual dollars:year and cents:gallon carried at least two decimal places (00.00¢:g).
- ◆ The separation process must include a chemical polymer (polyacrylamide or PAM) to flocculate the solids portion. Mechanical separation without PAM assistance is not sufficient.
- ◆ The liquid produced during mechanical separation without PAM assistance still should be considered slurry with all the bad things associated with slurry, including odor, suspended solids, high phosphorus concentration, etc. The solids removed by mechanical separation are referred to as separable solids and usually represent 30 – 40% of the total solids concentration in raw slurry.
- ◆ Separation by settling in a three stage lagoon system can be effective and can produce a desirable separated effluent, however, it is a slow process, (days to weeks) and has large volume storage requirements.
- ◆ Separation is most effective if the slurry is fresh i.e. no older than seven days. Slurry stored for prolonged periods has become anaerobic and requires the use of higher polymer concentrations, costs more per gallon to separate and does not remove as much of the solids fraction. Separating anaerobic slurry in comparison to fresh slurry, also, creates substantially more odor during the separation process.

## Polymer Use Required

- ◆ Selection of the appropriate polymer is crucial to successful separation. There are hundreds of polymers available and not all liquid manures are the same. Therefore, there may be some trial and error in selecting the most efficacious polymer for each farm
- ◆ Selection of the correct polymer is not prohibitive nor that difficult. Chemical sales technicians and separation specialists can provide on-farm assistance in selecting the most appropriate polymer.

## Frequency of Separation

- ◆ Pumping or draining manure pits once weekly for separation and then recharging each pit with approximately four inches of separated effluent or fresh water decreases odor of separation.
- ◆ Removing slurry from building pits on a weekly basis, also, improves the building environment substantially (decreases inside building odor, decreases building gas concentrations, increases pig performance and improves worker satisfaction).



Separated effluent is dramatically cleaner than the raw slurry