Separation Costs

Total separation costs, including equipment, labor, polymer and fuel, come in at less than 1.0¢ per gallon of raw slurry.

Separation Costs [a]

Equipment	$100,000	
Labor	$15:hour	.35/.34¢ SE/RS
Polymer [b]	$1.60:lb	.14/.13¢ SE/RS
Fuel	$2.10:gal	.15/.14¢ SE/RS
Main	2%:year	.08/.07¢ SE/RS
Depr.(15yr)	6.7%:year	.27/.25¢ SE/RS

[a] costs reflect 2007 prices

[b] 560 mg:gal SE, 510 mg:gal RS

Separation/Application Cost (¢:g)[a]

Item	Separation	Irrigation	Total
RS	0.90	0.10	1.0
SE	0.99	0.10	1.09

RS Direct Injection = 0.70—1.70

[a] costs reflect 2007 prices

Suspended solids are separated using a gravity belt thickener and chemical flocculent

BMPs for Effective Slurry Separation

- Frequent separation of slurry
- Fresh slurry (no older than 7 days) is easier and lower cost (requires less polymer) to separate than anaerobic slurry
- Not all liquid manure is the same, slurry composition can vary
- Select a polymer specific to the slurry produced
- Have adequate storage for separated effluent
- Separation equipment should be housed in a heated building to allow year around processing
- Match equipment size (gallons:minute processed) to slurry production
- Have appropriate storage for separated biosolids or an adequate sized compost facility

Separated solids

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Slurry Separation
A Systems Approach to Manure Management

Separation of municipal waste water into its solid and liquid components is a technology that has been utilized by municipal sanitation departments for decades. Removal of the biosolids fraction cleans the liquid portion sufficiently that the waste water can be added to the surface waters of Illinois and the U.S. Many city waste water treatment departments use polymer-assisted separation systems that combine the use of chemical flocculents, gravity belt thickeners and belt presses to remove the solids fraction from waste water. 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.

LUW Team Separation System

All slurry pits in all the swine buildings at the ISU Farm farrow to finish swine operation are drained once or twice each week and recharged with 2-3 inches of separated effluent. The raw slurry is drained by an underground sewer line to the slurry processing building. The raw slurry is passed across a gravity screen-roll process separator to remove separable solids. The separated slurry is mixed with polymer and passed across a gravity belt thickener to remove suspended solids. The resulting biosolids are transported to the compost site, mixed with landscape waste and composted. The resulting separated effluent is stored in a slurry store ® until land applied during the corn/soybean growing season via a center pivot irrigator.

Slurry Processed

1,067,237 gallons Raw Slurry
971,160 gallons Separated Effluent [a]
96,077 gallons Biosolids

[a] 91% collection rate

Separable solids are removed using a gravity screen-rollpress separator

Slurry separation provides an efficient and cost effective system for managing the odor and nutrient overload associated with swine manure while improving animal welfare, reducing non-point source pollution concerns, and providing a source of beneficial soil amendments for crop production. For more information check out the website at:

www.sweeta.illinois.edu

Land Application of Separated Effluent

The separated effluent, which makes up 90% of the raw slurry volume, is transferred to a slurry store® tank or other appropriate storage tank where it is aerated before being land applied using center pivot or subsurface irrigation. Because the total solids have been reduced by over 98% in the effluent, clogging in irrigation equipment and piping is not a concern. Additionally, no odor problems have been associated with the use of separated effluent even with above ground irrigation systems.

Separated effluent is applied using center pivot irrigation

Land Application of Separated Biosolids

The biosolids, which make up 2-10% of the raw slurry volume, are collected, composted and then land applied.

ABBREVIATIONS

IF = Inorganic Fertilizer (Anhydrous Ammonia, Potash, Diammonium Phosphate (DAP)
RS = Raw Slurry
RS1 = Raw Slurry Before Processing Started
BS = Biosolids/Separated Solids
BS-B = Biosolids/Separated Solids from belt press
BS-MS = Biosolids/Separated Solids from microscreen
SE = Separated Effluent
SE-B = Separated Effluent from belt press
SE-MS = Separated Effluent from microscreen
DM (%) = Percent Dry Matter
N (%) = Percent Nitrogen
P (%) = Percent Phosphorus
K (%) = Percent Potassium
Ca (%) = Percent Calcium
N:P = ratio of Nitrogen to Phosphorus

Fraction Characteristics

Both the composted biosolids and the separated effluent provide a comparable alternative to using inorganic fertilizers for crop production.

Characteristics of Slurry, Effluent and Solids (Year 1)

Item	% Solids	% N	%P	N:P
RS1	3.65	1.0	0.53	1.9:1
RS	1.3	0.19	0.05	3.8:1
SE	0.4	0.08[b]	0.004	20.0:1
BS	10.4	0.9	0.64	1.4:1
Change [a]	-69.2	-60.6	-91.7	

[a] percent change from RS to SE

[b] 0.09% in irrigant

Characteristics of Slurry, Effluent and Solids (Year 2)

Item	% Solids	% N	%P	N:P
RS	0.82	0.11	0.02	5.5:1
SE-B	0.39	0.07	0.006	12:1
SE-MS	0.37	0.06	0.006	10:1
BS-B	9.33	0.55	0.35	1.6:1
BS-MS	0.77	0.65	0.43	1.5:1
Change				
BS-B	-52.4	-36.4	-70.0	
BS-MS	-54.9	-45.5	-70.0	

Separated effluent is dramatically cleaner than the raw slurry