Separating Manure Solids
Swine Waste

- Manure is considerably wet
- Manure solids
  - spent feed
  - feces
  - hair
  - other material (trash)
Solids Separation

- Gravity or Mechanical
- Reduce organic loading to storage or treatment unit
- Reduce liquid manure volume and N content
Solid Separation (cont.)

- Flexibility in application
- Odor reduction
- Compost or direct application
- Value-added products
Mechanical Separation

- Several options for removing solids
- Some devices require manure to be pumped from holding basin
- Convenience
- Flexibility in loading manure solids into spreaders or other containers
Mechanical Separation

• Solids removal by screening and gravity settling
  – low separation of fine solids
  – less than 35% removal of all solids

• Factors influencing efficiency
  – type of manure
  – % solids in raw “liquid”
  – screen size
  – flow rate
Screen Separators

Stationary, rundown screen

Vibrating Screen

Influent

Screen

Optional - Dewatering Drum

Solids

Effluent

Influent

Solid

Liquid
Gravity Screen Separator

- Reception pit
- Pump
Gravity Screen with Roller Press
Roller presses make drier solids at the cost of removing less nutrients (N & P) from liquid.
“Lift” Screen

- Reception Pit
- Solids are lifted up, liquids flow to lagoon
- Solids are removed
“AgPro” Lift Screen Separator
Vibrating Screen
Centrifuge Separators

1 = Manure Slurry, 2 = Liquid, 3 = Separated Solids
Screw Press Separators

Diagram showing the process of screw press separation, with arrows indicating the flow of influent, screen, solids, and effluent.
Reception Pit
(manure from houses)

Wastewater to Lagoon

Separation Auger

Manure Solids
“FAN” Screw Press

Designed for manure with large amounts of fibers
Sand Separation

- Remove sand from flushed dairy manure
- Sand is used for free stall bedding
- Combination of gravity and mechanical separation
- Sand is separated and cleaned
MANURE FROM BARN

RECEPTION PIT

BARN

METERING DEVICE
(AUGER SHOWN)

RECOVERED SAND STORAGE

SAND MANURE SEPARATOR

MANURE EFFLUENT TO STORAGE

ENCLOSURE (AS NEEDED)
“Mc Lawhorn” Sand Separator
Gravity Separation

- Concrete or earthen settling basins
- Solids settle by gravity
  - greater separation of fine solids
  - 50% removal of all solids
- Easy to operate and remove solids
- Consider 2-cell system
  - 1 is charging while the other is drying
- Easy to install/retrofit in gravity flow systems
Gravity Separation

• Land and slope requirement
  – many farms have limited space between barns and lagoon/basins

• Modify plumbing to collect manure from all houses

• Requires loader to remove solids
Concrete settling basin

Perforated Pipe Outlet, with 1" x 4" slots

No. 9, 3/4" Expanded Metal Screen, sloping 18° away from wall. Build in 4' removable sections.
Flocculents and Polymers

- Increase removal of solids
- Increase removal of nutrients (N & P)
- Cost
  - materials
  - pumping/addition equipment
  - mixing devices (if needed)
Should you use a polymer or decrease the screen size?

<table>
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<th>Screen Size (inches)</th>
<th>Polymer Added (mg/L)</th>
<th>Solids Removal (%)</th>
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Options for Separated Solids

- Direct Land Application
- Composting
- Re-feeding to ruminants
Most manure solids are land applied to cropland or pastures.
Direct Land Application

Advantages
- Flexibility in application area
- Soil amendment
- High in N, P, & K
- Easy to spread

Disadvantages
- Increased labor & equipment cost for application
- Odors and flies if not incorporated
- Regular production of solids
- May require storage
Re-feeding

- Manure solids are high in protein and fiber
- Feed non-ruminant manure to ruminants
- Direct re-feeding
  - possible pathogen transfer
  - has been done by several producers
  - no USDA restrictions
- Fermenting prior to re-feeding
  - pathogen kill due to acidic conditions
  - may be more palatable for cattle
- Contact Dr. Matt Poore - NCSU Animal Science for more info
Composting

- Aerobic biological process to treat organic wastes
- C:N and % Moisture
- Volume, odor and nutrient reduction
- Land application, soil amendment
- Marketing and quality control are limiting factors for off-farm use

Windrow w/Mechanical Aeration

Static Pile w/Forced Aeration