WASTE MANAGEMENT

WASTE MANAGEMENT IN GENERAL

1. **At the Present Time:**
   
   A. Manure handling is no profit-making proposition!
   
   B. The best system is the one that minimizes the size of “red figures!”

2. **Regulations**
   
   A. The EPA sets minimal pollution tolerance levels that each state must enforce.
   
   B. Confined livestock feeding:
      
      1) Is defined as a point source by the federal law.
      
      2) Thus, confinement livestock operations need a permit from regulatory agency to discharge any pollutants into the waterway.

   C. In most states, need to apply for waste control permits if:
      
      1) The operation has more than 1,000 animal units (e.g., \( \approx 2,500 \) pigs weighing \( > 55 \text{ lb} = 1,000 \text{ animal units} \)).
      
      2) The operation is discharging wastes into the surface water.
      
      3) In some states (e.g., Wisconsin), even if all manure is contained in the storage facility, the operation must apply for a waste discharge permit!

   D. In most states, the operation is required to have sufficient capacity to accommodate manure & runoff from the heaviest rainfall.
   
   E. Lagoons (e.g., in Iowa) - Must comply with Soil Conservation Service standards & specifications.
   
   F. Many states have regulations or guidelines for land application of waste - i.e., rates, soil conditions, location, etc.

3. **Do's and Don't's**
   
   A. **Do** become familiar with the state pollution control agency & regulations, and comply!
   
   B. **Do** maintain a “good neighbor” policy.
   
   C. **Do** keep up-to-date on confinement & manure handling technologies.
   
   E. **Don't** become careless in management practices - i.e., manure disposal, handling carcasses, etc.
   
   F. **Don't** ignore early warnings of a nuisance lawsuit.

PRODUCTION RATE AND VALUE OF SWINE WASTE

1. **Manure Production Rate**
   
   A. Varies with many factors such as the weight of pigs, general health, diets, etc.
   
   B. A rule of thumb?:
      
      1) \(1 \text{ ft}^3/1,000 \text{ lb of animal wt/day for farrowing, nursery & G-F units.}\)
      
      2) \(0.75 \text{ ft}^3/1,000 \text{ lb of animal wt/day for breeding-gestation units.}\)
3) Allow an additional capacity of 0.5 ft³/1,000 lb animal wt/day for spilled or leaked water, wasted feed & water used for general cleanup - e.g.:

   a) 1.5 ft³/two sows and litters.
   b) 1 ft³/6-7 growing-finishing pigs.
   c) 1.5 ft³/3-3½ gestating sows and boars.

2. The Nutrient Content of Swine Manure

   A. Approximate composition & value of manure - See the table [Clanton, 1991. NHF 36(1)].
   B. The nutrient contents vary according to the type & amount of diets fed, the use of bedding & water for handling wastes, etc.
   C. Sampling tips:

      1) “Liquids” - Agitate manure before sampling or take samples from several locations.
      2) “Solid” - Take samples from several locations.
      3) Use plastic container with a screw-on lid or plastic bag, and seal tightly and freeze immediately.

3. Fertilizer Value of Manure

   A. Affected by a method of collection & storage, time & method of application, nitrification & soil characteristics.
   B. Nitrogen losses:

      1) A major loss occurs when manure is exposed to sun, wind and rain.
      2) A long-term storage can strip out N.
      3) Leaching & denitrification (ammonium N to nitrate by bacteria - leaching N & conversion of N into N-gas).

   C. Phosphorus & potassium:

      1) P & K are fairly stable, but runoff & leaching can result in 20-50% loss.
      2) As much as 80% of P in the lagoon can settle into the bottom, may never be applied to the field. (Need to agitate lagoons before application!)

4. Feeding Value of Swine Waste?

   A. Results of some experiments:

      1) Feeding 15% of dietary DM as dried swine waste had no adverse effect on growth performance of grower-finisher pigs. [Diggs et al., 1965. JAS 24:291 (Abstr.)]
      2) Feeding 22% of dietary DM as dried swine waste - weight gain by 39% and efficiency by 55% in grower-finisher pigs. (Orr, 1974. Ph.D. Dissertation. MSU)
      3) A gilt/sow study (Kornegay et al., 1977. JAS 44:608) indicated that wet swine waste (37% of dietary DM) can be utilized by gilts, and 15% ensiled waste had no adverse effect on gestating sows.
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B. Energy & protein digestibilities: (Van Dyke et al., 1986. JAS 63:1150)

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*Screened swine waste solids replaced 25, 50 or 86% of dietary ME.

<table>
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*CP from screened swine waste solids replaced 25 or 50% of dietary CP.

Swine waste an be used as a source of energy, but not as a source of protein!

WASTE MANAGEMENT SYSTEMS

1. Manure Removal Systems - Many options! (See PIH-63, 67 & 105)

A. Slatted floor:

1) Advantages - 1 below-floor storage volume & eliminates concerns over dunging patterns, can keep pigs clean & dry.
2) Disadvantages of “total slats” - Higher costs (slats & forms), need more careful environmental management (e.g., avoiding drafts), need more equipments to remove the manure (pump, wagon, etc.), need to handle a greater volume of water (e.g., in the flushing system), etc.

B. Scraper systems:

1) The use of scrapers in open gutters - Generally not recommended.
2) Should be placed in shallow (18-24”) slat-covered gutters.
3) Advantages include a frequent removal of manure from the pig area, and lower construction costs because of shallow pits.

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4) Disadvantages include costs of the initial investment & installation costs, maintenance costs of scraper systems & pumps & high daily operation costs.

C. Flushing systems:

1) Two types - “Open-gutter,” which can be used for finishing & gestation units, and “Under-slats,” which can be used for any unit.
2) Advantages: Can odors in buildings, convert older buildings easily, and reduce initial costs? (Need a larger lagoon & costs of under-slats flushing system could be very similar to constructing a deep pit, so ...?)
3) Disadvantages:
   a) Possibility of a disease transmission in the open-gutter system.
   b) Higher relative humidity - Need higher ventilation rate during the cold weather?
   c) Subject to mechanical problems (. . . tanks, pumps, etc.).
   d) Require a relatively large land area for the storage of used water.
   e) Must have a sufficient water supply.

4) Re-cycling flush water?
   a) Generally not recommended because of a risk of disease transmission, especially with the open-gutter system!
   b) Decided to use? - Use only water from the third cell of a 3-cell lagoon system.

5) Possible drug contamination (with the open-gutter system)?
   a) A potential exists, but no confirmed case has been reported.
   b) Options? - Provide a “slat-covered” gutter for several finishing pens that can be used 2-3 wk before marketing, and separate flushing systems for growing & finishing, even though it would be costly!

D. Pull-plug system - Becoming very popular for all phases of swine production!

1) A shallow (18-20” deep), slat-covered gutter with a plug.
2) Pull a plug every 5-10 days (manure/water into the storage facility or lagoon).
3) Can be beneficial in controlling solids buildup!


A. Introduction:

1) The primary reason for the interest/1° attraction? - A reduction of strong, objectionable odor in the swine building!
2) Being tried in the Netherlands & Japan - Both countries have a high population density, related have very tough restrictions on the waste management!

[For instance in the Netherlands, all pig manure must go into a capped tank, lagoons are not permitted (possibly because of the cost & water table?), liquid slurry must be knifed in or plowed under on the same day.]
3) May be a viable alternative in some situations such as living close to “non-farming” neighbors, a town has grown-out to the operation, and well-being of own family?

B. What is it?

1) Essentially a deep-litter system - Can be used for pigs after they are weaned, and needs a building designed specially for the system.
2) Pigs are raised on a 28-32” bed of organic materials:
   a) Must design accordingly so that materials can be stirred vertically & horizontally.
   b) Wood chips, coarsely ground corncobs, sawdust, etc. or a combination of organic materials can be used as a bedding material.
3) Organic matters are treated with a special enzyme/bacteria compound, which can facilitate an anaerobic decomposition of bedding & manure!
4) Each week, a top 12” of entire pen must be turned over, mixed & sprayed with a compound.
5) Add organic materials to maintain the depth as bedding decomposes & becomes more compacted.
6) The fermentation process can removes ammonia & eliminates odors, and can generates “heat, which can be beneficial for pigs during the winter months!
7) Manure & bedding are removed from the unit every 18 months or so, and can be sold as compost for gardening, etc.

C. Advantages?

1) No need for a closed tank or storing manure all winter, and only have to haul manure once a year or every two years.
2) Simplicity - Almost nothing can go wrong, i.e., no motors, slurry, slats, etc.
3) Can save heating costs.
4) Allowing pigs to live in a more “natural” environment, which might be important in terms of animal welfare!
5) May reduce respiratory problems? - “Moisture” in the bed can settle dust & pigs may be able to tolerate lower temperatures & higher ventilation rates because of warmer bed temperatures.

HANDLING OF DEAD PIGS


1. Introduction

A. No matter how well producers manage the swine operation, pigs die!
B. Iowa swine producers alone must dispose 26 million lb of dead pigs each year.
C. Improper disposal can pose disease, pollution and nuisance problems.
D. A task of disposing dead pigs is becoming more complicated every day!
E. Every state has the law regarding dead animal disposal.

2. Options

A. Rendering:
1) According to the estimate by the National Renders Association, the rendering industry handles 3.6 billion lb of dead animals (all species)/year.
2) Renders recycles carcasses into products such as meat & bone meal, meat meal, animal fat, paints and plastics - Often their services are free, but they’ve started charging a fee in recent years, and also they’ve became more selective in what they pick up.
3) Accessibility can be a problem for many producers (i.e., location, and also may or may not have enough quantity for a render to make a trip?).

B. Burial - Probably the most convenient way, but potential problems include water contamination/pollution, frozen ground during the winter months, predators, and possible disease problems.
C. Landfills - Many landfills issue a permit to bury dead animals, but that doesn't mean they'll take them! (A decision is up to the local landfill authorities.)
D. Burning (incineration) - Probably the best method in terms of disease prevention & elimination, but possible problems include environmental concerns (i.e., air pollution) & energy costs.
E. Composting:
   a) Use straw or other materials to absorb moisture.
   b) Microbes break wastes down, and the heat generated in the process can help destroy possible pathogens. (Can remain at 130-140°F during the winter!)
   c) Can be applied to the field by a manure spreader.

3. Regulations
A. The time allowed for disposal ranges from 12 h in Georgia to 36 h in Nebraska, and 24 h is common among many states.
B. Possible penalty:
   1) In most states, violations are misdemeanors, but they are felonies in Indiana.
   2) $100 to 500 fines are common, but can be $25,000 in Indiana.
C. “Restrictions” are very specific in some states, but very broad in other states:
   1) Incineration - Must comply with the standards (e.g., ones established by the EPA) in many states.
   2) Burial:
      a) Must be at least 3 to 4 ft deep, but no more than 6 to 8 ft deep.
      b) Must be covered with at least 6 in of earth immediately (Illinois & Iowa), and finally must be covered with 30 in (Iowa & Missouri) to 4 ft (Indiana) of earth.
      c) Some restrictions on the site, i.e., specific distances from the well, property line, existing neighboring residence, surface water, etc., and the number and(or) weight of dead pigs.