

Waste Management FACTSHEET



BRITISH
COLUMBIA

Ministry of Agriculture and Food

Order No. 381.600-3

Agdex: 440/721

May 1982

SWINE WASTE MANAGEMENT SYSTEMS

In many instances, a pork producer chooses a particular confinement system because of the waste management method used. A sensible system to collect, store and dispose of swine waste is an important component of the total management of a swine production unit.

FACTORS TO CONSIDER

Some of the factors a producer needs to consider in selecting a waste management system includes:

1. Legal restraints such as zoning ordinances.
2. Size and location of the swine operation.
3. Operator preference.
4. Investment and operating cost.
5. Labour requirements and availability.
6. Level of management required.
7. Existing equipment and facilities.
8. Future expansion.
9. Odour potential.
10. Fertilizer value of the collected waste.

The importance of each of these factors will vary with different locations in the province, however, each should be given careful consideration.

OPTIONS AVAILABLE

There are several swine waste management options available to the swine producer. There is no "one best" system and often the best system for a particular producer is a combination of several of the systems to be discussed. Keep in mind, however,

in "tailor making" a system that it is important to consider the advantages and disadvantages of each system. The options available include:

1. Total slotted floor with deep pit storage.
2. Partial slotted floor with:
 - a) deep pit storage.
 - b) shallow pit and separate manure storage.
3. Flush gutter with separate manure storage and/or treatment tank.
 - a) under slats
 - b) open channel
4. Open front shed with outside runs and separate manure storage.

TOTALLY SLOTTED FLOOR WITH DEEP PIT STORAGE

In this system, waste is collected in a large reinforced concrete storage pit beneath a totally slotted floor in the confinement building. The manure pit is generally from 1.2 to 1.8 meters (4 to 6 ft) deep in order to provide a storage capacity of 3 to 6 months. The liquid manure can be removed from the pit with a liquid vacuum tanker and spread on the land.

Advantages

Low management and labour requirement. Low operating cost. High retention of fertilizer nutrients in waste. Clean pigs.

Disadvantages

Odorous environment. High investment cost. Potential sludge accumulation and difficult removal.

Management Required

Sludge build-up in manure pits beneath slotted floors reduces the retention time of waste storage. Sludge build-up is caused by inadequate agitation during waste removal, skimming the liquid from the top of a manure pit, failure to completely empty the manure pit and excessive feed spillage.

Place porthole openings every 6 m (20 ft) along the side of the building or pit and remove waste from each when emptying. Maintain adjustment of feeders to minimize feed wastage and spillage into pits. Leaky waterers will also reduce the detention time of manure storage. Therefore, choose a waterer that minimizes water wastage, and after proper installation, perform periodic maintenance.

Use extreme caution when agitating an anaerobic manure pit. Gases may be liberated from the manure in quantities lethal to humans and pigs. The ventilation system must be designed to remove these gases.

Under floor pit ventilation has helped considerably in reducing the odour problem in enclosed confinement buildings with manure pit storage. If using under floor ventilation, be sure to provide sufficient depth in the pit for the ventilation system to function properly throughout the building. Electrical failures resulting in no ventilation may cause lethal conditions. Consider a stand-by generator to allow ventilation during electrical failures.

PARTIALLY SLOTTED FLOOR WITH DEEP PIT WASTE STORAGE

This system is similar to the totally slotted floor with deep pit storage except 1/3 to 1/2 of the floor is slotted over the waste storage. The manure pit is generally from 1.8 to 2 m (6 to 8 ft) deep, giving a storage capacity of 2 to 4 months. Liquid manure disposal is similar to the method used for a totally slotted floor – deep pit storage.

Advantages

Less investment cost for the building floor and waste storage. Low labour and management requirement. Low operating cost. Adaptable to renovated or existing buildings. High retention of fertilizer nutrients in waste.

Disadvantages

Odorous environment in enclosed building. Limited waste storage. Potential sludge accumulation and difficult removal. Pigs may be dirty. Pens may need occasional scraping.

Management Required

In general, management required for this system is similar to the totally slotted floor with deep pit waste storage.

Several management and construction techniques are being used to “toilet train” pigs to minimize the problem of dirty pens and pigs. For more information see Factsheet No. 381.610-1 “Developing Good Dunning Habits of Swine on Partially Slotted Floors”.

PARTIALLY SLOTTED FLOOR WITH SHALLOW PIT WASTE STORAGE

This system is similar to the partially slotted floor with deep pit storage mentioned previously, except that only 1/4 to 1/3 of the floor is slotted over a shallow 600 to 900 mm (2 to 3 ft) collection pit. Gravity or alley scrapers can be used to transport waste from the building to an outside storage facility.

Advantages

Less investment cost for the building floor and waste storage. Low management and labour requirement. Low operating cost. Adaptable to renovated or existing buildings.

Disadvantages

Odorous environment in an enclosed building. Additional storage for manure is needed. Potential sludge accumulation and difficult removal. Pigs may be dirty. Pens may need occasional scraping.

Management Required

See discussion of partially slotted floor – deep pit storage.

UNDER-SLATS FLUSHING GUTTER SYSTEM

The recirculating flushing gutter systems consist of a recirculation pump, flush tank, shallow concrete channel and a separate manure storage facility. Generally, aerobic liquid from the storage is pumped to a holding tank which periodically flushes a large amount of water 450 to 1400 litres (100 to 200 gallons) into the channel in a short time (10 to 30 seconds) to move the waste out of the building. Alternatively, a high volume pump can be used to flush the gutter.

The under slat gutter is generally about 250 mm to 500 mm (10 to 20 inches) deep. The width of the gutter is between 600 and 900 mm (2 and 3 ft). Gutters with varying slopes and widths are often used.

Advantages

Odour control within building. Reduced construction costs. Low labour requirement. Adaptable to renovated or existing buildings.

Disadvantages

Increased management required. Must maintain and keep pumps and flush tanks operating. Low fertilizer value of waste.

Management Required

Research has shown that a magnesium-ammonium-phosphate precipitate can form in pumps and pipe lines when using liquid from the manure storage for flushing. This causes eventual clogging of the flushing system. Any metal pipe lines are not acceptable since the precipitated salts build up rapidly. To minimize this problem, it is recommended that PVC pipe lines be used.

In addition, providing a means of flushing the recirculation lines with 1:50 solution of glacial acetic acid will dissolve any precipitate build-up. The problem of salt build-up can be prevented by providing adequate dilution water in the recycling flush water.

As mentioned before, pigs on partial slotted floors may need “toilet training”. For more information see Factsheet No. 381.610-1 “Developing Good Dunging Habits of Swine on Partially Slotted Floors”.

OPEN CHANNEL FLUSHING GUTTER SYSTEM

This system is similar to the flush gutter system under slats discussed previously except the flush gutter is generally 20 to 100 mm (3 to 4 inches) deep and there are no slats.

Advantages

Odour control within building. Reduced construction costs. Low labour required. Adaptable to renovated or existing buildings.

Disadvantages

Increased management required. Must maintain and keep pumps and flush tanks operating. Potential disease transmission. Low fertilizer value of waste.

Management Required

See discussion of flush gutter system – under slats.

FLUSH – FULL AERATION OF STORAGE TANK

The full aeration of storage tank consists of a storage tank large enough to hold 4 months’ manure and an aerator to bring the dissolved oxygen level of the manure to over 1 ppm. To control odour for a 100 sow farrow-to-finish operation, a 11 kw (15 hp) high-speed surface aerator would be required for the critical summer months.

Advantages

Low labour required.

Disadvantages

Extremely high operating costs. Low fertilizer value of waste. Loss of some of the storage volume of the manure storage tank. Medium management required.

Management Required

Experience has shown that the best material for flushing is near the surface of the storage tank. This requires the flush pump be kept near the surface as the tank fills with manure.

In addition, the manure tank should be emptied late in the spring so that there is the least manure in the storage tank during the summer months. After emptying the storage tank it should be filled with water to a level that allows the aerator to be operated.

The potential of an odour problem exists if the system is run with too small an aerator.

FLUSH – SEPARATE TREATMENT TANK AND STORAGE TANK

This system consists of a separate tank to treat the liquid that is used to flush the gutters. This is a new system being tried in BC and is showing some promising results.

Advantages

Less costly than full storage tank aeration. Does not interfere with the management of the manure storage tank. Possibility that the stored manure will have a higher fertilizer value.

Disadvantages

This system requires moderate to high management levels. Potential sludge accumulations and difficult removal in the manure storage tank.

Management Required

See discussion of totally slatted floor sludge removal.

OPEN FRONT SHED

This system consists of open shelter swine housing with 0.4 to 0.5 m² (4 to 5 ft²) per head under roof and an open sloping concrete lot of about 1.4 m² (15 ft²) per head. Manure is handled as a solid. Contaminated liquid runoff from the open feedlot must be controlled.

Generally, conventional solid manure handling equipment such as tractor scrapers, manure loaders and spreaders are used to remove manure from the building and open lot and spread it on the land. Runoff can be controlled by using a combination of settling basins with detention ponds. Depending upon the design, settling basins can be cleaned using solid or liquid handling equipment.

Advantages

Low investment cost. Ease of construction. Can use existing conventional solid manure handling equipment.

Disadvantages

Labour requirement moderate to high. Bedding and/or heat may be required. Pigs may be dirty. Periodic scraping of lot. Must control feedlot runoff.

Management Required

Open shed housing has been used successfully for some time, and much management information has been reported on this subject. A new concern for this type of housing and feedlot system is the need to control all contaminated feedlot runoff.

SUMMARY

Several waste management options are available for the confinement swine producer. This paper discusses the advantages and disadvantages of several of the more common systems. Producers are encouraged to visit farms with examples of the system they are considering. Design information is also available from BC Ministry of Agriculture, Food and Fisheries extension specialists, and company representatives.

The personal preference of the operator is the most important factor to keep in mind in selecting a system since each system described will work successfully with proper management and design.

FOR FURTHER INFORMATION CONTACT

Rick Van Kleeck, Waste Management Engineer
Phone: (604) 556-3108
Email: Rick.Vankleeck@gems3.gov.bc.ca

RESOURCE MANAGEMENT BRANCH

Ministry of Agriculture and Food
1767 Angus Campbell Rd.
Abbotsford, BC CANADA V3G 2M3