

Controlling Odors from Swine Operations

Author:
Alan Sutton, Purdue University

Reviewers:
Eric van Heugten, North Carolina State University
Don Jones, Purdue University

What Causes Odors?

Odors from swine operations can come from live animals, manure, dead animals and spoiled feed. The odors emitted are from the anaerobic breakdown of organic matter and proteins from these sources.

General Approaches for Control:

- Control the source and precursors of odors
- Reduce or inhibit emissions
- Dilute odors
- Use biological or chemical remediation

Specific Odor Control Practices

Diet Formulation

- Reduce excess proteins in the diet and reduce typical protein sources (generally soybean meal). Use synthetic amino acids to establish optimal available amino acid ratios and levels in the diet. This should reduce ammonia emissions, pH of the manure and potential odor emissions. In addition, reduced hydrogen sulfide and other sulfur containing emissions will be reduced when excess sulfur containing amino acids are reduced.
- Reduce sulfated mineral sources in the trace minerals in the diet formulation to reduce hydrogen sulfide emissions.
- Utilizing proper ratios of carbohydrates to utilize protein efficiently. The addition of 5 to 10% fiber can help reduce ammonia emissions and may alter odors depending on type of fiber added to the diet.
- Addition of feed additives and diet formulation to acidify the diet can help to reduce odor emissions.

Building Considerations¹

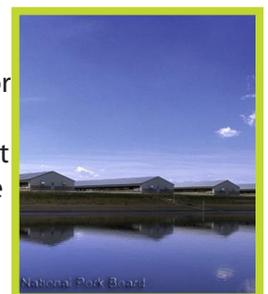
- Locate buildings and consider wind direction, atmospheric stability, terrain and air drainage, exposure angle and distance to neighbors to minimize nuisance odors.
- Type of ventilation system (natural, mechanical, pit, tunnel) will affect the emission of odors. Natural ventilation generally has a wider plume, whereas,

mechanical and tunnel ventilation generally has a narrower plume.

- Biofilters are effective in reducing odorants from exhaust air of buildings. The most efficient use is the treatment of pit ventilation exhaust air.
- Chimneys can aid in the distribution of air and dilution of odorants emitted from the building by elevating the plume of air higher in the atmosphere. This design is not commonly used in the US but is common in Europe.
- In deep bedded manure pack buildings, use sufficient bedding to absorb urine and keep the bedded surface dry. Control water leakage and wet spots in the bedded area.
- Shelterbelts or wind break walls downwind from buildings can deflect air flows up and dilute odor emissions.
- Minimize the surface area of the pit used to store manure to reduce the amount of odor emissions
- Methods to separate urine from feces after excretion will reduce ammonia emissions.

Manure Storages²

- Solid manure systems
 - Cover stacked non-treated manures with bedding, tarps or plastic to minimize exposure to rainfall or air movement.
 - Compost solid manure to reduce odors and preserve nutrients; proper composting practices require the correct moisture levels, periodic turning (oxygen incorporation), temperature monitoring and ensuring the correct nitrogen to carbon ratios.
- Liquid manure systems
 - Anaerobic treatment with digesters is effective for odor control of liquid slurries; consider costs, management requirements and use of the methane/electricity produced for its feasibility on your operation.



- Anaerobic treatment with lagoons can be effective for odor control. Dilute effluent; dilution water level, loading rate of the manure and application of effluent are critical. There may be siting and regulatory restrictions of lagoons in some areas.
- Aeration systems can be used to treat manure slurries and dilute manures but they are expensive and require a significant energy demand.
- Permeable or impermeable covers on outside manure storages are effective in controlling odors.
- Additives such as enzymes, bacteria, chemical agents and masking agents have not been very effective in consistently controlling odors. If you decide to try an additive on your farm, request a free sample to test and evaluate on your farm with no obligation to the vendor.
- Shelterbelts or wind break walls downwind from open manure storages can deflect air flows and dilute odor emissions.

Land Application³

- Direct incorporation or immediate incorporation of surface spread manures beneath the soil surface when applying manure is one of the most effective methods of reducing odor during land application.
- Agitate manure on sunny days and early in the morning when air flows tend to be upward to dilute odors. Beware of neighboring residences downwind from the agitation point to minimize the potential impact.
- If irrigating, use low trajectory irrigation systems with large droplet size.
- Minimize spillage of manure on end rows; incorporate in the soil immediately after application.
- Do not apply manure during weekends, holidays or when neighbors are planning special activities at their residences.



Mortality disposal

- Check for animal mortalities daily and remove from the building.
- Use recommended disposal methods as soon as possible.
 - Incineration for small pigs
 - Composting for all size of animals
 - Burial for all size animals (if approved by your state regulations)
 - Rendering for large animals
 - Opportunities for rendering large animals may

not exist or may be very limited

- Provide refrigeration or some means of temporary preservation if a rendering service cannot reach the farm within 24 hours

Spoiled feed

Remove spoiled feed and surface apply to available cropland. Incorporate the spoiled feed into the soil to minimize odors and pests.

The Bottom Line

Look for potential odor sources on your pork operation and use best management practices to minimize odor emissions. See more about odor mitigation practices at the Checkoff-funded Air Management Practices Tool⁴. Keep in mind “good housekeeping practices” on your farm. Public perception of your operation is important therefore, maintain an attractive farmstead. In addition, practice “good neighbor” principles to enhance public relations and communications. Let your neighbors know when you plan to apply manure to fields and make sure it does not conflict with activities at their residence.

For more information, please search for the following resources in PIG:

PIG Factsheets :

- Evaluating Proposed Swine Operations for Potential Odor Conflict
- Composting Swine Mortality
- Managing Nutrient Excretion and Odor in Pork Production through Nutrition
- Swine Manure Storage and Handling Practices to Minimize Odors
- Swine Manure Land Application Practices to Minimize Odors
- Siting and Building Design Considerations to Reduce Odor Potential from Swine Facilities

References:

1. Harmon, J. & Hoff, S. Siting and Building Considerations to Reduce Odor Potential from Swine Facilities. Pork Information Gateway; 2009.
2. Burns, r. Swine Manure Storage and Handling Practices to Minimize Odors. Pork Information Gateway; 2009.
3. Burns, R. Swine Manure Land Application Practices to Minimize Odors. Pork Information Gateway; 2009.
4. Air Management Practices Tool: <http://www.extension.iastate.edu/airquality/practices/homepage.html>