Classification of Effective Odor Mitigation Techniques

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Odor Mitigation Methods Classified as Effective

The following table gives information on various methods of odor control which are viewed as effective. This is not intended as an endorsement. It is felt that each site has unique challenges and a "one size fits all" philosophy is not appropriate. Techniques are grouped by odor source.

ODORS ORIGINATING FROM HOUSING				
Method	Description	Limitations	Primary Benefits	Relative Costs
Siting	• Selection of the proper site before construction, considering winds and neighbor locations.	• Terrain effects are difficult to model.	• Difficult to quantify but viewed as the most effective strategy.	• Cost effective • May lead to some sites being unusable
Biofiltration	• Biomaterials used to filter ventilation air. • Filtration of air during stable conditions is most effective.	• Only effective for fan ventilation. • Must be designed to minimize impact on ventilation. • Moisture maintenance very important. • Can have a large footprint.	• 60% odor reduction • 60% NH3 reduction • 60% H2S reduction • PM reduction	• Installation on existing fans: $9 per pig space • Operational cost: $0.45/pig produced
Vegetative Environmental Buffer	• Rows of trees and shrubs • Filters, disrupts air patterns and acts as a visual barrier	• Time to become fully effective. • Must be placed to minimize impact on natural ventilation. • Can use a large amount of land. • Effectiveness is very site-specific, yet could increase with time as vegetation grows	• 6 to 13% odor reduction (poultry) • Up to 15% (swine) • Visual barrier • PM reduction • NH3 reduction	• Large range – $0.03 to $0.33 per pig produced over 20 years
Diet Manipulation (swine)	Various approaches for swine including: • Crystalline amino acids used with a reduction in the dietary crude protein;	• Varies with cost of feedstuffs • Limited research is available	• Up to 30% reduction in odors when methods used in combination. • May improve hedonic tone of odors.	• Varies with feed ingredient costs. May be no added cost with some strategies.

	• Minimizing feed wastage; • Reduction of bloodmeal use in excess of animal need.		• 30 – 50% NH3 & H2S reduction	

ODORS ORIGINATING FROM STORAGE				
Method	Description	Limitations	Primary Benefits	Relative Costs
Permeable Covers	• Manure storage surface is covered with material that lets some air exchange but prevents wind from blowing across the surface • Material forms a biofilter on the surface to reduce odor • Materials include: straw, floating LECA rock, and geotextile fabric and geotextile fabric covered with straw	• Biological materials sink eventually and need to be replenished. Straw covers are effective for 2 – 6 months. • May cause some pumping problems • Materials that must be distributed across a surface (straw and LECA) impractical on very large storage (> 5 acres).	• 4" straw - 40%, 6" Straw - 60%, 12 inch straw 90% odor reduction respectively. • LECA Rock – 90% odor reduction • Geotextile – 50% odor reduction • Geotextile w/straw – 60% odor reduction • NH3 reduction • H2S reduction	• Straw – $\$0.10/ft^2$ (< 1 year) • LECA – $\$1.5/ ft^2$ (10 + years) • Geotextile – $\$0.25/ ft^2$ (3 to 5 years) • Geotextile w/Straw – $\$0.35/ft^2$
Impermeable covers	• High density polyethylene (HDPE), ethylene propylene diene monomer rubber (EPDM) materials traps gases, odors and dusts.	• Snow, wind effects • Life up to 20 years • Manure agitation and removal is more difficult.	• Depends on leakage from cover. With proper installation 90 + % odor reduction. Odor reduction will be much less if cover has significant leakage.	• $\$2.50 / ft^2$ for HDPE * * Cost per ft^2 will be higher for small area installations and lower for very large area installations.
Vegetative Environmental Buffer	• see Building Section			

ODORS ORIGINATING FROM LAND APPLICATION				
Method	Description	Limitations	Primary Benefits	Relative Costs
Injection	• Injection of manure during application either with an umbilical system or tanker with injectors	• The use of no-till injection tool-bars may be advisable on highly erodible land to reduce residue disturbance. • Requires more tractor horsepower compared to broadcasting manure.	• Odor reduction may be > 90% • Injection tool-bars can be retrofitted to existing manure tanks.	• Capital investment of injection equipment (injection tool-bar and hose reel. • While most custom manure applicators are currently charging the same price for injection and manure broadcast, producers who move from broadcast to injection systems can expect additional operating costs of ~$0.004/gal applied.
Timing	• Avoiding holidays, weekends and neighbors events	• Not always able to plan ahead	• Maintenance of neighbor relations	• NA