

Dairy odors don't need to be repulsive

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Odors used to be considered simply part of farming, but with increasing intensity of animal agriculture and increasing population of formerly rural areas, odor is becoming a serious point of contention between farmers and their neighbors. Eliminating odors from animal agriculture is essentially impossible. Frequency and duration of odor are the two properties that drive nuisance complaints, so the relevant questions become how much odor is too much, and how can we maintain odor below that threshold?

Odors are volatile compounds generated during the anaerobic decomposition of organic matter. Odor generation varies with type of animal, ration fed, manure moisture, and type and duration of manure storage. Odor control methods include prevention of odorous compound generation, dilution of these compounds below threshold levels, or treatment of air or manure to reduce offensiveness of odors. The two strategies with the greatest impact on potential odor problems, however, are neighbor relations, and site selection.

Tolerance of odor is driven at least as much by public relations and goodwill as by actual presence and intensity of odorous compounds. Perception of odor is individual, and is influenced by personal preference, experience, and associations. Odors from manure spread on the field next door are less offensive to the neighbor who was consulted about the timing of spreading than to the one having a family picnic on the 4th of July. Odors are less offensive to neighbors who are invited to the farm for an open house each year, or to neighbors who have access to free manure solids for their gardens or free sweet corn each summer, or to those who have their driveway plowed after snowstorms. Also, a clean, well-maintained, and well-landscaped farm generates fewer odor complaints than a weed-covered, debris-laden facility. The importance of maintaining good public relations in reducing the perception of farm odors as a problem cannot be overstated.

Appropriate site selection can be a very effective odor control technique. A location far from neighbors and upwind of densely populated areas will greatly reduce odor complaints. Orienting new buildings to minimize surface area facing towards neighbors or a nearby town reduces the size of the odor plume that travels in their direction.

The potential for odor problems is already a driving factor in site selection for new facilities, and will only become more important in the future. Unfortunately, site selection is of little use to producers with existing facilities in built-up areas. For these producers, management practices may help reduce the generation of odors.

Controlling odors from buildings

Frequent removal of manure reduces odors relative to letting it accumulate in barns. Flushing systems in free stall barns more completely remove urine and feces and reduce odor generation within housing areas compared to scraping systems. Slatted floors are least desirable

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in terms of odor generation due to the incomplete anaerobic decomposition that takes place within the pit.

Research on innovative odor control techniques indicates that the least expensive method for effectively removing odor from air is the biofilter. With a biofilter, air leaving the building is forced through a bed of peat moss, compost, wood chips, or other absorptive material. Biofilters reduce odor emissions by up to 95%, but require forced-air ventilation systems. This type of odor treatment system is currently being evaluated and further developed on a number of swine farms in this country.

Controlling odors during storage

Management of manure storage also affects odor emission. Dairy manure stored as slurry generally develops a floating crust from the fiber present in the feces, and with this crust, odors during storage are not often a problem. When a crust does not form spontaneously, adding chopped straw or peat moss (2.5-5 lbs/ft²) encourages crust formation. Covered manure storages generate fewer odors than uncovered storage. Bottom-loading manure storage tanks or pits generate fewer odors than top-loading systems, because in top-loading systems the surface crust is disrupted continuously.

Separation of liquids and solids can help reduce odors, because drier material generates less odor than wet material. Composting these solids results in a stable end-product with decreased volume and odor, but the process is not odor-free. In the initial stages, composting systems generate heat, and substantial odors may be produced, especially if the mix contains too much nitrogen or is too wet. Adequate mixing and aeration helps minimize odor formation during composting.

Aeration systems are worth discussing because of their potential to reduce odor. When liquid waste is sufficiently aerated, organic compounds are degraded to water, carbon dioxide, and other simple compounds, and the generation of many compounds linked to offensive odors is avoided. Solids separation prior to treatment increases effectiveness. Aerobic lagoons require a large surface area, typically one acre per 100 cows at 7 feet deep. Alternatively, continuous or batch aeration systems aerate slurry in a treatment tank. The main barrier to adoption of aeration on livestock farms is the cost of the power needed to drive the aeration device, pumps, and mixers.

Controlling odors during land application

Odor most often becomes a problem on dairy farms during spreading. Odor compounds trapped by the floating crust during storage are released when slurry is mixed and spread. Careful timing of spreading can reduce both the actual odor production and the perception of odor as a nuisance. Odor intensity and perception are least when manure is spread on cool days, breezy days, sunny days, and in the morning. Cold weather inhibits the formation and emission of odors.

Manure applied early in the morning (i.e. at dawn) emits less ammonia, and the odors released will move upward as the ground warms up, rather than across the ground. Also manure will dry more quickly when spread in the morning, reducing odor emission. Apply on breezy

days to speed drying and odor dissipation, but be sure the wind is blowing away from residential areas. Calm, humid days are least desirable.

Injection or immediate incorporation of slurry is an effective way to control odor during spreading, because soil is very effective at “scrubbing” air to remove odor. Another technique used to shorten the duration of odors is to aerate slurry for at least four hours before spreading. This works best if there is a strong wind in a direction away from close neighbors, and if aeration is done when few of those neighbors are likely to be home.

Other management approaches to reduce odor problems include avoiding spreading within 50 feet of roads and 200 feet of residences. These distances assume a breeze blowing away from roads and residences. If the breeze is blowing towards the populated area, a much larger buffer zone is needed. Also, a windbreak of 2 or 3 rows of trees can be very effective in reducing drifting of odors. Trees also serve to keep manure out of sight, and, hopefully, out of mind. Finally, reduced application rates speeds drying, reducing odor generation compared with heavy or uneven application.

Additives?

The use of various biological and chemical additives to reduce odors is often touted. Commercial odor control products fall into one of five categories: masking agents, counteractants, chemical deodorants, odor absorption compounds, and biological compounds. Unfortunately, none of these have proven to be consistently effective at reducing odor problems, and they are all expensive, but some may have potential in some situations.

Masking agents, compounds with odors stronger than, and hopefully more pleasant than manure may be the most consistently effective additives. Pine-Sol is one example. Use these sparingly, just before transport, and only when you expect a severe problem. Counteractants (compounds that block volatilization of odor compounds) and chemical deodorants (compounds that oxidize odor compounds and reduce bacterial populations) have varying effectiveness depending on which compounds are causing the odor problem. These additives can be dangerous, and very expensive in the volume necessary.

Biological compounds, enzymes or bacterial products to alter degradation pathways to reduce production of odorous compounds, are the additives most commonly marketed. Overall, these products have produced erratic and often disappointing results. The main factor limiting the effectiveness of these products is that odors are produced through many different pathways. One product will not work in all situations. Also, addition of a few gallons of new bacteria is unlikely to have a dramatic effect in a million-gallon system containing billions of bacteria.

Conclusions

Odor is increasingly seen as the primary environmental problem associated with animal agriculture. While odor concerns have focused on the swine industry in the past, relocation or growth of dairies where only small or few dairies have existed previously has increased public attention towards dairy farms. Local authorities in many areas are seeking increased control over new livestock operations, with potential odor problems nearly always cited as justification. Improved public relations for the industry as a whole, developing good relations with neighbors

on an individual basis, and well-planned site selection are the most effective approaches to reducing odor nuisance problems.

For existing facilities, management techniques offer the potential to reduce the emission of odorous compounds. Carefully planning time of spreading, immediate incorporation of waste, buffer zones and windbreaks all reduce odor problems. If you are considering using an additive to control odors, test the product in your facilities before purchasing large quantities. That an additive worked on the farm down the road is no guarantee that it will work for you, as the specific odor compounds causing problems are likely different.

Finally, innovative storage and treatment systems that are not typically used on dairy farms because of their expense may offer real opportunities for odor control. Time and changing legislation may lead the dairy industry to adopt these and other new approaches.