Controlling Odors from Confined Animals

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You probably have good reasons for wanting to minimize the offensive odors released from your confined animal operations. The operation and its surroundings are more pleasant for you as operator, for your family, and for visitors or neighbors. Frequently occurring odors can lead to complaints by neighbors. If you don’t provide relief voluntarily, you could face court litigation.

Neither Oregon nor federal regulations limit the amount of nontoxic odor that can be released to the atmosphere from an animal operation. Private regulation occurs indirectly through the nuisance law. Of common-law origin and similar in all states, the nuisance law is based on the right held by all landowners to be free from unreasonable interference with the enjoyment of their property.

Unreasonable interference with such enjoyment, as might be caused by offensive odors, is one kind of nuisance. However, Oregon’s “Right to Farm Law” protects livestock operations when they are using commonly accepted practices, even if some odors exist.

Recommendations for avoiding odor complaints

You can minimize the probability of complaints or court litigation because of odors from your livestock operation by taking these steps:

1. Locate new facilities in an area designated for agriculture in the land-use plan. Avoid sites adjacent to recreational, commercial, or residential areas. Land next to a public gathering place such as a school or church is unacceptable.
2. Provide an adequate distance between a confinement facility and points where the odor could offend others. The exact distance varies with each operation and is influenced by the level of management, number of animals, system design, topography, frequency of spreading, and wind conditions. Plan for this distance for odor dissipation in all directions from the odor source, not just in the prevailing wind direction.
3. Use manure management practices that minimize production and release of offensive odors. This is especially important if the separation distances are inadequate for normal odor dissipation by natural conditions.
4. Maintain a clean and orderly operation by taking these steps, you reduce or remove the odor source, not just in the prevailing wind direction.
5. Follow regulations concerning the operation and its surroundings are more pleasant for you as operator, for your family, and for visitors or neighbors. Frequently occurring odors can lead to complaints by neighbors. If you don’t provide relief voluntarily, you could face court litigation.

Principles for controlling odor from manure

These principles are relatively few and simple. For odor detection to occur, odorant compounds must be (a) formed, (b) released to the atmosphere, and (c) transported to the place of detection. When you prevent or inhibit any of these steps, you reduce or remove the odor problem.

Gases, some of which can be odorous, result from the natural biological decomposition of organic matter. Decomposition occurs in one or two basic ways. If oxygen is available, organisms will use it, and this process is aerobic decomposition. If there is no oxygen present, the process is anaerobic.

Systems that operate aerobically are odor-free. Anaerobic systems that are properly designed and managed can operate with an acceptable level of odor in a normal rural setting. Odor problems result when organically overloaded systems (through poor design or management) produce foul anaerobic gases.

A number of factors influence biological activity. Among the more important are moisture content, temperature, pH, and oxygen level. Odors can be reduced by aerobic manure, reducing the temperature by maintaining a high or low pH, and providing enough oxygen (aerobic conditions).

Moisture control inhibits bacterial activity

Moisture control commonly is used to inhibit bacterial activity. Maintain a manure-covered surface, such as in a lot or pen, in a relatively dry state (less than 40 percent moisture), and you will reduce biological activity. As the moisture content of manure increases, the pore space is filled with water, which reduces the oxygen available for organisms. When moisture content goes up, anaerobic decomposition usually results.

You can encourage aerobic decomposition of nonliquid manure by adding sufficient bedding or other relatively dry and porous organic material so that air...
(oxygen) permeates the manure and bedding: Moisture control and periodic turning or flushing are necessary to prevent compaction and resulting loss of the porosity necessary to permit air to pass through the mass of organic matter. This process is called aerobic composting.

Moisture control methods applicable to lots and pens without a roof include the following:

- Good lot-surface drainage
- Concrete surfacing of the lot
- Southern exposure to enhance evaporation and surface drying
- Maintenance of waterers to minimize overflow and spillage
- Diversion of runoff from adjacent land
- Gutters on building roofs

When animals are confined under a roof, rain is no problem, but moisture that the animals exhale requires attention. Ventilate animal confinement buildings to move moisture out of the building. You may need insulation and space heating to raise the air temperature (and, consequently, the moisture-carrying capacity of the exhausted air). Adequate insulation on the underside of the roof or ceiling will prevent moisture condensation, which may run down the side walls or drip onto the floor.

Other techniques to achieve a drier floor (and less moisture in the manure) include the following:

- Use of pea rock or a plastic sheet under a concrete floor to prevent upward movement of soil moisture
- Proper placement and maintenance of waterers to prevent spillage
- Installation of floor-heating equipment
- Legs or bedding under litter to absorb moisture

Manure management aids odor control.

Odor control within animal confinement facilities begins with frequent removal of manure from the pens. Clean animals result from pens with clean floors. Clean animals and floors cause less odor than manure-coated animals and floors. Daily or more frequent scraping of manure, bedding, slatted or other perforated floors, and manure-flushing systems are useful techniques.

Frequent application of manure to land reduces odors. Manure undergoes anaerobic decomposition during storage, and odorous gases are produced. Any manure that has undergone anaerobic decomposition during storage will release these gases when it is removed from storage and applied to the land surface.

Several techniques help minimize off-site odors—and the resulting complaints. These include dilution with irrigation water, soil incorporation during or immediately following land application, and selection of the most appropriate time and place for application.

To minimize opportunities for off-site odors, apply manure during periods when wind will not carry off odors toward the closer or more sensitive neighbors and when a temperature and humidity condition will encourage rapid drying of manure and rising air currents during the warmer period of the year. Off-site odor detection is greater hazard than warm weather than during cold weather.

Odor generation inhibits odor production.

Mechanical devices are commercially available that provide oxygen and maintain a partial or complete aerobic environment within liquid manure. This oxygen encourages aerobic organisms that do not produce odorous gases.

Types of aerated systems include oxidation ditches, fixed or floating surface aerators, and lagoons. Regardless of the system you use, the same principle applies—atmospheric air (oxygen) is mixed with the liquid manure to encourage aerobic bacterial activity and to discourage decomposition by anaerobic bacteria.

Chemicals to control, modify, or mask odors

You can control odor production, concentration, and quality by using various chemicals. A number of odor-control chemicals are widely available. There are three general categories: masking agents, odor counteractants, and enzymatic products. Little data exist concerning the effectiveness of most of these materials, and results are difficult to predict. Some have proved to be effective under special conditions; others have been disappointing. Since most of these chemicals are expensive, it’s wise to conduct a trial before purchasing a large quantity.

Masking agents have a stronger and (in theory) more pleasant odor than the one you want to mask. Use them intermittently and only when you expect severe odor problems. Otherwise, the masking agent odor could become as offensive as the odor from the manure.

Counteractants are formulated to chemically interact with odors to cancel or reduce their intensity. Because of the chemical complexity of manure odor, counteractants have had limited success in reducing odor.

Enzymatic products are designed to alter the biological pathways of manure decomposition. Limited data have erratic results. Additional research and development may reveal more extensive application of this technique.

Odor removal techniques

You can collect air exhausted from covered manure storage and animal confinement buildings and treat it to remove odorous gases. Check out the investment, maintenance, and operating costs for your situation to determine the practicality of these techniques.

Scrubbing the exhausted air through contact with water or a dilute solution of potassium permanganate is one approach. Another is to filter the air through activated carbon or through soil. You also can burn natural gas to eliminate odorous gases.

Limited laboratory and field trials indicate that some zeolites (natural or synthesized silicates used for water softening and as absorbents) have odor-absorption properties. This technique seems promising, but further testing is needed.