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Controlling Odors from Confined Animal Operations

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.

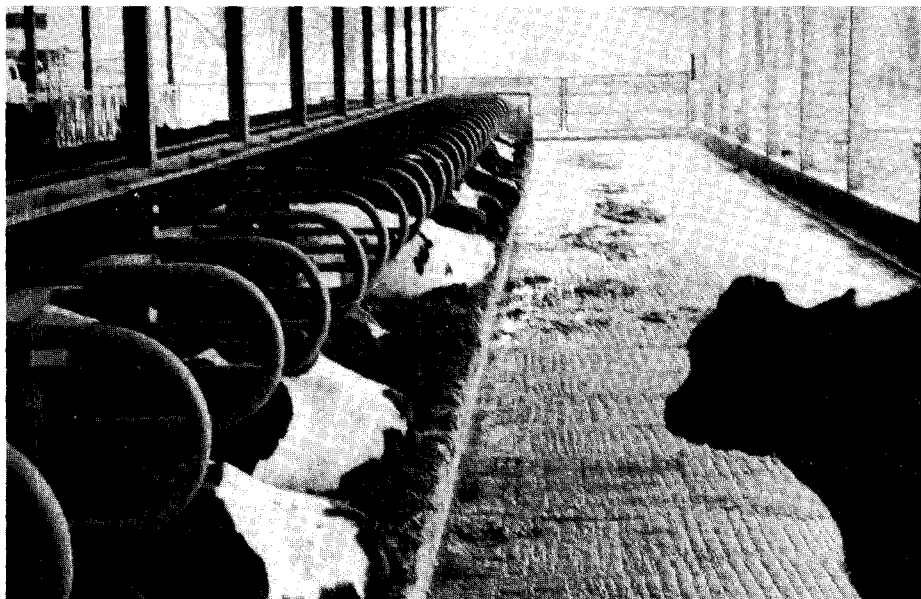
Neither Oregon nor federal regulations limit the amount of nontoxic odor that can be released to the atmosphere from an animal operation. Private regulation occurs indirectly through the nuisance law. Of common-law origin and similar in all states, the nuisance law is based on the right held by all landowners 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 new "Right to Farm Law" protects livestock operations when they are using commonly accepted practices, even if some odor exists.

Recommendations for avoiding odor complaints

You can minimize the probability of court litigation because of odors from your livestock or poultry 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 separation 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



Frequent cleaning removes manure from animals areas.

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 appearance around the confined animal operation. Screen or isolate from public view any unsightliness suggesting that the operation could be a source of odors, flies, or other possible nuisance. A row of trees not only serves as a screen but also causes upward wind deflection and turbulence for odor mixing and dilution with a greater air mass.
5. Follow regulations concerning the timely and proper disposal of dead animals.
6. In general, be a good neighbor.

Principles for controlling odor from manure

These are relatively few and direct. For odor detection to occur, odorous 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 in a normal rural setting. Odor problems result when organically overloaded systems (through poor design or management) produce foul anaerobic gases.



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

Moisture control inhibits bacteria activity

Moisture control is commonly 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% moisture), and you will reduce biological activity. As the moisture content of manure goes up, the pore space is filled with water; this 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 fluffing 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 roof include (a) good lot-surface drainage, (b) concrete surfacing of the lot, (c) southern exposure to enhance evaporation and surface drying, (d) maintenance of waterers to minimize overflow and spillage, (e) diversion of runoff from adjacent land, and (f) gutters on building roofs.

When animals are confined under 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 use of pea rock or a plastic sheet under a concrete floor to prevent upward movement of soil moisture, the proper placement and maintenance of waterers to prevent spillage, the installation of floor-heating equipment, and the use of bedding or litter to absorb moisture.

Manure management aids odor control

Odor control within an animal confinement facility starts with frequent removal of the manure from your animals. 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 various 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 transport odors toward the closer or more sensitive neighbors and when air temperature and humidity conditions will encourage rapid drying of manure and rising air currents during the warmer period of the year. Off-site odor detection is a greater hazard during warm weather than during cold weather.

Aeration 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 chem-

icals 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, conduct a trial before you purchase 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 it.

Enzymatic products are designed to alter the biological pathways of manure decomposition. Limited data have shown 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. The burning of natural gas can also be used 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.

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