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 and next to a public gathering place such as a school or church. A row of trees is a most excellent screen.

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 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.
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 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 roof include (a) good lot-surface drainage, (b) concrete surfacing of the lot, (c) southern exposure to enhance evaporation and surface dryness, (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 the animals exhale requires attention. Isolate animal confinement buildings to move moisture out of the building. You will need insulation and space heating to raise the air temperature (and, consequently, the moisture-carrying capacity) of the exhausted air. Adequate insulation of the underside of the roof or ceiling will prevent moisture condensation, which may run down the sidewalls or drip onto the floor.

Other techniques to create a drier floor (and lower 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 lighting equipment, and the use of clean 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 to oxidize the odoriferous gases. Types of aerated systems include open ditches, fixed or floating surface aerators, and lagoon covers. Regardless of the system you use, the principle applies—oxygen available for aerobic organisms.

Types of aerated systems include (a) open ditches, fixed or floating surface aerators, and lagoon covers. Regardless of the system you use, the principle applies—oxygen available for aerobic organisms.

**Odor-control techniques**

You can collect air exhausted from covered manure storage and animal confinement buildings and treat it to remove odor. 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 absorents) have odor-absorption properties. This technique seems promising, but further testing is needed.

**This publication was prepared by James A. Moore, Extension agricultural engineer, and Ted L. Willrich, professor emeritus, Agricultural Engineering Department, Oregon State University. Partial support was provided by Federal funds from the Oregon Department of Environmental Quality and the Soil and Water Conservation Commission for the Confined Animal Feeding Operations project, conducted by Agri-Check, Inc.**

Extension Service, Oregon State University, Corvallis, Henry A. Wadsworth, director. This publication was produced and distributed in furtherance of the Acts of Congress of May 18 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties.

Oregon State University Extension Service offers educational programs, activities, and materials without regard to race, color, national origin, or sex as required by Title VI of the Civil Rights Act of 1964 and Title IX of the Education Amendments of 1972. Oregon State University Extension Service is an Equal Opportunity Employer.