



GREAT PLAINS BEEF CATTLE FEEDING HANDBOOK

GPE-7800

Feedlot Odor

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Traditionally cattle have been fed in pens having earth floors and no overhead roof. Economics and technology has resulted in a concentration of cattle into large feedlots. However, the basic pen style has not been altered. The cattle feedlot has a slight odor. This odor may become intense on certain calm, humid, warm days just after a rain. Concentration of cattle into large feedlots also tends to concentrate the odor.

With the increased emphasis on the total environment, regulatory activities inspired by a few days of excessive odor might affect feedlots using the traditional pen style. The magnitude and ultimate form of these regulatory activities is difficult to determine. Odor is a subjective and emotional issue. Just the discussion of odor may encourage over-reaction by an urban public. The urban population may demand more enforcement by the regulatory agencies than is required or than can be provided with the present technology.

The economic value of feedlot odor control depends upon public concern and can not be easily determined. The majority of feedlots have felt little pressure to abandon the traditional pen style. Yet, odor has been the major complaint in private lawsuits against confined livestock operations.

Most cattlemen are concerned about odor control because they realize that odor does leave the confines of the feedlot, and, at present, there appears to be no economical method of positive control. Feedlots, forced to move by urban expansion may lose over 50% of their investment.

Most cattlemen are also aware that the intense odor conditions caused by rain occur a small percentage of the time throughout the year. They also know that the routine "housekeeping duties", i.e., cleaning bunks of old feed, maintaining a dry feedlot, and a systematic method of manure removal also results in some odor abatement. At present, odor abatement

from open feedlots is best accomplished by maintaining good standards of "housekeeping" and moisture management of the feedlot surface.

What Causes Odor?

The lack of oxygen causes feedlot odor. Cattle manure still contains energy for metabolism. Micro-organisms in the manure accomplish this metabolism. The metabolic process converts complex carbohydrates, proteins, and fats to simpler compounds. When oxygen is present, the end products of metabolism are heat, CO₂ and H₂O. This process is called aerobic metabolism.

The oxygen transfer rate into manure must exceed the demand to prevent odor. Micro-organisms consume oxygen in proportion to their growth rate. The growth rate depends upon the amount of nutrients. The usual nutrients in manure result in an oxygen demand greater than the transfer rate. When oxygen demand exceeds the transfer rate, anaerobic metabolism produces odor compounds.

Another odor produced in feedlots is ammonia (NH₃). Ammonia is lighter than air and has an irritating smell. Ammonia escapes as gas from urine. Ammonia is also water soluble and will be absorbed by moist manure. Therefore, during wet weather less ammonia escapes from the feedlot.

Where Does Odor Occur?

On a feedlot odor occurs in three places. Ammonia escapes from the dry surface of the feedlot. Complex odor compounds from anaerobic metabolism come from the solid manure beneath the surface of the feedlot. Odor compounds also occur in the holding ponds because of anaerobic metabolism.

What Are The Physical Effects of Odor?

The transfer of nitrogen in ammonia and in amines from anaerobic metabolism, can be large.

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These odors are a source of human irritation. Also the nitrogen may enrich the nearby ponds. The enrichment of surface water might hasten eutrophication of a lake or pond.

What Are The Best Methods for Odor Control?

Odor control actions should enhance aerobic metabolism on the feedlot surface, in the holding pond, and in the manure stockpile. Aerobic metabolism depends upon *temperature, oxygen, and moisture* (TOM). Some management of the last two factors may be possible. Dilution of the nutrients in the holding pond water will also reduce odor.

Effects of The Feedlot Surface

Cattle stir the surface of a feedlot constantly. If the moisture content is correct, the surface solids will have enough oxygen transfer to support aerobic metabolism. Then the complex compounds from beneath the surface will be metabolized before they reach the atmosphere. This situation can be observed on fair days during the summer. The loose surface manure will usually have less odor than the packed manure below the surface.

Thus, a well maintained feedlot surface will reduce odor transfer. Management practices that encourage aerobic conditions on the feedlot surface are desirable.

Moisture of the feedlot surface is a vital factor for aerobic metabolism. The moisture can be partially controlled by good drainage, cattle density and water.

The feedlot surface should be shaped to provide an overall slope between 2 to 4% so that all excess moisture will move out of the pen. Prevent sink holes where moisture stays. Any spot with excess moisture will turn anaerobic and cause odor.

Flat pens can be re-shaped with mounds when manure is removed. Some of the manure and soil can be used to build the mounds where desired. Mounds having a height of 4 feet above the drainage point of the pen are recommended. The mounds should have a broad crown to enable most of the cattle to lay down.

Unsurfaced pens require constant attention to maintain shape. Pens are best maintained by using grader equipment. A systematic method of grading the lots to maintain the desired shape is recommended. Tractor equipment using a rear mounted blade and a front end loader can be used to assist in clean-up of corners and around water fountains.

During wet weather, pen surfaces may require additional effort to provide firm dry footing. Sloppy manure should be bladed away from the mounds, bunks

and waterers. If the pens have been shaped correctly, this manure can be pushed into the lower portions of the pen with a blade.

Stalks, straw or other rough fibrous material might be added where firm footing is desired. Besides binding the manure pack together, the fibrous material helps aerobic metabolism by providing air passage ways.

Dry Weather Control

The moisture content of the feedlot surface can be controlled during dry weather by sprinkling. Either mobile equipment or a well designed sprinkler system may be used. Besides reducing the dust, sprinkling provides moisture for biodegradation of the manure aerobically. A 40% moisture content is required for the best aerobic bacteria activity. During dry seasons, daily sprinkling may be required. A surface moisture content between 25 to 30% is needed for good dust control. If no wet spots are formed by sprinkling it is possible to maintain this moisture level for both dust suppression and good aerobic conditions on the feedlot surface.

Management checks on the odor and dust control are possible. Dust and wet spots on feedlot surfaces can be seen. The moisture content of the feedlot surface can be determined by the oven drying procedure or similar moisture testing instruments.

Holding Ponds

Odor control for the holding ponds begins with removing solids from the runoff. This dilutes the nutrient concentration in the holding pond water. Odor from the holding pond can be further reduced by adding more water or using aeration equipment. More water dilutes the nutrients and provides more oxygen. Aeration of the surface of the pond will reduce the odors transferring into the air.

Manure Stockpile

There may be times when manure cleaned from the holding pens will have to be stockpiled prior to dispersal on farmland. When stockpiling is required, the solid manure from the pens should be piled in long narrow rows. Access lanes for trucks and earth moving equipment should be left between these rows. This stockpiling procedure will enable rapid control of fires caused by spontaneous combustion. Also, this stockpiling procedure is compatible with present day composting machines. Proper composting is an aerobic process and therefore may reduce the odor potential of the manure stockpile.

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