PRELIMINARY APPROACHES FOR PLACEMENT AND USE OF FLY ASH IN LIVESTOCK FACILITIES

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Background

Livestock producers in North Dakota and the region are seeking a low cost alternative to placing concrete in feedlots. The majority of the North Dakota's 12,000 beef producers and 800 dairy producers have at least some drylot areas subject to concentrated traffic by livestock. Earthen pens and laneways do not withstand this pressure, particularly when wet for any length of time such as during spring thaw. As the integrity of the pen or laneways surface breaks down, deep mud and poor drainage reduce animal performance and health (as indicated by poor weight gain), increase odor emissions, and prevent regular maintenance operations such as manure removal. Commonly, the soil/manure interface layer is damaged, resulting in deeper leaching of nutrients and an increased risk of groundwater pollution.

Keys to Success

The following are the cornerstones to the construction of a good feedlot surface with fly ash:

- Optimum soil type, clay or clay/loam, with minimal sand or gravel
- Uniform distribution of the fly ash within the soil blend
- Proper pulverization and thorough mixing of the fly ash with the material to be stabilized
- Adequate moisture content for maximum density and strength
- Final compaction within a time frame of approximately 2 hours

Steps for Placement and Use of Fly Ash in Livestock Facilities

Step 1 – Determine the Quantity of Fly Ash Required

A simple calculation of the site area and desired depth allow the user to determine the amount of fly ash needed.

Step 2 – Arrange for Ash Transport from the Power Plant

Participating power plants will provide contact and price information. Bottom-dump grain trucks were used effectively in the CREC demonstration for delivery and placement of the fly ash.

Step 3 – Site Preparation

The surface should be clean and soil loosened to an appropriate depth.

Step 4 – Placement at the Site

- Option 1: Spread the fly ash evenly over the loose soil in the desired location. Mix the fly ash and soil with a rototiller or disc, and compact the mixture to achieve the desired surface.
- Option 2: Mix soil and fly ash outside of livestock area in a windrow configuration preferably on a roadway. The soil–fly ash mixture can then be placed where needed with a loader bucket, box scraper, or other equipment and then compacted.

Step 5 – Postplacement

After placement and compaction, the stabilized surface should be maintained in a moist condition for approximately 5 days through periodic application of water. The site should not be used for an additional week to ensure peak performance of the surfaces.

Step 6 – Run-Off and Manure Management from Soil–Fly Ash Surfaces

Fly ash is intended for use in pens where animals are confined throughout the year. Run-off in containment ponds can be used for irrigation, and manure can be spread on cropland according to current nutrient management guidelines.

Fly Ash Placement and Use Considerations

Peak performance of soil/fly ash surfaces will be ensured by following the steps noted and careful attention to some additional considerations:

- Soil–fly ash blending and compaction will be most effective at moderate temperatures (50°F to 80°F). Based on field experience, it appears that cooler temperatures have an impact on soil blending and compaction characteristics of the mixture as well as on ash hydration. Effective stabilization of cohesive soils can be accomplished as long as the soil temperature is 0°C (32°F) or above and construction procedures (soil blending and compaction) are modified to achieve proper mixing and compaction of the stabilized surface.
- Fly ash is a light, fine, powdery substance, and it is best placed and blended with soil under low wind conditions. People working with fly ash should wear appropriate masks for breathing and eye protection to minimize irritation. Vehicles may require more frequent maintenance of air cleaners when working in a dusty environment.

Just recently, the North Dakota Department of Health has determined that fly ash can be used in livestock pens in North Dakota with two conditions. Feedlots must be approved and licensed according to current runoff containment and waste management guidelines and fly ash must be incorporated according to approved procedures.

Where to Find More Information

A more detailed publication with photos describing the mixing, placement, and packing process is being prepared for distribution through the North Dakota Extension Service.

Fly Ash Contacts:

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