Demonstration of Lignite Ash for Feedlot Surfaces -Project Update

S. Birchall

A new research project at the Carrington Research Extension Center is using coal combustion byproducts (CCBs) from power utilities in North Dakota and Minnesota in an attempt to improve feedlot conditions. Research from other states such as Texas, Iowa, Pennsylvania and Ohio suggests that CCBs can be used to form a stronger, more durable surface in feedlot pens than can be obtained using only the original soil.

This project has completed two types of surface improvement to date:

1. Soil stabilization of entire pen surfaces.
Soil stabilization is a means of improving the properties of the in-situ soil by adding fly ash.
Feedlot pens were prepared by loosening the soil with a chisel plow or set of discs. The pens were watered to raise the soil moisture content as high as possible without hindering trafficability prior to placing the ash on the feedlot surface. The fly ash was unloaded directly onto the feedlot surface using a belly-dump trailer and was spread out using a box scraper. The ash was incorporated into the soil using a set of discs or roto-tiller and then compacted immediately. Compaction was achieved using a rubber-tired roller or at least two passes with a tractor. The amount of fly ash used ranged from 17 to 35% by volume in the top six inches of the feedlot surface. The effect on soil compressive strength is shown in Table 1.

Table 1. Effects of stabilization with coal ash on soil strength.

Ash Source	Ash addition (by volume in top 6" of profile), and 28-day Compression Test Strength		
Coal Creek Station	17%	24%	34%
	-	284 psi	297 psi
Hoot Lake Station	19%	24%	33%
	179 psi	183 psi	183 psi
Stanton Station	18%	23%	35%
	296 psi	228 psi*	179 psi*

Note. The soil forming the surface of the control pens has a compressive strength of 50 to 66 psi at 9 to 12% moisture content.
*** Soil was dry of optimum for compaction.**

2. Fly ash-bottom ash mixtures for feed bunk and waterer aprons.
Because most fly ash in our region is cementitious, a mixture of fly ash and bottom ash will produce a concrete-like surface for heavy traffic areas of the feedlot such as aprons beside feedbunks and waterers.

The "flowable fill" placed in the bison research facility contained 2700 lb bottom ash, 300 lb of fly ash, 150 lb Portland cement, 10 lb of air entraining agent and 416 lb water and was mixed at the concrete batching plant prior to placement. No reinforcing was used.

At the time of printing, strength data and cost estimates were not available. However, the 28 day compressive strength of this material is expected to be approximately 1000 psi (as a comparison, concrete has a compressive strength of at least 3000 psi).

Placing the fly ash/bottom ash aprons at the bison research facility, CREC.