

Review of “Final Report for Demonstration of Coal Ash for Feedlot Surfaces” dated May 13, 2003

The North Dakota Department of Health (NDDH) has reviewed the above-referenced report prepared by the Energy & Environmental Research Center (EERC) and received on May 14, 2003. The EERC, working with four generators of coal combustion byproducts (Great River Energy’s Coal Creek Station near Underwood, North Dakota; Great River Energy’s Stanton Station near Stanton, North Dakota; Otter Tail Power Company’s Coyote Station near Beulah, North Dakota; and, Otter Tail Power Company’s Hoot Lake Station near Fergus Falls, Minnesota), is seeking approval to utilize coal combustion waste materials for stabilizing approved feedlot surfaces. This review addresses the report and makes recommendations for incorporation into the final user training materials that the EERC is to submit to the NDDH for review and approval.

Two issues need clarification. First, the report states that “fly ash alone and fly ash/soil mixtures have numerous characteristics which make it an environmentally benign material that will not contaminate local surface or groundwater or form a contaminated leachate” implying that the material is inert. The results of the study do not support this assertion. Fly ash and fly ash/flue gas desulfurization waste (FGD) mixtures are not inert waste or “benign materials.”

Secondly, the report states, “North Dakota requires permits for applications of fly ash for soil amendment.” The NDDH has no record of requiring permits for beneficial use. The NDDH has worked with a number of other generators of coal combustion waste and approved various uses that do not require permits. The NDDH has developed Guideline 11, “Ash Utilization for Soil Stabilization, Filler Materials, and Other Engineering Uses,” which explains our approval process for ash utilization. This guideline is available from the NDDH’s web site: <http://www.health.state.nd.us/ndhd/envIRON/wm/pdf/guide11.pdf>.

A more thorough review of the investigation protocol and the testing of the proposed soil stabilization materials, as well as bottom ash analysis, is attached (see Attachment 1, “Review of 100 Percent Leachate, 25 Percent Fly Ash/Soil Leachate and Carrington Research Extension Center Pond Runoff Data - “Demonstration of Coal Ash for Feedlot Surfaces,” North Dakota Department of Health, Division of Waste Management”).

Investigation Protocol

It appears the final report generally addresses most of the issues outlined in the above-referenced guideline; however, as with any scientific or engineering investigation, many variables must be considered. In this project some variables were not fully considered or were apparently outside the scope of the project.

For the field study and examination of runoff and manure data, no analysis was performed on the water, feeds or supplements given to the animals. This may have affected some of the results. Also, the study did not include an analysis of initial runoff water shortly after ash placement. The first runoff sampling and analysis were performed by the NDDH about a year after the initial ash placement. Unfortunately, this runoff analysis was not completed until after animals were placed in the pens, introducing a host of other variables in considering runoff chemistry.

In addition, most of the pens, including the “control pens” (which were not to have ash placed on them), had a flowable fill pad constructed near the feed bunks utilizing coal combustion products. This may have affected the runoff results.

Finally, no field testing was performed on one ash product, the Otter Tail Power Company - Coyote Station fly ash/FGD waste mixture.

Water Testing Results

Laboratory analyses (Synthetic Groundwater Leaching Procedure) were performed on the four waste products utilizing a 20:1 water to waste procedure. The analysis at intervals of 18 hours, 30 days and 60 days was a good approach and yielded interesting results.

The 100 percent leachate analysis results exceeded drinking water and/or surface water standards for some of the heavy metals tested. Twenty-five percent fly ash/soil mix results exceeded drinking water and/or surface water quality standards for some of the heavy metals tested. In contrast, leach testing results of the on-site soil did not exceed water quality standards for any of the heavy metals tested. The levels of sulfate in the Coyote Station fly ash/FGD waste leachate test are significantly higher than the results for the three fly ash materials, exceeding the recommended drinking water standard and the surface water standard for sulfate. The pH is elevated in both the 100 percent fly ash leach results and the 25 percent fly ash/soil mix results.

Generally, the pond runoff data shows lower concentrations than the 25 percent fly ash/soil leachate results except for the boron levels associated with the Stanton Station ash ponds. “Indicator” parameters, such as aluminum, boron and sulfate, commonly associated with coal combustion waste are at higher levels in the runoff from treated pens.

The NDDH does not find that these results support the statement that the material is “environmentally benign” or inert. The NDDH does recognize that it may have some beneficial uses in controlled situations at certain sites.

Groundwater Issues

Regarding groundwater issues, the NDDH and the EERC agreed that, given the construction, setting and soils, it could take years before infiltration from the pens or the surface water ponds could reach the monitoring wells. The study site had a compacted

clay liner and monitoring wells installed before the feedlot was approved. Because of the liner, setting and soils, the groundwater data did not show any evidence of groundwater impacts. It is not possible to state that no groundwater impacts could occur from this material; rather, the NDDH believes use of the material may be appropriate in locations where groundwater impacts are not reasonably expected to occur.

Manure Analysis Results and Management

Regarding manure analysis completed by the NDDH, the data showed manure from the fly ash-treated pens had consistently higher levels of heavy metals (except for silver) than manure from the untreated control pens. For the heavy metals tested (except silver), the average result from all of the fly ash pens ranged from 1.4 to 31 times higher than the results of metals measured in the control pen. If applied at agronomic rates, manure should not contain excessive levels of heavy metals for land application when compared to the Environmental Protection Agency sludge regulations.

Livestock Health Issues

The NDDH recognizes that improved feedlot surfaces will provide benefits for livestock and for producers. Animals with clean, dry feet are less subject to hoof problems. By improving the integrity of feedlot pens, certain improvements in livestock health and animal performance, as well as improved management of manure and runoff, is possible. In addition, better feedlot surfaces can help control odors and flies.

Livestock health issues associated with potential exposure to fly ash was not addressed. While the participants and sponsors mentioned studies in other states, no information was provided. At minimum, it is recommended that animals should not be directly exposed to uncured ash product (airborne ash dust, direct physical exposure, surface runoff, etc.) during initial application or curing of the pens. Some guidance should be developed as to when animals may be placed into the pens. From the NDDH's research, dust control is an issue for animal health for many producers. Dust control from treated pens might be an issue producers should consider.

Siting Issues

The scope of the study did not address appropriate settings for utilizing coal ash. Given the fact that coal ash can potentially impact water, it is prudent that coal ash not be utilized in environmentally sensitive locations including areas near wetlands, drainageways, steep slopes, areas with a high water table, areas close to water wells, and areas with highly permeable, coarse-textured soils. Sites should be nearly level to gently rolling, underlain with fine- to medium-textured soils, with a depth to groundwater or seasonally high water tables greater than three feet. The NDDH Animal Feeding Operation Program considers siting conditions in approving feedlots. Since coal combustion waste usage will be on NDDH-approved feedlots as agreed and such use is coordinated with the NDDH Animal Feeding Operation Program, siting issues should be adequately addressed.

Material Safety and Health issues

While the report did not provide material safety data, such information should be included in the user manual. Based on material characteristics, there is a potential for adverse health and environmental effects if the material (like many products) is not properly handled. Fly ash dust is alkaline. It can irritate the eyes and upper respiratory system and may cause symptoms ranging from aggravation to respiratory disorders. The use of a NIOSH-approved respirator should be recommended. Direct eye contact, prolonged skin exposure or material ingestion should be addressed. Adequate skin protection and cleanup, along with ventilation (in enclosed areas) and eye protection, should be considered. Some of the material safety data information reviewed by the NDDH mentioned that fly ash can contain trace metal compounds that can have adverse health effects.

Recommendations for Coal Ash Utilization Manual for Feedlots

Due to the potential for fly ash to impact water, all participants have agreed that use of the product should be limited to feedlot areas that are approved. The NDDH agrees with the EERC that coal combustion material utilization can proceed for the tested materials on approved feedlots once agreed-upon training materials are developed and adequate training is provided.

Based on the issues addressed above, the NDDH again reiterates that fly ash is not an inert or “benign material”; however, if properly handled, the NDDH believes it can be beneficially used on appropriate sites. The following issues need to be addressed in the draft user training materials submitted for NDDH review and approval:

1. Use must be restricted to NDDH-approved feedlots that have runoff controls.
2. Environmentally sensitive locations including areas near wetlands, drainageways, steep slopes, areas with a high water table, areas close to water wells, and areas with highly permeable, coarse-textured (sand or gravel) soils must be avoided. Sites should be nearly level to gently rolling, underlain with fine- to medium-textured soils, with a depth to groundwater or seasonally high water table greater than three feet. The NDDH reserves the right to require appropriate modifications in use, application, siting or construction as deemed necessary.
3. Transportation and storage equipment must be loaded, moved, maintained, and covered so that the contents will not fall, leak or spill and to keep the fly ash dry prior to use. Should spillage occur, the collector or transporter shall immediately return spilled waste to the vehicle or container and then clean and decontaminate the area.
4. Appropriate measures must be addressed to minimize dust generation and interaction of run-on and runoff water with coal combustion material during transportation, application and incorporation. Application during high winds or

inclement weather must be avoided. It is recommended the soil be in a loose and moist condition prior to application of the ash. Controlled amounts of water may need to be sprayed during incorporation to minimize dust.

5. Material safety and health issues must be addressed including the protection of workers, nearby residents and animals from excessive dust, prolonged skin exposure, and direct contact with runoff. Users and workers must be provided a material safety data sheet or other information for education on potential safety and health issues. Respiratory protection as well as skin protection measures (long-sleeve shirts, pants, etc.) for users/workers must be addressed.
6. Use must be restricted to feedlot areas approved by the NDDH. Placement, spillage or disposal close to homes, wells, sources of water, environmentally sensitive areas, or improper use may raise health or environmental issues. Any construction or placement of coal combustion material must be in accordance with any local zoning authority or any other requirements of any political subdivision of the state.
7. Excess ash or unused or unusable ash must be either returned to the vendor or disposed in a permitted municipal, industrial or special waste (ash) landfill.
8. The manual should address what measures should be taken if areas of the feedlot need additional application, patching, etc.
9. If or when a feedlot is to be converted to another use such as cropland, pasture or other uses, appropriate soil investigation and testing may be warranted to determine suitable measures for reclamation. The site may need to be reworked, deeply tilled, ripped, amended, etc., to loosen and restore the soil. If an area is to be converted to other uses, such as building sites, real estate development, etc., any new landowner or occupant should be informed of the ash placement. If necessary, the NDDH can be contacted. Some analysis and/or remedial action may be necessary.
10. The NDDH shall not be cited as endorsing use of the product. The NDDH does not accept liability for handling or use of the product. Any liability issues reside, as appropriate, with the material user, landowner, transporter, vendor and/or generator. If mismanaged or used in an unapproved manner, or if significant adverse health or environmental impact occurs within the state, the material is subject to appropriate North Dakota laws and rules, including, but not limited to, North Dakota Century Code Section 23-29 and North Dakota Administrative Code Section 33-20.

Bottom Ash Results

As discussed in Attachment 1, analysis of bottom ash from the four plants utilizing the Synthetic Groundwater Leaching Procedure and analyzing the lixiviant at 18 hours,

30 days, and 60 days shows some elevated elements. Some of the bottom ash may be co-mingled with ash or FGD sluice water in the handling process and thus may be contaminated with other waste. Prudent management of these materials appears appropriate.

Conclusion

It appears careful utilization of coal combustion material can benefit the livestock producer; however, the use and application must be carefully controlled to minimize the potential for adverse environmental or health impacts. It is especially important that users be properly trained and adequately protected. Coal combustion products used in this study can impact water and air resources. The EERC and the material producers/sponsors recognize use of the product as described in this report will be limited to feedlot areas that are approved by the NDDH, based on the scope and results of their report. Such areas have controlled runoff systems and soil and surface conditions are or will be made available. Such feedlots are required to adequately address surface water runoff so they will not discharge except under catastrophic or chronic rainfall conditions. We look forward to working further with the EERC in this endeavor.