Reducing Mud Problems in Cattle Heavy Use Areas with Coal Combustion By-Products

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Management Considerations
- Little vegetative cover
- Muddy in wet weather
- Impede cattle and equipment movement
- Muddier animals
  - Can increase cow health problems
  - Can increase milking times
- Tend to accumulate manure
- Exposes runoff water to manure and bare soil
- Affects appearance of farm
- Can not be eliminated
- Can be managed

Design Considerations for HUAs
- Affects appearance of farm
- Exposes runoff water to manure and bare soil
  - Tend to accumulate manure
  - Impede cattle and equipment movement
  - Muddy in wet weather
  - Little vegetative cover
- Soil Strengthening Options for HUAs
  - Concrete (durable, but expensive)
  - Gravel (lower cost, but short lived)
  - Coal ash
    - Fly ash mixed with clay soil (very dusty and difficult to mix and water)
    - Fly ash alone as fill (very dusty, requires way to contain fly ash)
    - Fly and bottom ash blend (best fits most situations, requires no special equipment and requires less water)
  - Costs for all ash options depend on haul distance (at 100 miles costs will be similar to concrete)
  
  Approaches To Using Fly Ash
  - Fly ash used alone to fill hole or area (Avoid)
    - Fly ash is fire proof and difficult to handle
    - Fly ash "flows" like water requires containment
    - 100% fly ash is expensive approach
  - Fly Mix with Soil (May be appropriate)
    - Fly ash is fire proof and difficult to handle
    - Requires correct type of clean clay soil
    - Requires thoroughly mixing soil and ash
    - Equipment and labor needs high
  - Blend to build pad (Usually recommended)
    - Blend = 30% fly ash + 70% bottom ash
    - Blend handles like soil

Arkansas Projects
- Tarry Cole Dairy
  - Road for mix wagon side of feed bunk (soil mix)
  - Cattle travel lane (soil mix)
  - Watering trough HUA (structural fill)
- Jeff Alls Dairy
  - Cattle travel lane (built up pad)
  - Truck off-loading area (built up pad)
- Alexis Roulet Dairy
  - Equipment travel lane (built up pad)
- Lance Pruitt Dairy
  - Gutters and pipes for clean water runoff
  - Cattle travel lane (built up pad)
- Dewayne Davis Dairy
  - Cattle travel lane (built up pad)

Coal Ash Trivia
- 90 million tons of ash produced annually
- To generate electricity
  - Coal is pulverized
  - Ash flows like water
  - Ash properties affected by coal type and combustion system
  - Transportation is a major factor in delivered price

Possible Coal Ash Applications
- Heavy Use Areas
  - Travel Lanes
  - Loafing Areas
  - Watering Areas
  - Feeding Areas
  - Base for Silage and Hay Storage
- Other Uses
  - Calf Bedding
  - Free Style Bedding
  - Additive for cement
  - Structural fill
  - Stabilizing road banks

Application Concepts
- Ash varies in reactivity—fly ash is a very fine powder and difficult to handle
- A blend of 50% fly to 70% bottom ash, mixed by the supplier is easier to install
- If the supplier cannot supply a blended ash, it is possible to use a clean clay soil and fly ash in a 95:5 volumetric ratio
- The pad should be 12+" for heavy equipment and 10" for cattle traffic
- Hydro has to about 25% moisture; grade for proper drainage and compact with tracked or rubber tired equipment in layers of 6-8" if possible
- Requires water well when available
- Ash takes about 30 days to reach ultimate strength
- Normally blended fly and bottom ash can be used immediately in dry weather
- Ash soils mixes should be usable after 12 to 24 hours

Application Process
- Design/plan the area
- Divert clean surface and roof water away from area
- Remove as needed any existing fencing
- Remove and land apply layer of any existing manure and soil
- To reduce required amount of ash use native soil to establish basic grades
- Install ash, adding water as you compact the ash, and achieve desired grades
- Insta/loose fence
- Reestablish as needed down slope vegetation
- Maintain the area