A Drainage Geocomposite for Coal Combustion Residual Landfills and Surface Impoundments

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Composite Liner Systems

What is currently being used

- Sand or select ash is often used for filter and drainage
- Often expensive and difficult to place on slopes
- An alternative geosynthetic filter and drainage layer is often acceptable
An Alternative Drainage system

Often accepted equivalent

- A geocomposite: geotextile filter + drainage core
- Must meet performance requirements
- Filter performance is the most critical requirement
Coal Ash Properties

Coal ash and gypsum sludge:

- 85 to 100% finer than silt size
- Uniformly graded industrial by-product
- Wet and dry placement
- Not an easy stuff to filter
A Drainage Geocomposite

GSE CoalDrain for coal projects

- A new filter meeting challenging filter requirements
- Developed for projects where coal combustion by products are disposed off
- Providing an alternative to sand filters and drainage layers
A Layered Geotextile Filter Consisting of a Woven Filter and a Nonwoven Filter

Primary components of CoalDrain

1. A nonwoven needlepunched filter
2. A woven monofilament filter
3. Combined 1 and 2 – layered filter
4. GSE geonet
5. A nonwoven needlepunched geotextile for friction surface
Laboratory Testing of CoalTex Geotextile

A broad range of evaluations

- Gradient ratio tests against fly ash and gypsum
- Hydraulic conductivity ratio tests
- Filter press tests
- Pore size distribution
- Hydrodynamic testing to find filter opening size
- Apparent opening size tests
CoalTex Layered Geotextile

Matching the geotextile opening size against ash

- The geotextile should retain all the ash particles
- The geotextile should not clog
- The geotextile should have enough flow through it
- The geotextile can be laminated to geonet
What Do We Find from Lab Tests?

Fines passing the geotextile, HCR tests

- Within two pore volumes fines passing stabilize at a very low value
- Geotextile does not clog
What Do We Find from Lab Tests?

Resistance to clogging, gradient ratio tests

- All tests show a gradient ratio of less than 2
- Tests have been performed with different CCR materials
- The geotextile found to be compatible with fly ash and FGD gypsum
Field Testing of CoalDrain

Four field tests at Ohio State University

- Intermediate size test plots
- Fly ash and FGD gypsum from two plants
- Suspended solids and dissolved solids measured in leachate passing the geocomposite
Typical Field Test Results

Four field tests at Ohio State University

- Leachate quality stabilizes within two pore volumes
- Municipal waste water plants provide require treatment to 30 mg/L
- Water with 20 mg/L suspended solids is considered clean
- The new geotextile works very well against CCR materials
Summary

A drainage geocomposite for CCR containment projects

- Innovative layered geotextile
- Extensive independent testing
- Satisfies filter requirements while traditional geocomposites do not
- Reduces head on the liner system to a few mm vs. 300 to 600 mm or more with natural drainage layers
- Easier to install and no damage to the liner system