Binders for Dust and Erosion Control

Overview
Bayer MaterialScience is considering expansion into the dust palliative and soil stabilization market with their resin and coating materials. The Bayer product’s performance needed to be tested against established commercial products in order to determine the viability of entering the market. The Penn State team determined that quantitative erosion and percolation tests coupled with a qualitative compression analysis would yield results leading to a recommendation.

Objectives
Eight commercial products were selected to be used as a benchmark for the four Bayer products. Each product was tested using the erosion control apparatus which was designed and built to meet the specifications of the ASTM D7101 standard. The results from the erosion, percolation, and compression testing were used to develop a recommendation.

Approach
- Research was done to determine the properties that needed testing and the types of products to be tested. Water erosion, dust control, percolation, and compression properties would be tested. Chloride based products were not used.
- The commercial products and testing methods were determined by a selection matrix yielding 8 products and 4 tests, 3 of which were performed.
- The products were procured and the procedure for the testing was developed.
- Due to time constraints, testing was focused on the water erosion performance. Non-standardized testing was applied to percolation and compression yielding preliminary results.
- The water erosion was designed and built based on specification from ASTM D7101.
- Sand was used for testing because it provided small grain size with low variance.
- Application and dilution for each commercial product was recommended by the respected manufacturer for usage on sand. Varied application rates were used for Bayer products.
- Each trial run involved three samples and one control which were watered at 5 minutes intervals for a total of 30 minutes.
- Runoff volume and sand mass data were collected for each product and tracked every 5 min interval for water erosion.
- For percolation, 25 ml of each diluted product was applied to sand samples and depth was measured after allowing time to cure.

Outcomes
- Bayer’s product performed comparable to commercial products showing the same distribution and values in water erosion control.
- Results support feasibility in water erosion performance.
- Other properties, such as compression and dust control, should be tested before a full recommendation can be made.