

EVALUATING PRODUCTS FOR ROADWAY DUST CONTROL

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Photo from the LTAP Graphics Collection, Indiana LTAP, depicting a country road in the fall.

The West Virginia Division of Highways (WVDOH) has approximately 14,000 miles of aggregate surfaced roadway. Dust that is expelled from these roads is a nuisance that road officials would like to minimize for citizens. Air borne dust also generates safety, health, and environmental concerns, such as reduced visibility, respiratory hazards associated with dust inhalation, blocked drainage systems, and potential damage to vegetation. Air borne dust also indicates that surface deterioration is occurring.

At the WVDOH's current funding levels, it is anticipated that state owned roadways will not be paved for the purpose of dust control. The good news, though, is a variety of commercial products are available for dust control. These products work by: 1) attracting moisture, 2) binding dust particles together, 3) sealing the surface, or 4) some combination of these effects.

Chloride salts are moisture attractants, which work by drawing moisture out of the air during periods of high humidity, particularly at night. They also reduce the evaporation rate of water during hot-dry periods. Moisture in the gravel road surface tends to hold the dust on the road surface, although there is no physical bonding. Physical binders for dust control involve the application of organic or synthetic compounds that bind the dust particles together and attach them to the larger aggregate. Some of these binding materials produce a surface similar to an asphalt emulsions treatment, but at a lower cost. Surface sealants work by either adhering or agglomerating the surface particles together and often form a semi-rigid film on the road surface.

In 2010, a research project was conducted under the direction of Dr. John Zaniewski, a professor at West Virginia University and director of the West Virginia Local Technical Assistance Program. The roadway that was used for this research project was located in Wood County in the WVDOH's District-3 area. The purpose of this research project was to evaluate the effectiveness of five commercially available dust palliatives for use on secondary gravel roads maintained by the WVDOH. Dust control products included in this study were: a petroleum emulsion with polymer, synthetic organic fluid, calcium chloride, bituminous resin pitch, and lignin sulfonate. Three methods of field testing were used which included a mobile dust sampling device (Figure 3), soil silt fractions, and moisture analyses.



The mobile dust collector was used to determine the amount of dust released from the roadway when driven over.



As part of this study, samples were collected for lab analysis.



This photo shows calcium chloride being applied to the test route. This product proved to be the most effective of the five tested for this project.

CALCIUM CHLORIDE

Results of field testing indicated that calcium chloride proved to be effective at controlling dust. It was also economical and easy to apply. The calcium chloride produced minimal impact to traffic and the treated roadway sections did not require any curing time before being opened to traffic. Based on visual observations, no product runoff was observed and the calcium chloride appeared to have minimal environmental effects. However, for long-term storage of this product, it is recommended that the calcium chloride solution be kept in plastic tanks to minimize corrosion.

A PETROLEUM EMULSION WITH POLYMER AND BITUMINOUS RESIN PITCH

Both the petroleum emulsion with polymer and the bituminous resin pitch had very long curing times, required multiple applications, and received complaints from passing motorists and residents living adjacent to test sections. These products splashed onto passing vehicles where pooling occurred on the roadway and were difficult to remove from the undercarriages and exteriors of vehicles. Among the tested products, the petroleum emulsion with polymer and the bituminous resin pitch created the most concern for environmental impacts. Based on visual observations, these two products were highly flowable after application. Both remained tacky for days and were also very odorous for approximately two weeks after application.

LIGNIN SULFONATE

Lignin sulfonate is a byproduct of the process involved with reducing wood pulp to paper. The sulfonate component acts to break down soil particles and the lignin acts to cement the particles together. Sulfur in the vapors released after application produces an objectionable odor that lasts while the product cures. The curing time is typically eight to twelve hours, but may be longer depending on weather conditions. Prior to complete curing, the product is susceptible to being washed away by rain, potentially creating an environmental hazard.

SYNTHETIC ORGANIC FLUID

There were no observed constructability issues with the synthetic organic fluid, and like the calcium chloride, the roadway sections treated with this fluid did not require any curing time before being opened to traffic. Additionally, no product runoff was visually observed. Since the synthetic organic fluid is a relatively new product, no storage concerns have been recorded; however the potential for creating problems associated with long-term storage should be considered.

RESULTS

The results of this field evaluation and research project are that of the five commercial products tested as part of this research project, calcium chloride is the preferred choice for dust control. This conclusion was based on the cost, ease of application, impact on traffic, impact on the environment, and long-term storage capabilities.

For more information regarding this project or roadway dust control in general, please contact John Zaniewski at John.Zaniewski@mail.wvu.edu.

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