

UPDATE ON SOYBEAN OIL AND BIODIESEL BYPRODUCT USE FOR GRAVEL ROAD SURFACES

by Kelly Bengtson, PE with ND LTAP and NDSU UGPTI

Dust control on gravel roads is a fast-growing maintenance tool for road authorities across the United States. There are 1.3 million miles of gravel roads in the United States and dust control is a \$300 million business. There are 59,000 miles of gravel county and township roads which is about 60% of the local road system in North Dakota. Dust control in North Dakota has become increasingly popular on low- and high-volume gravel roads. Not only does dust control improve safety by increasing visibility, it also secures the clay binder that is mixed with road gravel and reduces maintenance costs including re-graveling material, loading and hauling and blading operations. Additional benefits include cleaner air and improved ground water quality.



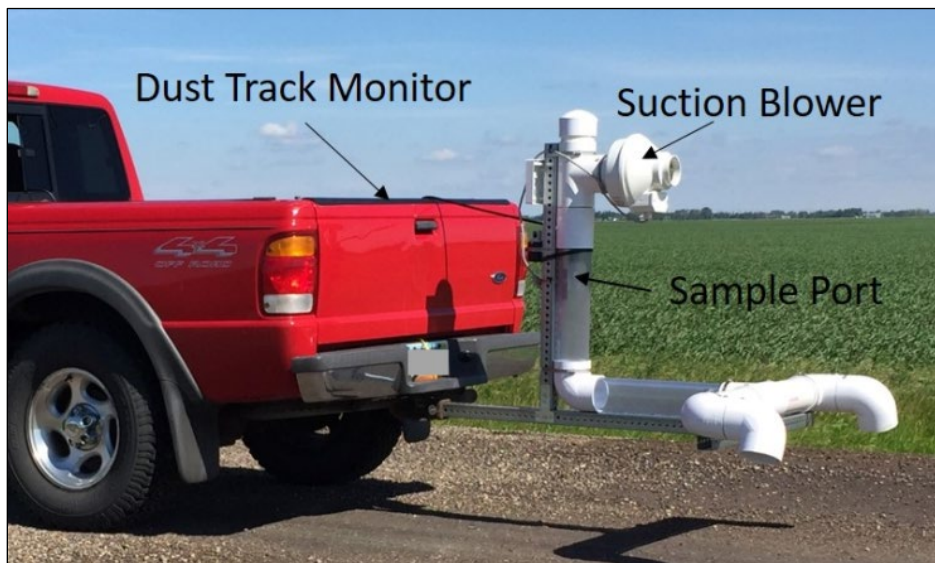
Bahr is analyzing a sample of gravel and reclaimed asphalt from a road in Cass County.

Calcium chloride and magnesium chloride applications to a gravel road are the primary methods of controlling dust today. Application rates vary from 0.25 to 0.5 gallons of liquid solution per square yard of gravel surface area. A typical application that is 18 feet wide and includes 0.33 gallons/square yard would amount to 3,485 gallons and the costs would be about \$3,000 per mile including application. These products are popular as they are fairly inexpensive and easy to apply. However, they are corrosive to vehicles and tend to wash away with rainfall resulting in environmental buildup concerns.

In 2016, the ND Soybean Council helped to fund a study at NDSU which began in 2017 as a soybean utilization and sustainability project. James A. Bahr is the principal investigator for this project at NDSU's Office of Research and Creative Activity.

This study was performed using soybean oil mixed in a chemical reaction with a biodiesel waste product called glycerol. The resultant product is a synthetic nontoxic, biodegradable and non-corrosive dust suppressant. The lab produced 1,200 gallons of the product and applied it to a gravel road using a tanker truck application method:

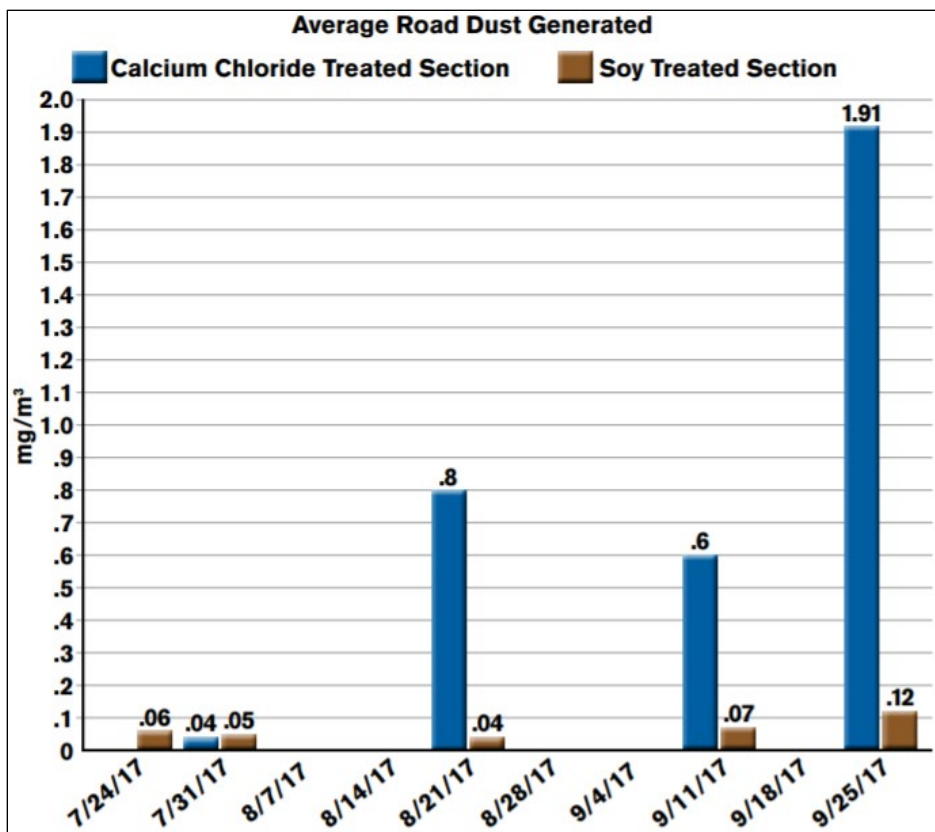




He compared this product to calcium chloride and developed a dust monitoring and measuring device that is mounted on the back of a vehicle. This unit measures the weight of dust in a cubic meter.

Final results of this study were very promising for the soybean-based product as it showed longer lasting power than calcium chloride and it had equal initial effectiveness as shown in the bar graph.

During this study Bahr noticed that the soybean-based product also appeared to rejuvenate the recycled asphalt pavement millings the county had applied to the gravel road test area. The millings appeared to become softer and were glued together after the application of the soybean oil and glycerol product. This may have been a factor in the excellent performance of it as a dust control product. It has also opened the door to future study of using rejuvenated recycled asphalt pavement millings either as road surfacing, shouldering or aggregate base material. He is already in conversation on this with the NDSU Civil Engineering Department. Look for more exciting news on this usage of soybeans from the NDSU Research and Creative Activity Department in the near future.



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