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LRRB
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PROJECT COST:

$75,000

Dust control products could be sprayed by trucks used for applying asphalt products.

MINNESOTA DEPARTMENT OF TRANSPORTATION
RESEARCH SERVICES SECTION

# Best Practices for Dust Control on Gravel Roads

## What Was the Need?

Of the estimated 4 million miles of U.S. roads, nearly half are unpaved. Though the benefits of a paved road are numerous, the investment in converting a gravel road to a paved one is sizable, so most counties rely on maintaining their existing gravel roads.

One of the drawbacks of gravel roads is that they are prone to giving off dust, particularly as daily traffic increases. Clouds of road dust can be a nuisance for those living nearby as dust settles on their homes and parked vehicles. Road dust in the air can potentially affect the quality of life of nearby residents. This dust can also pose serious safety issues for drivers by causing impaired vision, especially on narrow roads or at intersections and railroad crossings.

## What Was Our Goal?

The aim of this study was to evaluate the effectiveness of several common dust control products when applied to a variety of gravel surface roads at various schedules. The findings of this study would be used to better control the dust on rural roads and reduce the number of calls for service, particularly from residents moving to the country from the city who have higher expectations for dust-free roads.

## What Did We Do?

Researchers selected 51 test sections—each either 0.5 or 1 mile—on roads in northwest, east-central and southwest Minnesota. Traffic levels varied from 25 to 700 vehicles per day, and gravel materials were mostly consistent across all roads.

Three dust control products were evaluated: calcium chloride, magnesium chloride and an organic polymer-plus-binder. Product was sprayed evenly onto the road from a tank truck. One treatment was applied during the first year, and dust levels were monitored throughout that year. In the second year, some roads were treated again while others were not. For comparison purposes, each road was also evaluated over sections having no dust control treatments during the two-year study.

A vehicle-mounted dust collector was selected to monitor dust levels because of its ease of operation, ruggedness and consistent field measurements. The collector was attached to the rear bumper of a Dodge 1500 pickup. While the vehicle traveled down the road at 40 mph, dust collected on a preweighed glass microfiber filter. Three sampling runs were performed on each test section; then the filter was sealed in a plastic bag and later weighed to determine how much dust was collected. Over the course of the two-year study, approximately 317 samples were collected from individual test sections.

Additionally, a field survey was sent out to all engineers who participated in the study to further aid in quantifying the performance, value and effectiveness of various dust control strategies.

## What Did We Learn?

Overall, researchers observed that treatments lowered dust levels, which improved visibility, air quality and safety conditions on gravel roads.

- Results generally supported the assumption that higher application rates (more than once per year) reduce dust more effectively when applied to gravels containing greater amounts of fine aggregates (passing the #200 sieve). Treatments on gravel containing higher levels of sand, however, tended to be less effective.

*continued*

*"It was extremely useful to be able to establish a best practice for dust control applications. I look forward to improving this practice with future research on emerging dust control products."*

**–John McDonald,**
Engineer, Faribault County

*"Gravel maintenance at railroad crossings can be a safety hazard. Chloride applications at these crossings would reduce maintenance requirements for these problem areas."*

**–Eddie Johnson,**
Research Project Engineer, Mn/DOT Materials and Road Research

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This mobile dust collector, based on a device designed by Ado and Sanders called the Colorado State Dustometer, was built by the research staff.

- The surface moisture of roads was the best predictor of treatment effectiveness. Dust levels decreased with increased surface moisture. Treatments between 0.18 and 0.55 gallons applied per square yard appeared to maintain maximally effective surface moisture.
- A secondary benefit was observed in that treatments reduced the need for grading by a conservative estimate of 50 percent. Participants also perceived a reduction in the frequency of gravel replenishment.
- A single successful application of dust control product appears to last 100 to 150 days; the maximum time that a treated road will have noticeably less dust than an untreated area is 200 days.
- Magnesium chloride treatments were found to be as effective as those with calcium chloride; both were more effective than the organic polymer with binder.

## What's Next?

Because of the resulting road surface stabilization from dust control applications, researchers recommend that spot treatment be considered for problematic intersections and railroad crossings where it is particularly difficult for maintenance trucks to reshape and replenish the gravel.

A growing number of agricultural and industrial byproducts show potential for being effective dust control agents. Also, a number of proprietary products have received formulation upgrades. Researching and documenting the performance of these products would be of great benefit for all agencies.

*This Technical Summary pertains to the LRRB-produced Report 2009-04, "Best Practices for Dust Control on Aggregate Roads," published January 2009. The full report can be accessed at* http://www.lrrb.org/PDF/200904.pdf.