# Controlling dust on unpaved roads

ONE TON—that's how much dust is kicked up in a year by every vehicle traveling daily on a particular mile of unpaved road. How do you plan to control traffic-generated (fugitive) dust on your county's roads in the coming summer months?

**Challenges**
Fugitive dust is a nuisance to drivers, nearby residents, and county agencies that maintain these roads. Fugitive dust results in

- increased expenses for aggregate and road maintenance
- decreased visibility for drivers
- hazardous (rough) road surface
- complaints from nearby residents

The Iowa Administrative Code (Rule 23.3(2)(3)(1)) requires public highway authorities to take "corrective action" when fugitive dust is a problem.

**Where it comes from**
Fugitive dust consists of subgrade soil that has worked its way up through the aggregate and/or fine particles (fines) in the aggregate mix. Fines act as a cement or stabilizer for the mix and help prevent potholes, washboards, and washouts. Because fines are necessary in the mix as a cement or stabilizer, a certain amount of dust is inevitable.

**The solutions: geosynthetics and dust suppressants**
To prevent soft subgrade soil from becoming fugitive dust, a geosynthetic material can be placed six to eight inches below the surface aggregate. The cost for this material is high, but the cost for installation is fairly low. Unfortunately, this material may degrade with exposure to ultraviolet rays.

Dust suppressants used today are either inorganic or organic. See the table at right for a quick overview.

Inorganic suppressants, such as calcium chloride, absorb water from the air and reduce the rate of evaporation from the aggregate.

Organic dust suppressants bind materials so the fines do not separate from the large aggregate particles and become airborne. The most common binder used in Iowa is lignin, or tree sap.

The applied costs of organic and inorganic suppressants are generally very similar.

A concern with any dust suppressant is whether it poses potential environmental problems during the leaching process following rainfall.

Materials are always being tested to discover the most effective, safest, and cheapest way to control fugitive dust (see sidebar below).

**For more information**
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*At least two Iowa agencies have had problems with nails remaining in ground-up shingles [used as a dust suppressant], which have punctured travelers' tires.*

## What's new in dust control?

NEW MATERIALS are always being tested for use as dust suppressants. Often the materials result from recycling efforts and from attempts to take advantage of natural materials that may be safer for the environment.

**Do you smell French fries?**
Last year, the Iowa Waste Reduction Center (IWRC) at the University of Northern Iowa (UNI) conducted a study that was overseen by the Department of Natural Resources (DNR). The preliminary report discusses applying used vegetable oil as a dust suppressant.

Used vegetable oil was found to be as effective a dust suppressant as the soy oil tested, but the used vegetable oil proved to be more cost effective during initial application. The food service venues using vegetable oil must usually pay for its disposal, so currently there is no cost for collecting the used vegetable oil from the venues.

Unfortunately, early in the study the vegetable oil contributed to the formation of ruts, which may result in higher road maintenance costs later on. Also, the fried food smell lingered through the summer months.

**Old roads and roofs**
Recycled asphalt from roads or roofing material can also be used as a dust suppressant. Using millings from asphalt roads as a dust

| Material | Application | Approximate Cost per Road Foot* (one application) | Advantages | Disadvantages |
|---|---|---|---|---|
| Calcium chloride ($CaCl_2$) | flakes mixed with water | $0.29 | absorbs water from air; reduces rate of evaporation; can be repaired by blading | corrosive to most metals; may cause slick road conditions during winter weather conditions |
| Lignin derivaatives (lignosulfates) | liquid | $0.26 | binds fines to large aggregate particles | corrosive to some metals; blading reduces effectiveness |
| Used fryer oil (vegetable oil) | liquid | $0.25 | recycles used materials; noncorrosive | cannot be repaired by blading; may stick to undercarriages of vehicles; may contribute to rutting |
| Soy oil | liquid | $0.40 | noncorrosive | cannot be repaired by blading; may stick to undercarriages of vehicles |
| Asphalt shingles (ground up) | mixed with water | $0.12 | recycles used materials | may result in tire damage if all nails are not removed |
| Asphalt millings (recycled asphalt materials) | solid | $1.10 | recycles used materials; can be repaired by blading | may contribute to rutting |
| Bentonite | mixed with water | $0.31 | effective for up to 2–3 years | effectiveness depends on type of aggregate |

*Cost of materials will vary based on supplier, percentage of product concentration used for solution, delivery charges, etc. More than one application may be needed, depending on amount of traffic and rainfall.

An overview of organic and inorganic dust suppressants

suppressant may help county agencies save on disposal or storage costs for the used material. However, millings can contribute to the formation of road ruts, resulting in higher maintenance costs.

If asphalt shingles are cleaned properly, they can be ground up and mixed with water to form an effective dust suppressant. At least two Iowa agencies, however, have had problems with nails remaining in the ground-up shingles, which have punctured travelers' tires.

**In our own backyard**

A natural clay material, bentonite, has some advantages over other inorganic dust suppressants. Bentonite can be used for long-term treatment (two to three years), is effective, and in the long term can be less expensive than chemical road treatments. Bentonite does not pose any threat of metal corrosion or environmental damage.

The choice to use bentonite depends on the type of aggregate being used. Bentonite's negative charge allows the material to adhere to limestone aggregate, but these same electrochemical properties prevent bentonite from adhering to other negatively charged (igneous rock) aggregate.

**For more information**

For information about the IWRC study, contact Tim Trumbull, Iowa Waste Reduction Center environmental specialist, 319-273-8905, tim.trumbull@uni.edu. For general information about dust suppressants, contact Jim Hogan, CTRE library coordinator, 515-294-9481, hoganj@iastate.edu. •