

# Tools and Techniques for Clean Air

Controlling dust at construction sites calls for proper planning of grading and excavation activities along with wise use of appropriate practices and palliatives.

By Greg Northcutt

Dust happens. All it takes is dry, bare soil and some type of mechanical action, such as the wind, a dozer blade, or a truck tire to disturb the soil's surface and kick up tiny particles of sediment. Once airborne, this particulate matter can create a variety of problems. In addition to its nuisance factor, dust can threaten the health of humans, animals, and plants. This gritty material can reduce visibility, posing a hazard to motorists and damaging construction equipment. What's more, if not controlled properly, this fugitive dust can also leave you vulnerable to costly penalties for violating air-quality rules.

The greatest threat to public health are the very fine particles of airborne sediment measuring less than 10 microns in diameter—about one-seventh the thickness of a human hair. Known as PM10, they can pass through the throat and nose to lodge deep inside the lungs.

Exposure to these particles can aggravate such chronic respiratory diseases as asthma, bronchitis, or emphysema, contribute to heart problems and reduce the body's ability to fight infections.

Damage to equipment from abrasive dust particles can include increased wear of engine components, seized hydraulic pumps, and blocked hydraulic valves. PM10 from construction sites can also contribute to smog.

Under provisions of the federal Clean Air Act, the EPA has set air quality standards that include limiting the amount of PM10 produced at construction sites. Depending on the state, country or city, local requirements for controlling PM10 may be more stringent than the EPA rules.

## A 24-and-Seven Challenge

Maricopa County, which includes Phoenix, is one of several metropolitan areas in the western United States being required by the EPA to reduce PM10 concentrations to meet federal standards. Air monitoring in the county has found that, if not controlled, PM10 levels at the edge of a construction site can be as much as three times higher than the federal standard. Under the county's requirements, grading and excavation contractors must have an earthmoving permit and submit a dust control plan if they disturb 0.1 acre or more total surface area. They are required to use the dust control measures they have specified in their plan 24 hours a day, seven days a week. Also, emissions of dust anywhere on the site must not exceed 20% opacity. (Dust is not allowed to block the view of more than 20% of the background.)

"If dust is being generated on a site, the contractor must take steps to control it, such as treating the area with water, or suspend operations," reports Lorraine Sinclair, a dust control supervisor with the Maricopa County Air Quality Department. Responses of contractors to the county's dust control requirements vary widely. "Some are very serious about complying," Sinclair says. "Some are resisting every step of the way."

Penalties for violating the country's dust control rules can range up to \$10,000 per violation per day.

In all of 2006, the county collected \$3.7 million in air-pollution fines, Sinclair notes. Through the first nine months of 2007, violators had paid more than \$4 million.

Still, in various areas of the country some contractors view the fines they pay for not controlling dust properly as one of the costs of doing business, says Chad Falkenberg, president of Soilworks LLC in Gilbert, AZ, which manufactures soil stabilizers and dust control products used around the world. "There's still not enough financial incentive for them to be proactive about dust control."

## Developing a Plan

The challenge of controlling fugitive dust on a construction site involves areas of active grading, excavating, trenching, and demolition work, as well as other areas. These include vehicle traffic areas, like haul roads, unpaved parking lots, site exits, and nearby roads and streets. It also means controlling dust emissions from stock piles of soil and inactive areas, such as certified construction pads and where active construction work has been suspended for several days, weeks, or even months with the soil remaining bare and exposed.

An effective dust control plan lays out specific practices and procedures for preventing or minimizing fugitive dust before, during, and after any operations that generate dust on the construction. It also addresses backup measures in case the primary dust control measure fails. For example, if the current watering technique isn't controlling dust adequately, the plan might call for ceasing operations until winds decrease.

The dust control plan covers the time work is being done as well as overnight and over the weekend. Depending on the site, these control measure may range from wind barriers, tarps for loaded dump trucks, and gravel pads to limit the amount of dirt and mud tracked off site by truck tires to restricting the amount of area graded at any one time and using water or chemical stabilizers to suppress dust emissions.

Implementing the individual portions of a dust control plan isn't all that difficult, Sinclair points out. "However, someone on the site has to be aware of dust conditions and proper use and maintenance of the control measures 24 and seven," she says. One problem she often sees is lack of maintenance on devices, like gravel pads, steel rails, or grates designed to dislodge dirt and mud from tires and undercarriages of trucks prior to leaving the job site. "Some contractors allow the surface to become compacted or filled with dirt, defeating their purpose," she says.

Other common problems that have been observed in Maricopa County include lack of prewetting of work areas and haul roads, failure to clean up dirt tracked onto adjacent public roads, and lack of record keeping.

#### Changing Attitudes

Thanks to growing awareness of the problems caused by dust and stepped-up enforcement of air-quality regulations, more and more grading and excavating contractors are recognizing the importance of controlling dust.

Eight years ago, erosion control consultant Tony Brighi moved to Las Vegas, NV, where he's president of Eros Environmental, which provides developers and contractors with a variety of services for complying with air- and stormwater-quality rules and regulations.

"When I first moved here, many contractors had a Wild West mentality," he recalls. "The view was that, if you live in the desert, you're going to have dust. Since then, contractors have become much more accepting of the need to control dust, and they include the costs in their budgets. Most are extremely aware of air-quality requirements, just like they are of OSHA requirements. Instead of paying fines for noncompliance, more and more are doing the right thing by implementing dust control measures."

Grading and excavating contractors who work in the arid southwest region of the United States aren't the only ones challenged by dust. Whether you're developing a large retail site in Georgia, building a road in Iowa, or otherwise moving earth in much more humid areas, you can still face dust problems, given the right soil and weather conditions.

#### Working With Water

In many areas, water is the first choice for temporarily keeping dust down on disturbed portions of a construction site. Applied with a water truck, hoses, or sprinklers, wetting creates a thin crust on the soil surface that protects the soil from wind erosion until the water evaporates. "For areas where you're actively grading and excavating, water is, hands down, the most cost-effective dust suppressant," says Falkenberg.

The Dust Devil Academy Construction Guide, a pamphlet produced by the Arizona Department of Transportation, Arizona State University, and the Maricopa County Air Quality Department, recommends wetting the area as deep into the soil as a blade or equipment penetrates 15–30 minutes prior to starting work. Apply enough water periodically throughout grading and excavating operations as well as to unpaved haul roads, access roads, and equipment paths to keep the surface moist. Applying too much water on the haul roads can increase the amount of sediment tracked from the site by trucks and other equipment. The area to be worked the next day should be soaked overnight.

Despite its advantages for controlling dust temporarily, water isn't a smart choice for longer-term dust suppression, say the experts. For one thing, the protective soil crust can be easily broken by birds or foot traffic, not to mention vehicle tires. For another, water controls dust only until it evaporates. The hotter and drier the air and the faster the wind, the sooner water loses its effectiveness. In desert areas, that can occur in as little as 30 minutes or less after application.

One reason for the reluctance of some contractors to use alternatives to water is a misconception about the true costs of water. However, note proponents of these alternatives, water isn't as cheap as some contractors may think. Often, the cost of a water truck and operator ranges from about \$60 to \$90 per hour. On larger, rapidly developing projects, where four or five trucks may be running 12 or more hours a day, costs can pile up quickly. Rising fuel prices are likely to drive them still higher. Even where water can be had for the taking, pressure on agencies and contractors to limit use of water due to drought and expected future shortages can reduce its attractiveness for controlling dust.

#### Chemical Alternatives

A number of chemical dust control agents offer more durable solutions to dust problems. Depending on dilution and rate and frequency of application, these products may remain effective on inactive areas anywhere from several weeks to several years.

"In the long run, chemical dust control products can cost less to buy and apply than water," says \_\_\_\_\_ who helped pioneered the soil stabilization field more than 20 years ago. Based in \_\_\_\_\_ the company manufactures a line of chemical dust control, erosion control, and soil stabilization products. As \_\_\_\_\_ points out, chemical dust palliatives can be used to reduce or eliminate the costs of continually applying water on areas subject to daily disturbances and truck and equipment traffic.

The choices include:

**Magnesium chloride**—A byproduct of potash production, resulting from the reaction of magnesium hydroxide with hydrochloric acid, this reduces the evaporation rate of surface moisture, increases compaction density of road materials, and retains its effectiveness after reblading. It can leach out with heavy rains. Repeated applications and long-term use may harm nearby vegetation.

**Calcium chloride**—Produced from natural salt brine or an ammonia-soda process, this offers features similar to magnesium chloride.

**Lignin derivatives**—These materials, the byproduct of paper-making, are a solution of lignin and carbohydrates. They act as adhesives to bind soil particles together. They increase the dry strength of soil and are effective after reblading. They can leach out in periods of heavy precipitation. Runoff of these materials into surface waters may harm fish. They may also increase groundwater concentrations of such pollutants as iron and sulfur compounds.

**Tree resin emulsions**—These adhesive materials, which are derived from pine tree resins, also bind soil particles together. Their low solubility minimizes leaching and helps waterproof soil surfaces. They require certain weather and time to cure and are not effective after reblading. Any environmental impacts can vary among different products.

**Synthetic polymer emulsions**—Made from such compounds as polyvinyl acetates and vinyl acrylic copolymers, these products form a matrix which binds soil particles together. They, too, require proper weather conditions and curing time to be effective. They may also be susceptible to ultraviolet degradation and are not effective after reblading.

**Water soluble polymer**—Made from such compounds as polyvinyl alcohol, this product is biodegradable, water soluble, and forms a complex matrix binding soil particles together. It is a new product which constantly rejuvenates, perpetuating its ability to capture dust—even after its application—by simply applying water. It's less sensitive to reblading.

One of Brighi's top concerns in selecting a dust palliative is that of environmental safety. That's why one of his first steps in evaluating a product is to check its material safety data sheet. In addition to information on handling and working with the product safely, the data sheet also describes any environmental risks of using the product.

#### Cost Figures

Overcoming the reluctance of some grading and excavating contractors to use chemical dust control agents instead of water can be a challenge, say manufacturers of these products.

Much of this reflects lack of knowledge about alternatives or misconceptions about the effectiveness of water, say proponents of chemical agents.

**"Contractors know and understand how water works," says Falkenberg. "But they may be unfamiliar with the capabilities of dust palliatives."**

"Contractors face a huge challenge in minimizing costs," notes \_\_\_\_\_ director of new business enterprises for \_\_\_\_\_ of \_\_\_\_\_, which manufactures a water-soluble dust control polymer. "Dust abatement hasn't been a high priority for them. Some control dust only because it's mandatory and will do no more than necessary. If they think water is the least costly option, that's what they'll use."

"I've done a lot of research on dust palliatives, and I've looked at a lot of products," adds independent consultant Brighi. "There are some great products out there that can help contractors. However, for some of them to try these chemicals requires a taking a leap of faith."

"Everyone in the building industry is watching their pennies these days. Contractors who have tried these products and seen how they work are now using them. As a result, they're saving money and compliance is actually improving."

\_\_\_\_\_ is western regional manager for \_\_\_\_\_ y. The \_\_\_\_\_-based company makes a wide range of dust control products. He compares the expense of water with that of a polymer for controlling dust. Depending on the size and location of the construction site, costs of one truck and operator in southern California can range from about \$60 to \$90 per hour, he notes. "Some big jobs may require four or five trucks running 12 to 16 hours a day to control dust on haul roads and other active areas," \_\_\_\_\_ says. "While the actual cost of a polymer varies with such factors as the type of soil, the type of polymer, and method of application, material, application costs for a haul road usually range from about 5 to 10 cents per square foot to control dust for several months to a year, depending on traffic volume."

Disturbed areas that are lying dormant between the end of grading operations and the start of the construction phase must also be treated. In the case of water, that means regular applications of water, as needed, throughout the dormant period, which may last anywhere from 6 to 12 months, he explains.

"The cost to control dust on that same area for the same length of time using a polymer would usually range from about \$400 to \$600 per acre for the material and application," \_\_\_\_\_ reports.

Vermillion estimates the cost of dust control on soil stockpiles for a period of one month at about one-fifth of a cent per square foot.

As Brighi points out, reducing or even eliminating the use of water as a dust control agent also helps minimize the cost of removing mud or dirt tracked off the site onto roads. In the Las Vegas area, that can mean a savings of about \$65 to \$70 for each hour a street sweeper would have been needed on the job.

#### The Case for Experts

Experts in the field differ on the skill and type of equipment required to apply chemical dust control products.

Most products are applied to haul roads and other traffic areas using asphalt spreaders or converted water trucks equipped with a spray bar or cannon. Applications to inactive areas and stockpiles are made with hydroseeding equipment using a hose or tower gun.

“Applying dust control products looks easy,” says Brighi. “But, done right, it’s a very complex procedure that requires matching the right product, application rate, spay pattern, and spray pressure to the specific type of soil. If you don’t know what you’re doing, you can quickly waste a lot of product that may cost as much as \$6 to \$7 a gallon.”

That’s why he recommends hiring a reputable dust control contractor to apply dust control palliatives.

“You need someone who understands your dust control problems and what you want to accomplish and knows how to prescribe and produce the best solution,” Brighi says. “A top-notch application company isn’t there to sell you one particular product. “Instead, it’s your partner in dust control who knows how to analyze your dust control problems and your site conditions and can objectively prescribe and provide the best solution.”

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