

Dust Control

EROSION CONTROL TECHNIQUE

Revegetation	[1]	Temperate Climates	✓	Short-Term	✓
Non Vegetation	[1]	Wet Tropics	✓	Long-Term	[2]
Weed Control		Semi-Arid Zones	✓	Permanent	

[1] Treatment options can include temporary vegetation and non-vegetated treatment options.

[2] Most treatment options, excluding permanent revegetation, provide only short-term benefits.



Key Principles

1. Potential adverse impacts of dust control products/chemicals on the environment (both short- and long-term) **must** not exceed the potential benefits achieved by their use, or any locally adopted measures of unacceptable environmental risk.
2. Critical design parameters include ability to control dust generation, suitability of the product to the work place conditions and the soil type.
3. Effectiveness and durability of most treatment measures depends on soil type, weather conditions, and frequency of disturbance (e.g. traffic movement).

Design Information

Dust control involves the suppression of dust particles generally in the range 0.001 to 0.1mm (1 to 100 microns). Much of the dust generated on construction sites is likely to be greater than 10 microns. Non-visible dust particles (less than 5 microns) are potentially the most harmful to human health.

Dust generation associated with wind erosion is normally controlled using one or more of the following techniques:

- (i) Maintaining moist soil conditions (water trucks and sprinkler systems)
- (ii) Chemical sealants placed over the soil surface (refer to *Soil Binders* fact sheet)
- (iii) Surface roughening (refer to *Surface Roughening* fact sheet)
- (iv) Revegetation (short- and long-term ground cover options)
- (v) Wind breaks (e.g. retention of existing vegetation, or 60:40 fabric:opening shade cloth).

Dust problems can also be reduced by the following activities:

- Limiting the area of soil disturbance at any given time.
- Promptly replacing topsoil after completion of earthworks
- Programming works to minimise the life of soil stockpiles.
- Temporarily stabilising (e.g. vegetation or mulching) long-term stockpiles.
- Graveling unsealed access and haul roads.
- Minimising traffic movements on exposed surfaces.
- Limiting vehicular traffic to 25kph.
- Retaining existing vegetation as wind breaks.

International Erosion Control Association (IECA, 1993) reports that:

-% soil cover will reduce soil losses by%.
- Roughening the soil to producemm high ridges perpendicular to the prevailing wind can reduce soil losses by%.
- A small decrease in velocity can have a major impact in reducing wind erosion given that the erosive power of wind is proportional to the cube of the velocity.
- For wind barriers perpendicular to the wind, the width of the [protected] zone leeward of the barriers is around to times the height of the barrier.

Possible treatment options for dust are summarised in Table 1. A summary of dust suppressant agents is provided in Table 2. Discussion on the use of soil binders for dust control is provided in the *Soil Binders* fact sheet.

Table 1 – Dust control practices [1]

Site condition	Treatment options							
	Permanent vegetation	Mulching	Water	Chemical surface stabiliser [2]	Gravel road	Stabilised entry/exit pad	Haul truck covers	Minimise site disturbance
Areas not subject to traffic								
Areas subject to traffic								
Material stockpiles								
Demolition areas								
Clearing & excavation								
Unpaved roads								
Earth transport								

[1] Sourced from: California Stormwater BMP Handbook – Construction (2003).

[2] Oil or oil-treated subgrade should not be used for dust control as this may migrate into downstream water bodies. It is also noted that surface stabilising chemicals (soil binder) may make the soil water repellent, possibly resulting in long-term revegetation problems.

[3] On long-term access and haul roads, the sealing of road with an application of 10mm single-coat bitumen seal can be more effective than the application of dust suppressants.

The following materials must not be used for dust suppression purposes:

- oil;
- landfill gas condensate;
- any contaminated leachate or stormwater when the use of such material is likely to cause unlawful environmental harm.

Table 2 – Summary of dust suppressant attributes^[1]

Suppressant type	Typical attributes
Soil binders	<ul style="list-style-type: none"> • Refer to <i>Soil Binders</i> fact sheet
Chlorides: Calcium chloride (CaCl ₂) Magnesium chloride (MgCl ₂)	<ul style="list-style-type: none"> •
Organic, non-bituminous: Calcium ligno-sulfonate Sodium ligno-sulfonate Ammonium ligno-sulfonate	<ul style="list-style-type: none"> •
Petroleum-based products: Bitumen emulsion (slow-breaking non-ionic)	<ul style="list-style-type: none"> •
Electrochemical stabilisers: Sulfonated petroleum Enzymes	<ul style="list-style-type: none"> •

[1] After UMA Engineering Ltd 1987, *Guidelines for Cost Effective Design and Application of Dust Palliatives*. UMA Engineering Ltd, Ontario, Canada.

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Water trucks and sprinkler systems

Water trucks have traditionally been used to control dust within construction sites, particularly on haul roads and for highway construction. The maintenance of moist soil conditions through watering remains a viable dust control measure.

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Dust-suppressing fog and mist generators

High volume mist generating machines can be used to suppress airborne dust resulting from blasting operations. Large cannon-like systems can throw a mist some 250m to blanket the treatment area. On small sites, hydraulic atomising misting nozzles can be attached to sprinkler-like distribution system.

An ionic wetting agent can be added to the water to improve the performance of misting dust suppression systems.

Foaming agents

Foaming agent additives can be added to directional dust-suppressing sprinkler systems to apply a foam to the surface of conveyor belt materials to reduce dust resulting from crusher and material handling plants.

Vegetable oil based soil binders

Biodegradable vegetable oil based soil binders can be applied as a water-based emulsion to provide up to 3 months service life in most vehicular traffic areas.

Polymer based soil binders (see also Soil Binders fact sheet)

Polymeric emulsion soil binders include: acrylic polymers and polymers; liquid polymers of methacrylates and acrylates; copolymers of sodium acrylates and acrylamides; poly-acrylamide and copolymers of acrylamide; and hydro-colloid polymers.

In general terms, polymers can provide around months service life if the treated area remain free of disturbance and traffic movement. On haul roads and permanent unsealed roads, polymer soil binders can be incorporated into road maintenance (grading and rolling) to improve surface stability and compaction.



Photo 1 – Dust generation on a construction site



Photo 2 – Dust control using a water truck