



Redefining possible.

BEST MANAGEMENT PRACTICES PLANS

Lessons from the Aggregate Industry

An Overview of Fugitive Dust

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Fugitive dust can be generated by:

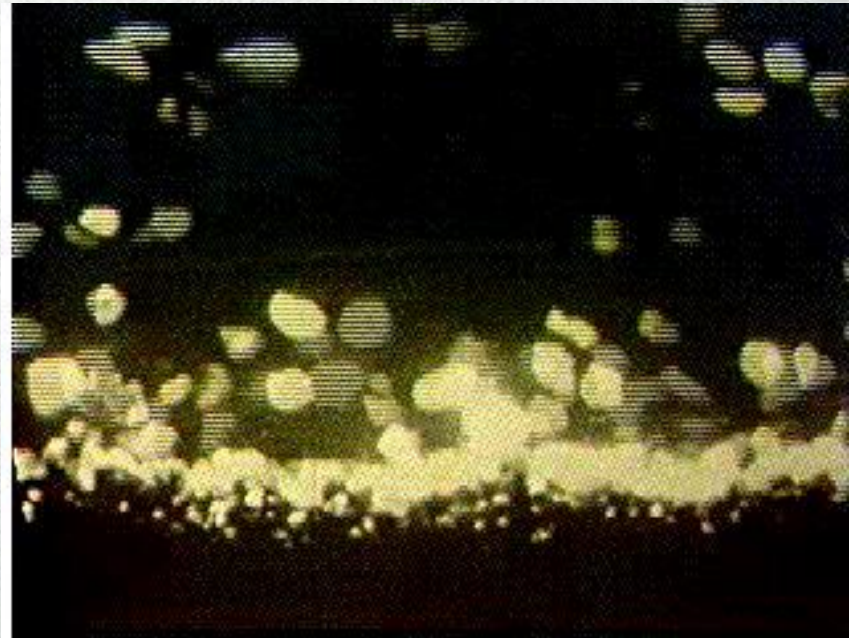
- Construction and land-clearing activities;
- Wind erosion of bare, unvegetated surfaces and stockpiles;
- Open-pit mining operations;
- Aggregate extraction and processing facilities;
- Bulk material handling operations (grain, minerals, etc.);
- Movement of equipment on paved and un-paved roads;
- Agricultural activities; and,
- Grain and feed mills.



An Overview of Fugitive Dust

Controlling fugitive dust involves four key principles:

- Minimizing the dust particles available;
- Increasing the size of the dust particles;
- Decreasing the wind speed; and,
- Reducing potential impacts.





Minimizing Available Dust Particles

Minimizing Available Dust Particles



“Brian, we make big rocks into small rocks.”

Minimizing Available Dust Particles

Minimizing the dust particles available simply means preventing the particles from being generated or emitted in the first place:

- Equipment design can often limit the formation or emissions of fine dust particles.
- Process controls that reduce the amount of fine dust particles created in the first place, which may not be feasible at many sites.
- At larger sites, full enclosures may be possible.
- Full enclosures are not always feasible however, such as for roads or in the quarry, so other techniques are required.



Minimizing Available Dust Particles

The second component of this approach to keep sites clean (and vegetated) to eliminate as many potential sources as possible:

- Good housekeeping is a key step – simply cleaning up fine material that accumulates on-site can have big impacts.
- Vegetating open areas of the site can also have huge impacts, reducing erosion, and also helping to reduce the transport of dust off-site (more on that later).
- That said, one must also ensure that the proposed solution isn't itself potentially causing issues.





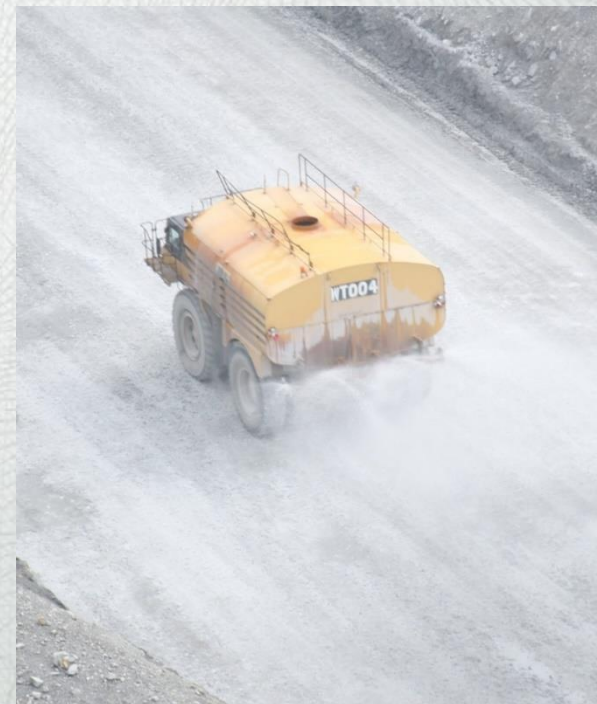
Increasing the Particle Size

Increased Particle Size

Water or other suppressants cause dust particles to stick together, increasing the particle size.

Larger particles are less likely to become airborne, and settle out faster if they do.

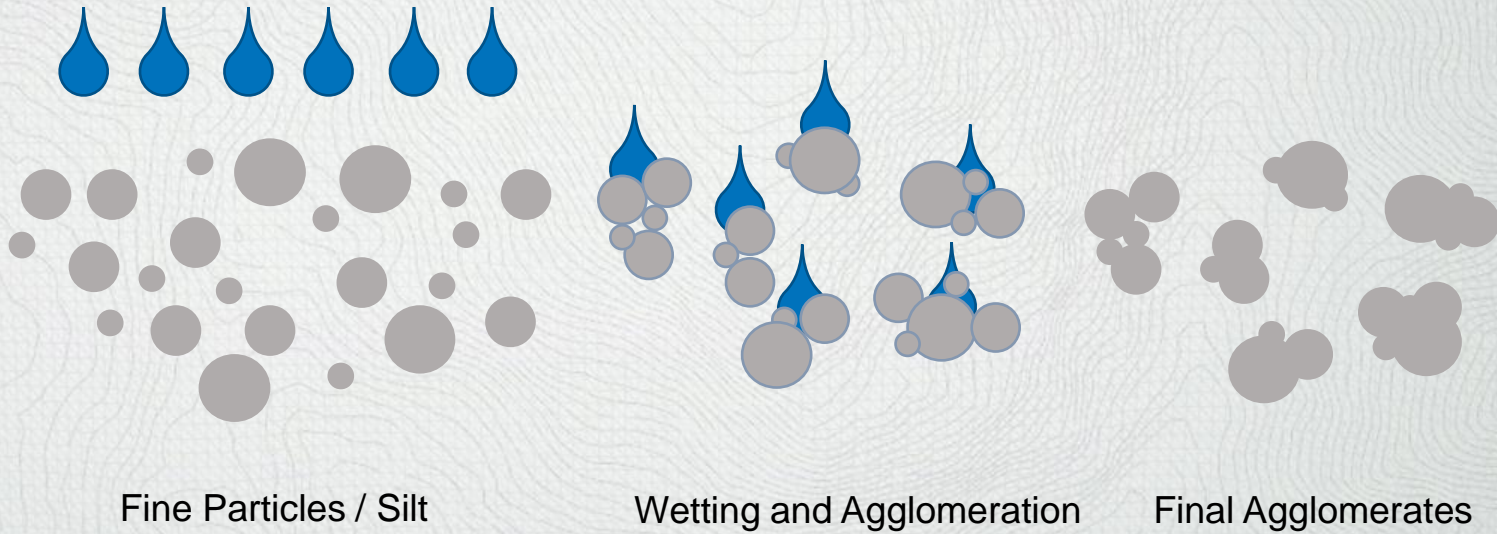
Water trucks and spray bars on plant equipment both work for this simple reason.



Now that's a water truck

Increased Particle Size

Water and / or Chemical
Dust Suppressant



Increased Particle Size

This can be taken to an extreme by paving a haul road.

- Recycled asphalt can also be a good alternative.
- The hard surface must also be kept clean however!
- If not, it can be worse than unpaved roads, as material is ground into fine powder, on a surface that dries relatively quickly.



Increased Particle Size

Water is the most common suppressant:

- As concerns about water use increase, the need for efficient application also increases.
- The key concept is to offset evaporation once the road surface has been wetted.
- The best way to do this is to monitor the weather, since watering once dust is observed is often already too late.
- A predictive watering scheme may be useful for some operations.

Increased Particle Size

Sample Predictive Watering Matrix

Temperature	Relative Humidity (%)	Hours Between Watering @ 1.5 L /m ² (h)
Less than 10°C	75% or less	3
	75-90%	7
	90-100%	15
10-20°C	75% or less	1.5
	75-90%	3
	90-100%	7
Above 20°C	75% or less	1
	75-100%	1.5
	75% or less	3

Increased Particle Size

Water is best applied by water truck(s) with the capacity to water the entire haul road network (in-use) at a rate of up to 1.5 litres per square metre per hour.

That rate of 1.5 L/m² is critical, as it allows an operator to offset the peak evaporation rate on a dry, windy day.

Below 4°C, watering isn't feasible, so curtailing operations may be necessary.

Dust Control Options – Increased Particle Size

It may be necessary to equip the truck with a water cannon to spray stockpiles or working faces prone to wind erosion.

This is especially true in pits where the limit of extraction is close to residences.



Increased Particle Size

Another option to reduce water application is through MOECC approved chemical dust suppressants, such as:

- calcium chloride;
- magnesium chloride; or,
- a commercially-available dust suppressant, typically forest products industry residue.

These pose additional cost, and must be re-applied several times each season, but can help reduce water use.

Reducing the Wind Speed



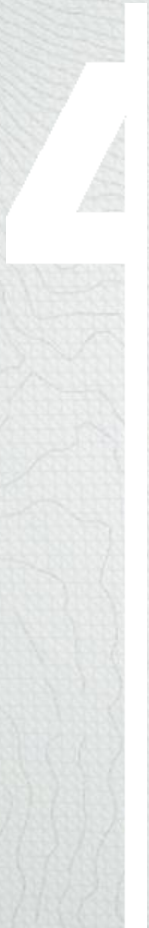
Reduced Wind Speeds

Decreasing the wind speed is the least preferable option, but can be very effective when all else fails:

- The tendency of particles to become airborne is closely related the wind speed – even short gusts can pick up significant amounts of fine dust.
- Solid walls are not actually the answer, unless a piece of processing equipment is being fully enclosed, for example. Screens are better!



Reduced Wind Speeds

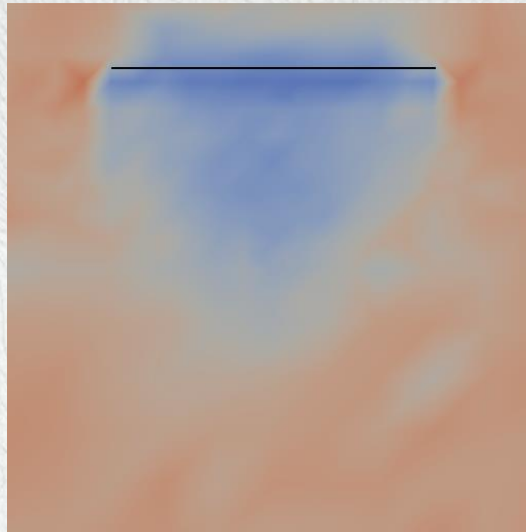


Perpendicular
winds

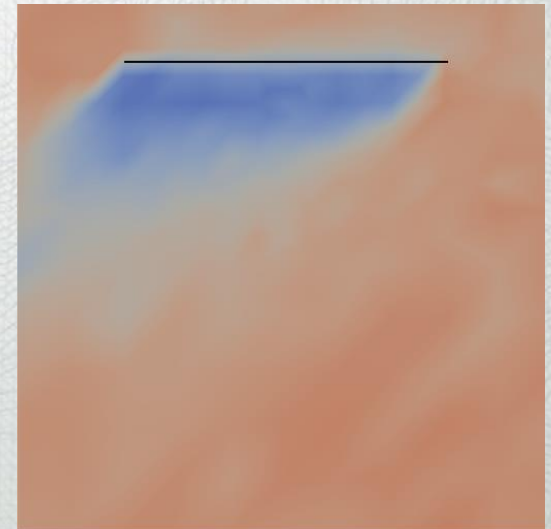
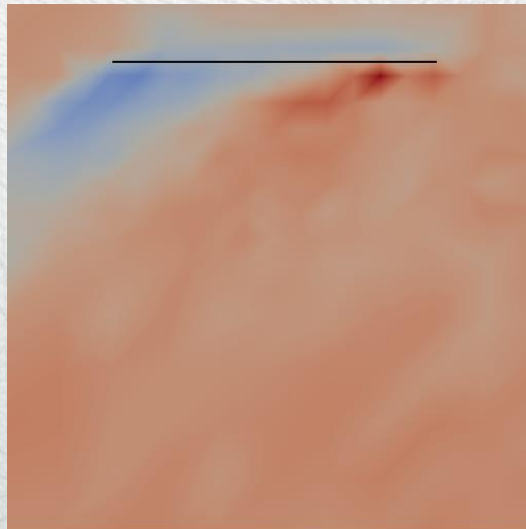
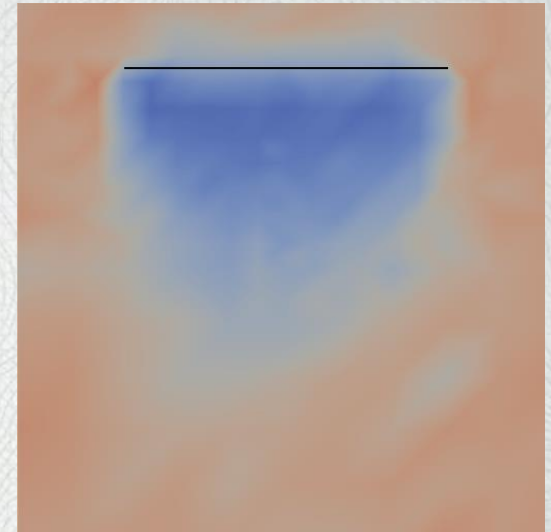


Winds at 40°

Solid wall



36% Porous Screen



Reduced Wind Speeds

Using wind screens, whether engineered materials or through well-planned vegetative screening, lowers the wind speed but does not block the wind.

This is important, as solid structures can actually increase wind speeds as the wind is forced over or around a solid obstacle.

The same concept behind snow fences works for dust control, but location is key, like in Fermont, Quebec!



Reduced Wind Speeds

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A good wind screen should:

- Be at least as high as the stockpile or process that is being protected;
- Be located no more than twice the height of the fence itself away from the stockpile or process that is being protected;
- Have a porosity of approximately 30%.
- Ideally create a 3-sided wind barrier, with the open side away from the prevailing winds.

Reduced Wind Speeds

4 Vegetative screens are also useful, and should be similar in nature to the elements listed for engineered wind screens.

The key issue with vegetative screens is to ensure that the vegetation is mature enough and thick enough to do the job.

Use established vegetation if possible, as new plantings may take years to develop.



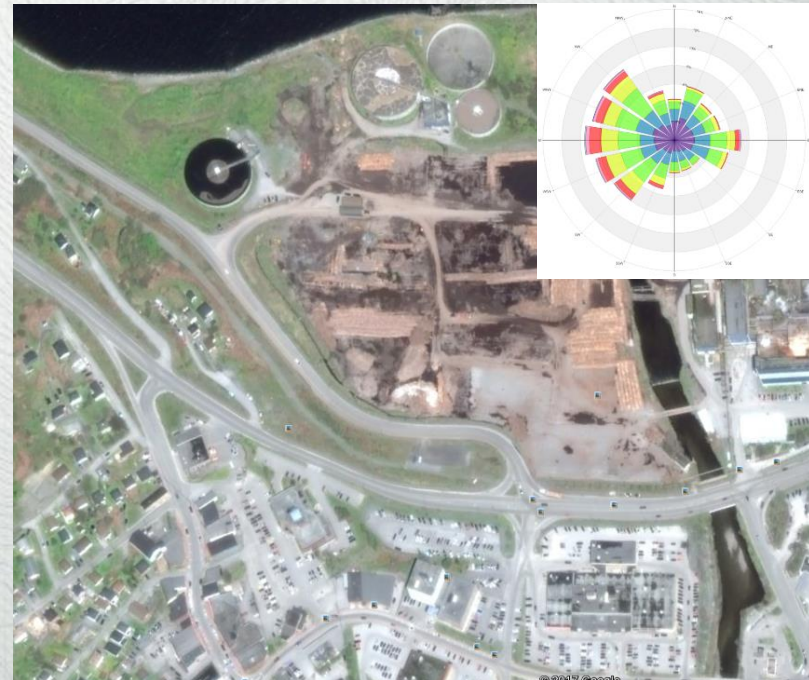


Reducing Impacts

Reducing Potential Impacts

When all methods of control have been exhausted, the final option is to operate in a manner that reduces the potential impact to neighbours.

- The simplest, and not always the most costly, is to simply buy up neighbouring properties.
- When that isn't an option, keeping dust away from those neighbours becomes the focus.



Reducing Potential Impacts

This can be accomplished through:

- Maximizing the separation distance between operations and residences.
- Keeping enough flexibility at a site to allow dust-generating operations near residences only when winds are favourable.
 - When operations are near a residence, curtail or restrict dust-generating operations when the wind is blowing toward the residence.
 - When the winds are blowing from the residence toward the operations, ramp up operations as much as possible.

Remember, this is a last resort, when all else fails, but it can be effective.

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THANK YOU

Redefining possible.

Contact Information



Peter Rehbein

Air Quality Engineer

Email: Peter.Rehbein@rwdi.com

Tel: +1.519.823.1311 x2317



Brian Sulley

Senior Air Quality Specialist | Associate

Email: Brian.Sulley@rwdi.com

Tel: +1.519.823.1311 x2373