

# Materials Handling Products

# Dust Control

## Finding the dust control solution for your operation depends on many factors:

- The material producing the dust (coal, ore, etc.)
- The processing operation generating the dust
- The physical location of the operation generating the dust (underground or above ground, enclosed or exposed areas, etc.)
- The available utilities and resources – electricity, compressed air, water, labour, etc.

**There are many options available for dust control, but there are four basic approaches:**

- Using wet systems that use water sprays to prevent dust or capture airborne dust
- Using enclosures to contain dust
- Using ventilation systems/exhaust systems to remove dust
- Using a combination of these techniques

## Our focus is on wet systems that use spray technology to control dust because:

- It is highly effective
- It is often more economical than other technologies
- Implementation is typically fast and straightforward
- It is a long-term solution that can provide years of trouble-free performance with regular maintenance

## Many variables to consider for dust control:

- Dust particle size
- Surface wetting of material substrate
- Chemical approach
- Spray placement, pattern, spray angle and drop size
- Water quality and availability
- These, and many other factors, can have a significant impact on performance.

## Particle diameter in microns:

- Ground limestone: 10 to 1000  $\mu\text{m}$
- Fly ash: 10 to 200  $\mu\text{m}$
- Coal dust: 1 to 100  $\mu\text{m}$
- Cement dust: 3 to 100  $\mu\text{m}$
- Carbon black: 0.01 to 0.3  $\mu\text{m}$
- Pulverized coal: 3 to 500  $\mu\text{m}$

## Nozzle Type

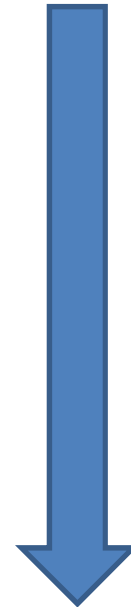
Air atomizing

Fine spray

Hollow cone

Flat fan

Full cone



## Drop Size

Drop size

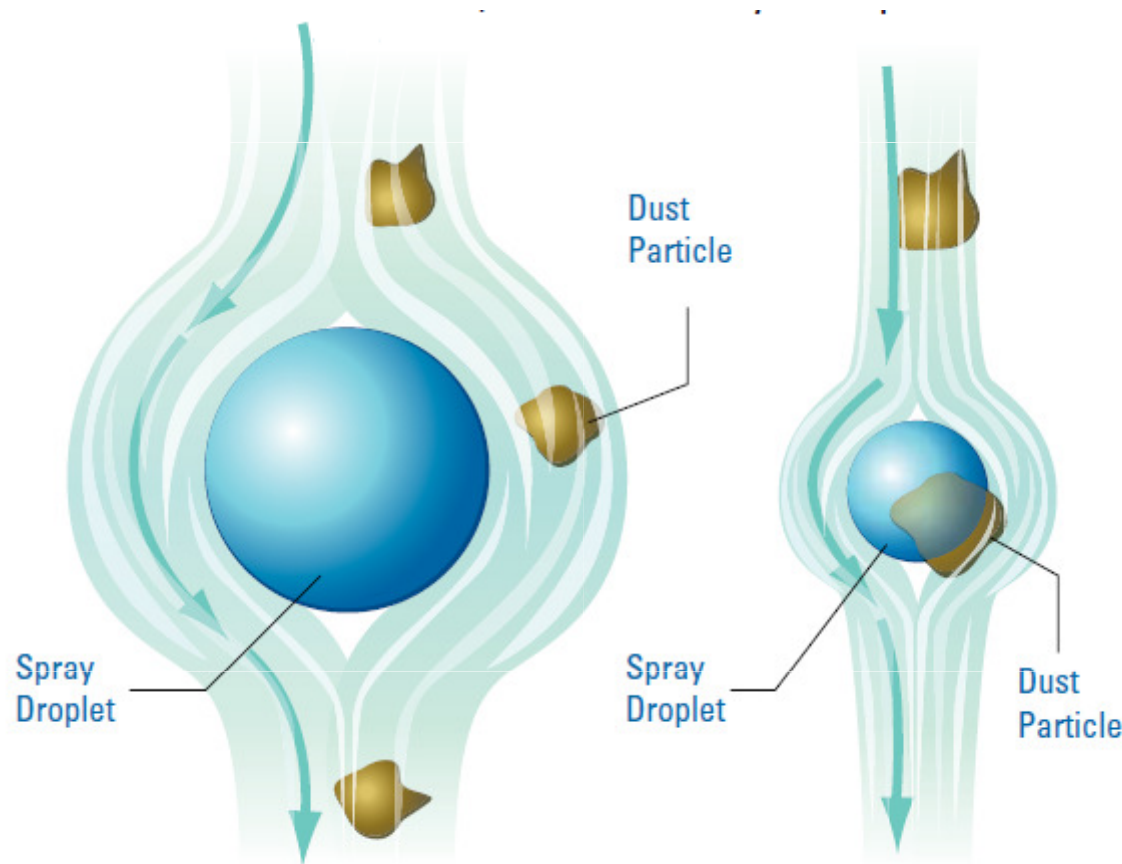
Increases in  
size

- **Pressure** – high pressure gives smaller drops and lower pressures yield larger drops
- **Flow** - lower flow nozzles produce the smallest drops and higher flow nozzles produce the largest drops
- **Surface Tension** – increase will increase drop size
- **Velocity** - small drops have a higher initial velocity, but velocity diminishes quickly. Larger drops retain velocity longer and travel further



## Large Drop

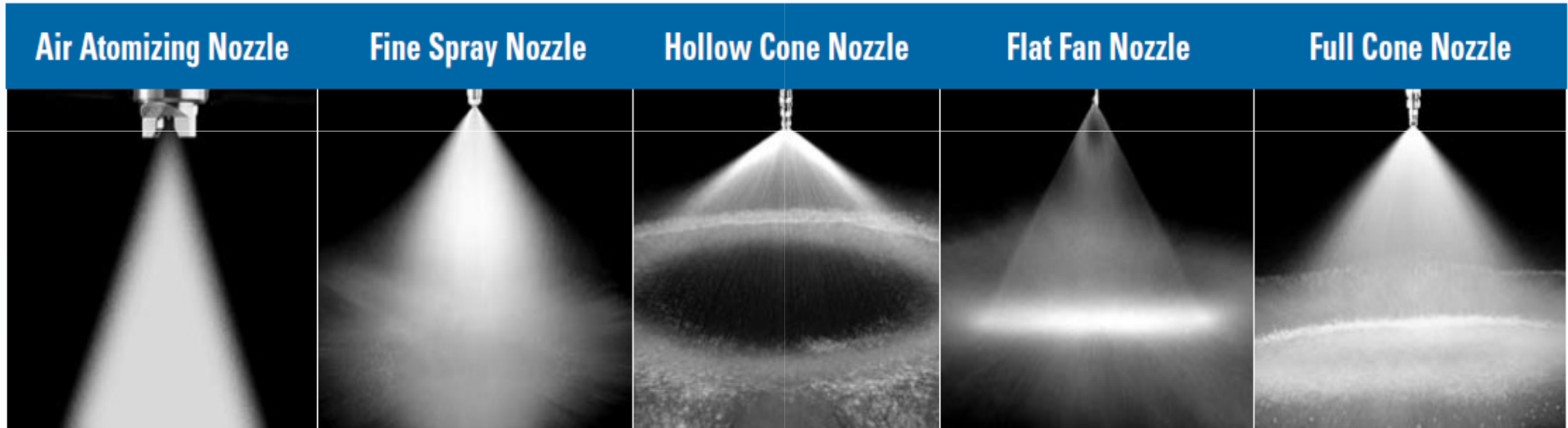
If the drop diameter is larger than the dust particle diameter, the dust particle will follow the air stream around the drop and escape.



## Small Drop

If the diameters of the drop and the dust particle are comparable, the dust particle will follow the air stream and be captured by the drop.

# Spray Patterns



Smallest  
Drop Size



Largest  
Drop Size

**Dust prevention** - hydraulic nozzles that produce drops between 200 and 1200  $\mu\text{m}$  are generally used.

**Dust suppression** - air atomizing nozzles or hydraulic fine spray nozzles that produce drops between 20 and 200  $\mu\text{m}$  are used.

## Dust Prevention

- Nozzles should be placed as close to the beginning of the transfer point as possible.
- The force of the moving material helps the water penetrate the material as it moves through the transfer point.

## Dust Suppression

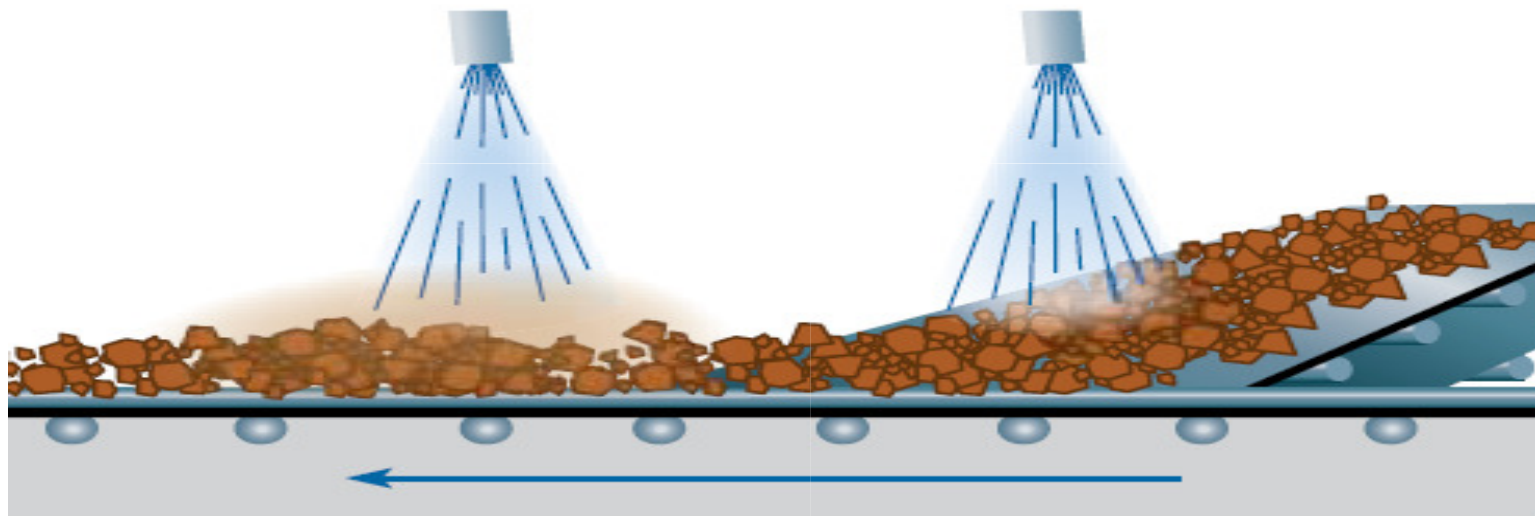
- Nozzles treat the air around the material rather than the material.
- Nozzles are placed at the end of transfer points so the material can settle and are positioned so they are spraying above the material and not on it.

# Nozzle Placement at Transfer Points



**Dust Prevention** - nozzles at the beginning of the transfer point positioned to spray on the material

**Dust Suppression** - nozzles to spray the air above the material at the end of the transfer point



## Water Hardness

- Increases the surface tension of water and may increase the amount of water needed for adequate wetting.
- Can cause hardness deposits or corrosion which block the nozzles and increase maintenance.

## Contaminants

- May influence the nozzle selection process.
- Debris may need filtering to minimize clogging and excessive nozzle wear.
- Strainers may be required even with clean water supply because contaminants can be introduced to the water from eroding pipes.

# Advantages and Disadvantages of Various Wet Approaches



	Pros	Cons
Water	<ul style="list-style-type: none"> <li>• Least expensive</li> <li>• Limited carryover effect is possible</li> <li>• When good mixture of water and material is possible, quite effective</li> </ul>	<ul style="list-style-type: none"> <li>• Some materials can't tolerate excess moisture or repel water</li> <li>• Can't use in freezing temperatures</li> <li>• Large volumes of water and over wetting is common</li> <li>• Water evaporates – reapplication is necessary</li> </ul>
Surfactants	<ul style="list-style-type: none"> <li>• Efficiency can be higher than water</li> <li>• Equivalent efficiency may be possible using less water</li> </ul>	<ul style="list-style-type: none"> <li>• Not all materials tolerate surfactants</li> <li>• Material is contaminated with surfactants</li> <li>• Capital, operating and maintenance costs</li> </ul>
Foam	<ul style="list-style-type: none"> <li>• Best efficiency when effective mixing of foam and material can be achieved</li> <li>• Moisture addition is low</li> </ul>	<ul style="list-style-type: none"> <li>• Material is contaminated with foam</li> <li>• Compressed air is usually required</li> <li>• Capital, operating and maintenance costs</li> </ul>
Binders	<ul style="list-style-type: none"> <li>• Eliminates the need for re-application</li> <li>• Better efficiency</li> <li>• Applied at multiple transfer points</li> </ul>	<ul style="list-style-type: none"> <li>• Nozzle and equipment maintenance</li> <li>• Capital, operating and maintenance costs</li> </ul>

## Binding Agents

- Classified as humectant or adhesive formulations.

## Humectants

- Absorb and maintain surface moisture to keep the dust "wet."

## Adhesives

- Maintain fine particle agglomerates in the absence of surface moisture.
- Oils and polymers are considered to be adhesives in dust control applications.

**Crusting Agents** - binding agents used for long-term surface stabilization.

- The primary active components are water-based latex polymers that cure to form a mechanically stable water-insoluble film.
- Wetting agents and/or viscosity modifiers are added to affect the rate and degree of liquid penetration into the bulk solid surface.



# Binding Agents



Product	Type	Application	Comment
RPT 563	Oil/Tackifier/ Surfactant	Coal, Coke, Limestone, Fly ash and ores. Specially developed for use on hot materials (<175°C). Also used cold and on roads	Self-emulsifying when mixed with water. Reduces emissions during handling and open storage
RPT 564	Lignin based	Roads, coal, ores, etc	Inexpensive and environmentally friendly binder
RPT 565	Inorganic	Coal, coke, ores, taconite clinker	Some emulsification when mixed with water
RPT 567	Polymer based	Coal, coke, ores, etc	Completely water soluble. Can be applied wet or in foam

**Several Binding agents are suitable for application as crusting agents at higher dose rates**

# Binding Agents



Product	Type	Apply at	Comment
RPT 563	Oil/Tackifier/Surfactant	For fugitive dust 1 – 10% in water. Apply at 5 -50 litres per tonne	Proven properties in reducing coal oxidation
RPT 564	Lignin based	For fugitive dust Apply at 50 – 150g per tonne at an appropriate solution strength	Can be used at higher dosage as a low cost short term crusting agent
RPT 565	Inorganic	Apply at 1 – 5% solution in water	Can be used at higher dosage as a low cost short term crusting agent
RPT 567	Polymer based	For fugitive dust 0.5 – 1.0%	Can be used at higher dosage as a low cost crusting agent

# Crusting Agents



Product	Type	Application	Comment
RPT 569	Latex polymer emulsion	Inactive storage piles of coal, coke, ores (anything dusty normally) stored outside	Provides a semi-permanent rain resistant seal. Inhibits coal oxidation, freezing and reduces moisture content

# Crusting Agents



Product	Type	Application	Comment
RPT 569	Latex polymer emulsion	Dilute 3 – 7% Apply by spraying at 5 -20 litres/m3	Two half strength applications are best. Wait 48 hours for settling of the pile before application

## Dust Control Binding Agent

- Provides excellent control of fugitive emissions
- Effective on coal, ores and other bulk solid materials
- Controls dust in active storage piles and roads
- Reduces inventory losses



- Controls fugitive dust from storage piles and haul roads.
- Biodegradable and contains no chlorides or waste oils.
- Reduces safety hazard, and environmental nuisance
- Reduces maintenance and loss of valuable material.
- Applied as a spray at a material transfer point or from tank trucks equipped with sprays.
- Provides residual control and needs only to be applied at a minimal number of locations.
- Reduces the cost of losses associated with added moisture and oxidation.

## Typical Applications

- Control of fugitive dust emissions for solid materials including road dust, coal, ores and waste materials stored in open piles exposed to the weather.

## Treatment and Feeding Requirements

- For fugitive dust apply at 50 – 150g per tonne at an appropriate solution strength
- Can be used at higher dosage as a low cost short term crusting agent

## Crusting Agent

- Provide long term control of fugitive dust emissions (>90% dust reduction for many materials)
- Reduce explosion hazards
- Reduce inventory losses and pile run off
- Reduce oxidation of coal and control moisture content
- Improve working conditions, community relations and protect the environment



## General Properties

- Appearance: White Liquid Dispersion
- pH (5% dispersion): approx. 6.5
- Viscosity: approx. 100-400 cps



## Description and Use

- RPT 569 product is a material storage pile crusting agent especially formulated to control dust from long term storage piles
- Provides a durable, semi-permanent rain-resistant surface seal which reduces wind erosion and also helps to protect against atmospheric oxidation.
- The rain resistance also reduces the chance of bulk freezing.

## Typical Applications

- RPT 569 provides control of fugitive dust emissions from a wide variety of solid materials including coal, limestone, calcined coke, taconite, clinker, ores, fly ash, mine tailings and waste materials stored in open piles exposed to the weather.

## Treatment and Feeding Requirements

- Crusting agents - diluted 3-7% and applied at 1 - 5 litres/m<sup>2</sup>.

# Benefits of Chemical Dust Control



- Eliminates the capital, operation and maintenance costs associated with mechanical dust collectors.
- Achieves better dust control and reduces costs associated with loss of material
- Maintains the surface moisture level required to obtain a dust-free material
- Reduces oxidation of coal and improves calorific value
- Improves working conditions, community relations and protects the environment