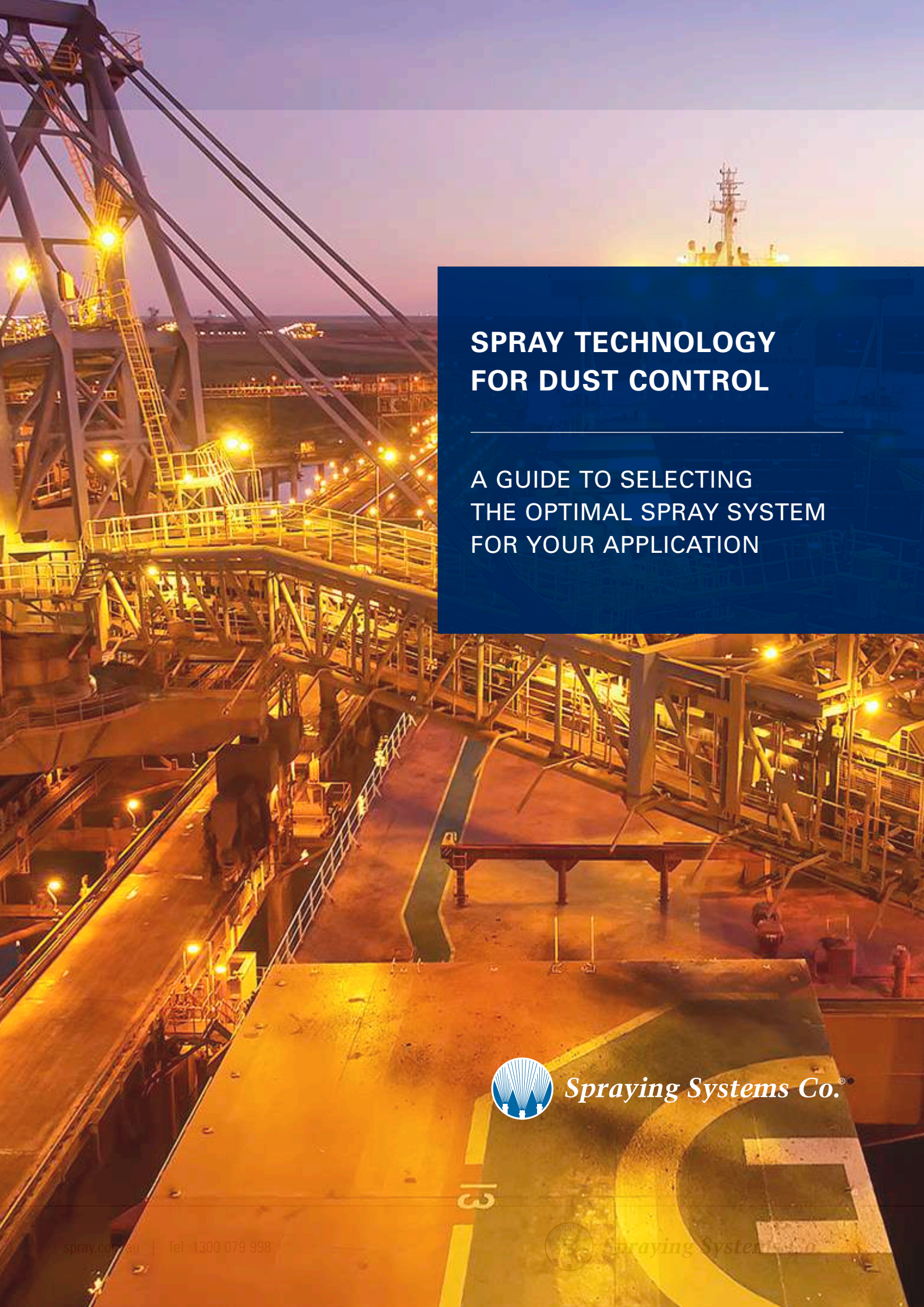

SPRAY TECHNOLOGY FOR DUST CONTROL

A GUIDE TO SELECTING THE OPTIMAL SPRAY SYSTEM FOR YOUR APPLICATION

Spraying Systems Co.®

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SPRAYING SYSTEMS ARE THE WORLD LEADERS IN DUST CONTROL AND DUST SUPPRESSION

Our complete range of product solutions includes:

- Spray nozzles
- Accessories
- Design and manufacture of spray bars and headers
- Design and manufacture of control valve assemblies
- Design and manufacture of spray control systems
- Design and manufacture of pump skids
- Engineers that can design and supply spray systems for new, upgrades and maintenance projects

SPRAYING SYSTEMS CAN HELP YOU EVERY STEP OF THE WAY.

We can do everything to solve your dust problems, from audit and appraisal right through to commissioning.

Our team of engineers are backed by over 80 years of experience in the business, and Spraying Systems have solved a variety of dust-related problems all over Australia and the globe.

AutoJet® TECHNOLOGIES

From *Spraying Systems Co.*

Spraying Systems has developed AutoJet spray controllers and automated systems for coating, lubricating, marking and many other spray applications. Our Autojet technologies range from simple on / off controls to sophisticated, real-time monitoring of process variables and automatic adjustment of spray performance that can be key for dust control.

EFFECTIVE SPRAY SYSTEMS FOR DUST CONTROL

Spray technology plays an integral role in improving the safety and efficiency of mining operations in Australia. When considering spray technology as your dust control solution, you must first consider whether you are aiming for dust prevention or dust suppression.

KEY CONSIDERATIONS

- What process and material are generating the dust?
- Where is the dust being generated?

DUST PREVENTION

Dust prevention refers to the principle of adding water to ore to control the problem at the source and prevent dust particles from becoming airborne. When the particle absorbs water, it increases the mass and weighs the particle down. When applied correctly, this is a practical and straightforward application that provides a long-term solution that can be easily managed with regular maintenance.

DUST SUPRESSION

Dust Suppression refers to the principle of controlling already airborne particles and can be done alone or in support of dust prevention. Creating the correct droplet size is critical to success as it must be of equal size to the particles to merge and increase mass. This causes the particle to return to its material source or the ground.

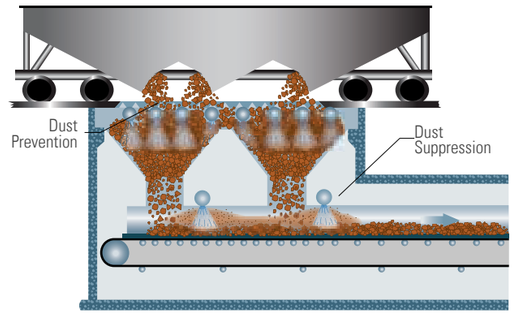


Figure 1: Moisture is added to the material to prevent dust from forming as it is transferred from the hopper car to the hopper bin. Sprays are then used to capture airborne dust as the material moves down the conveyor line.

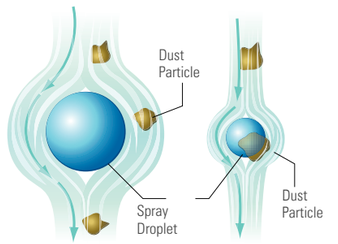


Figure 2: If the drop diameter is larger than the dust particle diameter, the dust particle will follow the air stream around the drop. (Shown above.) If the diameters of the drop and the dust particle are comparable, the dust particle will follow the air stream and collide with the drop. (Shown left.)

VARIABLE TO CONSIDER WHEN SPECIFYING A SPRAY SYSTEM

- Dust particle size
- Spray drop size
- Spray pattern
- Spray angle
- Operating pressure
- Surface wetting
- Nozzle placement
- Water quality and availability
- Control options
- Available compressed air

Operations requiring dust prevention:

- ROM/feed bin
- Ship loaders
- Conveyors
- Stockpiles
- Train load-outs
- Crushing
- Stackers
- Reclaimers
- Ore dumpers
- Transfer points

In these operations, moisture can be applied to the material when it is stationary, moving or both.

ADVANTAGES AND DISADVANTAGES OF VARIOUS SOLUTIONS

	PROS	CONS
PLAIN WATER	• Most cost-effective • Simple to design and operate • Limited carryover effect is possible • When a good mixture of water and material is possible, quite effective • Enclosure tightness isn't critical	• Can't use with products that can't tolerate excess moisture • Some materials repel water • Can't use if freezing temperatures are possible • Requires large volumes of water, and over wetting is common • Water evaporates, making re-application necessary
SURFACTANTS	• Dust control efficiency can be higher than plain water • Equivalent efficiency may be possible using less water	• Not all materials tolerate surfactants • Material is contaminated with surfactants • Higher capital, operating and maintenance costs
FOAM	• Most efficient when effective mixing of foam and material can be achieved • Moisture addition is low	• Material is contaminated with foam • Compressed air is usually required • Higher capital, operating and maintenance costs
BINDERS	• Eliminates the need for re-application • Most efficient in multiple transfer points	• May cause production problems and nozzle/equipment damage • Higher capital, operating and maintenance costs • Binders are effective when ore is stationary, moving ore breaks the bind between particles and allows them to become lighter and airborne

CRITICAL QUESTIONS FOR SYSTEM ANALYSIS

DUST PREVENTION

What material are you adding moisture to?

It is important to understand exactly how much moisture to add as different materials will respond to moisture in different ways. Too little moisture means you'll still have a dust problem. Too much moisture, and the integrity of the material may be compromised, and cause quality issues. For example, if you have a limit of 6% allowable moisture in the ore, the maximum amount of water per ton is 60 liters.

You still need to factor incoming moisture content and evaporation. To get the balance correct Spraying Systems does a complete calculation for an optimal operational spray system. Poorly designed systems quickly result in excess water usage that will result in conveyor carry back issues, chute blockages, belt slippage and tracking issues, increased plant clean ups and excess moisture content when loading onto ships.

Should chemicals be added?

The material will also determine whether chemicals should be added to the water to improve suppression and/or lower overall application costs. Coal, for example, can repel water and in some cases requires the use of chemical additives to increase absorption.

Also, consider the processing stage. Most particles created during breakage are not released into the air. The dust stays attached to the surface of the broken material. Adequate wetting is critical to ensure dust stays attached. Keep in mind that partially processed minerals and coal may be more sensitive to moisture than unprocessed material.

Is the material moving or stationary?

Drop size, spray angle, and capacity output can affect surface coverage when spraying stationary material, while drop size and drop velocity affect coverage when spraying moving material. These factors must be considered when selecting and positioning spray nozzles.

DUST SUPRESSION

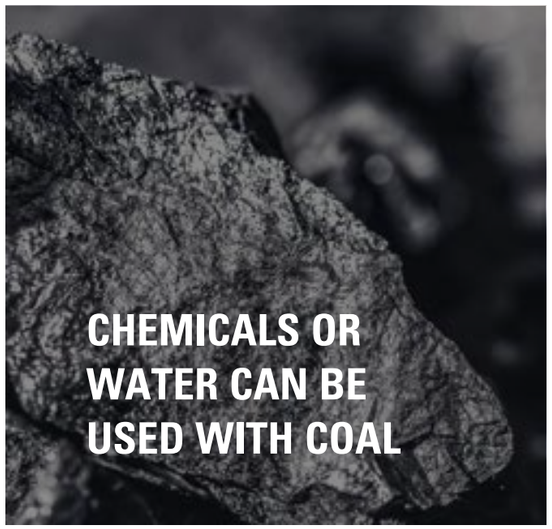
What is the ore particle size?

Dust capture is most effective when dust particles merge with water drops of an equivalent size. Drops that are too large won't collide with the smaller dust particles and drops that are too small evaporate too quickly and release the captured dust particles. Understanding the particle size of the dust is critical to effectively design a suppression system. See Figure 2. You can use these general guidelines regarding dust particle size. However, further research may be necessary depending on the material and stage of the material in processing.

Particle diameter in microns	Particle	Microns
Ground limestone	10	1000 µm
Fly ash	10	200 µm
Coal dust	1	100 µm
Carbon black	0.01	0.3 µm
Pulverised coal	3	500 µm
Iron ore	1	150 µm

Operations requiring airborne Dust Suppression:

- ROM/feed Bin
- Continuous mining
- Screening
- Transfer points
- Reclaimers
- Ore dumpers
- Shearing
- Crushing
- Dryers
- Stackers
- Train load out
- Ship loaders



GENERAL CONSIDERATIONS

Will the treated dust control water be returned to the product stream?

This needs to be included in moisture spray calculations to avoid product quality problems.

Is rollback dust a problem?

Rollback dust occurs at the ROM / feed bins when dumping from front end loader, dump trucks, ore cart dumpers, crushers, grinders, cutting heads and entrances to scrubbers. Rollback dust can be a significant problem and may require a separate system for suppression.

What is the quality of the water?

Poor quality water can be problematic in many dust control applications. Strainers are essential, and there should be a primary and secondary strainer installed, even when using clean water, because contaminants can be introduced from the water supply.

Poor water quality will also require more frequent nozzle maintenance, increase the nozzle wear rate, and shorten service life. Water hardness also affects nozzle performance. If the water is classified as “hard water”, it will have greater amounts of calcium and magnesium. Hard water has an increased surface tension which makes it more challenging to produce a smaller droplet. Additionally, the more significant amounts of contaminant increase nozzle wear and the deposits slowly accumulate in the nozzle, reducing nozzle efficiency.

Correct strainer selection and manual or auto cleaning are a must. Strainers that are not regularly cleaned result in pressure/flow drop to the nozzle, resulting in poor performance. It is always recommended to use the auto-purge cleaning strainers.

How important is water conservation?

Water conservation is a crucial issue in Australia. It is important to specify nozzles that minimise overspray and water waste. Controls should be used to ensure the system is active only when needed. Many options are available, ranging from simple solenoid valves for on/off control to sophisticated spray controllers that monitor a wide range of operating conditions and make automatic adjustments.

Poorly designed spray systems and lack of maintenance will lead to increase water consumption to excessive levels. This leads to ore quality issues, not meeting current mining licenses, and long-term environmental impacts.

Is compressed air available?

Air atomising nozzles mix fluid and compressed air to produce small drops. These tiny drops evaporate quickly and are perfect for use in operations where wetting is needed, but excess moisture cannot be tolerated. Small drops are also required when the capture of small airborne dust particles is required.

What is the spray solution?

- Plain water systems are typically the least expensive and easiest to design and implement
- Adding surfactants to water will lower the surface tension and allows better interaction between water and certain types of dust that resist water absorption
- Foam systems use less water but usually require compressed air
- Binders agglomerate particles together after the moisture evaporates. However, binders can cause clogging and build-up on nozzles, conveyors and other equipment. Water-soluble binders can cause environmental problems should run-off occur.

ROM BIN

Up to a thousand tons a minute can be tipped into ROM bins, creating large amounts of dust. As the ROM bins are normally at high points on the site this can spread all over the facility very quickly.

SOLUTION

There are two solutions that have proven results. and both utilise two layers of spray. The second layer in both solutions will use our FogJet® nozzles that provide a balanced amount of water and coverage for dust prevention.

The first option is to use air atomosing nozzles which require compressed air supply. This strategy is highly effective because the air atomising nozzles produce a small droplet size with a large orifice to minimise blockages with air and water pressure less than 5 Bar. When compressed air is unavailable or air atomising nozzles are not the preferred option, a hydraulic solution can be used. As an alternative, a hollow cone spray nozzle can also be used for dust control. Although the hydraulic nozzle does not produce the same droplet size from an air atomising nozzle, it is still an adequate solution if the correct water pressure is available.

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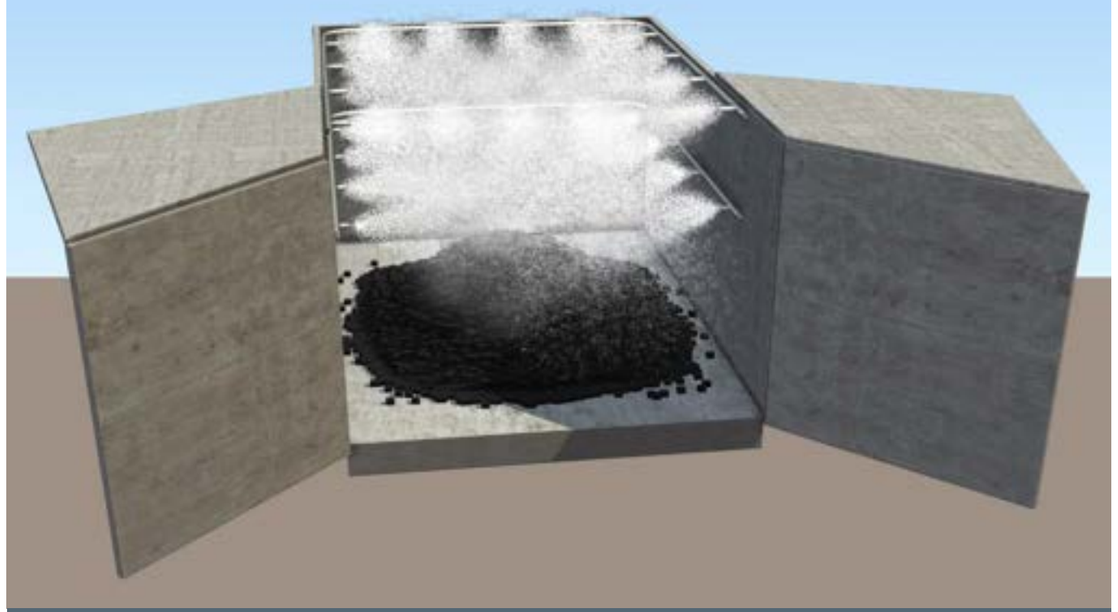
Figure 3: ROM BIN



GRIZZLY/SCALPERS CRUSHERS

Dust is generated as ore moves through the ROM bin to the grizzly and crusher and is sifted and crushed. To control the dust the correct amount of water must be added. Too much can potentially cause bogging issues in the crusher. whilst not enough water would mean that the dust is not adequately controlled.

SOLUTION

Our WhirlJet and SpiralJet (C) nozzles are perfect when you need small and precise amounts of water. The correct positioning of the nozzles is critical to ensure you cover the particles without using excessive amounts of water. Adjustable ball fittings may be required to position the nozzle.

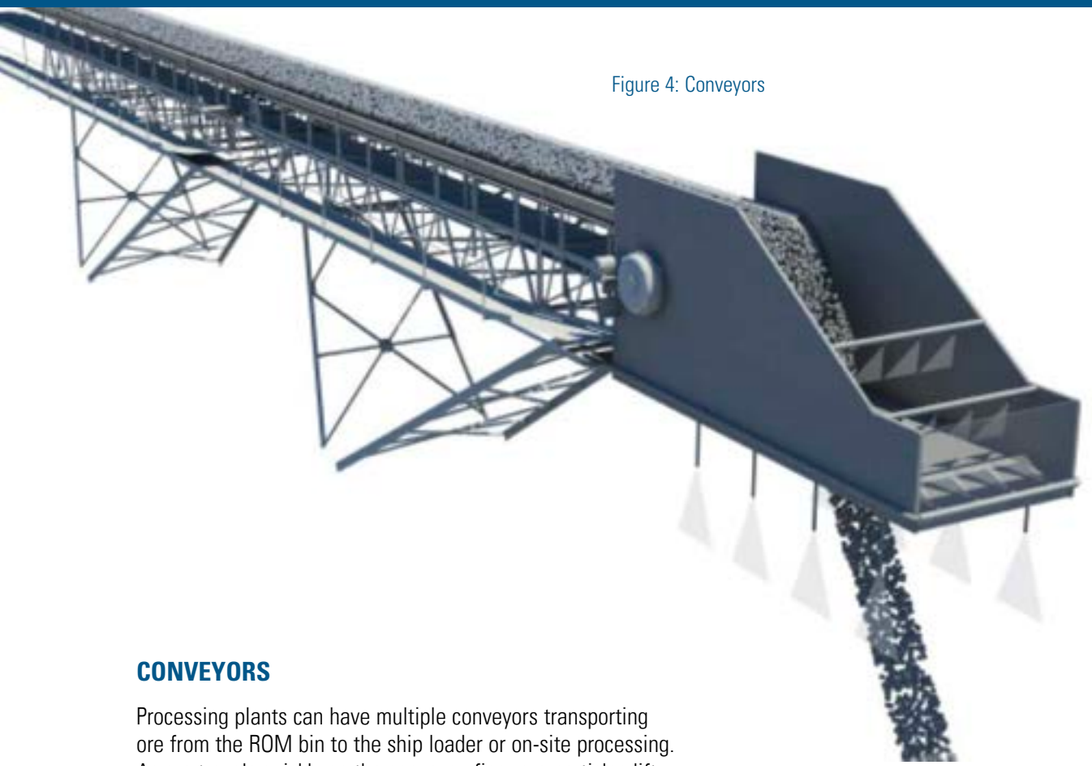


Figure 4: Conveyors

CONVEYORS

Processing plants can have multiple conveyors transporting ore from the ROM bin to the ship loader or on-site processing. As ore travels quickly on the conveyor, finer ore particles lift-off, generating airborne dust.

Winds can also generate dust off conveyors.

Moisture can quickly evaporate in environments exposed to heat and wind. This makes adding water to conveyors essential to reducing dust throughout your facility, especially at transfer and drop points.

SOLUTION

You need the correct setup on the conveyors for the best results in pursuing dust prevention. The wrong spray arrangement can cause issues such as carryback or chute blockages.

To achieve the best results, use a flat spray with an accurate angle, output, and the necessary capacity.

STACKERS

Stackers expel ore from the conveyor onto the stockpile and produce considerable amounts of dust, which can increase depending on the height of the boom to the stockpile.

SOLUTION

The correct positioning of nozzles is critical for both suppression and prevention principles. Spraying Systems Co combines VeeJet, WhirlJet®, FogJet® and SpiralJet® nozzles for the best performance on stackers.

Adjustable ball fittings are required to position nozzles correctly to maximise dust control efficiency.

TRANSFER CHUTE BLOCKAGES

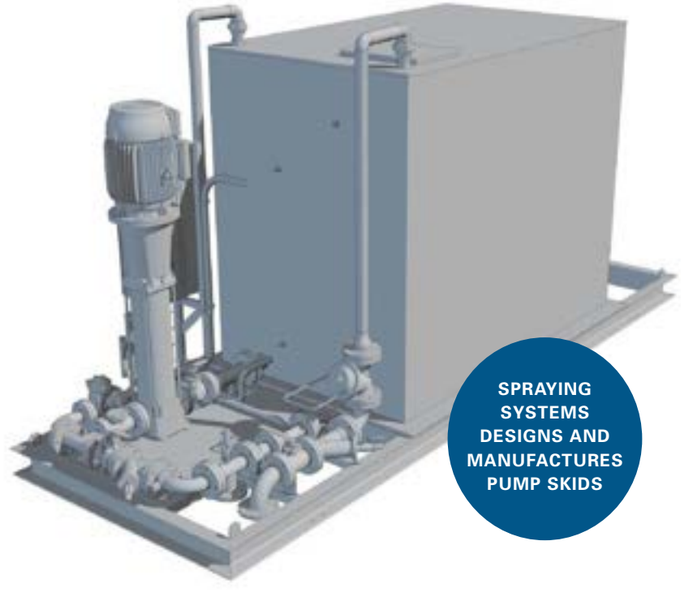
Transfer chute blockages are a significant challenge for a plant operation, especially with conveyors running fine ore. The ore can accumulate on the wear deflection plate and cause the ore to deflect in the wrong direction, causing spillages, damage, and conveyor tracking issues. Production then needs to be stopped, and a manual cleaning process is required, leading to production stoppages, impacting profitability.

SOLUTION

Spraying Systems has designed a spray bar solution that uses FlatJet® nozzles to clean the deflection wear plates whilst minimising production loss. Adjustable Ball fittings are required to position the nozzle correctly to maximise cleaning efficiency.

There can also be significant amounts of ore that have accumulated below the wear plates, and our TankJet® nozzles can be put in place internally and rotate on a 360-degree rotation, cleaning the chute internally.

Figure 5: Pump skids can be used to provide water for dust control or suppression on transfer chutes.



SPRAYING SYSTEMS DESIGNS AND MANUFACTURES PUMP SKIDS

STOCKPILE DUST

It is important to stabilise the surface of a stockpile to maximise dust control through regular watering. This is achieved by watering regularly. AutoJet has developed a spraying control system that can keep your piles stable and minimise the amount of dust spread on site.

SOLUTION

Spray canons are used to wet these stockpiles to reduce dust emissions. Spraying Systems Stockpile Dust Suppression System is an ideal solution. You can use binding agents through the Spraying Systems Dosing system. Dust prevention prior to the stockpile creation also adds constant moisture reducing dust emissions.

THE AUTOJET DIFFERENCE

The AutoJet automated system analyses the weather conditions and determines the best time for the spray canons to operate. The systems ensure the stockpile holds the optimal amount of moisture so that the dry dust does not fly away as wind passes over the ore.

Water Cannons, nozzles and other electrical and pneumatic devices can be incorporated into an effective system that saves water, labour and operates at the highest efficiency. Being an automated system, monitoring operating conditions and adjustments are made without operator intervention.

These can be fixed in by cone shape pile forms or in a more elongated form, such as when the stacker moves along a rail. Stockpiles easily exceed dust emission levels and are high-risk work areas for personnel.

RECLAIMER

The reclaimer bucket wheel cuts into the stockpile to extract ore for the outgoing transport, generating large amounts of dust.

SOLUTION

Nozzle position is critical to reducing the amount of dust generated from the bucket wheel cutting into the stockpile and the conveyor. The ore should be wet before the bucket wheel cuts into the ore. The appropriate nozzles should then be positioned to spray either side of the bucket, utilising

the bucket to disperse the sprays further. The nozzles are positioned on the underside of the bucket to control dust. The last set of nozzles is placed to wet the ore as it comes off the bucket onto the conveyor.

NOZZLE SELECTION

We recommend using a combination of FogJet®, WhirlJet® and VeeJet® nozzles. Adjustable Ball fittings are required to position the nozzle correctly to maximise dust control efficiency.

FogJet®

VeeJet®

WhirlJet®

LAUNDER TRAYS

Inefficient launder tray washing techniques can lead to expensive clean-ups and even obstructions to conveyor belts that can potentially result in belt fires and unwanted production stoppages. By utilising the right spray technology, your operation can ensure that waste is cleaned off launder trays effectively, allowing your site to continue production uninterrupted. Incorrect nozzle types can also lead to large amounts of water wastage.

SOLUTION

Spraying Systems understands launder washing needs to be quick and effective. Our engineers will provide recommendations to ensure that when water flows, the ore will flow to the ground level. Launder trays are fitted below conveyor belts, generally at belt washing stations or belt scrapers. Any removed ore falls into the tray that is washed away into a drain that feeds into holding ponds to be recycled.

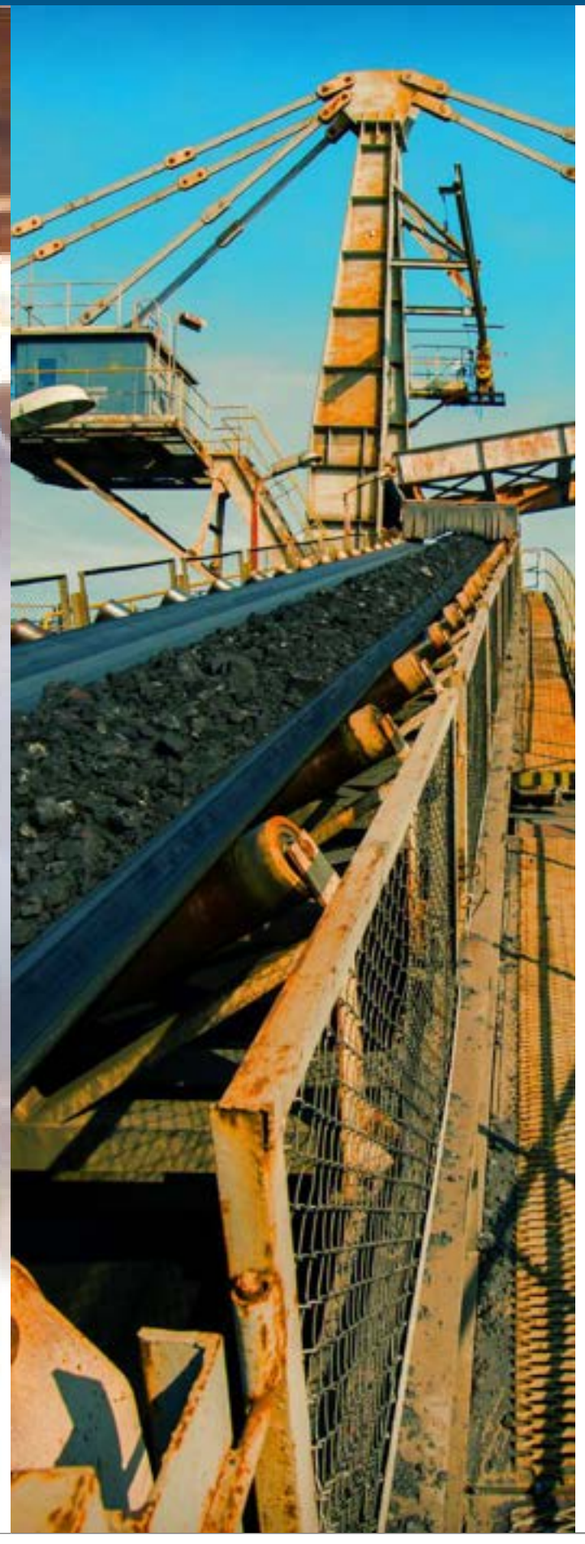
VeeJet®

FlatJet®

FloodJet®

NOZZLE SELECTION

High impact flat sprays are required to clean the launder tray efficiently and effectively. Our VeeJet®, FlatJet® or FloodJet® nozzles are recommended. Each of these nozzles provides different levels of efficiency and utilises our adjustable ball fittings. The sprays can be offset to increase spray coverage area and impact, which increases efficiency with the same amount of water.



CONVEYOR CARRY BACK

Conveyor carryback occurs when small amounts of ore remain attached to the conveyor belt instead of dislodging at the next transfer point. Conveyor carryback can increase when the moisture content is higher in the ore or when the belts are in poor condition. The smaller ore particles cling to the belt due to both the small pits and moisture of the ore. As the belt loops around, the ore vibrates loose and falls onto the conveyor structure, either onto the ground or the conveyor guide rollers. Generally, the ore particles that come off the conveyor are very fine, like bulldust. This is one of the most significant contributors to uncontrolled dust around plant structures. As small ore particles accumulate on and around the plant structure, these become airborne when stronger winds are present. This becomes very difficult to control, and it is why preventing the carryback in the first place is so critical.

SOLUTION

Belt scrapers are essential as they remove the larger particle sizes, though they do not remove the smaller particles, which is the major cause of carryback. The best way to remove carryback is to use water with a combination of the correct nozzle selection, pressure, and positioning good filtration to prevent nozzle blockage. The Brush Spray Bar is ideal in this scenario. Spraying Systems Co can provide you with additional information on the correct arrangement.

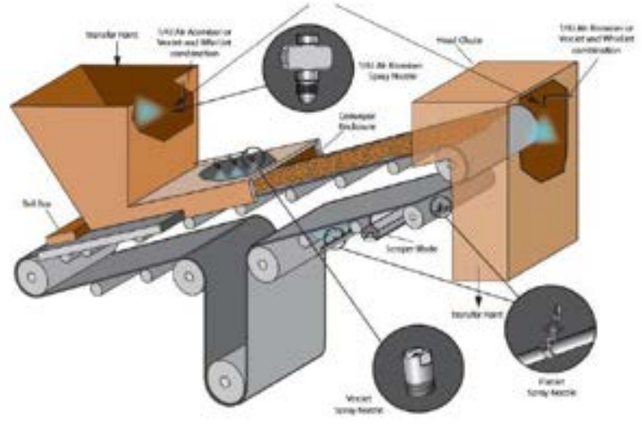


Figure 6: Autojet® fluid delivery system for dust control and conveyor belt cleaning at various locations along the conveyor line.

FABRICATION SOLUTIONS

BRUSH SHOWER HEADERS

When dust or other material can easily block nozzles, a brush header spray bar may be the best solution. These spray bars are fitted with an internal rotating brush mechanism that can clean the nozzles and ensure they continue to perform in challenging conditions. If you are experiencing nozzle plugging, you can choose between an automatic or a manual system, depending on the application. Maintenance time due to clogged nozzles can be eliminated. Brush headers have a valve at the end of the spray bar that opens to flush out contaminated water. This procedure is performed during normal production, allowing the nozzles to spray at maximum efficiency without any production loss.

Our brush headers are designed and built to order at our Australian manufacturing and fabricating facility in Melbourne. Our local knowledge and ability to get on-site allow us to optimise the nozzle performance and easily integrate it into existing lines.

AUTOMATIC BRUSH HEADERS

Spraying Systems are the world leaders in designing and installing automatic brush headers. Our motor/control package offers an economical way to eliminate the need for operator intervention to rotate the brushes. Cleaning cycles occur automatically when used with the programmable timer. If not, activation requires a simple push of a button. The brushes wipe the nozzles, and the dirty water is flushed away.

MANUAL BRUSH HEADERS

To remove the debris, the brush is manually rotated using a handwheel. The debris is flushed away without disrupting shower operation.

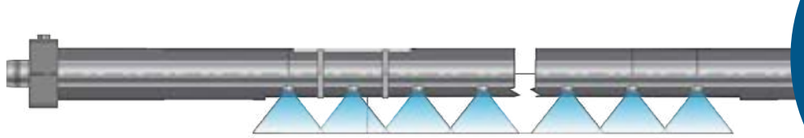


Figure 7: ShowerJet® Nozzles

BENEFITS

- ✓ Eliminates manual cleaning entirely in existing mining applications.
- ✓ Reduce downtime caused by blocked nozzles and ineffective dust control.
- ✓ Provides controlled and even spray distribution.
- ✓ Standard nozzles can be used on Brush Spray Bar.

AUTOMATIC BRUSH HEADERS SAVE TIME, IMPROVE QUALITY & BOOST PRODUCTIVITY

VALVE TRAIN ASSEMBLY

To best control and operate spray bars, a valve train assembly is often required to be installed with the spray bar. The valve assembly line can be used to turn the spray bars on and off, control the pressure, and stop blockages using filters. Our valve train assemblies are designed and built to order at our Australian manufacturing and fabricating facility in Melbourne. Our expertise in using valve assemblies in mining applications allows us to optimise the performance of your spray bars

Our valve assemblies can include but are not limited to; ball filter valves, solenoid valves, pressure reducing valves and flow meter valves.

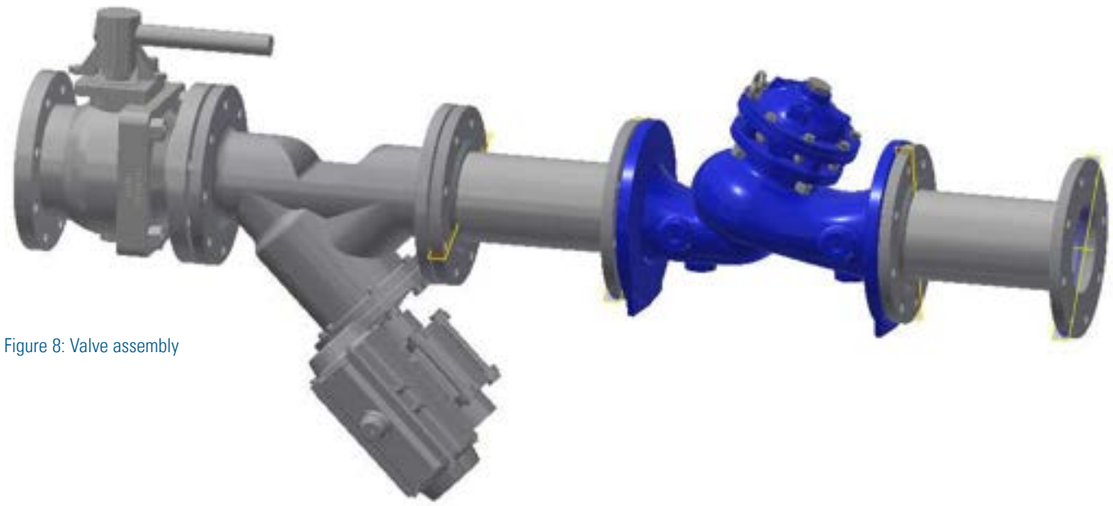


Figure 8: Valve assembly

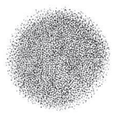
SPRAYING SYSTEMS AUSTRALIAN FABRICATION FACILITY

Our facility in Melbourne is ready to custom build your order. Our team of Sales Engineers can do everything from audit and appraisal through to the commissioning of your projects, meaning you can be assured that our experts are with you every step of the way and will be able to meet any challenge.

SPRAY PATTERN SELECTION

The spray pattern selection can be the most critical choice you make when attempting to tackle on-site dust problems. Have a read of this table and talk to our spray experts to ensure you have picked the correct pattern for your application.

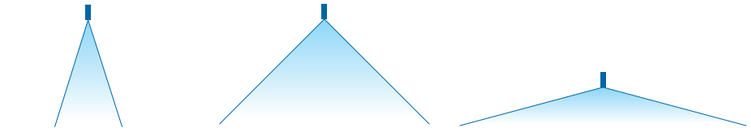
Figure 9 - Spray Nozzle Overview

SPRAY NOZZLE TYPE	SOLUTION	APPLICATIONS	FEATURES	SPRAY PATTERN	APPLICABLE SPRAYING SYSTEMS NOZZLES
HOLLOW CONE	Dust Prevention/ Airborne Dust Suppression	Transfer Points Stackers Reclaimers Ship Loaders Primary Crushers	Large nozzle orifices that reduce clogging. Small drop size – generally smaller than other nozzle types. Typically used in locations where dust is widely dispersed.		WhirlJet® In-line BD and Right-Angle Series Hollow Cone Hydraulic Nozzles SpiralJet® Series Hydraulic Nozzles
FLAT SPRAY	Dust Prevention	Train Load Out Conveyors Transfer Points Stackers Reclaimers Primary Crusher	Small- to medium-size drops. Typically used for bulk Ore conditioning.		VeeJet® Series Flat Spray Hydraulic Nozzles
FULL CONE	Dust Prevention	Primary Crusher Deluge Stockpiles Fire Suppression	High velocity over a distance. Medium- to large-size drops. Commonly used for deluge for moisture addition.		FullJet® Series Full Cone Hydraulic Nozzles SpiralJet® Series Hydraulic Nozzles
AIR ATOMISING	Airborne Dust Suppression	Crushers Ship Loaders Primary Crusher Transfer Points	Small drops fogging mist Commonly used to capture small dust particles in enclosed areas to minimise drift		J Series Air Atomising and Automatic Nozzles
HYDRAULIC FINE SPRAY	Dust Prevention/ Airborne Dust Suppression	Transfer Points Crushers Ship Loaders Primary Crusher	Small drops. Commonly used to capture small dust particles in enclosed areas to minimise drift.		Fine Spray Hollow Cone Hydraulic Atomizing Nozzles FogJet® Series Multiple Orifice Hydraulic Fine Nozzles

Note: Hydraulic Fine Sprays should only be used with clean water.

SPRAY ANGLE SELECTION

The spray angle of the nozzle, which ranges from 0 to 180, is dependent upon the application, including spray pattern, the number of nozzles used and nozzle placement.



Narrow Angle 15 - 50° | Standard Angle 60 - 95° | Wide Angle 110 - 180°

OPERATING PRESSURE

The ideal operating pressure is dependent upon many application-specific variables. However, these basic principles should help you decide:

- Increasing pressure decreases drop size
- High-pressure sprays are better suited for enclosed areas
- Nozzles operating at higher pressures should be placed close to the dust source to minimise the amount of air set in motion along the spray path

SURFACE WETTING

To increase surface wetting, use nozzles that produce many large drops and decrease the contact angle of the spray on the material.

Impact, which is influenced by operating pressure, also can increase surface wetting. Keep in mind that drops normally travel through turbulent air before they hit the material. Friction drag of air reduces the impact velocity as the water travels away from the nozzle orifice

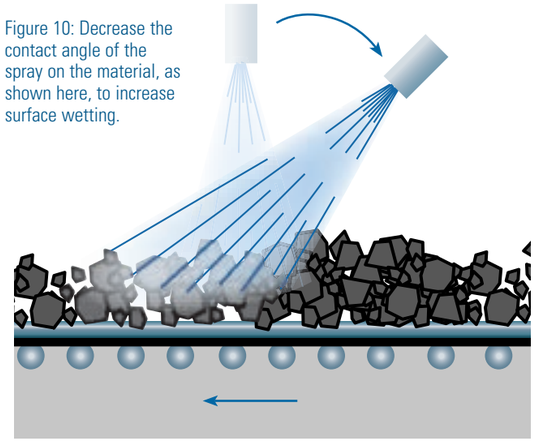


Figure 10: Decrease the contact angle of the spray on the material, as shown here, to increase surface wetting.

NOZZLE PLACEMENT AT TRANSFER POINTS

Nozzles used for dust prevention in chutes need to be fitted on a spray bar in which the flat nozzles are directed into the ore stream. The spray angle should be narrow so that the impact force can penetrate the ore stream, allowing for improved absorption. By spraying into the ore stream, you avoid wetting the belts, allowing for greater water absorption by the ore.

Additionally, on the same spray bar, you can a fit hollow cone nozzles to reduce any airborne dust, reducing the amount of dust being drawn out of the exit of the chute. If a spray bar cannot be fitted inside the chute, a spray bar with nozzles should be fitted on the exit to allow maximum time for absorption before the next transfer point. The first nozzle should be a hollow cone nozzle to capture any airborne dust, and the remaining nozzles should be flat nozzles for dust prevention.

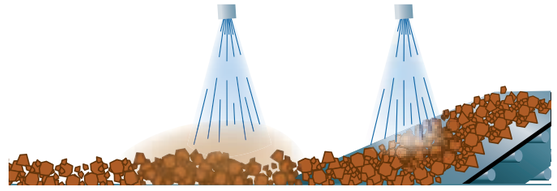


Figure 11: Position nozzles at the beginning of the transfer point for dust prevention. Position nozzles to spray the air above the material at the end of the transfer points to suppress airborne dust.

WATER QUALITY

Water hardness increases droplet surface tension, making it difficult to produce small droplets. The calcium and magnesium leave deposits in nozzle orifices that increase blockages.

Contaminants in the water source may influence the nozzle selection process. If the water contains debris, consider using maximum free passage nozzles and/or filtering water to less than 50% of the maximum free passage size of the nozzle to minimise clogging and excessive nozzle wear.

Filtration is critical to ensure contaminants are captured in the mesh element and not the nozzle orifice.

ADDITIONAL CONSIDERATIONS

- Keep nozzles out of the range of equipment or falling debris that could cause damage
- Be sure nozzles are accessible for maintenance
- The precise placement of nozzles will depend on many factors.
- Consult with your nozzle supplier for recommendations

AIR ATOMISING AND AUTOMATIC NOZZLES

J SERIES NOZZLES

- Extra small drop size fogging mist – ideal for use in airborne dust suppression
- Provides maximum dust suppression with minimal water usage
- Suitable for use with surfactants for greater wetting and decreased water consumption

FINE SPRAY HOLLOW CONE HYDRAULIC ATOMISING NOZZLES LN NOZZLES

- Extra small drop size – ideal for use in airborne dust suppression
- Standard and wide-angle spray patterns available
- Suitable for use with clean water – versions with integral strainers available
- UniJet® nozzles feature replaceable spray tips; bodies are re-used

MULTIPLE ORIFICE HYDRAULIC FINE SPRAY NOZZLES

FOGJET® NOZZLES

- Small drop size – ideal for use in airborne dust suppression and some dust prevention operations
- Produces a fine mist or fog over a large area
- Suitable for use with clean water when a TW line strainer is placed upstream of the nozzle

HOLLOW CONE HYDRAULIC NOZZLES

WHIRLJET® IN-LINE BD AND RIGHT-ANGLE NOZZLES

- Small to medium drop size
- Uniform distribution over a wide range of flow rates
- Lower-profile projection for installation in a tee or pipe header
- Most popular dust control nozzle in mining as the balance of larger orifice - less blockages - produces small enough droplet for effective dust control

HYDRAULIC SPRAY NOZZLES

SPIRALJET® NOZZLES

- Medium to large drop size
- Provides maximum liquid throughput for any given pipe size
- Full or hollow cone spray pattern
- Extra-large, free passage versions available
- Suitable when water quality is poor

FULL CONE HYDRAULIC NOZZLES

FULLJET® NOZZLES

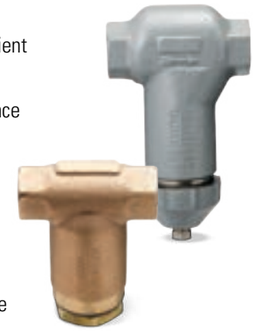
- Medium to large drop size
- Removable caps and vanes for easy inspection and cleaning on many models
- Maximum free passage (MFP) models for clog-free performance available

FLAT SPRAY HYDRAULIC NOZZLES

VEEJET® NOZZLES

- Small to medium drop size
- Narrow to wide spray angles
- Unobstructed flow passages to minimize clogging
- Most popular for dust prevention

T-STYLE STRAINERS



- Large open screen area for efficient liquid straining
- Designed for minimal maintenance
- Cleaning options: Removable bottom cap or plug for complete withdrawal of entire screen assembly; bottom pipe plug can be replaced with a drain cock for quick-flush cleaning, removable guide bowls and more

36275 ADJUSTABLE BALL FITTINGS

- Use to minimize overspray and ensure precise spray placement
- Simplifies nozzle positioning without disturbing pipe connections
- Smooth, finished surfaces eliminate leaking
- Increase spray coverage area with the same amount of water.

SPLIT-EYELET CONNECTORS

- Use to install nozzles, gauges, and hoses in piping systems quickly and easily
- Reduces sediment and clogging – inlet extends into the pipe
- Quicker way to manufacture
- No welding required - less labour requirement
- If socket thread damage - easily replaced
- Can be fitted to different material types e.g. HDPE
- If additional nozzle required - easily added

DUST CONTROL SYSTEMS

Systems vary by region

- Pre-packaged, pre-assembled and pre-tested system ready for site installation
- Can operate one or many nozzles, manifolds or headers
- Spray Systems designed by Spray experts - to meet your requirements
- World class manufacturing - meeting all mining standards
- System monitoring to give feedback on operational status
- Automated systems reduce labour requirements
- Efficient operations with minimal water wastage - environmentally friendly

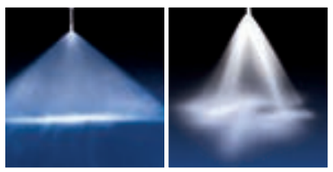
MAINTENANCE IS CRITICAL TO NOZZLE LIFE

PREVENTATIVE MAINTENANCE

Spray nozzles are designed for long-lasting, trouble-free performance. However, like all precision components, spray nozzles do wear over time. Spray performance can suffer, and costs can rise. How quickly wear occurs is dependent upon a variety of application-specific factors. Other factors that can negatively impact spray nozzle performance are plugging, corrosion, scale build-up and caking. Establishing and implementing a nozzle maintenance program is the most effective way to prevent and minimise costly spray nozzle problems.

PLUGGING/CLOGGING

- Use proper water clarification devices
- Use strainers
- Be sure to specify nozzles with adequate free passage
- Conduct maintenance on a regular basis



CORROSION

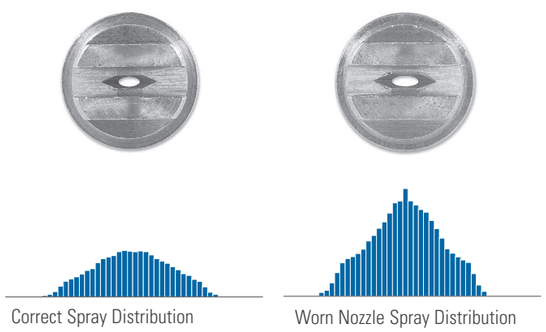
- Specify nozzles in the appropriate materials for the solutions being sprayed
- Scale build-up
- Control hardness level of the water
- Use chemical additives as needed
- Conduct maintenance on a regular basis

CAKING/CALCIUM BUILD-UP

- Conduct maintenance on a regular basis to remove build-up inside the nozzle or on the exterior
- Fit trickle Bypass on valve assembly

MAINTENANCE TIPS

- Determine the optimal maintenance schedule based on the specifics of your operations
- Examine spray patterns and watch for changes in spray angles, distribution and heavy edges
- Wear may be hard to detect, so go beyond visually inspecting nozzles. Check flow rate and spray pressure at a system level
- The nozzle orifice is precision-engineered, so be careful to avoid damage, or a replacement will be necessary
- Cleaning tools should be significantly softer than the construction material of the nozzles. Use a toothbrush or toothpick, never clean the orifice with metal objects
- Soak in mild solvent to loosen debris for easier removal with proper equipment



Correct Spray Distribution

Worn Nozzle Spray Distribution

COAL PRODUCER IMPROVES SAFETY AND OPENS NEW MINING AREAS WITH ADVANCED WATER SPRAY TECHNOLOGY

A leading coal producer needed to dissipate methane gas in an underground mine to eliminate the possibility of ignition.

Certain areas of the mine near methane well sites were considered unsafe due to a higher concentration of methane gas. Saturating the air to a specific humidity will prevent the ignition of the methane.

SOLUTION

Spraying System FloMax air atomising nozzles provide the ideal solution. These nozzles produce very small droplets at low flow rates for effective dust control and humidification , ideally this is between 40 and 60 microns. During operation, these nozzles create a curtain of fine mist that suppresses the dust, and dissipates methane gas preventing the possibility of ignition.

BENEFITS

- ✓ Improved mine safety
- ✓ Allowed coal producers to mine untapped areas
- ✓ Increased productivity resulted in a payback period of less than two weeks.

EQUIPMENT MANUFACTURER KEEPS WORKERS AND ENVIRONMENT SAFE WITH DUST CONTROL SYSTEM

A leading manufacturer of bulk handling equipment needed a system to control iron ore dust. When the rail cars are used by customers, they are inverted for

unloading, so the iron falls from the cars into chutes. The manufacturer's customers could be jeopardising the health of its employees and facing significant environmental fines without effective dust control.

SOLUTION

The Spraying Systems solution was a fluid delivery system including pumps, filtration and three spray manifolds. The dust control system uses more than three hundred hydraulic nozzles and eliminates the need for the costly compressed air often required in other systems.

Centrifugal pumps supply water to the spray manifolds, and liquid line strainers are used to prevent nozzle clogging and reduce ongoing maintenance.

BENEFITS

- ✓ Effectively suppressed dust
- ✓ A safe work environment
- ✓ Avoiding several hundred thousand dollars per year in fines

Spraying Systems, world leaders in sustainability since 1937.

Sustainability is at the core of everything we do here at Spraying Systems, and it has been since 1937.

Over the years, the technology we use to make our nozzles have changed, the materials we use have developed and our logo and tag lines have been updated. But our core mission is still the same, we make the best quality nozzles and spraying systems to save you water or product.

Our spray products can have had a tremendous positive impact on the environment all across the globe. In the harsh but delicate Australian environment, saving water is more important than ever. We use our worldwide experience and excellent team of Australian engineers to customise your business's needs.

Spraying Systems Co.®

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