Controlling coal dust in ports

Coal dust can be potentially hazardous to both the environment and human health – but controlling it can be surprisingly simple

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Introduction

The import and export of minerals through ports is a major undertaking for any authority. Most minerals are inherently dusty. Unless materials are transported in sealed containers, fugitive dust will be the inevitable consequence.

Environmental authorities are becoming much more strict on emissions and have the ultimate sanction of closure notices – a risk not worth taking. Furthermore, neighbouring storage areas can be easily polluted by dust, leading to unnecessary clean-up expenditure and – worse still – lost business.

This article explores the solutions available to prevent dust arising when handling coal in a port. The techniques described can be equally applied to other minerals.

Why is coal dust a problem?

Coal is generally transported in loose lumps of varying sizes. Sometimes, this includes dust but at other times, the coal is pre-screened to a certain size. The volumes of material being handled when offloading ranges between hundreds and thousands of tonnes per hour. Even minute percentages of dust at these levels become a problem. When the coal is then stockpiled it generally entails dropping it from a height; any entrained dust will be separated out by crosswinds. Every time a transfer occurs, there is potential to break the lumps and dust will be produced at this point.

Once the coal is stockpiled, it can still be a problem. Even if it arrives wet, movement of wind across the stockpile can evaporate the moisture and dust will be lifted. Any vehicles driving over crushed coal will also raise dust. All of these sources of dust require special consideration in the design of the coal handling scheme and have different solutions.

Once airborne, fine dust can be carried hundreds of metres, if not kilometres, which has an adverse impact on neighbours' buildings, processes and, most importantly, human health. Any fine dust, less than 10 microns in diameter can penetrate deep into the lungs. Prolonged exposure will result in Chronic Obstructive Pulmonary Disease (COPD), which is similar to asbestosis, and it is a matter of historical record as to how companies have been wiped out by huge retrospective asbestosis claims. It is essential to protect your operation from such litigation in the future.

Dust sources

When handling coal, there are a number of sources of dust, and all need to be addressed to arrive at an evironmentally sensitive and professional operation. For an unloading operation these sources are:

1. Unloading at the ship
2. Reception at the wharf side
3. Conveying transfer points
4. Open belt conveying at height
5. Drop from conveyor to stockpile
6. Time spent as a stockpile
7. Vehicle movements around stockpile
8. Transfer to onward transport.

Shiploading operations would be the reverse of the above list.

Methods of dust control

Clearly, there is not going to be one 'silver bullet' that is going to solve all of these problems. There are, however, different techniques available that, when combined, form a powerful armoury for eliminating the problems.

Fog

Uses: wharf side reception hoppers; conveyor transfer points, stockpile building, wagon loading.

A new, proven and cost effective technique to control dust is to use a Renby MicronFog™ fogging system to remove dust from the air. The name fog is just what it implies – small droplets of water injected into the air.

Fogging works by releasing very small droplets of water into the air. Airborne dust particles adhere to the water droplet and agglomerate. Once several have agglomerated together they become heavy enough to fall out of the air. The water droplet size is very important. If the droplet is too large, say 50 microns plus, the dust particle will bounce off the water droplet surface tension and remain airborne. To achieve a useful dust suppression effect, the droplets need to have a mean diameter in the region of 10 to 15 microns, i.e a similar size and mass to the respirable dust particles.

Typical fogging nozzle.


Fogging a tripper conveyor discharge.

If the fog is generated in the right way, by using pressurised water, the energy required can be very low – between 2 to 3kW for a system requiring hundreds of nozzles, e.g. a large stockpiler tripper conveyor – giving considerable operating cost savings when compared to other techniques.

Stockpile design

If a stockpile is to remain in position for some time, it is important to pay attention to the shape of the pile. Some shapes, whilst being easier to build, leave an edge that can be dried quickly by the wind. This edge then allows the wind to lift dust and all of the benefits arising from the other techniques used are instantly lost.

Conveyor covers

Uses: all transfer conveyors

When material is being conveyed from one point to another, cross-winds over the conveyor can cause dust to be lifted. It is therefore essential to ensure that all conveyors are covered. This can be done simply with covers fitted over the conveyor belt, such as the Traffield Conveyor covers available from Renby. For a tripper conveyor, as the belt is lifted at the moving discharge point, the top of the conveyor cannot be covered as easily, so wind boards should be fitted to keep wind off the belt.

Sprinklers

Uses: stockpiles and haulways

Once stockpiled, water can be sprayed on the stockpiles to keep them damped down. Sprinklers should be used with caution, however, as the volume of water required can be significant, causing drainage and run-off treatment problems. Irrigation systems can be used to control dust on outdoor stockpiles, but when the stockpiles are excavated, dust will arise as the drier material in the pile is exposed and moved around. The sprinkler droplet sizes are often in excess of 100 microns, which is too large to suppress airborne dust, and it is quite common to observe dust rising from the ground where the sprinkler water lands, thus exacerbating the problem! An irrigation system uses a lot more water than a fogging system – typically 10 times the amount – and is much less effective when materials are being moved around.

Sprinklers should be used as a last line of defence and with considerable planning and forethought.


Covers fitted directly onto a conveyor.

Surfactants

Uses: haulways and stockpiles

To reduce the amount of water used with sprinklers, it is possible to add chemicals that improve the penetration and wetting effect of the water. This can be especially useful on haulways, where regular vehicle movements stir up dust regularly. The proper use and application of surfactants can halve the number of times that a surface has to be treated. There are a number of ways they can be applied:

1. As an additive to a sprinkler system
2. Application from a pumped hose and mobile bowser
3. Sprinkling as dry granules.

The third option uses granules that are hygroscopic. These draw in moisture from the air to create the damping effect and can eliminate the need for a network of sprinklers.

The RDB range of surfactant materials available from Renby are biodegradeable and do not contaminate soils, streams, vegetation etc.

Covers

Uses: static stockpiles

If a stockpile is to remain in one place outdoors for any length of time, its surface will inevitably dry out. One option to protect against this is to locate it in a building, when fog can be used to keep the dust under control. However, when thousands of tonnes of material are being handled in a shipment, this is rarely an option.

An alternative to this is to create a protective layer over the stockpile. This is achieved through using a water additive that forms a skin over the stockpile, keeping dust in. By tailoring the rate of dilution of the additive, protection times can be adjusted to range from days to months, up to a year. As long as the surface is not disturbed by, for example, vehicle movements, no further action is necessary and will save vast amounts of water and money that would have been wasted by sprinkling in this time.

Perimeter fogging

Uses: at sensitive perimeters

Fog can also be used to prevent dust crossing a boundary. An option is to cover the site by enclosing everything in a large shed. However, the cost of this would be prohibitively expensive. As an alternative, Renby MicronFog can be supplied as a perimeter fogging system, which is installed around the perimeter boundaries of the site.

Conclusion

As dust pollution legislation becomes more onerous, the Renby MicronFog fogging system is becoming a vital and cost effective tool to combat dust problems. When used in conjunction with Traffield conveyor covers and the RDB range of surfactants, dust pollution need no longer be an issue for a busy port authority.

Perimeter fog to protect neighbours.

ABOUT THE COMPANY

Renby Limited is a family-owned and managed company dedicated to working for a sustainable, cleaner and safer world. The company's extensive experience has led to a product range that focuses on environmental solutions. These products are selected on the basis of proven technologies that will save money for customers. At the same time, by eliminating wastage and reducing power consumption in the workplace, they help to improve the environment.

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