Recycling • Conveying • Health & Safety • Control & Instrumentation • Size Reduction

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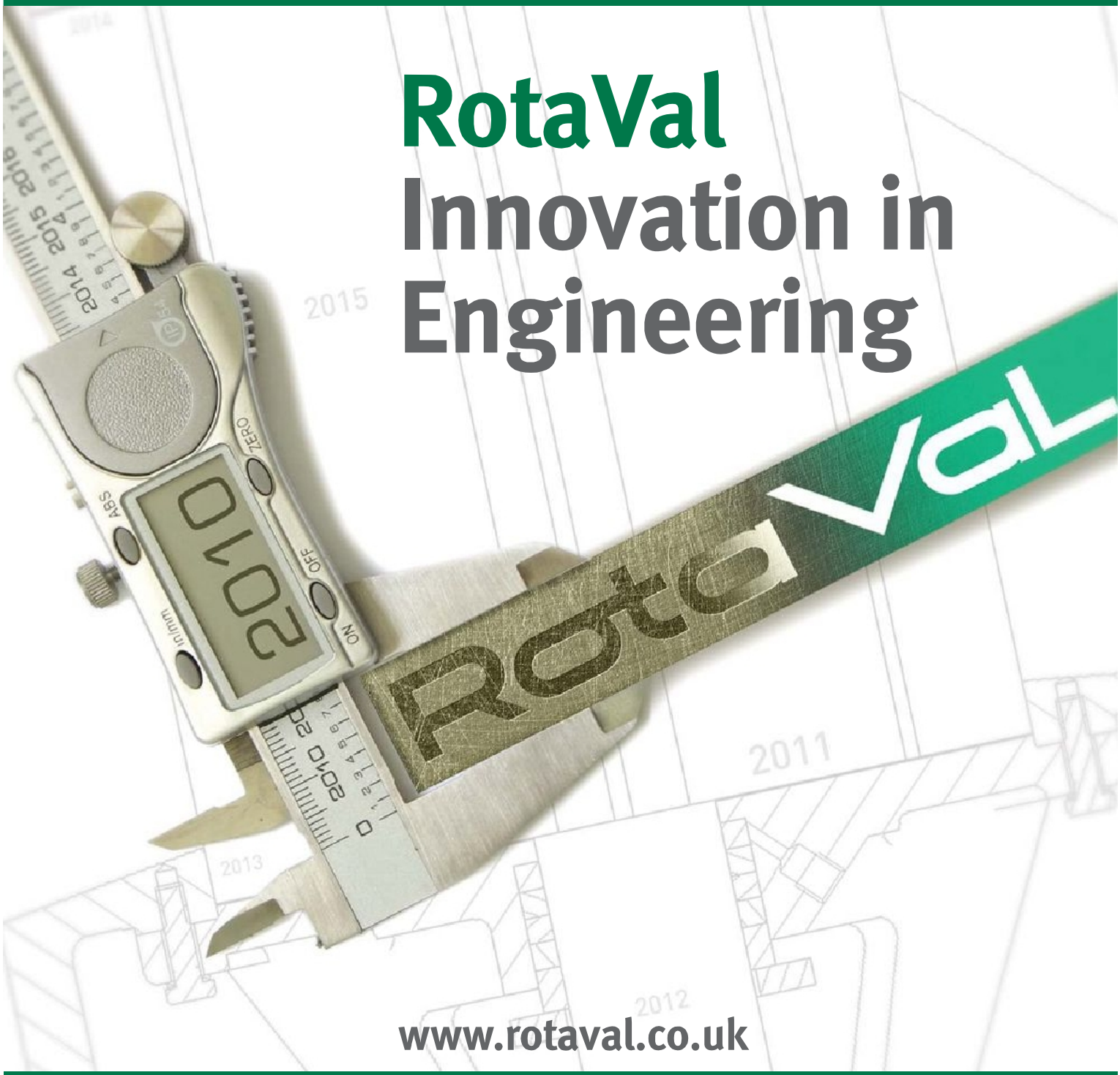
SOLIDS & BULK HANDLING



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Storage, Control, Movement and Processing of Loose Materials

Achieve clarity with fog

Fogging: a vital tool in the dust suppression armoury – an overview from Robin Travis at Renby

The processing of bulk solids inevitably generates fugitive dust at some stage in the production cycle. There are many processes where it is not possible to contain dust at all stages and the escape of fugitive dust becomes inevitable. Persistent offenders will receive closure notices from the Environment Agency or punitive damages from employee health claims. Doing nothing will result in company closure and is not an option.

Typical Fogging Nozzle with Push Fit Fittings

Why is Dust a Problem?

There are many traditional ways of controlling dust, but a new, proven and cost effective technique is to use fog to remove dust from the air. The name fog is just what it implies – small droplets of water injected into the air. If the fog is generated in the right way, the energy required can be very low – between 1 to 2 kW for a large warehouse – giving considerable operating cost savings when compared to the 25kW+ power consumption of fans on a comparable dust collector.

Some years ago, a dusty work environment was not seen as much of an issue, unless the dust was explosive or toxic. This is no longer the case. In a dusty environment, machinery will fail sooner as bearings wear out and motors overheat. The plant will also waste valuable energy due to the loss of efficiency, thereby giving an unnecessary increase in operating costs.

There are also proven links between inhaled silica dust and silicosis, a condition that is very similar to asbestosis. Silica occurs in most mineral products such as:

- Rock and sand
- Concrete, cement, and mortar
- Topsoil
- Granite, sandstone, and slate
- Masonry, bricks, and tile
- Asphalt (containing rock and stone)

Strict legislation is now in place setting tight limits to the workplace exposure to silica. When the exposure level figure of 0.1mg/m^3 was set in 2006, it was seen by industry as being a challenge to meet. After taking traditional steps to contain dust, the levels were often still too high. Several years on, now that companies are managing to achieve this level, there are further plans to reduce the level to 0.05 mg/m^3. A moving vehicle e.g. a fork lift truck can raise enough dust to breach the exposure limit. A fogging system over such fork lift truck routes would control this.

It is not just silica that is the problem. There are pressures now to increase the burning of wood to generate energy. Some fast rotation coppice woods have particularly hazardous dust that has microscopic hooks on the surface that lodge the particle into the lungs. With regular lorry loads delivering materials, warehouses rapidly fill with dust. Diseases similar to silicosis will result if steps are not taken to protect the workforce. By fogging the reception area, the dust can be eliminated.

All of these conditions lead to potential health problems down the line for the work force. Doing nothing in the short term is a false economy as a company is leaving itself open to future claims. In an increasingly litigious society, these claims will come, in some cases, years after the event. Many companies were put out of business by asbestosis claims. Why put your company at risk of claims due to silicosis and other respiratory diseases?

Fog must form a part of the strategy to achieve the required legislated minimum exposure levels.

What is fog?

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+, 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.

It is important not to be misled by sprinkler systems operating at typical water main pressures of c. 6 Bar. The droplet sizes are often in excess of 100 microns and it is quite common to

observe dust rising from the ground where the sprinkler water lands, thus exacerbating the problem! Irrigation systems can be used to control dust on outdoor stockpiles, but the instant they are excavated, dust will arise as the drier material in the pile is exposed and moved around. An irrigation system uses a lot more water than a fogging system – typically 10 times the amount – and is much less effective.

Pressurised water fogging nozzle

There are several ways to generate fog at the required micron sizes, the two main techniques are:

1. Pressurise the water to high pressures e.g. 70 Bar and use nozzles with a special impeller to atomise and thereby generate the fog. (see nozzle picture on this page)
2. Inject compressed air into the water stream and force it to hit a target to atomise the water.

The second approach whilst effective, can have a high cost of ownership for systems requiring more than a handful of nozzles. Use of compressed air nozzles becomes very expensive to operate as the energy required is large.

The Renby Fogging System uses pressurised water as in option 1 and will typically only require 1.5kW for a system of 50+ nozzles. Water consumption would also be low at 6 litres per minute for such a system. The nozzle based system is very versatile, enabling nozzles to be placed just where they are required. The flow rate at each point is determined by the nozzle, which is easily interchangeable and there is no calibration required. The 70 Bar pressure is also important, much lower and the droplet size will be too large.

A common misconception with fog is that it will wet material. By careful design of the system, fog can be distributed to achieve the required objective of suppressing dust whilst keeping moisture to a minimum. Comparing the small volume of water with the huge volumes of material handled in the process, it can be seen that the percentage of water introduced is negligible.

Where would I use fog?

The uses for fog are numerous. To give some idea of its versatility, consider the following applications:

Conveyor transfer point

Grain conveyor transfer point without fog

A major UK port had a problem with fugitive dust being emitted from the transfer chute on a grain conveyor. The conveyor was handling 800 tonnes per hour. Dust was travelling several hundred metres (as can be seen above) and being deposited on cars on the wharf awaiting export. The customer had looked at fitting a cyclone system costing £100,000+, but this was prohibitively expensive.

Grain conveyor transfer point with fog

Renby designed a fogging system with nozzles fitted in and around the transfer chute. The second picture above was taken by the customer with the fog and conveyor operating. It graphically illustrates that the dust problem has been eliminated. This project resulted in a capital cost saving of £80,000.00+.

Materials recycling facility

A skip waste company was expanding its sorting facility and knew that there would be increased dust levels. A Renby fogging system was used to fog the material feed pile, conveyor transfer points and around the trommel screen.

The result was elimination of the dust inside the building, which has extended the life of the plant and given a much improved working environment for the customer's employees.

Fog protecting a trommel outfeed

The result is improved morale and enhanced reputation for the company in the marketplace.

Perimeter fogging

Fog can be used to prevent dust crossing a boundary. A metals recycling company was instructed by its local environmental officer that they had three months to contain dust within its site. One option was to cover the site by enclosing everything in a large shed. However, the cost of this was prohibitively expensive meaning that the site would close with the loss of 10 jobs. As an alternative, Renby supplied a perimeter fogging system which was installed around three sides of the site.

Perimeter fog around a metals recycler yard

The successful outcome was that the inspector accepted this solution, lifted the enforcement notice and the business was saved from closure.

In industry alone, there are many uses for fog. In this article, we have just considered dust suppression. Fog can also be used for odour control, cooling, humidification and visual effects to name but a few.

Conclusion

As dust pollution legislation becomes more onerous, Renby's fogging system is becoming the vital and cost effective tool to combat dust problems.

For more information contact Renby on tel: 01829 740913 or visit www.renby.co.uk