

THE UK'S "BIGGEST" PROCESS INDUSTRY PUBLICATION

# PROCESS INDUSTRY INFORMER

January/February 2011

Volume 7 No. 1



Powerful, no shear food pumps

Unique sine pump design provides minimal product damage and higher yields in food and beverage processing.

Pumps combine high suction lift with pulse-free flows to 90,000 litre/hour.

## In this issue...

News & Events

15 editorial articles covering a wide range of processing topics

Over 80 Product Applications, Introductions & Updates

Plus the latest editions of BPMA News from The Pump Industry Association and the first of this year's Solids & Processing Focus/SHAPA Newsletters

Tel: +44 (0) 1326 370370  
info@wmpg.co.uk www.wmpg.co.uk

Watson-Marlow Bredel Alitea Flexicon MasoSine

**WATSON**  
**MARLOW**  
**MasoSine**

wmb-424

PROCESS INDUSTRY INFORMER - the worthwhile process industry read

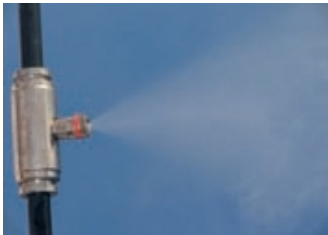
# CONTROL OF DUST AND THE OPERATING ENVIRONMENT FOR BULK MATERIALS

By Robin Traviss - Renby Limited

## Abstract

This article explores the innovative use of fog to prevent airborne dust when handling bulk materials. It continues by exploring other applications for fog where for example, humidification and cooling are required.

## Introduction



### Typical Fogging Nozzle

Most minerals are inherently dusty. Unless materials are transported in sealed containers, fugitive dust will be the inevitable result. Airborne dust brings consequences of complaints from neighbours, increased machinery wear, cross contamination, lost revenue from spilled product and most importantly, workforce health issues.

Environmental authorities are becoming much stricter on dust emissions and have the ultimate sanction of closure notices - a risk not worth taking. Furthermore, neighbouring areas can be easily polluted by dust, leading to unnecessary clean up expenditure and legal action from neighbours.

### Why is Dust a Problem?

Solid bulk materials are handled in a range of sizes from dust to loose lumps of varying sizes. Regardless of material size, the very act of handling the large volumes being processed will cause dust to arise. Every time a transfer occurs, there is potential to break the lumps and dust will be produced at this point.

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 COPD (Chronic Obstructive Pulmonary Disease) and is similar to asbestosis. It is

essential to protect your operation from future litigation because it is a matter of historical record as to how companies were wiped out by huge retrospective asbestosis claims.

### Dust Sources

There are a number of sources of dust when handling bulk materials and all need to be addressed to arrive at an environmentally sensitive and clean operation.

- 1 Reception areas
- 2 Conveying transfer points
- 3 Open belt conveying at height
- 4 Drop from conveyor to stockpile
- 5 Disturbance of stockpiles by loading vehicles
- 6 Air emissions from crushers and screens
- 7 Vehicle movements in warehouses, for instance fork lift trucks
- 8 Transfer to onward transport

### 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, for instance, dust collectors, dust containment etc. Whilst effective, there are often applications when such technologies are not an economical option. Fog is the economical alternative to solve dust problems.

### Fog

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 term "fog" is just what it implies - small droplets of water injected into the air.



### Fogging a Boundary

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.

An efficient method for producing fog is by using pressurised water, combined with precision nozzles. The energy required can be very low - between 2 to 3 kW for a system requiring hundreds of nozzles. The required

droplet sizes result at pressures starting in the region of 60 Bar.

There follows some examples of applications where dust has been successfully controlled by using fog:

### Example Applications

#### Conveyor Transfer Point

The best way to prevent dust arising is to capture it at source. Conveyor chutes are a classic example. By simply adding two or three nozzles into a transfer chute, the dust falling through is entrained with fog, preventing dust from escaping. Furthermore, the material is retained in the conveying system, preventing the need for additional cleaning.



#### Looking Down the Head Chute of a Conveyor

#### Warehousing

Consider a large warehouse storing loose bulk materials. Doors will open and close regularly which generates unpredictable air flows into the building. To attempt to implement a dust collector system in such a building would be prohibitive both in terms of capital cost and revenue energy expenditure. Fog offers a viable economical alternative to this. Rows of nozzles are placed in the roof and emit a background level of fog which constantly clarifies the air, eliminating dust. Such systems have been used for dry powder bagging plants to great effect, resolving a problem that had previously been thought to be insoluble.

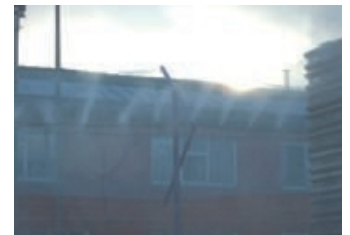


#### Fogging a Large Warehouse

#### Perimeter Fogging

Fog can also be used to prevent dust crossing a boundary. Following complaints and visits from The Environment Agency, one client was considering the option of covering the site by enclosing the operation in a large shed. However, the cost of this was prohibitively expensive, would not have happened and the site would have closed.

Instead, Renby **MicronFog™** was supplied as a perimeter fogging system installed around the perimeter boundaries of the site. The success of the project prevented the site closure and saved 10 jobs.



#### Perimeter Fog to Protect Neighbours

#### Humidification

One of the reasons that a fogging system does not wet an area is that the droplets are so small that they evaporate rapidly. This can be put to good use where a building requires controlled humidity. By adding a humidity sensing control loop, humidity can be controlled effectively. This can be useful for paper stores, food stores, barrel stores and other areas that have materials sensitive to humidity levels.

#### Cooling

In a similar way to humidity, the evaporation of the water droplets also gives a useful cooling effect as heat is absorbed for evaporation. This approach can often be more energy efficient than alternative methods for cooling, as it takes advantage of a readily occurring effect. For cooling to occur, a large surface area for the water is required. Fog is perfect for achieving this. As the water droplets are microns in size, the Renby **MicronFog™** system maximises the available surface area, resulting in a rapid removal of heat from the air through evaporation with the result of several °C cooling.

This approach is not only used as part of industrial processes but also as comfort cooling in hot factories to improve workforce comfort, resulting in increased working efficiencies.

### 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. It has many uses within process industry to assist with increasing the precision of environmental control in the production area. Fog forms a versatile and vital component in the armoury for resolving dust and other issues. The capital costs of the systems are a fraction of other technologies and enjoy low running costs.

Renby Ltd, Chester, Cheshire  
Can be contacted on  
Tel: +44 (0)1829 740913  
Web: [www.renby.co.uk](http://www.renby.co.uk)  
and [www.micronfog.co.uk](http://www.micronfog.co.uk)