



Dust Suppression System

INTRODUCTION.

Many processes create clouds of fine particle airborne dust while transferring or transporting bulk materials. This airborne dust is not only annoying but can be toxic and debilitating to humans and damaging to surrounding facilities and equipment.

BMH CONCARE TECHNOLOGY INC. has been floated by highly experienced Technocrats exponents having concern for Environmental pollution in the industry and has brought into the market revolutionized conveyor care products and Dust suppression systems.

The promoters have a wide experience in pre engineering, post order detailed engineering, installation and successful commissioning of all types Dust Suppression systems namely

- 1) Fine Mist spray systems by water
- 2) Fine Mist sprays systems by chemical aided water solution.
- 3) Dry Fog type Dust Suppression systems using water and compressed air.

In their previous employment in the senior managerial capacity and have executed more than 100 such Dust suppression system Installations in all segments of the process Industry like Steel, Cement, Power, Ports etc.

A good Dust Suppression system should have the following:

- a. Ease of Installation
- b. Maintenance friendly
- c. Flexibility to upgrade.

BMH CONCARE TECHNOLOGY strives to achieve the above by a well designed DRY FOG type Dust Suppression System to arrest even the fugitive / Respirable fine dust particles of less than 5 microns. DRY FOG Type Dust Suppression System has been considered at various Transfer points namely at receipt points of conveyor i.e.; Skirt Board and the Discharge points of conveyors i.e.; Discharge Hood.

PRINCIPLE OF OPERATION.

The Dry Fog Type Dust Suppression System operates on the Agglomeration Principle i.e.; air borne dust particles are enveloped by a fine Dry Fog (Droplet Spectrum of 0 to 10 microns), the innumerable collisions of dust particles with that of equalized droplet of water in the fine Dry fog makes the Dust particles Agglomerate, become heavy enough and fall back on to the running stream of material.

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In effect fine Dust of even respirable type (less than 3 microns) is suppressed even before it is air borne. The unique feature of such dry fog type Dust Suppression over other types of Systems is that the moisture added is hardly a maximum of 0.1% and around half of it evaporates, thus the moisture retention in the final material is always less than 0.1%.

The Leaflet clearly depicts as to how an equalized simulated droplet spectrum can help in agglomerating the fine Dust particles in a Dry Fog type Dust Suppression system.

DRY FOG NOZZLES:

The Nozzles are of Dual Flow Air driven acoustic oscillator type.

Compressed air passes through a specially designed convergent / divergent orifice enters a resonating chamber and repeatedly reflected, thus the air stream attaining a high frequency of sound waves and accelerate past the speed of sound.

Water is delivered through annular orifices into the nozzle where it is sheared into relatively smaller droplets which are carried by the primary air stream into the intense shock wave zone when the sound energy is converted in to work by exploding the droplets in to thousands micron size droplets from 0 to 10 microns.

The air passes around the resonating chamber and carries the Micronics sized droplets down stream as a soft velocity Fog.

The Dry Fog Nozzles will be of self cleaning type. The nozzle will be constructed of SS304 for longer life.

THE SYSTEM:

The Dry Fog Dust Suppression System has to be operated at a certain optimum compressed air pressure of 5 to 7 kgs with safe guards in the form of a pressure regulation units and Flow Activation Stations to ensure that system operates on fulfilling two conditions namely of the conveyor system running with load (sensed by LSU) and the maintaining of the set pressure (sensed by pressure switch).

The system invariably will be tripped off if either of the above conditions are not complied, ensuring no unwanted addition of water onto the material stream.

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FAS (FLOW ACTIVATION STATIONS)

The Air line 20 Nb size and Water line 15 Nb size pipe lines are provided with ON/OFF controls of the system is through the Flow Activation Stations. The FAS can be operated through manual mode or Auto mode through Auto Manual Selector Switch. The Switch when energized and activated the solenoid valves of both Air and Water line which permit compressed Air and Water to enter in to the Pressure regulating Unites and Spray Bars.

In addition, a pressure Switch is installed in the air line to ensure that air and water solenoid valves are energized only when Pre set air pressure is available in the air line. This ensures that the system can not operate without sufficient air pressure to the nozzles and reduces the chance of un-atomized water to pour into the dust source.

The Flow activation stations will be controlled fully through the control panel and Load Sensing Units.

PRU (PRESSURE REGULATION UNITS)

Basic research has shown that if water droplets of approximately the same size as the dust particles produced. The probably of collision between the two is extremely high. On the other hand, if the droplet size exceeds the size of dust particles, there is very little possibility of impact.

The nature and particle size of dust generated in the material handling system changes in size and characteristics of the material. In practice, the size of the dust particles e have a very wide spectrum (1-800 microns) which may change due to changes in the climate conditions i.e. temperature and humidity etc.

A careful control of Air and Water flow and pressure is therefore necessary to obtain dust suppression system results. For this purpose, Pressure Regulating Units are provided in the system. Operator can adjust both the air and water pressure independently to change the fog Character tics to obtain optimum dust suppression system results vis- s- vis the site requirements.

Air and water pipe lines are provided with sufficient quality air filters for air and water filters & strainers for water respectively. The Air and water pressures are regulated to achieve the desired flow rates of water volume and Air quantity, to achieve the desired Micronics droplet spectrum.

SRAY HEADERS:

Spray Headers will have different numbers of nozzles and the number of spray Headers and Nozzles will be determined by the Belt width / Belt speed and the capacity handled by conveyors.

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The Spray Headers with nozzles will be strategically located to ensure the dense Fog not hitting the conveyed material but encapsulate like a thick blanket ensuring agglomeration of Dust and achieve desired Efficacy levels.

The spray Headers will be of SS304 / MS IS 2062 construction depending upon the application requirement.

COMPRESSOR:

A positive screw compressor Air cooled type of sufficient capacity dedicated to the Dry Fog Dust Suppression System has been considered.

Drive Motor, Mounting base frames oil cooling unit to ensure very little oil traces in the compressed Air an Air receiver to ensure uninterrupted Air quantity with sufficient pressure to have adequate Air pressure at the down stream nozzles are included.

WATER PUMP:

A dedicated water Booster pump with Drive Motor and Mounting accessories has been considered.

The booster pump will be of centrifugal type and horizontally oriented with drive to have a maintenance free running.

The Booster pump will be inter connected with water level switches to control ON/OFF operation automatically through control panel.

From water source being provided by client, the same is brought to the storage tank of 0.5 Cu. Mtr. capacity thro' an auto operated solenoid valve getting ON & OFF signals from the level switches provided in the tank. A Bypass supply arrangement is provided. The storage tank being provided with standard feature like vent, float valve, over flow and drain arrangements.

The water is pumped by a booster pump to the main header, sub-headers and to the spray headers through Flow activation station and Pressure regulating Unit.

The solenoid valve is normally closed and water is brought to the storage tank. The storage tank is provided with high and low level switches of reputed make. When water is above high level signal is given to the solenoid valve to cut off water supply and the low level switch helps in START & STOP of the booster pump.

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CONTROL PANEL

A control panel for start and stop control is normally supplied with a “Hand / OFF/Auto “switch for “Local” control and “Remote” start application.

The panel should be installed in a location that is accessible and convenient for the operator.

The spray system will be energized upon start –up of the process either manually or automatically through an interlock with the process.

The Air and Water pressure regulation will be set on start up and will maintain their settings for Remote ON/OFF operation.

The ON/OFF operation of the air and water pump will be independent of the system. This is to insure that they get the individual attention that they require for extended performance.

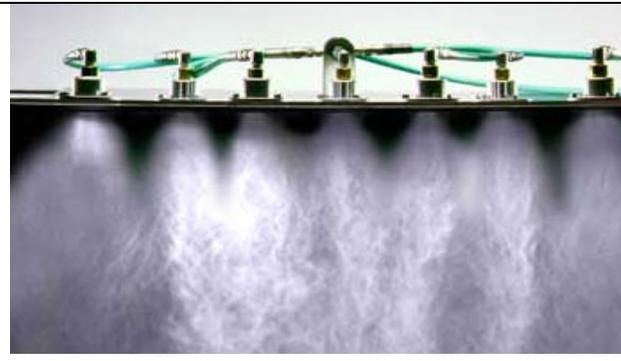
BMH CONCARE TECHNOLOGY strives to achieve the above by a well designed Dry Fog spray Dust Suppression system.

Dust Suppression System to arrest even the fugitive / Reparable fine dust particles.

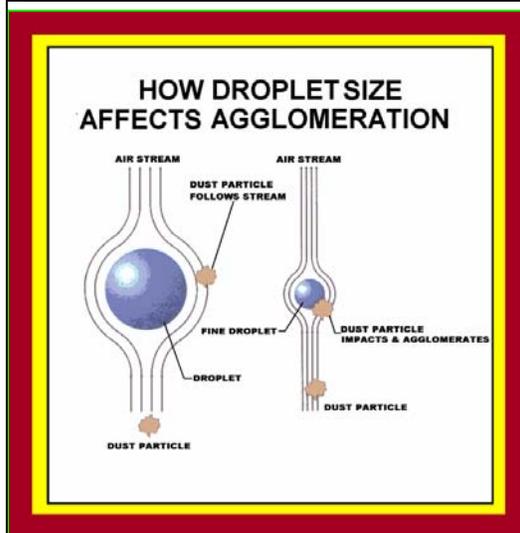
Dust generation is stopped at source.
No Extensive equipment and disposal arrangement.

Reduced cost.

Moisture addition is 0.05 to 0.1%



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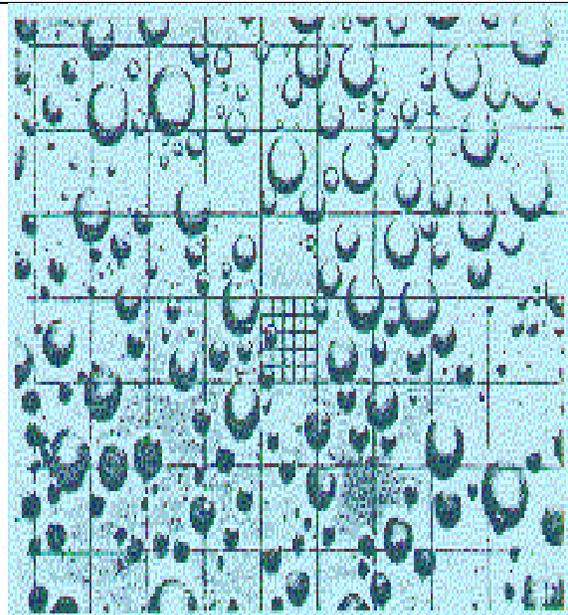


The air borne dust particles collide with water droplets of spray, more particles after such collision with water droplets agglomerate and thus the increase mass of dust settle down.

It is essential that for an effective collision of above nature to take place water droplets should be of very small diameter almost equal to that off dust particle.

“Consider a water droplet about to impinge on a dust particle, or what is aerodynamically equivalent, a dust particle about to impinge on a water droplet, as shown in the drawing. If the droplet diameter is much greater than the dust particle, the dust particle simply follows the air stream lines around the droplet, and little or no contact occurs. In fact, it is difficult to impact micron-size particles on anything, which is why inertial separators do not work well at these sizes. If, on the other hand, the water droplet is of a size that is comparable to that of the dust particle, contact occurs as the dust particle tries to follow the stream lines. Thus the probability of impaction increases as the size of the water spray droplets decreases.”

To achieve agglomeration at the dust source point, two conditions need to exist;
 Enough water droplets of the same size as the dust particles have to be generated at the same rate as the dust particles, and
 Both the dust particles and the water droplets have to be contained in the same area so that agglomeration can occur.
 The design of the BMH Concure system is based on a unique nozzle that can produce a very fine water droplet size micron that can literally blanket the dust source and keep the dust particles from becoming airborne.



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Pumping System Operating Principle.

Water supplied by client enters the water tank after strained through a Gate valve, Strainer and Float valve. A float valve at the tank inlet controls the water supply input. As and when the water levels reaches the full level water input supply cut off to the tank and as soon as water level goes down the float valve allow the water supply to the tank.

The pump suction end connected to the water tank at outlet port with flange connection with required control Gate valve and Strainer with fittings and the Pump discharge end connected to the main pipe header with required control gate valve, non return valve, pressure gauge and also connected to the by pass arrangement with control and pressure relief valve.

The by pass arrangement connected to the water tank, In addition a Pressure Relief valve is used at the discharge line, so that, if some or all of the nozzles are stopped, the pump pressure does not increase abnormally.

Pressure gauge used before and after the Globe valve on pump discharge line helps to set and monitor the line pressure.

whenever the pressure increases and the flow rate consumption reduces at spray point during pumping system the excess water pressure actuate pressure relief valve and passes through bypass arrangement and goes to water tank.

A Globe valve at the main discharge header line of the pumping system is used to tune the water flow/pressure of the spray system.

Level Switch is used in the tank to prevent the pump run dry, incase water reaches below the low level. In addition the pump has one Gate valve at suction side and discharge side for isolation of the pump to facilitate maintenance.

The system has been designed to work automatically as follow:- The pump to be started manually by a suitable in the electrical panel. The 'Low' level switch stops the pump to prevent the from running dry.

DUST SUPPRESSION SYSTEM APPLICATION

Crusher and Screening Plants, Mines

Cement Plants, Ceramic Plants

Steel Plants, Power Plants