

Dust Control Systems Using Spray Nozzles (Part 1)

Suppressing Airborne Dust Particles | Soft Fog Design



Dust control systems using nozzles to create a variety of fogs to effectively suppress dust from becoming airborne and dispersing

Dust Control Systems Using Spray Nozzles | Two Versions of the System

To design and provide a system suited for an individual worksite, IKEUCHI has prepared two main versions of the system. One is a “soft fog design” that sprays fine and soft fog to settle airborne dust and suppresses scattering. The other one is a “high-velocity fog design” that sprays a large volume of semi-fine fog at high velocity directly at the point where the dust is generated to prevent dust from dispersing.

Both designs are already used in power plants and steel mills in Indonesia, Thailand, Vietnam, South Korea, the United States, Japan, and other countries, to reduce air pollution and improve work environments.

Problems with Airborne Dust at Coal Storage Facilities

At power and chemical plants airborne dust from coal storage escapes into the air and is carried away by wind, resulting in air pollution, affecting nearby residents. The most common measures taken to prevent the dust from dispersing are to install windbreaks upwind and dust netting downwind.

The success of these measures is very limited since controlling airborne dust it is next to impossible.



Even though dust prevention measures are required, despite the lack of effectiveness, many companies do not act until they are forced to, because of complaints from nearby residents or workers complaining about health issues.

Soft Fog to Capture and Suppress Airborne Dust Particles

Even though it is difficult to implement solutions to these problems, IKEUCHI would like to present a dust control system using fog. It is the first of its kind with a well proven record for solving industrial dust problems around the world.

The soft fog system does not deal with dust in the environment outside the facility, it is a way to prevent dust from dispersing in the first place. More specifically, the spray nozzles produce very fine fog to which dust particles adhere, causing them to become heavier and settle to the ground, thereby keeping them from dispersing. Each system is individually designed based on the amount of airborne dust and the site layout, selecting the optimal nozzles after also considering any other equipment present.

The only things the customer needs to provide are water and compressed air. The amount of dust can be significantly reduced without creating mud as the sprinklers, the costs are a fraction of the electrostatic precipitator and there are less space restrictions.



Principle of Dust Suppression; Importance of Fine Water Droplet Size

A nozzle sprays fine fog into its surroundings which then collides with airborne dust particles and absorbs them. The absorbed dust particles slowly settle to the ground due to gravity; this is the principle of dust suppression.

The key is to produce water droplets which are the same size as the dust particles. If the water droplets are too big, the dust particle slide off them and will not be absorbed, preventing effective dust suppression.

The pneumatic spray nozzles, or air-atomizing nozzles, developed and designed with IKEUCHI's atomization technology, produce water droplets with a diameter of 20 to 50 μm , and can perform effective dust suppression.



Effective Suppression of Airborne Dust at a Coal Storage Facility

Looking at a facility that installed the soft fog system for dust control, it only took 10 minutes for the fine fog to start spreading all the way to the ceiling. Then it slowly drifted downward, absorbing airborne dust particles to such an extent that the difference could be seen by the naked eye.

The dust content in the outside environment was drastically reduced, to the point there have not been any more complaints from nearby residents or citations from the authorities. The work environment inside has also improved greatly, mitigating concerns for the health of the workers. Clearly demonstrating the effectiveness of the system.



Summary | Dust Suppression System | Soft Fog Version

The "soft fog" design sprays fine and soft fog which are the same size as the dust particles to settle airborne dust and effectively suppresses scattering. IKEUCHI selects proper spray nozzles, configures ancillary devices and designs a installation layout to propose an optimal system.

The system also delivers effective performance even in a large space where a large amount of dust arises.



Move from QR code to YouTube (Case study)

IKEUCHI have two main versions of dust control systems: a "soft fog design" and a "high-velocity fog design".

The system is applicable to a very wide variety of applications such as dust prevention at a hopper gate or conveyor transfer points, improving a worksite environment and maintaining operators' health, dust control in sludge treatment, fume suppression at rolling and welding processes, odor prevention, and improving corporate compliances.

Product Details

Dust control system using fog

Suppressing dust from erupting and becoming airborne

- An extensive lineup of spray nozzles and control devices to design a best suited system for each individual worksite
- Capable of dust control in a large space
- Highly effective in suppressing dust from erupting and becoming airborne
- Excellent energy-saving and water-saving effects



For inquiries, requests for materials, demonstrations, and estimates, please contact below.
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Dust Control Systems Using Spray Nozzles (Part 2)

Preventing Dust from Erupting | High-Velocity Design



Dust control systems using nozzles to create a high-velocity fog to effectively suppress dust from erupting and becoming airborne

Dust Control Systems Using Spray Nozzles | Two Versions of the System

To design and provide a system suited for an individual worksite, IKEUCHI has prepared two main versions of the system. One is a “soft fog design” that sprays fine and soft fog to settle airborne dust and suppresses scattering. The other one is a “high-velocity fog design” that sprays a large volume of semi-fine fog at high velocity directly at the point where the dust is generated to prevent dust from dispersing.

Both designs are already used in power plants and steel mills in Indonesia, Thailand, Vietnam, South Korea, the United States, Japan, and other countries, to reduce air pollution and improve work environments.

Problems with Airborne Dust at Coal Storage Facilities

There are a variety of sources for dust in steel mills. A large amount of dust comes from the material yards, coke ovens and in blast furnace taphole areas. From there it is spread easily by draft and wind causing unhealthy work conditions inside the mill and complaints from nearby residents outside the mill.



Outside measures to suppress dust were implemented, which include spraying water in the raw material yard to keep the dust from dispersing and renovating the equipment of the coke ovens to reduce dust.



Problems of Dust Eruptions | Blast Furnace Taphole Areas | Steel Mills

However, preventing dust from erupting in the taphole area when the taphole was opened had not been solved and was still causing a worsening of working conditions.



There are two main sources for the dust; one is area right around the taphole, and the other is the main runner that is the flow path of molten iron. Dust is generated around the taphole when the hot metal comes into contact with air and causes dust to escape at the opening, this however can be remedied with the help of a dust collection hood placed above this area.

The molten iron then goes through the main runner to the next process. The main runner is usually covered by main runner cover, each

section is approximately eight meters in length. These cover sections keep the molten iron from splashing but are also a shield against heat and prevent the dust clouds from escaping the runner.

These measures generally work well, but the cover section in front of the taphole is removed temporarily to allow the drilling machine to move into position to open the taphole. During these three or four minutes while the taphole is opened, this gap without the cover leaves the pig iron surface exposed to air and allows the dust to rise and escape into the facility on an updraft of hot air. This dust, reaching high up in the facility and then dispersing broadly, cannot be completely captured with the overhead dust hood, and thereby causes a harmful environment.



High-Velocity Fog for Preventing Dust from Erupting

To address this problem, a high-velocity dust control system was proposed. It sprays a large volume of fog at high velocity to suppress the dust from escaping.

Specialized nozzles installed to the upper left and right of the taphole start spraying directly at the taphole as soon as it is opened, suppressing the dust, and keeping it from escaping.

By spraying the fog at a high flow velocity, it is possible to engulf the point of origin of the dust without being affected by the updraft. The fine droplets, approximately 80 μm , will also prevent the surrounding area and equipment from getting wet.

Installation of the system is not a large-scale project, and the only things the customer needs to provide are water and compressed air.



Effectively Preventing Dust in the Blast Furnace Taphole Area

The high-velocity fog can prevent dust from escaping even during the opening of the taphole, drastically lowering the negative effects on the work environment. In addition, several of the nozzles were installed higher up and away from the source of the dust, spraying fog horizontally at areas where dust tends to drift and collect. This layout helps direct the drifting dust towards the intake of the overhead dust collection hood, which supports the control of dust flow, and has improved the efficiency of dust collection.

Summary | Dust Prevention System | High-Velocity Fog Design

By spraying a large amount of the fog at a high flow velocity, it is possible to engulf the point of origin of the dust without being affected by the updraft.

IKEUCHI selects proper spray nozzles, configures ancillary devices and designs a installation layout to propose an optimal system.



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