

Using Spouts & Filters to Control Dust During Material Loading

This article discusses dust exposure issues that can occur when loading dry bulk material into vessels for transport. These concerns can be addressed by using loading spouts and filters to control the dust and create a safer working environment.

Companies involved in handling dry bulk material to be transported by truck, rail, barge, or ship are facing more stringent regulations relating to the existence of product dust in the workplace. These regulations are a result of extensive research performed by the US Department of Labor's Occupational Safety and Health Administration (OSHA). The research revealed that health and safety risks relating to dust aspiration and exposure are even more severe than previously recorded. Furthermore, the impact of these risks extended beyond the workplace environment to affect nearby neighborhoods, waterways, and other local ecosystems. Luckily, engineering controls and industrial equipment exist that address the management of fugitive dust - in this case, at the point of loading.



Dust created during an open loading environment.

Health Issues

When considering health issues, dust is classified into three categories:

- **Inhalable dust:** Airborne material that enters the nose and mouth during breathing and has the potential of entering the respiratory tract.
- **Respirable dust:** Inhalable dust that penetrates into the gas exchange region of the lung.
- **Nuisance dust:** Airborne materials that have minimal harmful effects on the lungs when exposures are kept to reasonable limits.

The type and size of dust determines how toxic it may be. Dust may cause coughing, eye irritation, skin reactions, hay fever, shortness of breath, and sneezing. Breathing high concentrations of dust over a long period of time will reduce lung function and contribute to chronic bronchitis and heart and lung disorders.

Certain types of dust will cause pneumoconiosis. Included with this group is crystalline silica (quartz) dust which enters the lungs to create scar tissue that reduces the lungs' ability to take in oxygen. Crystalline silica is classified as a carcinogen - capable of causing cancer in living tissue.

Safety Issues

Dust accumulation within the workplace can create numerous safety issues. Concentrations of dust on floors and handrails have the potential of causing employees to slip or fall as they travel through walkways or climb steps or ladders. Dust in the air can create vision issues - not being able to see where one is navigating to. Good housekeeping can prevent legal fees, OSHA fines, and worker medical payments.

Additionally, certain materials handled may cause combustible dust. This type of dust creates a fire or explosion hazard when suspended in the air and ignited by a spark or flame. OSHA has created list of materials that pose a threat for combustible dust. The list includes such items as coal, grain, flour, and sugar. For the full list, visit: www.osha.gov/Publications/combustibledustposter.pdf.

The Loading Process

There are four main factors present dust generation issues during the loading process:

- **Falling distance:** The vertical distance between point A (the material origin) and point B (the material pile).
- **Loading rate:** The speed and quantity of the material being loaded within a given time frame.
- **Environmental considerations:** (e.g. rain, wind, etc...)
- **Type of vessel being loaded:** (e.g. enclosed or open trucks and railcars, barges, ships)

Steps can be taken to address some of these issues. They include:

- **Moisture content of the material handled:** Slight moisture may be added to the material handled to reduce dust, yet not significantly affect the flowability of the material itself (overall, keeping the material dry).

- Reduced falling distances: A shorter falling distance between points A and B slows material velocity and impact and reduces dust.
- Physical barriers at the loading point: Create walls or areas where personnel are removed from the affected area.

Regardless of the steps taken, dust will be created and must be managed appropriately to promote workplace and environmental safety. With this in mind, companies need to pay strict attention to the final piece of equipment that touches the dry material before it enters the transport vehicle - the loading tube, chute or spout.

Tubes, Chutes and Dust Socks

Many companies continue to use tubes, chutes, and dust socks when loading dry bulk material for transport.

Advantages:

- Inexpensive
- No moving parts
- Requires no utilities
- Easily repairable

Items to consider:

- No way to capture fugitive dust
- Environmentally unfriendly
- Create health and safety issues
- Loss of product (dust in the wind)
- Potential penalties / fines



Typical loading tube



Dusting from open loading

Industry personnel generally understand the problems involved with this type of loading apparatus; however, are reluctant to make the capital expenditure necessary to acquire a telescoping loading spout.

During a sales call to a company who was using a dust sock to load an open truck (and creating a dust storm in the process) a Vortex representative asked the loading supervisor "When environmental inspectors visited the facility, what is their reaction to the loading sock?" The supervisor replied,

"We don't load trucks when they are here!"

Given the hazards associated with this type of loading, the purchase of a telescoping loading spout is well worth the cost.

Telescoping loading Spouts

The telescoping loading spout has been the "go to" method used to load dry bulk material and control dust emissions for decades. Over the years, manufacturers have continued to improve their products, especially when it comes to dust mitigation.

The spout consists of a number of stackable cones that are surrounded by a material sheath. The cones and sheath can be extended or retracted through a cable system. The outer sheath protects the product handled from external elements (wind, rain) as well as contain any dust created during the loading process.

The spout can be extended directly to the top of a containerized truck or railcar or to the floor of a truck that is being "open loaded". In the case of open truck loading, a dust skirt is typically installed at the bottom of the spout to help contain dust. A tilt probe may be employed to retract the spout in increments - keeping the dust skirt in contact with the material as the vehicle is loaded.



Containerized loading



Open loading

Removing dust - Routing dust to a collector

Many spout manufacturers provide a port at the top of the unit that allows vacuum drawn dust to be routed to a dust collector. Typically, the collector contains fabric filters that trap the airborne particles. These particles are eventually moved into a hopper where they are temporarily stored and later disposed of.

Advantage: Dust generated by the loading process is removed from the loading area to create a safer environment.

Disadvantage: Lost profits. Product is being removed from the load and disposed of rather than being sold. Over a period of time the value of this removed product can add up to a sizeable cash loss.

Capturing and re-entraining dust - The dust filter

A superior alternative to a dust collector is a dust filter. The dust filter unit is engineered to capture the fugitive dust emitted from the loading process and deposit it back into the material flow. The filter is equipped with a single, high-volume exhaust blower that pulls the material dust up between the internal cones and the outer sheath. Dust is temporarily trapped by several pleated cartridge filters within the filter. An automatic pulse jet filter cleansing system uses high-pressure compressed air to purge the

filters of the accumulated dust – sending it back down the spout through the material flow stream and into the vessel being loaded. **The dust is captured, re-entrained, and sold as product.**



Telescoping spouts offer an answer to dust control

In an environment where dust can become such a health and safety risk, controlling the risk of dust exposure becomes imperative.

Loading spouts offer a viable solution to addressing dust issues created by the loading and subsequent transporting of dry bulk material. Additionally, the telescoping loading spout fully encloses any material being conveyed from point A to point B. Tubes, socks, and hopper-type spouts cannot meet this requirement.

Advantages of telescoping loading spouts:

- Dust is contained
- Health and safety issues are addressed
- When utilizing a filter unit, material is re-entrained into the load and sold rather than disposed of.
- A telescoping loading spout easily handles varying product sizes and flow rates
- A telescoping loading spout easily handles larger particles or agglomerated products
- The vertical distance of a telescoping loading spout is adjustable
- Product height can be indicated or controlled with tilt probes and auto-raise features
- Telescoping spouts offer controlled loading

Items to consider:

- Spouts and filters do require utilities for operation

- Truck tarp support rails may create spout entry issues with open trucks
- Potential drive away damage may occur if spout not properly retracted

Conclusion

Every industry addresses dust issues. OSHA offers these guidelines:

- Use engineering controls (convey through sealed systems, utilize dust collectors, consider water-based suppression systems)
- Provide respirators in certain areas
- Limit worker and visitor access to high exposure areas
- Develop a written exposure control plan
- Provide medical exams for highly exposed workers
- Train staff and visitors regarding the risks regarding dust exposure

People contend with dust every day. It is nice to know that during the process of loading dry material, solutions exist to tame this critter!

Vortex manufacturers loading spouts, positioners, and filter units for tote, truck, rail, barge, and ship loading. Additionally, Vortex designs and manufactures slide gates and diverters for dry bulk material handling. For more information, please visit www.vortexglobal.com

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For additional information
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