

# SUPPLIERS' TIPS

## How can I safely mechanically convey my highly combustible bulk solid?

When selecting mechanical conveying equipment for a powder, pellets, or granules, review the material's MSDS data sheet, research the material's combustible properties, and identify what category the material falls under: agricultural products, dusts, carbonaceous dust, metal dusts, or plastic dusts. Refer to OSHA's fact sheet on combustible dust and OSHA's *Hazard Communication Guidance for Combustible Dusts* (available at [www.osha.gov](http://www.osha.gov)).

Know your material's properties. OSHA classifies combustible dusts based on the severity of the explosion the material can generate. A class St 0 dust has no explosion risk, while a class St 3 dust has a very strong explosion risk. Another important property to know is your material's Minimum Ignition Energy (MIE), expressed in millijoules. Carry out a comprehensive dust hazards analysis to determine whether any ignition sources are present capable of generating enough energy to exceed your material's MIE value.

Typical mechanical conveying equipment for bulk solids transport includes: bucket elevators, open belt conveyors, chain or cable conveyors, open vibratory trough conveyors, screw conveyors, and vibrating tubular conveyors. OSHA and NFPA recommend the following broad guidelines for protecting against combustible dust explosions during mechanical conveying. [*Editors Note:* These guidelines are covered in detail in the various industry-specific NFPA standards, available at [www.nfpa.org](http://www.nfpa.org).]

**Dust control methods.** Dust control involves regular housekeeping to minimize fugitive dust accumulation on surfaces. Any open mechanical conveyor is prone to dust spillage and leakage. Control dust by providing dust hoods and dust extraction systems and avoiding spillage whenever possible.

**Ignition control methods.** Metal-to-metal contact generates frictional sparks, which can lead to combustion. Most mechanical conveyors (excluding vibrating conveyors) have potential metal-to-metal contact and power transmission drives that use bearings. Rotor-tip velocities below 1 m/s are recommended, and rotor-tip velocities above 10 m/s should be strictly avoided. A spark detection system can detect spark generation and deploy preventive action. Another new technique being developed is to incorporate contact detection systems to provide early warning of metal-to-metal contact and automatically shut down the equipment if necessary.

Use equipment with outboard bearings because inboard bearings can directly contact the material and transfer heat, potentially causing ignition. You can also incorporate a bearing temperature and vibration monitoring device to detect bearing malfunction and overheating and provide an early warning signal.

Check for any break in the metal-to-metal contact (such as gaskets, flexible connectors, or others) and provide bonding and grounding to ensure electrical continuity and dissipate electrostatic charges that could be generated in these areas.

Prevent tramp metal from entering open mechanical conveyor systems and screw conveyors. Tramp metal can create frictional heat and sparks by metal-to-metal contact. Include a separation device, such as a screener, magnetic separator, metal detector, or a combination of these to detect and remove tramp materials. Vibrating-tube conveyors, which have no internal components or rotating parts, are less susceptible to foreign tramp metal contamination.

**Explosion protection methods.** Ensure that you have adequate explosion protection for your particular conveyor type. Some conveyor types, such as bucket elevators and screw conveyors, require explosion protection measures, such as explosion panels, deflagration suppression systems, or spark detection systems. These are based on the hazard analysis and specified by the industry-specific NFPA standard. A vibratory tube conveyor, on the other hand, generally doesn't require specific protection measures, other than providing suitable grounding and bonding on the flexible isolators at material infeed and discharge points.

To know what you're dealing with, perform a risk assessment for the material being handled and the surrounding environment. Depending on the risk level, a solution could be as simple as reducing potential ignition sources by using antistatic materials and following proper bonding and grounding procedures for both electrical and mechanical components. Ensure that you clearly understand area requirements and plant safety standards. In an explosive environment, use only intrinsically safe electrical devices and explosion-proof components. In some situations, the conveyor controls can be located in a designated safe area while the mechanical conveying equipment is in the hazard area.

You can use a dust collection system to create negative pressure in the conveying system and safely collect and contain any nuisance dust created during handling. In some applications, you can also purge the conveying system with an inert gas such as nitrogen to prevent dust cloud ignition.

All of these practices can be used separately or together to safely handle combustible materials. Conveying equipment manufacturers have helpful data explaining how their specific equipment can be used safely, so work with your supplier to determine the safest and most successful conveying method for your combustible bulk solid. For more information, refer to your material's MSDS as well as OSHA and NFPA standards.

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