GV TECHNOLOGY
FIRE AND EXPLOSION PROTECTION

METAL MAKES THE WORLD GO AROUND BUT IT ALSO CAN BE A COMBUSTIBLE HAZARD

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METAL DUST EXPLOSIONS ARE DIFFERENT FROM TYPICAL COMBUSTIBLE DUST EXPLOSIONS AND CAN BE MORE DIFFICULT TO CONTROL. LEARN HOW TO MITIGATE METAL EXPLOSIVE RISK.

METAL POWDERS

Metal dust explosions are different from typical combustible dust explosions and can be more difficult to control. The flame temperature of some metal dusts can exceed 3,300°C which can limit the possible mitigation strategies.

The flame speed and combustible characteristics (Pmax and KSt) can also be much higher for metal dusts compared to organic materials.

The finest metal powders are referred to as ultra fine metal powders, which can be prone to spontaneous ignition when exposed to air due to their extremely small particle size and surface area. Metal dust deflagrations are often associated with more severe consequences in terms of human loss and financial impact. Aluminum dust deflagrations, especially, produce high temperatures and elevated explosion pressures which can cause severe burns and heavy damage. Metal dusts can also react with water to produce hydrogen and create a very reactive hybrid gas-dust mixture.

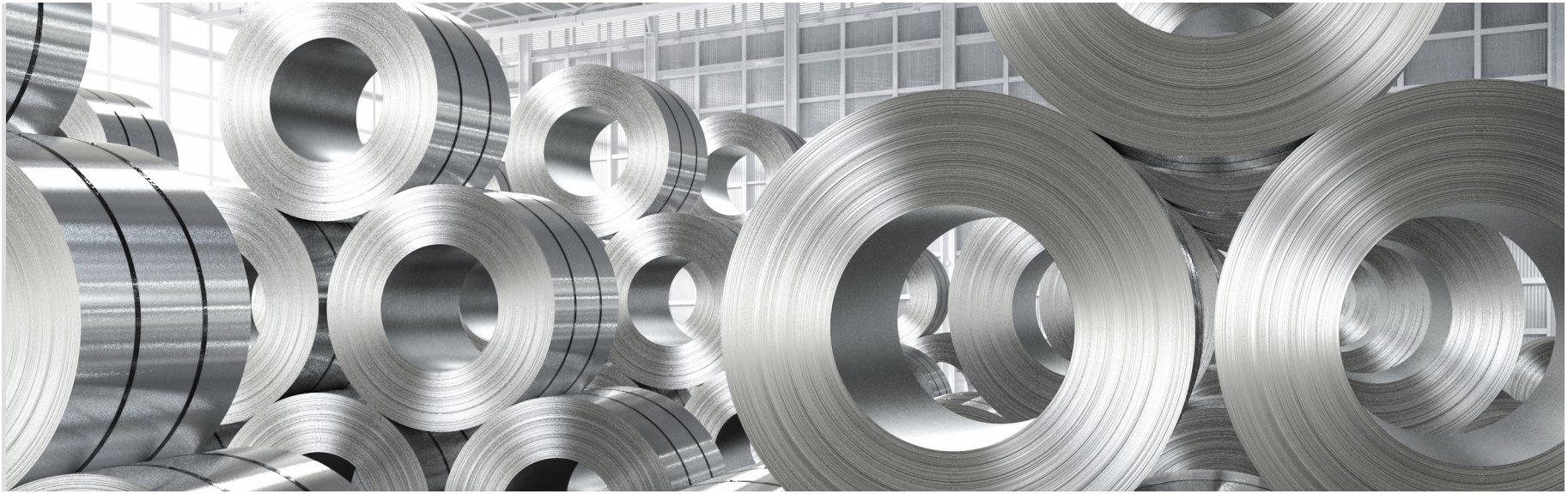
METAL HAZARDS

Dust explosion hazards must be assessed and controlled to protect people, processes, and operations. Because of the greater risks and the growing number of incidents, standards are becoming more stringent for plants handling metal dusts. In the United States, dust explosion prevention and protection are addressed in a few of the NPFA Standards:

NFPA 68 Explosion Protection by Deflagration Venting
NFPA 69 Explosion Prevention Systems
NFPA 484 Combustible Metals

Metal processing facilities generate metal dust during a wide range of operations including cutting, welding, milling, and grinding. Hazards in these process areas should be addressed through a dust hazard analysis.

After identifying the hazard, having the specific dust tested, is critical to understanding the risk of handling the metal material. Both prevention and mitigation methods may be needed to provide safeguards to manage the metal dust hazard. Common mitigation methods for metal dust deflagrations are venting, suppression, and isolation.



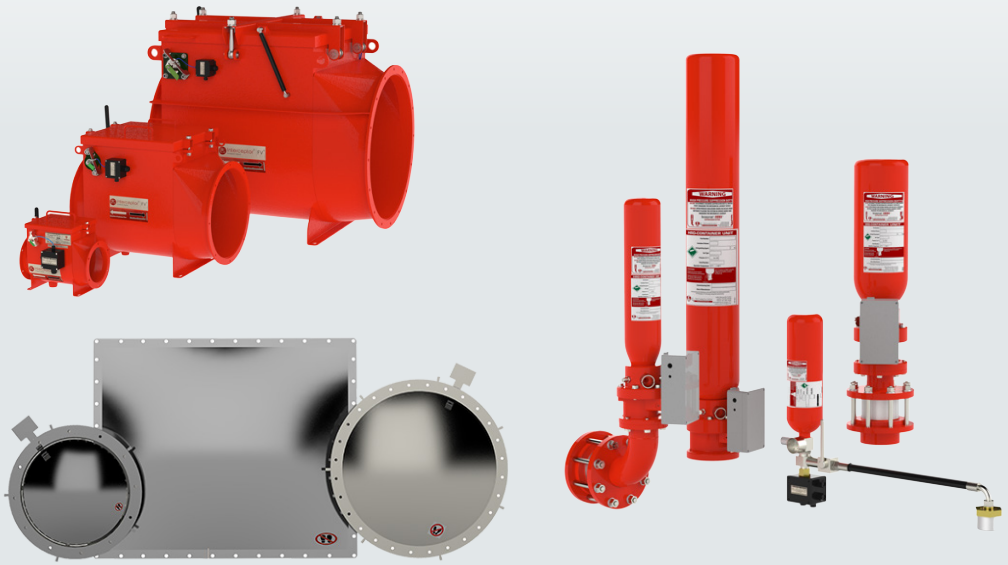
MATERIAL	MASS MEDIAN DIAMETER (µM)	MINIMUM FLAMMABLE CONCENTRATION	PMAX (BAR)	KST (BAR-M/SEC)
Aluminum	29	30	12.4	415
Bronze	18	750	4.1	31
Iron carbonyl	<10	125	6.1	111
Magnesium	28	30	17.5	508
Zinc	10	250	6.7	125
Zinc	<10	125	7.3	176

The flame speed and combustible characteristics (Pmax and Kst) can be much higher for metal dusts compared to organic materials.

The finest metal powders are referred to as ultra fine metal powders, which can be prone to spontaneous ignition when exposed to air due to their extremely small particle size and surface area. The flame temperature of some metal dusts can exceed 3,300°C which can limit the possible mitigation strategies. Therefore, a solid explosion prevention strategy should be the first priority of safety managers.

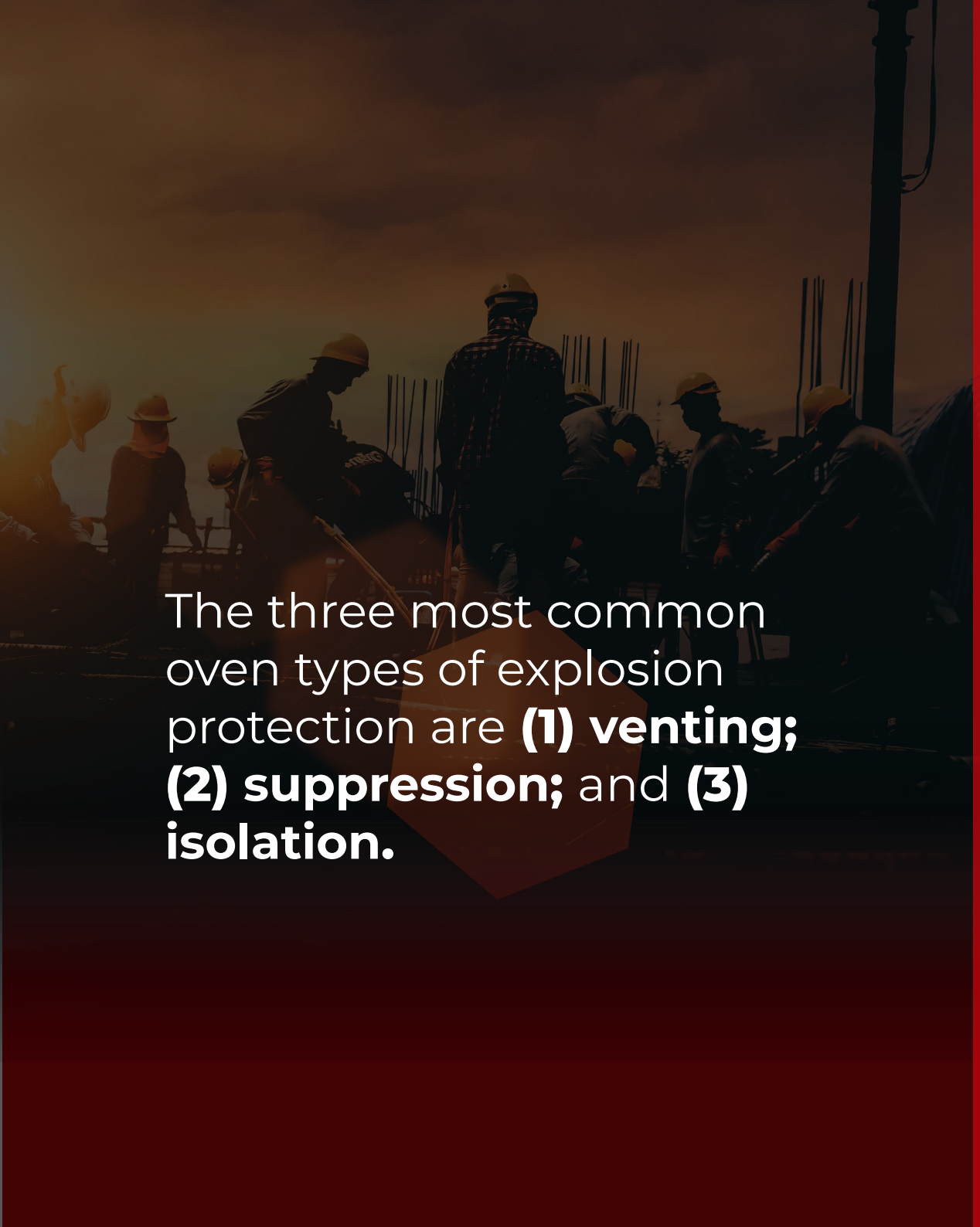
DUST EXPLOSIBILITY PROTECTION

Dust explosion hazards must be assessed and controlled to protect people, processes, and operations.



Explosion venting is an effective and simple method to mitigate a dust explosion. Venting enables pressure that has developed during a deflagration to be released safely, which in effect prevents the process enclosure from rupturing. **Explosion suppression** helps control deflagrations, by absorbing the energy created during the combustion reaction.

Explosion isolation is used to prevent flame and/or pressure from propagating from one piece of equipment to other parts of the process. Isolation is difficult to achieve when explosion pressure and flame speed are high, which is common in metal dusts



The three most common oven types of explosion protection are **(1) venting; (2) suppression;** and **(3) isolation.**

VENTING

Venting enables pressure that has developed during a deflagration to be released safely, which in effect prevents the process enclosure from rupturing.

SUPPRESSION

When pressure waves created by a deflagration are detected, the suppressant discharge is initiated to extinguish the fireball.

ISOLATION

Isolation is difficult to achieve when explosion pressure and flame speed are high, which is common in metal dusts. Isolation can be accomplished with mechanical systems that interrupt or block the passage of flame, such as with the Interceptor®-FV®.

CV Technology specializes in complete explosion and fire protection solutions for the prevention and mitigation of explosions and fire hazards.

Over the past 20 years in the industry, we have become one of the world leaders in superior fire and explosion protection design. Safety and continuity of processes are of significant value to all companies. Powders and dry bulk materials, production, and handling methods commonly used put factories, equipment, process, and employees at risk.

The proper strategy for dust explosion and fire protection is unique for each situation, factory, process, and company. Our engineering, manufacturing, and system integration capabilities allow us to custom tailor each safety solution specific to the operation's conditions. Our unique approach has led to an unblemished safety record and is why we have become the safety vendor of choice for a wide variety of Fortune 500 companies.

Keep Your Metal Process Operational

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