

A white-bordered box containing the title text, which is centered over a background of a welder's mask and a shower of sparks.

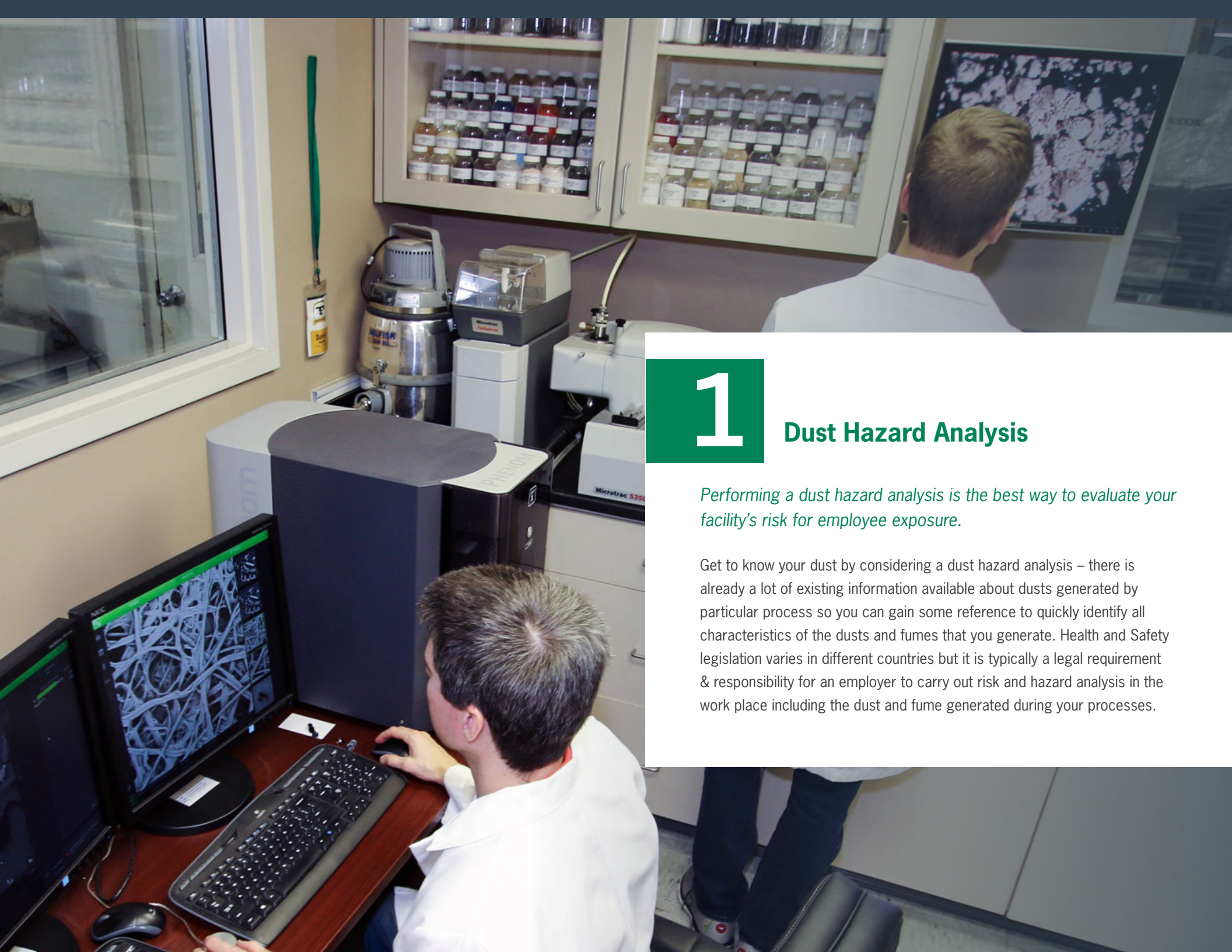
7 **TIPS FOR MANAGING**
DUST AND FUMES IN METAL PROCESSING

7 TIPS FOR MANAGING DUST AND FUMES IN METAL PROCESSING

Metalworking facilities that perform large-scale fabrication must be diligent in controlling hazardous dust and fumes, especially those that contain harmful metal particulates from processes such as welding, thermal cutting, sanding and polishing. Removing dust and fumes generated by these processes is a must for good housekeeping, worker safety, equipment reliability and regulatory compliance. You must have a system that captures dust and fumes from the air, safely contain them, and returns the clean air indoors or exhaust it outdoors.

A well-designed and maintained dust and fume collection system will properly filter fumes and other hazardous contaminants generated during heavy fabrication. These systems prevent respiratory problems and keep facilities in compliance with current air quality requirements. Air filtration also helps to protect controls and other computerized systems from damaging dust and fumes. In facilities where air can be recycled, collection systems can minimize the need for costly makeup air. In this eBook we provide 7 important tips for you to consider in relation to the management of dust & fume generated by processes within your facility which are potentially hazardous to both employee health and the wider environment.





1

Dust Hazard Analysis

Performing a dust hazard analysis is the best way to evaluate your facility's risk for employee exposure.

Get to know your dust by considering a dust hazard analysis – there is already a lot of existing information available about dusts generated by particular process so you can gain some reference to quickly identify all characteristics of the dusts and fumes that you generate. Health and Safety legislation varies in different countries but it is typically a legal requirement & responsibility for an employer to carry out risk and hazard analysis in the work place including the dust and fume generated during your processes.

2

Dust Explosion and Flammability Testing

The ATEX directive requires that the employer is responsible to carry out a risk assessment to determine the necessary fire and explosion protection.

The ATEX directive has a few interpretations in different countries but it is typically a legal requirement and responsibility for an employer to carry out risk assessment and to understand if dusts that are generated or being handled as part of the process are potentially explosive and to what levels. This is to ensure safety of your employees, your production equipment and entire facility in the case of an explosion occurring.

The testing can be carried out by sending dust samples to an independent registered testing facility and will determine the dust explosion class “ST0 to ST3” and if it is explosive then the Kst (rate of the increase generated in the event of an explosion) and Pmax (maximum pressure values generated in the event of an explosion) values. Additionally it will classify the dust type as organic or metal.

Some dusts / powders being used in your process have already had these properties determined and they are available on the Material Safety Data Sheet (MSDS). Once you have this information it can be used by your dust collection equipment supplier to correctly select and size the explosion venting or suppression systems to ensure optimum safety for your employees and your entire production facility.

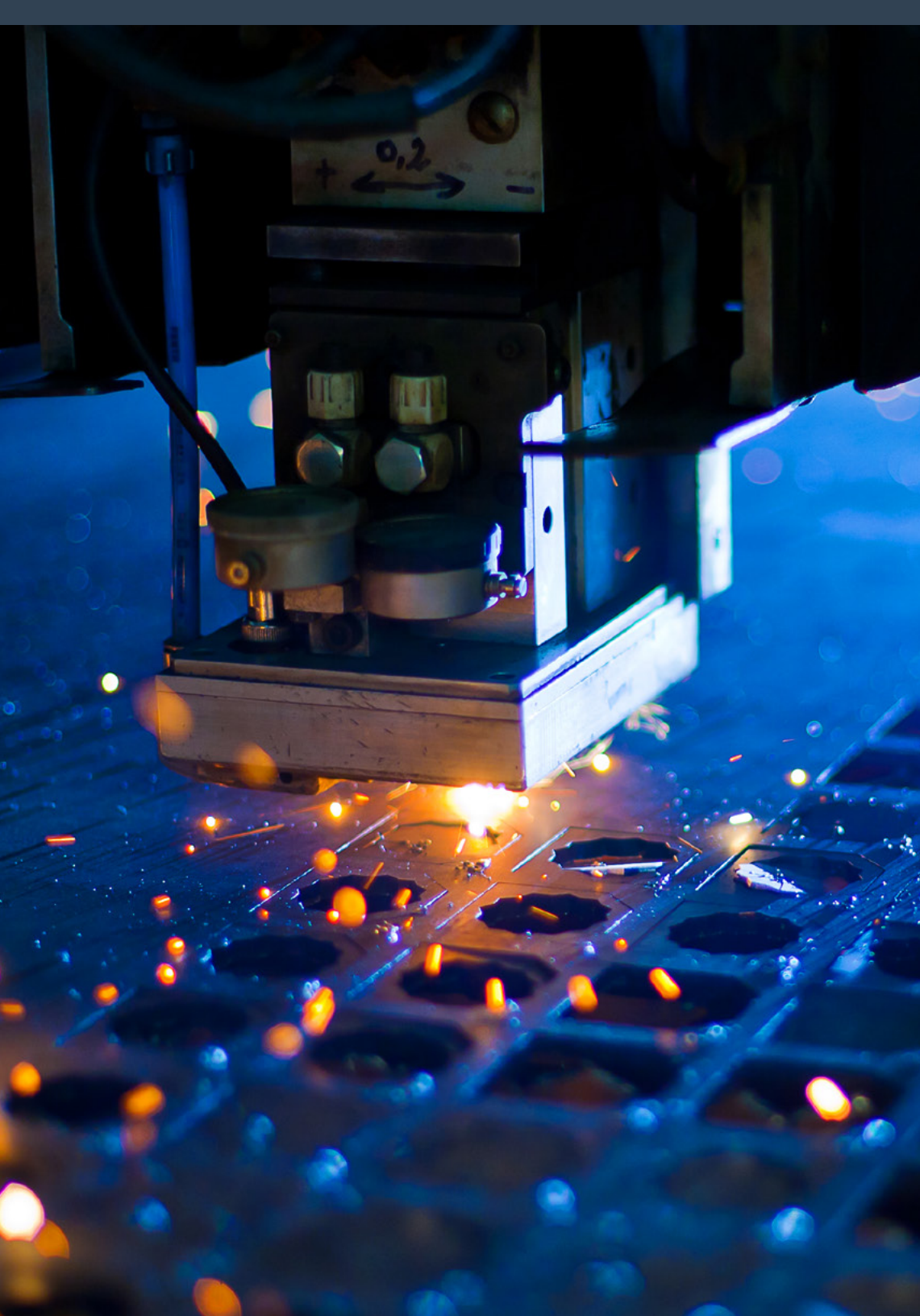
Combustible Dust Classifications

Dust Explosion Class	Kst	Characteristic
St-0	0	Not explosive
St-1	<200	Weak to Moderately Explosible
St-2	200-300	Strongly Explosible
St-3	>300	Very Strongly Explosible

Combustible Dust Properties

- **Kst** – Deflagration index (bar-m/s)
- **Pred** – Reduced pressure after venting (bar)
- **Pstat** – Vent static burst pressure (psi)
- **Pmax** – Max pressure for an unvented dust explosion (bar)
- **(dp/dt)** – Rate of pressure rise (bar/s or psi/s)
- **Pes** – Enclosure strength = 2/3 of yield strength of weakest part or 2/3 of ultimate strength if deformation is allowed





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Consider Workplace Indoor Air Quality (IAQ)

To identify and control harmful exposures to dust and fumes, you will need to conduct workplace occupational hygiene assessment.

European Directive (EU) 2017/2398 considers the protection of workers from the risks related to exposure to carcinogens or mutagens at work (WEL Workplace Exposure Limits). Health and safety in the workplace legislation typically requires that employers must ensure that adequate measures are in place for the Control of Substances Hazardous to Health (CoSHH). In order to determine the indoor air quality it is often necessary to carry out tests to ensure that your employees are not subjected to excessive levels of these hazardous substances such as: iron oxide, lead oxide, manganese, nickel, chromium, respirable dust and total particulate. Ask your dust collection equipment supplier to recommend an industrial occupational hygienist or specialist IAQ monitoring company experienced in identifying dust and fumes that are specific to heavy metal fabrication facilities. A useful guide to WELs can be found on www.hse.gov.uk.

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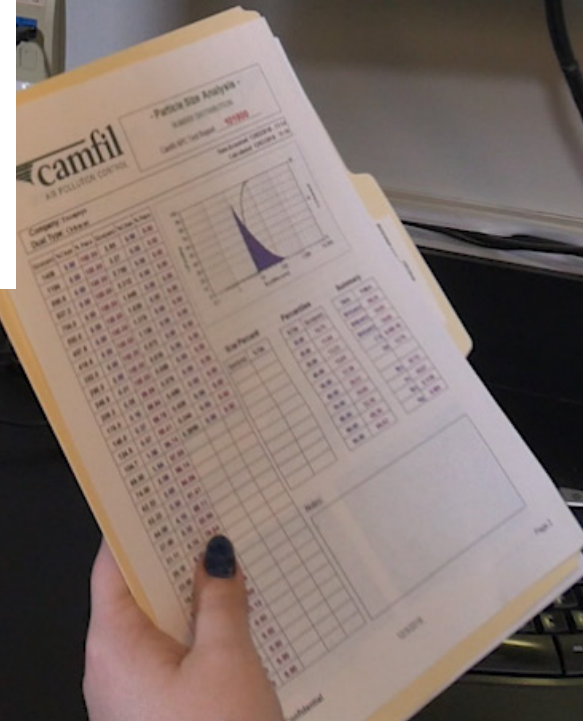
Identify Dust Characteristics

It's also important to analyse other dust characteristics to determine the best dust collection system and filters for your metal processing application.

To ensure that you have the most effective & compliant dust extraction system, conducting explosion and flammability testing or Indoor Air Quality assessment is not enough. You must also identify key dust characteristics such as particle size and distribution, particle shape, bulk density, moisture level and abrasiveness. Understanding these attributes enables the design of the optimal dust extraction solution.

Leading dust collection equipment suppliers can conduct this dust testing and work with you to specify the best system for your application. Bench testing of your processing dust helps you better understand the physical properties of your dust, and select the best equipment for your application.

To create a complete picture of your operation, the testing laboratory should ask for detailed application & process information such as welding, cutting, blasting, grinding and brazing operations and the type of materials that you are working with.



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Consider Efficiency in Excellent System Design

It is important that your dust and fume extraction system is not only effective but also performs in an efficient manner in relation to energy consumption and reduction of the total cost of ownership.

There are some widely accessible guides to good practice for the design of a dust extraction or local exhaust ventilation (LEV) system such as:

- Association Advancing Occupational and Environmental Health (ACGIH)'s Industrial Ventilation: A manual of recommended practice for design can be found on www.acgih.org
- Health & Safety Executive guidance for controlling airborne contaminants at work: A guide to Local Exhaust Ventilation (LEV) HSG258, available on www.hse.gov.uk

It is important to capture hazardous dusts and fumes as close to the source as possible. In conjunction with the results from explosion & flammability testing, IAQ assessment and dust characteristic analysis, we recommend to use the design guide as reference to explore the right capturing solutions for your application. Evaluate these methods in order:

- Receiving hoods: extraction arms, workplace systems with integrated extraction
- Enclosing hoods: blasting/thermal spray booths, welding cells, cnc machines
- Capturing hoods or ambient extraction: located above the source of rising dust & fumes

If you are recirculating the cleaned air, you'll need to keep below the local guidance for Workplace Exposure Limits (WEL) of hazardous dust and fumes and may need to consider using HEPA filtration. If you are exhausting the air outdoors you will need to consider local environmental regulations for emission limits which are sometimes related to the process, application and type of contaminant.

Ensure regular performance and functionality checks in accordance to good maintenance practice and to meet with local health and safety requirements.



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Network with Peers

Networking with peer manufacturers in your industry is another way to discover processes, equipment and suppliers to help you manage dust and fumes.

It's a great idea to consult with professional associations and certification groups. And don't forget to ask your local authority for environmental regulations of fire department for their safety guidelines. When selecting a dust collection system supplier, look for one that is experienced in heavy metal fabrication applications, knowledgeable about local legislative requirements and has the technical resources to develop an engineered solution. The supplier should also offer a full range of equipment in order to give unbiased advice on the right type of system for your facility.

Restrictive Particle Counts and System Cost

If your facility works with metals that are subject to more stringent health and safety restrictions or where particles exceed Workplace Exposure Limits (WEL), you can expect to pay more for your dust and fume management solution. These respirable particulates require a highly engineered system with high-efficiency filter cartridges and in most cases require a second stage of HEPA filters manufactured tested and certified in accordance with the globally recognised HEPA filter factory test standard ISO EN1822.





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Isolate High-Hazard and High-Quantity Dust/Fume Sources

The best way to reduce workers' exposure to hazardous dusts and fumes is to install a dust collection system with high-efficiency primary cartridge-style filters and secondary safety monitoring filters (HEPA).

It is preferable to capture dust and fumes at their source to prevent them from expanding throughout the plant. This is accomplished by incorporating extraction arms, hoods or enclosures into the process application. Source capture is extremely effective.

Once you have identified high-hazard and high-quantity dust and fume sources, you should isolate them from the rest of the facility and contain them in a specific area. These areas can be designed to be kept under negative pressure. The extracted air is either drawn directly into a local collector or ducted to a dust collector located remotely. Often the filtered air can be safely returned into the facility to create an airflow pattern to improve the contaminant control.

A legislative compliant, well-designed and maintained dust and fume collection system is a must for protecting your employees from respiratory problems and protecting your entire facility, control systems and your product from damaging emissions.

For further information please contact your local sales team or visit our website www.camfil.com



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