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AIR POLLUTION CONTROL

MANAGING METAL FABRICATION

Dust and Fumes

Dust collectors are an accepted and proven engineering control for removing hazardous airborne contaminants.

There are three general types of cartridge dust and fume collection systems:

1. ***Source Capture Systems*** are popular for applications involving small parts and fixture welding. They typically use flexible source capture arms, slotted fume hoods with side shields or small hoods that are application-specific.

2. ***Enclosures and Canopy Hoods*** are often used if the footprint area is a medium size (less than 12 x 20 feet). Curtains or hard walls can be added to the sides of a hood to create a booth or enclosure as long as they don't interfere with workspace. A full enclosure over and around the application can often be used or robotic weld cells and hard automation applications.

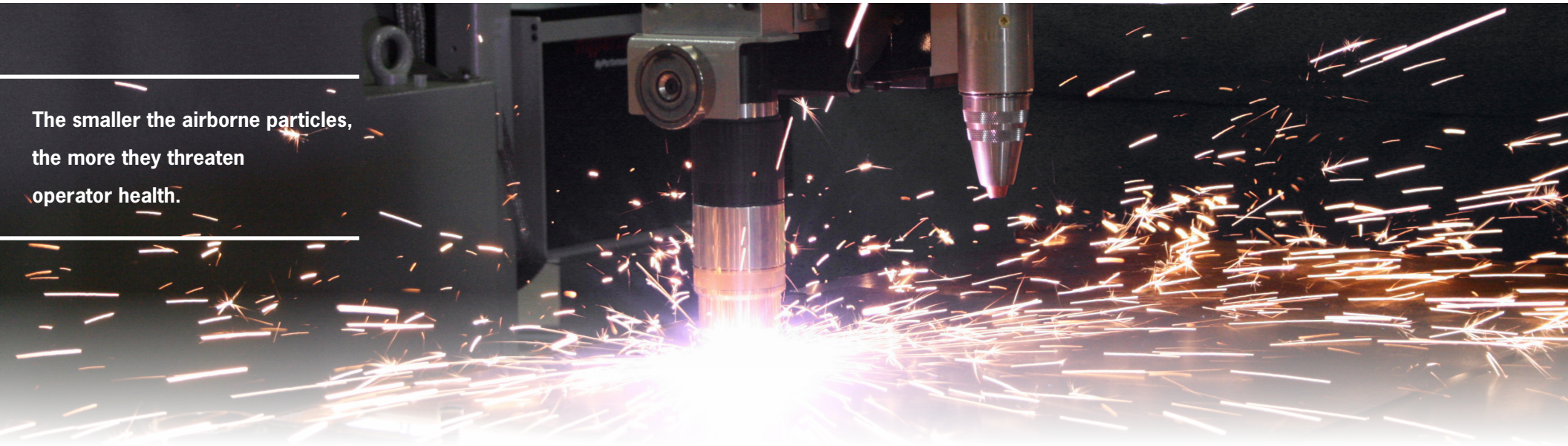
3. ***Ambient Systems*** are often favored for larger work areas involved in multiple facilities. Ambient systems filter all the air in the shop using a central system or multiple collectors. The dust and fume collector may also require a bank of HEPA safety monitoring filters (also called secondary or after-filters). These filters provide added filtration and backup protection, and are particularly useful for applications that return the filtered air indoors downstream of the collector. ***It's important to note that ambient systems only help to control hazardous airborne dusts. They do not remove fumes from the breathing zone. For this reason, personal protection equipment may still be required. Workers can also use fans to direct fumes away from the breathing zone.***

No matter which type of system

works for you, make sure that it is designed for your specific metalworking operation. This ebook explores some of the key dust management topics that metalworking facilities should consider including source capture, enclosures, operating costs, filtration, safety and compliance.

Dust collection systems should be designed specifically for each metalworking application.

SPECIAL NEEDS FOR
PLASMA, LASER AND ROBOTIC CELLS



The smaller the airborne particles, the more they threaten operator health.

Plasma, laser and robotic cutting processes generate sparks and airborne pariticles in the form of dust, fumes and smoke. Proper ventilation is required to prevent operators from inhaling those airborne particles, especially the tiniest particles that settle deep into lung tissues.

For these applications, it is ideal to use dust collectors that can effectively capture particles at the source. Dust collectors pull the airborne particles through the table or enclosure and ductwork, capturing them in filter cartridges and containing them in a barrel. The clean air is then recycled back into the workspace or out into the environment. The sparks and molten metal don't get pulled into the collector; they settle in the area below the table and accumulate in the spark arrestor.

Particle properties, airflow and loading rates differ widely in these applications. Many factors play a role in determining the required airflow and collector size including:

- Power (plasma amps or laser wattage)
- Number of cutting heads
- Table size and cell size
- Material being cut

Because of this complexity, it's important to work with a supplier that has metalworking expertise. They can help you design a cost-effective, space appropriate filtration system that is reliable, durable and easy to maintain.

Use enclosures to contain welding fumes.

INTELLIGENT DUST COLLECTOR DESIGN

Consider your current and future dust collection needs, especially if you foresee future growth.

Intelligent design is required to remove dust and fumes when floor space is at a premium. Modular dust collection systems have the most flexibility. They are built from separate modules bolted together instead of one large welded assembly. Each module houses two or four filter cartridges, and modules can be combined in dozens of configurations to fit the specific work environment and required air volume.

When the time comes to expand your operation, you can do so cost-effectively and efficiently. Adding modules expands the airflow that your dust collector can handle.

Intelligent design also requires understanding the specific needs of each facility. For example, it's a good idea to separate weld areas from the rest of the plant so you can isolate dust and fumes. An ambient system is a good solution for facilities with weld fumes because they typically float throughtout the plant. However, facilities that produce dust from machining or fabrication processes should use a source capture solution.

Energy and compressed air usage are key costs of operating dust collectors.

REDUCING OPERATING COSTS

Design your dust and fume collection system to minimize operating costs and energy usage.

For example, consider using system zoning within the plant.

Different work areas produce different types and quanties of dust, but you can section off areas and duct each to a dust collection system that can be turned on/off for each area as needed. This enables you to operate your collection system only where it is needed and turn down or shut off other areas.

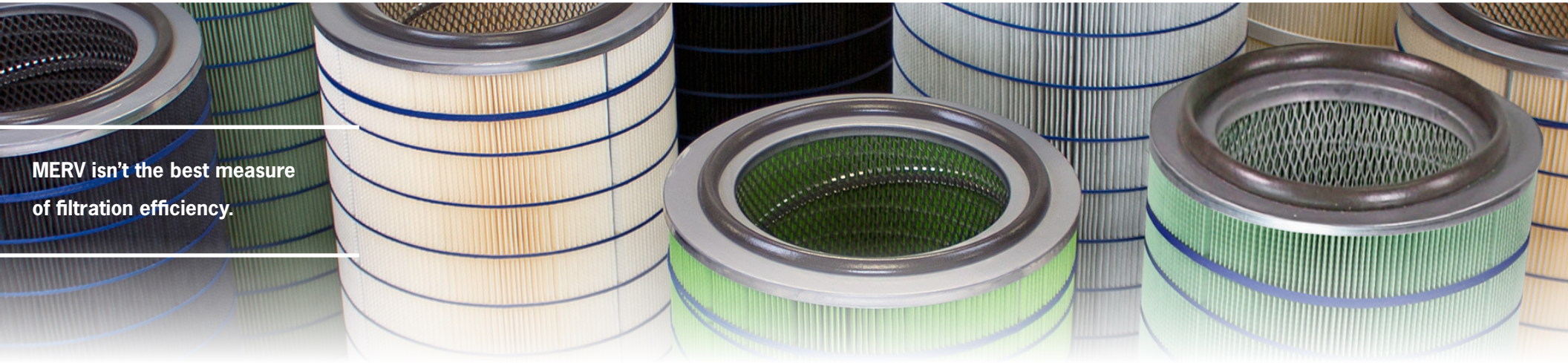
Also, you can select dust collectors that reduce your compressed air usage. For example, Gold Series X-Flo dust collectors use 50% less compressed air than other systems. The filter cartridges have more usable media, so fewer pulses are required to remove the dust cakes, using less compressed air. This means that even with higher airflows, you can use less filters.

You can save energy by using variable speed fan drives on your dust collectors. A dust collector with a variable speed drive is governed by the static pressure of the system. This produces a steady airflow, and fans don't run at full speed. The system will only run the motor speed as needed to maintain the static pressure setpoint, and it automatically reacts to filter loading or movable applications such as a long plasma table. In addition to offering energy savings, this feature increases reliability, extends filter life and reduces maintenance.

Recirculating the filtered air is an ideal way to save energy and maximize return on investment when using a dust collection system. Recirculating heated or air-conditioned air back through the plant instead of venting it outdoors eliminates the cost to replace that air.

Facilities in some regions of the United States report five- to six-figure annual energy savings, with the greatest savings seen in northern climates that experience longer, colder winters. In addition, you can eliminate the complex EPA paperwork and monitoring procedures involved when fumes are exhausted outdoors. A secondary safety filter is recommended when recirculating air. Incorporating a integrated safety monitoring filter (iSMF) gives you the ability to add HEPA filtration as needed to meet OSHA PEL levels.

FILTRATION
CONSIDERATIONS



MERV isn't the best measure of filtration efficiency.

The minimum efficiency reporting value

(MERV) scale was designed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) to compare the effectiveness of air filters. The MERV scale goes from 1 to 16 to represent the worst-case performance of a filter when dealing with particles in the range of 0.3 to 10 microns. Filters with higher MERV ratings capture more particles on each pass, and they also capture smaller particles. For example, a MERV 16 filter will capture more than 95% of 0.3-1 micron particles, while a MERV 11 filter will only capture up to 79% of the particles in that range. However, a MERV 11 filter will capture 85% of 3 to 10 micron particles.

Although the MERV scale is a useful tool, don't rely on MERV alone to select dust collector filters. The reason for this is that MERV ratings only apply to new filters, and the efficiency of dust collector filters change during actual use. As a dust collector runs, dust loads onto the filters, increasing their efficiency as airflow becomes restricted. When this happens, the dust collector must work harder and the filter pressure increases. This triggers the pulse-cleaning system, which knocks off the dust cake and starts the process over. Eventually though, the dust load will increase to a level where pulse-cleaning is no longer helpful and the filter has to be replaced with a new one.

To determine the efficiency of the combined filter and pulse cleaning systems, ASHRAE created the Standard 199 test method. This standardized test calculates the performance of all industrial pulse-cleaned dust collectors. It calculates system efficiency from inlet to outlet, accurately portraying the dynamics of the equipment from its start-up with clean filters to the end of filter life.

Armed with this comparative data on operation, energy costs and particle emissions, you can make more informed long-term decisions to minimize your maintenance, consumables and disposal costs.

ENSURING
SAFETY AND COMPLIANCE

Metal fabricators must comply with OSHA and NFPA standards governing dangerous dusts.

It is necessary to manage dust and fumes in metal fabrication facilities to ensure the safety and well-being of employees. There is a real danger of combustible dust explosions in manufacturing plants, and the dust collection system itself can be a main cause of explosions if it isn't properly designed for your operation.

Many types of dust are combustible, and OSHA, ATEX and NFPA expect you to be compliant with government regulations. If you don't have paperwork verifying that your dust is not combustible, the NFPA 652 Standard on Fundamentals of Combustible Dust requires that you complete a Dust Hazard Analysis, which includes dust testing. The September 2020 deadline for having this completed is coming fast. This DHA shuld also outline the need for other considerations to be made if the dust type falls under the regulations of NFPA 484 Standard for Combustible Dust. An unprotected dust collection system can be a main source of combustible dust explosions, so make sure your system is designed with the correct explosion protection for your application. This may include explosion vents, isolation valves and/or safety monitoring filters.

The filters used in your dust/fume collector are another important safety consideration, especially when you are dealing with hazardous materials like hex chrome and beryllium. The filter design and type of media used directly affects how effectively you capture and contain hazardous airborne particles.

A dust collector system designed specifically for your operation and containing high-efficiency cartridge and secondary filters is an accepted and proven engineering control that will filter hazardous respirable particulates and make indoor environments safer and healthier. An experienced equipment provider will help make sure that you incorporate components that provide flexibility, increase reliability, reduce maintenance and maximize energy savings.

For more information, contact **1-800-479-6801** *or* **1-870-933-8048;** *email* **filterman@camfil.com** *or visit* **camfilapc.com.**

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