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AT A CROSSROADS

Cross-flow collectors provide a breath of fresh air to protect workers

When a worker's function puts them directly in the line of dust, smoke and fumes, safety becomes a primary consideration of workspace design. A capture device that harnesses dust directed by forced air can protect workers' lungs, but not all capture and collect approaches are equal in their effectiveness.

Applications vary, and so do the tools to address intrusive particles. While traditional extraction arm hoods can be effective in close-to-source collection situations, they lose effectiveness out of the 12-in. to 16-in. range. Similarly, canopy or other types of hoods may prove harmful if improperly placed as they may draw pollutants across a worker's breathing area.

Cross-flow collector devices offer a versatile alternative for the collection of practically any inorganic, non-explosive dust particulate. Cross-flow collectors effectively target the worker's breathing zone in the area of operation and they contain dust in specific, defined spaces, allowing dust-prone processes to co-exist with sensitive, clean zones on the same assembly floor, for instance. These modular devices offer filtration media options, size and performance that is scalable for diverse applications, including welding, grinding, abrasive blasting, batch mixing, buffing and dumping.

The cross-flow collector is a device with large open louvers, ideally hinged on one side of the enclosure with an integrated filter media and exhaust fan. The system draws large amounts of air in from the side or the back of the process or workcell. Particles are pulled away from the worker and removed from the work area, filtered out of the air and contained. The self-contained unit does not require a ductwork connection or overhead equipment. Then, relying on a compressed air connection, the self-contained cleaning system cleans the filters at defined intervals for continuous operation.

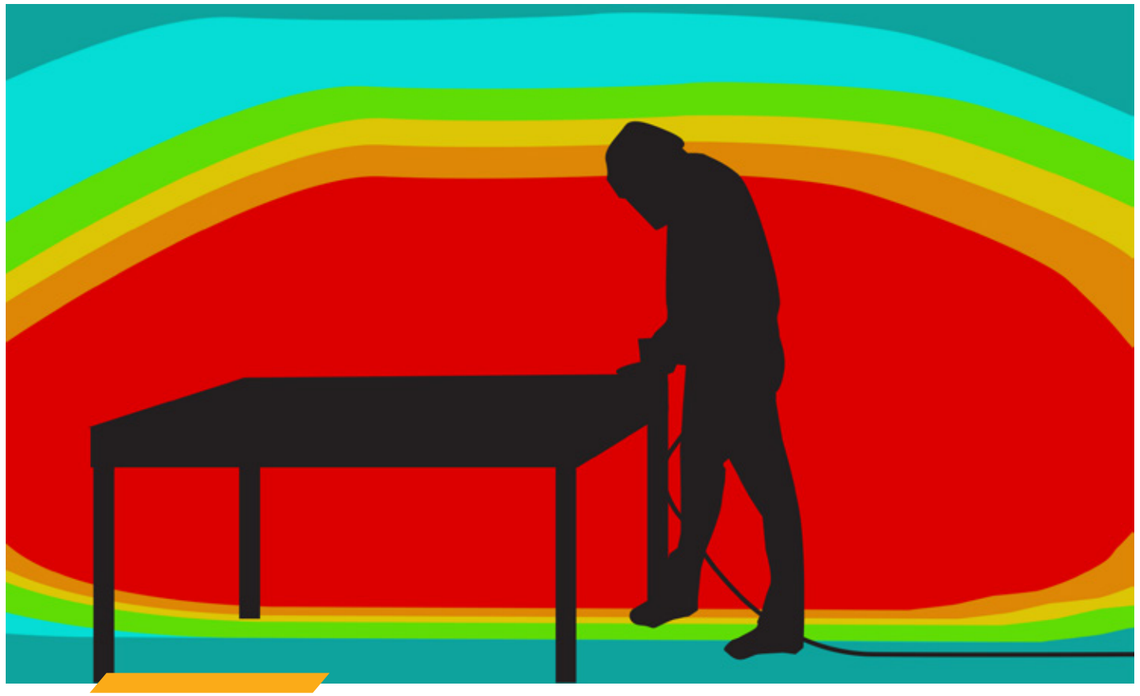
A cross-flow collection system is an optimal solution when: ›

“The cross-flow collector is a self-contained unit that does not require a ductwork connection or overhead equipment.

- The contaminant needs to be contained in a specific area
- Harnessing a dry, fine inorganic particulate
- The work process includes large parts and freedom of movement is required
- Compressed air is available
- A large, ducted system is impractical

Protecting the worker

Cross-flow collectors fitted with louvered inlets are designed to pull air across the work area, in effect bringing fresh, clean air directly through the worker's breathing zone. They are designed most often with an appropriately sized booth to draw air from the inlet side of the booth toward the collector at 50 to 250 ft./min., depending on the application.



A cross-flow collector's booth-wide velocity profile showing clean air pull across the worker's breathing zone. The red zone represents the highest air velocities.

The slot air velocity through the louvers is typically around 2,000 ft./min., depending on the contaminant being collected and the size of the work area. With this velocity, cross-flow collectors generally meet most OSHA or EPA standards, which relate specifically to the type of particulate collected. Parker's DustHog MCB cross-flow collector, for example, is suitable for virtually any inorganic, non-sparking particulate.

A common alternative is an overhead hood, which is not an optimal solution and is potentially harmful as this hood design may allow contaminated air to be pulled across the worker's breathing zone. Likewise, source capture arrangements such as extraction arms often require continuous repositioning and are typically ineffective for work on larger pieces and in their ability to adequately contain contaminants in an open area.

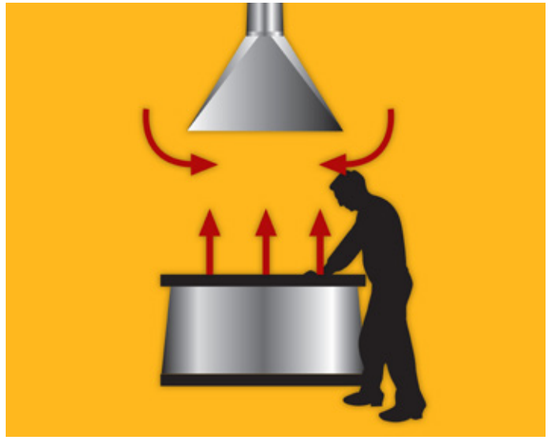
In the cross-flow collector, there is a higher velocity airflow in this critical area which is concentrated near the worker's breathing zone, pulling the air across and away from the worker inside the booth and providing a continuous flow of clean air.

When the louvered openings on the cross-flow collector are oriented vertically and low to the ground like that of the DustHog MCB, the air (and particulate) is collected more uniformly away from and out of the worker's breathing zone. Many cross-flow collector models orient slots horizontally, which tends to create a more striated airflow that may only optimize air quality at the worker's knees or above their heads.

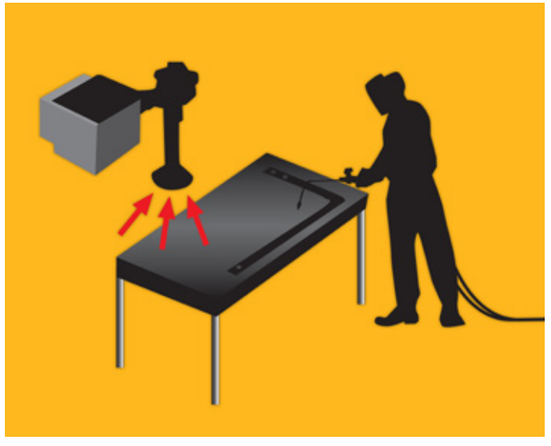
In addition to lung protection, the MCB model operates quietly thanks to an airfoil design wheel and low-RPM motor, which protects workers' hearing.

Equipment protection

Cross-flow collector systems protect more than people. A cross-flow setup can keep computers, sensitive production areas and even facility rafters safe from harmful dust, alleviating cleaning costs and extending electrical equipment life. Because the collectors can contain up to 100 ›



Using an overhead hood may allow contaminated air to be pulled across the worker's breathing zone.



Source capture hoods are ineffective on a large part that requires continuous repositioning while work is underway.

percent of the collected dust, fine dust is prevented from migrating to areas with sensitive electrical and mechanical equipment, even those in close proximity.

This function allows a dirty process to be set up adjacent to a final assembly area with no contamination, especially desirable on production floors where space runs at a premium. For additional filtration efficiency and air purification, the collectors can be fitted and can operate with secondary HEPA filters.

For effective dust mitigation, whether specifically targeting the breathing zone or seeking broader facility protection, cross-flow collectors with the right-sized enclosure offer a versatile, scalable and safe option.

Dust collector design

While many hood and collector options are readily available, it's best to consult an experienced industrial ventilation system designer to help select the best dust collector and enclosure for an individual application.

The best way to minimize dust collector size and costs is to capture fumes and contaminants as close to the source as possible. The closer to the source, the less air required for effective capture (measured in cubic feet per minute, or CFM). Additionally, a capture hood closer to the source means there is less chance of any particles, including fume and dust, escaping to the surrounding atmosphere.

This means a smaller filter unit, motor and blower and less energy consumption – some of the main drivers of dust collector costs. Designers should use source capture as a primary control mechanism wherever possible; this includes backdraft or cross-flow booths and tables.

Extraction arms can be another good option for fume and dust collection, though this relies on the worker moving the hood or the work to be within 12 in. to 16 in. of the hood to capture dust optimally or pausing the task to move the hood as needed. It also does not offer the broader containment feature of a cross-flow collector.

In applications where having a localized source capture hood is not possible or effective, such as when an overhead crane is needed, many hood arrangements simply won't work. A cross-flow booth, for example, can be installed with a crane that provides full process functionality as well as providing other benefits that a source capture hood arrangement may not afford.

The enclosure is also an important element of the cross-flow system and should be carefully designed to maximize dust collection performance. A full-service collector manufacturer will provide complete design support to customers, from the selection of size and number of units to assistance designing the enclosure or booth, to most efficiently and effectively meet dust collection needs.

For example, a single 3-ft. dust collector may do the job for a small artisan pottery manufacturer, while ›

Two cross-flow collectors and enclosure setup options using Parker (formerly UAS) DustHog MCB cross-flow collectors.

a wall of modules across an entire room may be the best option for an aerospace manufacturer. But, simply setting up a module in a room without considering the enclosure aspects will render the device ineffective. The enclosure is a necessary element of the collection system. Parker is one cross-flow collector manufacturer that helps design the appropriately sized booth or considers the enclosure dynamics of a room when designing the cross-flow setup.

This kind of design support can be helpful when design considerations extend beyond dust filtration performance. With assembly floor space at a premium, retractable enclosures offer flexibility. Custom shapes, such as a long, narrow booth to accommodate a helicopter blade, also economize space. In another setting, an entire room of a manufacturing facility can function as a large booth, with cross-flow modules lining an entire wall. Units ›

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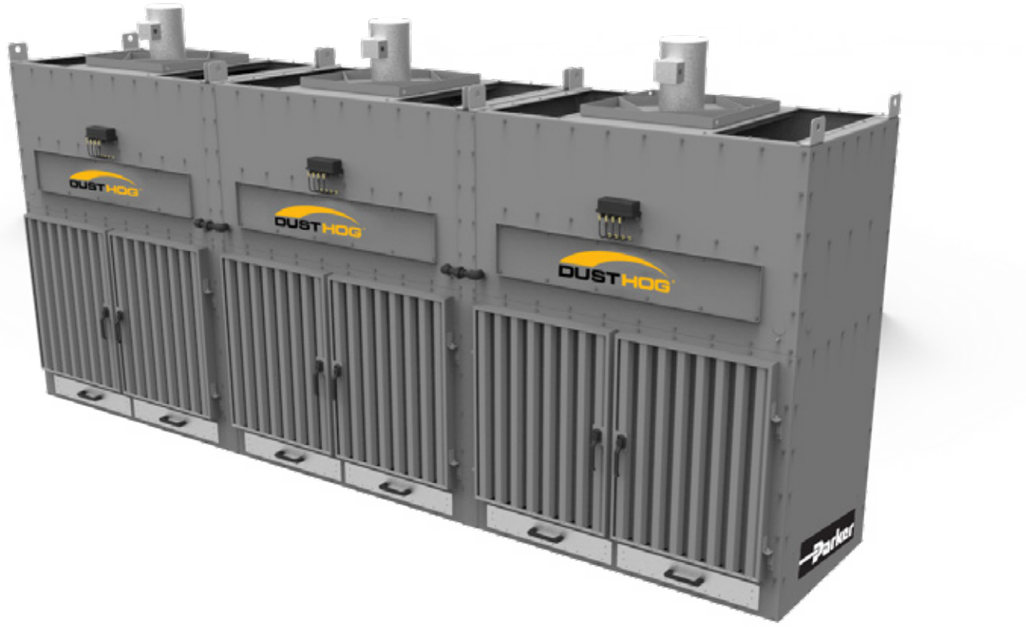

The Parker DustHog MCB cross-flow collector is available in 3-ft., 6-ft. and 9-ft. units that can be used alone or in groupings.

are available in 3-ft., 6-ft. or 9-ft. widths, and multiple collectors can be combined to contain virtually any size process or floor space footprint.

Filtration issues

When choosing a fume filtration system, correct sizing of the ducting from the capture device to the collector is critical. Cross-flow collectors are modular, self-contained units that do not tie into the ductwork, eliminating these considerations.

The ratio of CFM to filter media for a dust collector is called the air-to-media or air-to-cloth ratio. In general, the smaller the particle size, the lower the air-to-media ratio should be (the more filter media needed for the airflow). Without enough filter media, the collector filters will clog faster, resulting in shorter filter life and higher energy costs. This can mean changing filters more often than once or twice a year. Working with an experienced industrial ventilation system designer that will help calculate the appropriate air-to-media ratio and specify the dust collector will provide the best results.

Along with CFM, the amount of filter media is a big driver of the initial cost of a dust collector. Collectors with a greater area of total filter media cost more upfront than those with less filter media. Filters can be matched to the particulate and application setting. The DustHog MCB, for example, can be fitted with oil-resistant, water-resistant, fire-resistant, nanofiber, wide-pleat filters or filters without cages that can be recommended for a specific application. Various media types also are available, including cellulose, polyester and PTFE.

Looking at the MCB cross-flow collector, the filter chamber, capture hood or device, fan and blower are all part of the same assembly. The installation is simple as ducting is not required and the dust collector is part of the capture device. Filter changeout happens from the front of the unit. There is no need for access to the sides or back for routine maintenance. A cam-action locking device facilitates fast, simple and tool-free cartridge filter installation and replacement.

When choosing a cross-flow module, filter position can influence cleaning effectiveness, and, in turn, filter life. Filters in the MCB are oriented vertically, so automated pulse cleaning takes advantage of gravity to release particulates into the dust drawer. The MCB also has a specialized filter cleaning nozzle that pulses air at a precisely calculated distance through an unobstructed airway, granting increased pulse cleaning energy, lower pressure drop and longer cartridge life.

Fewer pulses are needed to clean the cartridge filters, so less compressed air is used. Filter life increases because running fewer pulse cycles reduces stress on the filter media. The filters and cleaning mechanism are interior to the cabinet, which adds another element of worker safety. ■

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