Choosing Laser Fume Extractors

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When using lasers for marking, etching, or cutting there is an obvious need to offer proper ventilation to protect yourself and your employees. These processes create airborne particulates and vapors that can irritate eyes, contribute to occupational asthma, or worse, expose your employees to cancer causing carcinogens. OSHA notes, "*Adequate ventilation shall be installed to reduce noxious or potentially hazardous fumes and vapors, produced by laser welding, cutting and other target interactions,* to levels below the appropriate threshold limit values." This is normally accomplished using staged filtration that includes HEPA grade filters designed to capture 99.97% of particulates that are .3 microns in diameter.

Other reasons for proper ventilation include protecting the lenses of the laser from contamination, or possibly local EPA regulations.

Sometimes a client can vent the laser exhaust to the exterior using a blower motor. When this is not possible or desirable due to proximity of neighbors, EPA regulations, building issues etc., you will need to incorporate fume extraction systems so you can safely recirculate the air back into your facility or work area.

So how do you choose the right system?

First you should determine the air flow requirement (CFM = Cubic Feet per Min.) per the specifications of the laser manufacturer. Be sure you ask the fume extraction manufacturer for the system airflow with filters installed and not free blowing capacity.

The CFM requirements are usually driven by the type of laser configurations deployed.

Below are the three main configurations.

- *Cabinet extraction* is when you extract the fumes from the process via a port in the back of the enclosure that is typically somewhere between 2.5" to 6" in diameter. When extracting from a cabinet there generally are higher CFM requirement as the contaminates are airborne and you need enough airflow to rapidly evacuate the enclosure.

- *Source extraction* is when a nozzle or extraction arm is placed close to the application in an attempt to immediately pull off contaminates. In these cases, the diameter of the nozzle or arm will have a significant impact on the type of system best suited. Typically the airflow specifications for this style of extraction are lower than that of the cabinet extraction noted above. Obtaining good source extraction is a balance between static pressure and airflow and is dependent on the diameter of the nozzels. *(Note: Static pressure is measured in inches of water column or WC)* If working with a larger arm of say 2.5" diameter, you will still want good airflow and static pressure is less of a concern. As the diameter of the nozzle opening gets smaller airflow is limited, and static pressure becomes more important. By utilizing an extraction system with say 22" of water column you create faster velocity of the available airflow. This approach is often used when heavier debris is being created that does not float up and away from the application.
- *Down draft tables* are typically used on larger applications and generally require much larger fume extraction systems. In these cases you want to maintain 100FPM velocity of the air being pulled down through the openings on the table. The CFM to accomplish this can vary greatly depending on the application vs. the size of the table. Many times there will also be a source extraction arm or nozzle close to the application but when the laser head is moving over a wide range of area very fast, this can be challenging. Many of these applications are part of the design process and are custom designed to spec.

The second consideration is to identify the material you will be marking, cutting, or etching. Most metals and glass will not create odors so your main concern will be capturing the particulates generated when the material is incinerated by the laser during the process. Note, just because odors may not be present does not mean there are no dangers present. One example is when working with chrome alloys either in the form of plating or as part of the metal; such as the case with stainless steel. The vaporization creates a fume called Hexavalent Chromium which is highly toxic if you exceed the OSHA PEL limits. More information can be found on the OSHA web site https://www.osha.gov/Publications/OSHA-3373-hexavalent-chromium.pdf.

The third consideration is how to deal with odors or VOC's. When working with acrylics, plastics, wood etc., you will not only need to capture the particulates from the fumes, but there will also be gases generated from the vaporized material that can create strong nuisance odors, or in some cases noxious gases.

To help mitigate these odors the most common practice on the market is to utilize activated carbon as a medium to adsorb the majority of these gases. Not all activated carbon is the same, so be sure you inquire if it is bonded or granular. Studies have shown granular carbon is more effective than bonded. There are also different types of impregnation as well as different materials that can increase or decrease the effectiveness for a given set of gases. Consult with the manufacturer to be sure activated carbon is a good source for adsorption of the gases or odors your process will be generating.

For any carbon to be effective the gases must stay in contact with the carbon for a long enough duration so chemicals can be adsorbed. Systems that offer larger volumes of carbon and larger surface areas tend to create a better environment for effective adsorption.

In the end, if there is any question regarding the safety of your application it is always wise to consult with an industrial hygienist. This will create peace of mind that you are protecting both your employees, and your business.

Since 1992 IP Systems, LLC has supplied industrial fume extractors and fume filtration systems specializing in the Laser and Electronics and adhesive markets. It is our goal to be your trusted technical resource for your fume filtration needs and to offer you an unmatched customer experience. For more information contact us at info@ipsystemsusa.com.