

Six Important Factors about Filter Replacement for a Welding Fume Extraction System

White Paper

OVERVIEW

The purpose of a filter in a welding fume extraction system is to trap and hold airborne particulates so they do not contaminate the air. Filters incorporate a filter medium (fiberglass, cellulose, or polyester fibers) made from microscopic fibers woven in sheets and pleated in a "V" pattern. The pleating of the material increases the surface area of the filter providing an increased capture surface. This white paper discusses the six important factors about filter replacement for a welding fume extraction system.

1. What are the types of filters and what do I need to know about each?

Pre-filter – The purpose of a pre-filter is to capture larger particulates and remove them from the system so they do not reach the paper filter. The pre-filter is typically made from aluminum or steel mesh and acts as a spark arrestor.

Main filter – The main filter is designed to capture the majority of the particulates from the welding, cutting and grinding processes.

After filter – The purpose of the after filter is to filter out the remainder of very small particulates. This is similar to the high-efficiency particulate absorption (HEPA) filter on a vacuum cleaner. It is typically designed for very small particulates (0.1 to 0.3 microns).

A HEPA filter is also known as a High Efficiency Particulate Air filter that allows for filtration efficiency up to 99.9% depending on particulate size.

2. When should I replace the filter?

There are a number of factors that go into predicting when to replace your filter. Knowing how much particulate is going into the filters, how many hours and shifts you work, the type of welding processes and materials in use are among the factors that can affect this answer. Indicators signaling filter replacement vary depending on the type or model of fume extraction system. Here are some common indicators:

- An indicator light on the fume system control panel will blink or change from white to red, indicating the current filter cartridge is full. Once the filter is saturated with particulate it is time to replace the filter.
- The filter cleaning system will be unable to obtain a pressure below 1500 Pa. After 5 attempts, replace the filter cartridge. If the system is equipped with an audible reminder, a filter replacement audible tone will activate.
- After several cleaning cycles, the suction performance of the system remains less than normal. In these cases, the filter should be replaced to restore optimal performance.

The necessity for preventive maintenance, cleaning and filter replacement is critical to the performance of your weld fume extraction system.



Filters come in many different shapes and sizes.

3. What filter type should you use?

The welding and material used dictates what type of filter media is required for your system. A variety of filter types, based on a MERV rating, are available to address different welding processes and applications. For example, if you have a stainless steel welding application, a higher rated filter will generally be required because of the low OSHA PEL for chromium. If you use a standard mild steel MIG process, a lower rated filter can be sufficient. Once you have selected a filter, always check to be certain it is controlling worker exposure to constituents in the fume by having a qualified person measure worker exposure.

A filter should be selected based on the volume, frequency and type of welding performed. For example, welding with the gas metal arc welding (GMAW) process produces far less fume than a flux-cored arc welding (FCAW) or shielded metal arc welding (SMAW) process, meaning a filter used with the GMAW process will have a longer life. Welding electrode manufacturers typically publish weld fume generation rates, allowing you to match filter capability to the intended electrode's fume generation rate. The American Welding Society (AWS) also publishes some typical data regarding electrode.

Filter Rating System

A filter has a rating system referred to as the Minimum Efficiency Reporting Value (MERV) used to rate the ability of a filter to remove dust from the air as it passes through the filter. Higher MERV ratings mean fewer dust particles and other airborne contaminants pass through the filter.

**MERV Ratings
1 through 16**

**Minimum
Efficiency
Reporting
Value**

4. What are other indicators that can affect your fume extraction filter replacement strategy?

As particles are trapped in the filter, the medium becomes more densely clogged, or opaque, and the ventilation system motor and fan have to work harder to maintain optimal air flow. Eventually, the resistance of the filter reduces the air flow to an unacceptable level and the filter has to be replaced. Monitoring the static pressure across the filter is a good indicator of the tradeoff between desired flow rate and filter efficiency. Most filter replacement indicators use this method.

If there is not a clear indicator on the system you are using for filter replacement, you can estimate a regular maintenance/replacement strategy based on your welding process and arc time.

Filters have a specific service life. Filter life is determined by (1) how long it takes the fine particles to penetrate into the filter weave and form a cake, and (2) the type of material (i.e. oily vs. dry) penetrating the filter medium. Some filters are designed to be removed and properly disposed of when saturated, while others are designed to be reused if the system includes a self-cleaning filter cycle. Some ventilation systems utilize filters capable of being cleaned by compressed air blown backwards through the filter (called reverse pulse). Typically these filters have a significant extended filter life because the cake on the outside of the filter is removed.

5. What factors affect filter disposal?

Proper protocol should be used when disposing of a used filter. Depending on what elements have built up on the filter, you may have to treat it as a hazardous material. It's important to understand the correct method for disposal before selecting a filter type, as this can have an effect on the overall cost of operation.

Answer these questions when determining proper fume exhaust filter disposal for your welding application:

1. What is your company's or facility's hazardous waste generator status?
2. Do you have sufficient generator knowledge to "profile" the waste stream?
3. Do you need to perform testing to determine what the hazardous waste code(s) are?

If your team is not experienced with these issues, then you should contact your state environmental regulatory agency or third party for guidance on the requirements of your state's environmental rules.

6. Why should you create a filter replacement and preventive maintenance strategy?

Preventive maintenance is planned maintenance activity designed to ensure consistent, effective operation, improve equipment life and avoid any unplanned maintenance activity. The purpose of the system is to control worker exposure to welding fume and, if not maintained properly, the system may not adequately control that exposure. In terms of fume extraction, this assurance is provided to ensure the function of the equipment is effective and efficient and that long term use of the equipment is not subject to stresses or potential failures caused by the improper

care and handling. For instance, if a filter is clogged, the fan motor must operate at a higher level to try to operate effectively. This can result in reduced fume capture efficiency, motor failures or other associated issues. In terms of preventive maintenance, the filter can be changed on a regular basis, and equipment operation and cleaning can be scheduled and coordinated to ensure ducting is clean, fume extraction arms are tuned properly and more. Certain tasks must be scheduled at varying service intervals, all designed to keep the fume extraction equipment from experiencing any unexpected breakdowns. Preventive maintenance for industrial equipment is an effective way to maintain and extend weld fume control equipment operation and life.

CONCLUSION

Filter replacement and proper fume exhaust system maintenance can help to ensure airborne particulates do not reach employees during the welding process. To learn more about how Lincoln Electric can help you with your fume extraction system, call 888.935.3878 or visit www.lincolnweldfumecontrol.com

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