GLOBAL FINISHING SOLUTIONS

UNDERSTANDING FILTRATION
Replacement Requirements for Paint Booths

for DISTRIBUTORS ONLY

With an abundance of filters on the market, it can be overwhelming finding the right replacement filter for a customer's paint booth or oven. This guide was created to aid you through the process of selling replacement filters.

FILTER CHARACTERISTICS

The three key factors to consider when selling replacement filters are type, dimension and efficiency.

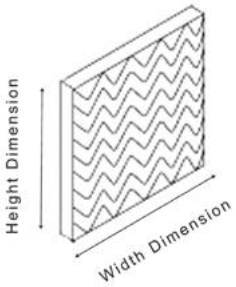
FILTER TYPE

Filter type provides the basic design parameter to ensure a proper cross-reference for a replacement product of similar type and design. The color, texture and other key visual features may have importance. Filter type is usually determined by the frame system that holds the filters.

FILTER DIMENSION

Filter dimension is also a factor controlled by the frame system. The limitations of the actual filter frame will determine the overall filter dimension and the size options that may fit within an existing framework.

Filter dimensions are most commonly provided in nominal dimensions, not exact dimensions.



For example, the peripheral dimension in a standard 20" x 20" poly panel filter is actually 19.5" x 19.5" but is referred to as 20" x 20".

Filter depth is also a nominal measurement. As depicted in Figure 1, the depth of standard filters can vary greatly.

FIGURE 1: Depth in Standard Filters

When using bag or cube filters (Figure 2), it is essential to not only determine the peripheral size of the filter in use, but also the available space behind the filter.

FIGURE 2: Depth in Non-Standard Filters

FILTER EFFICIENCY

Filters are designed to trap contaminants in the air from entering or exiting the paint booth, protecting your paint job, the operator and the environment. Thus, the efficiency of each filter in the booth is critical. The required efficiency rating of a filter depends on the type of filter and how it is used.

TYPES OF FILTERS

Exhaust and intake are the most commonly discussed and used filters in a paint booth, however, there are several other locations in a paint booth that use filtration. It is important to understand all the filtration locations in a paint booth and ensure that they are replaced on a routine basis to ensure the safety and performance of the booth.

In addition to filters for liquid booths, Global Finishing Solutions (GFS) also supplies replacement filters for powder booths, ovens and all our finishing equipment. In this guide, we will cover recommendations for replacing filters in all these products.

Liquid Paint Booth Filters

INTAKE FILTERS

The primary purpose of paint booth intake filters is to provide clean, filtered air for the coating operations performed within the booth.

Frame Configuration

Intake filters tend to follow these basic frame configurations (Figure 3):

- **Crossdraft, Side Downdraft & Semi-Downdraft Booths:** Standard filter holding frames, mounted in the doors or corners
- **Downdraft Booths:** Swing-down or ceiling filter frames

FIGURE 3: Filter Frame Configurations

Filtered doors for a crossdraft booth | Plenum filters in a crossdraft booth | Ceiling filter in a downdraft booth

Filter Type

Crossdraft, Side Downdraft & Semi-Downdraft Booths: The most common types of intake filters used in crossdraft, side downdraft and semi-downdraft paint booths are internally supported polyester panel filters or linked panel filters (Figure 4). These filters are typically designed to be installed without the aid of clips or other mounting hardware, and create a leak-free, static fit when inserted into the frame. Many of these filters are tackified for optimal capture.

FIGURE 4: Framed Filters

Downdraft Booths: The most common type of intake filter used in downdraft paint booths is a diffusion type media pad. These filters are designed to spread airflow uniformly throughout the booth. Referred to as laminar flow, this feature ensures optimum conditions for applying coatings. When properly installed, these filter frames create a leak-free seal.

Filter Efficiency

Crossdraft, Side Downdraft & Semi-Downdraft Booths: The efficiency of internally supported polyester panel filters or linked panel filters (Figure 4) used as intake filters for crossdraft, side downdraft and semi-downdraft paint booths will vary from a MERV 6 to MERV 8. GFS provides MERV 7 intake filters in all new crossdraft, side downdraft and semi-downdraft paint booths.

Downdraft Booths: The efficiency of diffusion type media pads used as intake filters for downdraft paint booths is MERV 10 or higher. This high-efficiency rating ensures an internal cleanroom atmosphere that removes more than 99 percent of all particulate 10 microns or larger from the air entering the booth.

EXHAUST FILTERS

The primary purpose of the exhaust filter system in a paint booth is to protect the fan, stack and plenum from the buildup of overspray contamination.

Frame Configuration

Paint booth exhaust filter systems will usually appear in two basic frame configurations, based on the type of booth (Figure 5):

- **Crossdraft, Side Downdraft or Semi-Downdraft Booths:** Plenum filters
- **Downdraft Booths:** Exhaust pit filters

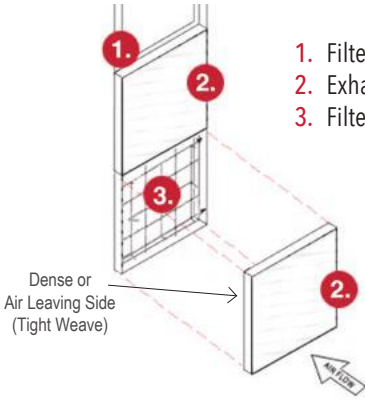
FIGURE 5: Exhaust Filters

Single-stage filters are most common in exhaust systems of both industrial and automotive refinish booths. However, there are situations where more than one stage of filtration can be used. (Figure 6)

FIGURE 6: Single-Stage and Multi-Stage Filtration

A **Front-Load** Frame Configuration (Figure 7) allows for the use of a single filter frame or multiple frames joined together. This filter configuration can be used as single-stage filtration or two stages loaded in tandem.

FIGURE 7: Front-Load, Single-Frame Style Configuration



1. Filter Holding Rack
2. Exhaust Filters
3. Filter Grid

Filter Type

Differences in the fiber configuration, density, composition and loft of a filter may impact the resulting performance of an exhaust system.

GFS has engineered its replacement filters to meet or exceed the performance of original equipment filters. GFS exhaust filters are designed for various coating applications, according to the properties of the materials in use. Refer to the **Filter Selection Guide** offered by GFS.

Filter Efficiency

Based on the most recent requirements from the EPA, paint applications must use filtration that meets the test protocol as outlined in 40 CFR Section 63 subsection HHHHHH of the National Emissions Standards. That is, the filtration must be accompanied by a valid independent laboratory test report that demonstrates the filter will remove at least 98 percent of overspray by weight, according to ASHRAE standard 52.1 for paint arrestance.

Systems such as those found in aerospace, or other specialized coatings found in metal fabrication, may require filtration that meets or exceeds the basic removal efficiency requirements. GFS exhaust filters have been tested and verified to meet the specified requirements for the applications intended.

Air Make-Up (AMU) Filters

The primary purpose of air make-up filters is to filter the air entering the air make-up unit (AMU), which provides pressurized air to a paint booth or building space containing a paint booth.

Frame Configuration

The **Side-Load** Frame Configuration (Figure 8) may use a single set of frames, or two sets of channels, to load filters. There are two types of side-load frames:

- Straight Frame
- V-Bank Frame

FIGURE 8: Side-Load, Side-Access, Frame-Style Configuration

<< V-Bank Frame

Filter Dimensions

In many AMUs, a heating and/or cooling coil is located directly behind the filter frame system. Filters should NOT come in contact with the coil.

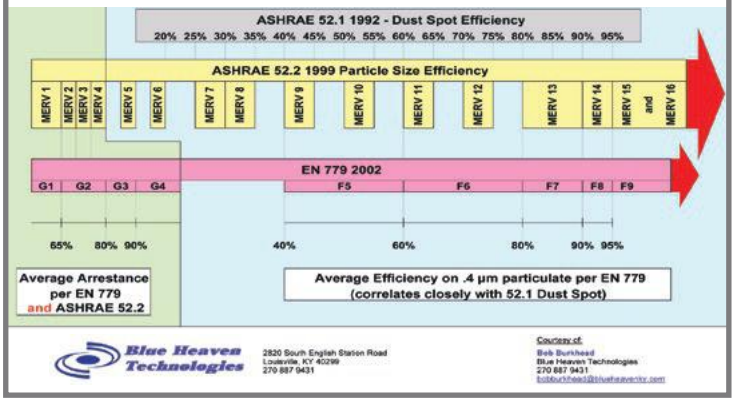
Filter Efficiency

For AMUs that are primarily used as heating and cooling units, the level of efficiency required is classified as a MERV 8 by current U.S. standards (formerly 30 percent ASHRAE) or F5 by European standards.

In multi-stage filtration systems, the type of process that the AMU supplies typically determines the efficiency of the second stage.

FILTER EFFICIENCY RATING

A chart that depicts the relative efficiency ranges by US and European standards is shown below.



In painting systems, the typical efficiency requirement would be MERV 12-15 by current U.S. standards (formerly 65-95 percent ASHRAE) or F6-9 by European standards.

Powder Booth Filters

There are two basic types of powder coating systems: spray-to-waste and reclaim.

SPRAY-TO-WASTE VS. RECLAIM

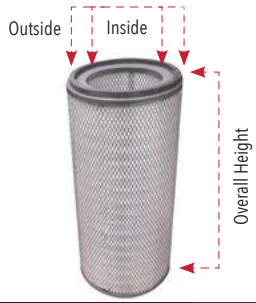
Spray-to-waste powder systems are designed to treat overspray in a manner similar to liquid spray operations. No effort is made to reuse the coating material once sprayed. Spray-to-waste powder systems may use a multi-stage filter system, similar to those used with liquid spray coating for aerospace, or cylindrical cartridge filters.

Reclaim systems are specifically engineered to allow the collection of sprayed powder coating material for reuse. In these systems, either a single coating is sprayed on all parts, or separate filter modules are dedicated to specific coating materials to prevent cross-contamination of the coating material in batch coating operations. Both allow for the reclamation of the coating material for reuse. Reclaim systems are only offered with cylindrical cartridge filters.

MULTI-STAGE VS. CYLINDRICAL CARTRIDGE

Multi-stage filter systems are designed in a similar manner as air make-up filters and can be identified and sized accordingly.

Cylindrical Cartridge Filters however, must be identified by the following precise information:

Dimensions: Overall height, outside diameter and inside diameter	
Media type: Cellulose, cellulose/polyester blend, 100% spun-bond polyester or treated polyester media, such as aluminized media or Teflon-treated media	
Ends: Enclosed or open	
Gasket: Type of material used	
Square footage of media: Standard or high-capacity	

Media differences can be determined by visual examination of the media, as well as by the part numbers assigned by the manufacturer. The most common are a blend of cellulose and spun-bond polyester.

FINAL FILTER

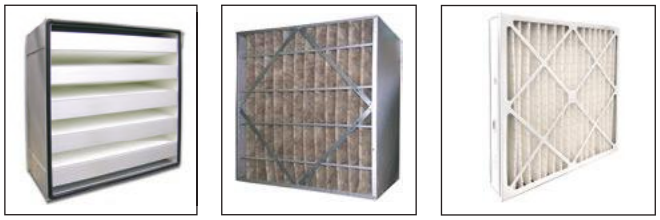
Powder systems with cylindrical cartridge filters also have a final filter (Figure 9). The purpose of the final filter is to prevent the dispersal of powder material into the plant atmosphere, should the cartridge filters leak or fail. They are typically a HEPA-style filter, but other high-efficiency filters have been used.

MAINTENANCE TIPS FOR FILTERS

Maintaining filter systems properly requires changes to be made according to the manufacturer's directions for both the filter and the equipment. Improperly maintained filters will reduce the performance of the equipment and its ability to void dangerous fumes from the paint booth.

SAFETY NOTE: Improper disposal of used filter pads may cause spontaneous combustion. You must consult local authorities for proper storage and disposal requirements.

FIGURE 9: High-Efficiency Final Filters



HEPA Style | Deep Pleated | MERV 13

Oven Filters

Industrial curing ovens are designed to set or cure the coating materials applied. These ovens may be gas-fired, electric or infrared.

GAS-FIRED OVENS

Most gas-fired ovens have at least one filter on the burner combustion chamber to keep the orifice clean from external contamination. Some may have additional filtration if a critical coating process requires a blemish-free surface, such as those found in high-end appliances, caskets and tier-one automotive suppliers.

Additional filtration can be found as part of the fresh air intake and/or downstream of the combustion chamber. The fresh air intake filters may be installed inside the heat chamber if the oven recirculates air that may contain solvent vapors, to protect the more expensive high-efficiency filters after the combustion chamber.

The second filter system may be high-temperature rated filters that are specifically designed to withstand plenum temperatures from 500 to 900 degrees Fahrenheit. They are constructed of aluminized steel and have media packs that are pleated using aluminum separators. High-temperature gasketing material is often used on the filter frame area that contacts the holding frame.

FIGURE 10: Oven Filters

High-Temperature Final Filter >> | Washable Aluminized Panel Filter >>

OTHER OVENS

Other oven types may or may not have any filters, depending on the applications involved. It may be necessary to ask the operator for additional information or consult with a GFS representative.