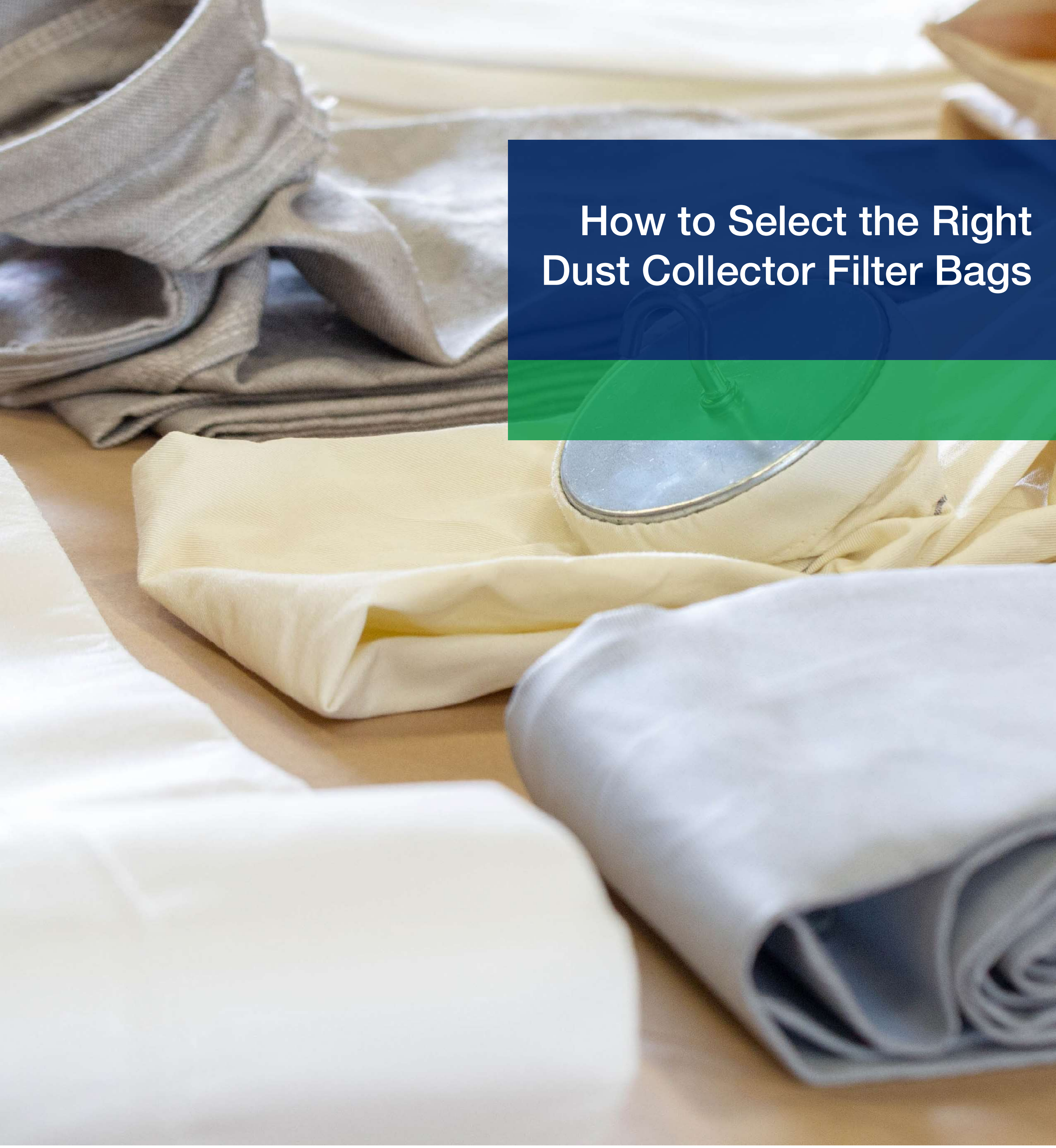
How to Select the Right Dust Collector Filter Bags



U.S.
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Thanks for downloading our eBook! Choosing the right filter bags for your dust collection system is critical to ensuring long term, reliable performance of your collector and the safety of your employees. Our guide will help you understand your facility's unique dust properties and provide an overview of various filter media, construction, and treatment options available.

Key Subjects

We've organized our guide into five key topics to guide your discovery:

1. *Dust Properties - Learn about dust properties you need to be aware of to select the right filter media.*

2. *Common Filter Medias - Learn about performance characteristics of the most common filter media options available.*

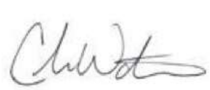
3. *Filter Bag Finishes - Learn the various treatments and membranes that can be applied to your filter to improve filter performance and extend filter life.*

4. *Filter Construction - Understand the different filter construction options and which is ideal for your dust collection system.*

5. *Air to Cloth Ratio – Understand how air-to-cloth ratio can impact the performance and health of your filter bags and your dust collection system.*

Thank you for allowing us to help with your discovery. If you have any further questions, please give us a call at 888-221-0312 or email us directly at info@usairfiltration.com to learn more.

Chris Watson



General Manager
US Air Filtration, Inc.

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UNDERSTANDING DUST PROPERTIES

01

UNDERSTANDING DUST PROPERTIES

Choosing the right filter media for your dust collection system is critical to achieving peak performance while reducing system wear, plant downtime, and extending filter life. The first step is to consider the properties of your dust particulate and review the following:

- **Product** - What you are filtering? Does your product contain a moisture or oil? Products with moisture content greater than 25% are not suited for a dry dust collection system (baghouse, cartridge collector or bin vent). Products containing hydrocarbons, including oils, may require the application of special treatment to your filter media for optimal filtration.
- **Temperature** – What is your typical operating temperature? Max temp? Media temperature ranges for dry dust collection can typically be sorted into three categories listed below:
  - **< 275°F** - Polyester filter media performs very well for ambient airflow temperatures in this range.
  - **Between 275°F and 400°F** – Aramid filter media is the optimal choice for temperatures in this range.
  - **Between 400°F – 500°F** – Fiberglass filter media is the most economical option for high-temperature applications; however depending on the type of dust, another filter media may be a better fit.

Once you understand the temperature of your work environment, you can narrow down your filter media options and in many cases, apply a special treatment to the media to further improve performance. Treatment application can be an efficient way to minimize costs before considering a more expensive filter media.

CHEMISTRY

Does the airstream or dust contain chemicals that could damage the filter media? Are their acids or alkalines in the airstream? Often when certain compounds are combined during processing, a chemical reaction can occur, which may require a specific media treatment or coating on your filter bags to protect the bags from accelerated wear.

ABRASION

How abrasive is the dust being filtered? Consider the hardness of the material that's being filtered along with the shape of the dust. The velocity of your airflow can also make your dust more abrasive. If you are designing a new dust collection system, it's important to engineer the ductwork, fan size, and unit placement to ensure the airstream is not entering your dust collector too quickly or too slowly.

PARTICLE SIZE

What size dust particulate are you collecting? Depending on your emissions requirements, your application may require a special membrane. This will apply if your particulate is very fine.

IS YOUR DUST COMBUSTIBLE?

Combustible dust can be defined as any fine material that has the ability to catch fire and explode when mixed with the proper concentration of air. Examples of combustible dust include wood, food products such as grain, sugar, flour, starch, metals, rubber, chemicals, pesticides, plastics, and more. To protect your plant and your employees from the risks of a serious explosion, carefully consider OSHA and NFPA guidelines and be sure to review your state and local regulations for proper identification and management of combustible dust.

OSHA STANDARDS

Implement and maintain OSHA's set of standards regarding combustible dust. When you adhere to OSHA's set of standards, you are creating a safe work environment, avoiding property and economic loss from an explosion, and avoiding regulatory fines.

NFPA GUIDELINES

Make sure you are meeting codes outlined by the NFPA (National Fire Protection Agency). The NFPA publishes a list of guidelines that will help you minimize injury or death from combustible dust. The following regulatory codes are related to the most combustible types of dust (e.g., sugar, wood, fine aluminum):

- 664, Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
- 484, Standard for Combustible Metals
- 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities

02

DUST TESTING

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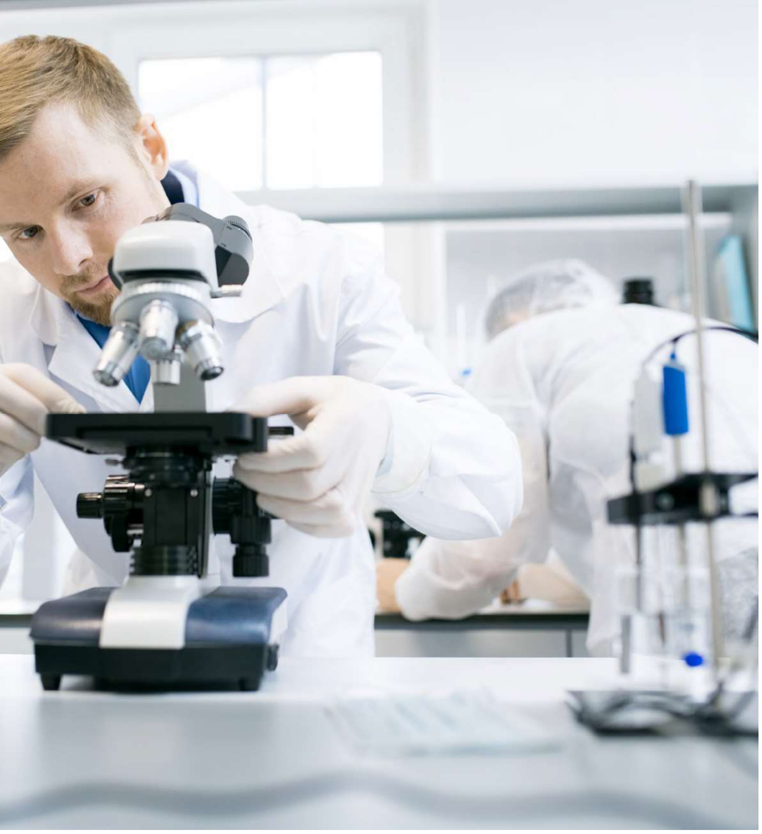
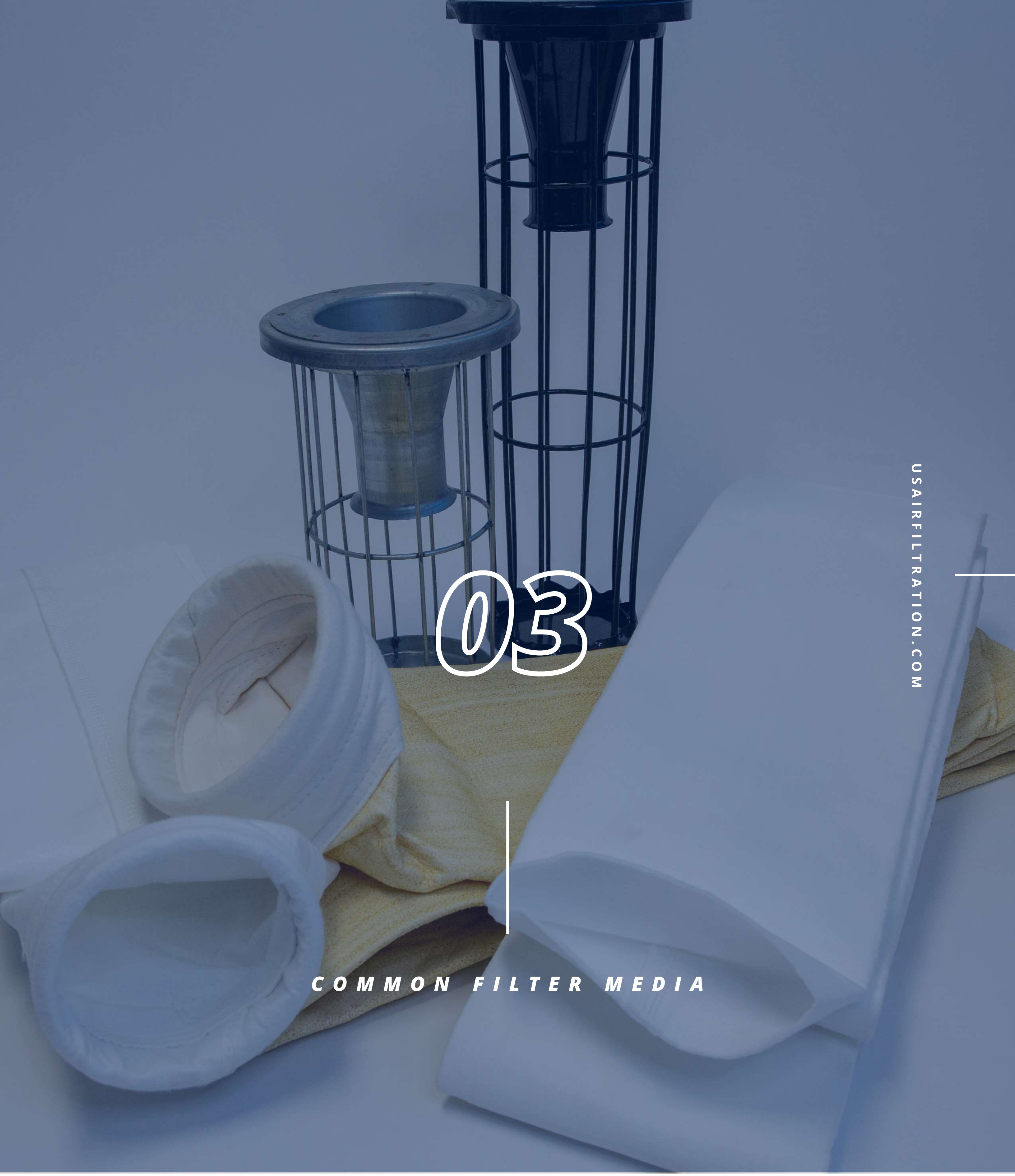


02

DUST TESTING

Dust testing may also be performed to assess the properties of your particulate and ensure proper filter selection and performance. This option may be ideal for new facilities and large applications. If you have an existing plant and many of your filter bags have failed prematurely with no consistent pattern, and there are no signs of workmanship error, it may be necessary to perform laboratory testing to find out if changes in the airstream could be compromising the bags.



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COMMON FILTER MEDIA

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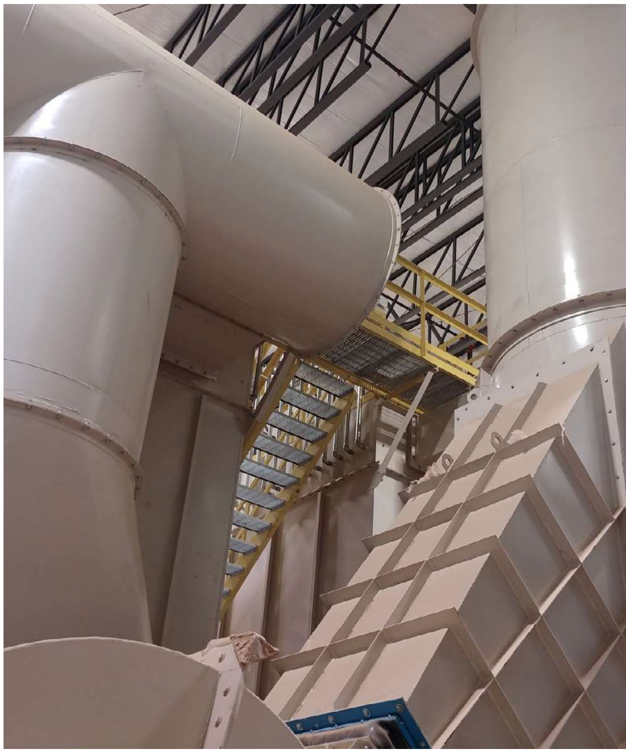
POLYESTER

Polyester media is an economical option with excellent filtration properties and is widely available. This makes polyester the most common filter media used across many industry applications. Polyester has an operating temperature limit of 275ºF and comes in both needled felt and woven medias. Both needled felt and woven polyester can be treated with several finishes and membranes to increase the efficiency and filter bag performance in varying operating conditions.

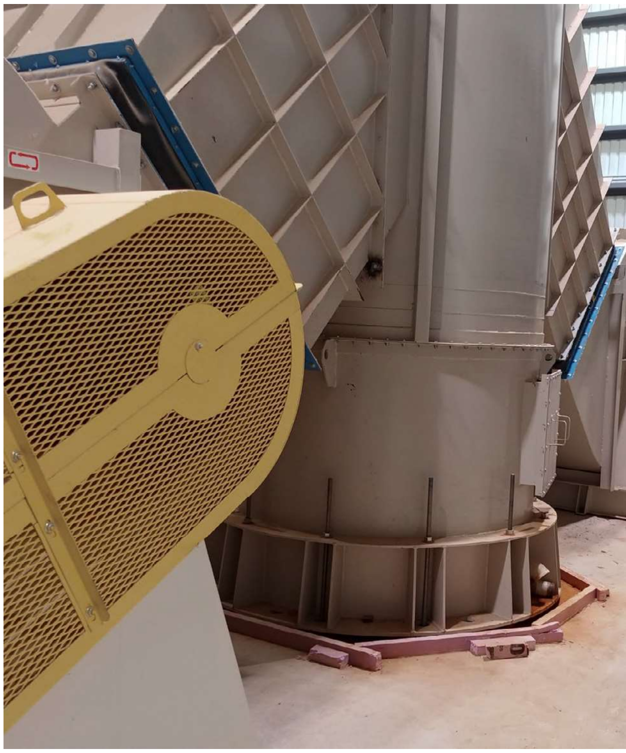
ARAMID



Aramid, also known as Nomex, is used in applications with high temperatures and has excellent filtration and abrasion properties. The operating temperature limit for aramid is 400F which makes it a great choice for applications such as asphalt batch plants, furnaces, and dryers. Both needled felt and woven aramid can be treated with several finishes and membranes to increase the efficiency and filter bag performance in varying operating conditions.

FIBERGLASS

Fiberglass is often used in baghouses with temperatures ranging up to 500°F. Since fiberglass media is typically woven, the efficiency of a plain fiberglass media is lower than most felts. However there are several different membranes and finishes that can be added to fiberglass to increase filter efficiency and performance in harsh baghouse conditions. These finishes and membranes make fiberglass a versatile media for applications with high temperatures. You'll see Fiberglass media used in industries such as energy, cement/ concrete/aggregates, and agriculture. Different membranes, coatings and finishes can be added to fiberglass media to increase performance in certain applications. This makes fiberglass a versatile media for applications with high temperatures.



P84

P84 media has a high temperature rating of up to 500°F. This filter media handles acids better than fiberglass and also results in less abrasion to the filters due to filter media flex.

TEFLON

Teflon (PTFE) is one of the highest performing filter medias available for a wide range of applications and is also the most expensive. It bears well against chemical and acid resistance, high temperatures, and moist heat. Teflon membrane can also be applied as a treatment on other filter medias to further extend filter life and reduce system wear.

For more information on other media types in the dust collector industry (e.g. PPS, Acrylic, and Polypropylene) access our Fabric Characteristics Chart below.

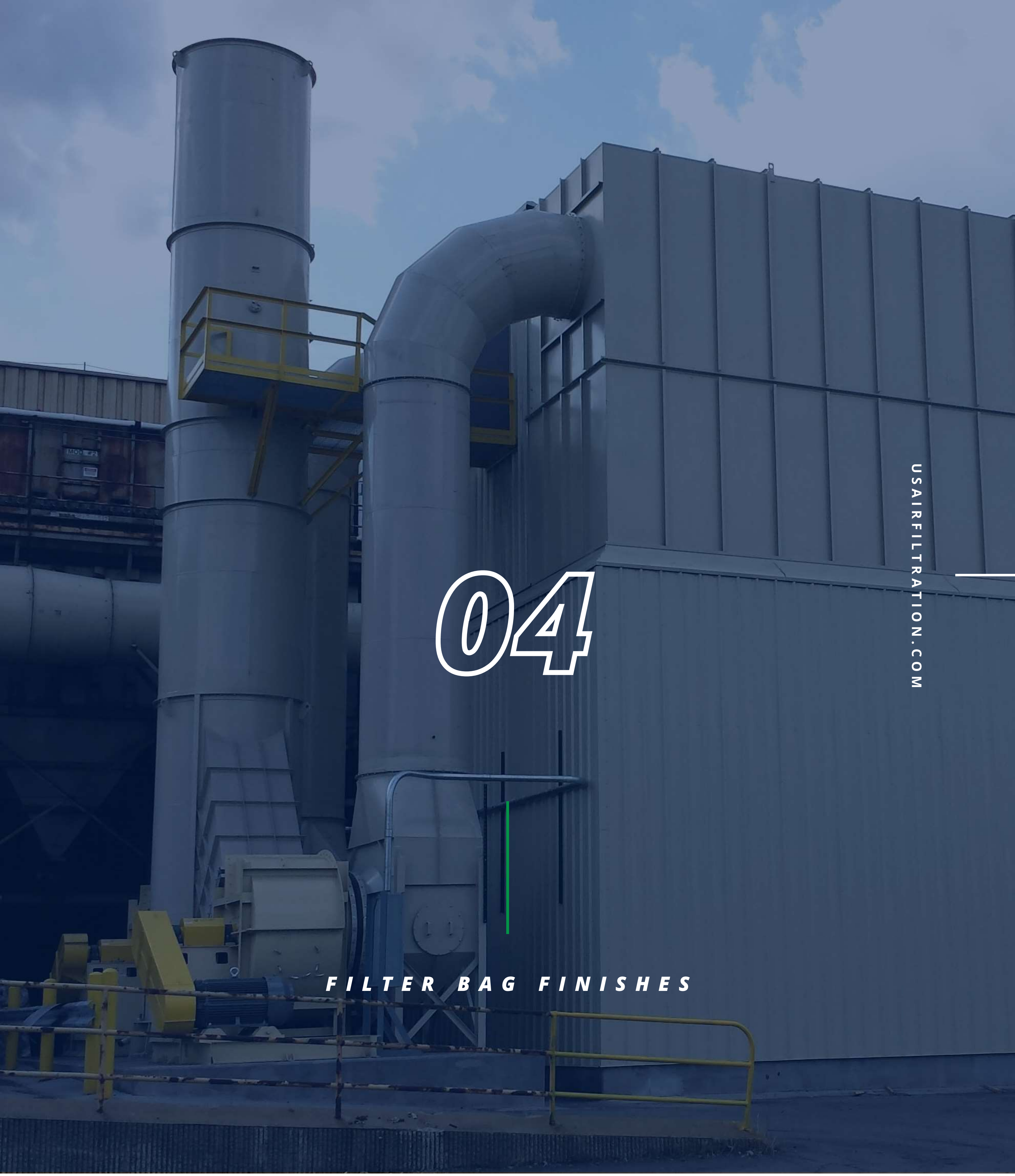
	Polyproplene	Polyester	Acrylic	Aramid (Normax®)	Fiberglass*	Ryton® (Procon®)	P84***	Teflon® ***
Max. Continuous Operating Temprature	170° F (77° C)	275° F (135° C)	265° F (130° C)	400° F (204° C)	500° F (260° C)	375° F (190° C)	500° F (260° C)	500° F (260° C)
Abrasion	Excellent	Excellent	Good	Good	Fair	Good	Fair	Good
Energy Absorbsion	Good	Excellent	Good	Good	Fair	Good	Good	Good
Filtration Properties	Good	Excellent	Good	Excellent	Fair	Good	Excellent	Fair
Moist Heat	Excellent	Poor	Excellent	Good	Excellent	Good	Good	Excellent
Alkalines	Excellent	Fair	Fair	Good	Fair	Excellent	Fair	Excellent
Mineral Acids	Excellent	Fair	Good	Fair[1]	Poor**	Excellent	Good	Excellent
Oxygen (15%+)	Excellent	Excellent	Excellent	Excellent	Excellent	Poor[2]	Excellent	Excellent
Relative Cost	$	$	$$	$$$$	$$$$	$$$$$	$$$$$$	$$$$$$$

Non-Fiberglass Finishes	Finish Purpose	Available For
PTFE Membrane	For capture of fine particulate, improved filtration efficiency, cake release, and airflow capacity	Nomez®, Polyester, Acrylic, Polypropylene (felt and woven), P84, Procon, Ryton®
Singe	Recommended for improved cake release	Polyester, Polypropylene, Acrylic, Nomex®, Procon, Ryton®, P84 (felts)
Glaze/Eggshell	Provides short-term improvements for cake release (may impede airflow)	Polyester, Polypropylene (felts)
Silicone	Aids initial dustcake development and provides limited water repellency	Polyester (felt and woven)
Flame Retardant	Retards combustibility (not flame-proof)	Polyester, Polypropylene (felt and woven)
Acrylic Coatings (Latex base)	Improved filtration efficiency and case release (may impede flow in certain applications)	Polyester and Acrylic felts
PTFE Penetrating Finishes	Improved water and oil repellency, limited cake release	Nomex® (felt)

Fiberglass	Finish Purpose	Applications
PTFE Membrane	For capture of fine particulate, improved filtration efficiency, cake release, and airflow capacity	For capture of fine particulate, improved filtration efficiency, cake release, and airflow capacity
Silicone Graphite Teflon	Protects glass yarns from abrasion, adds lubricity	For non-acidic conditions, primarily for cement and metal foundry applications
Acid Resistant	Shields glass yarn from acid attack	Coal-fired boilers, carbon black, incinerators, cement, industrial and boiler application
Teflon® B	Provides enhanced fiber to fiber resistance and limited chemical resistance	Industrial and utility based load boilers under mild pH conditions
Blue Max CRF-70®	Provides improved acid resistance and reduces fiber to fiber abrasion, resistant to alkaline attack, improved fiber encapsulation	Coal-fired boilers (high and low sulfur) for peak load utilities fluidized bed boilers, carbon black, incinerators

* Sensitive bag-to-cage fit
** Fair with chemical or acid resistant finishes
*** Must oversize bag for shrinkage for temperatures above 450° F (232° C)

[1] Good below 300° F
[2] Good to excellent with acid resistent finish



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04

FILTER BAG FINISHES

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Benefits of Filter Bag Finishes

- Lengthen the life of your filter bag
- Better dust cake release (reduced valve pulsing = reduced compressed air consumption)
- Achieve more consistent airflow
- Reduces downtime and maintenance

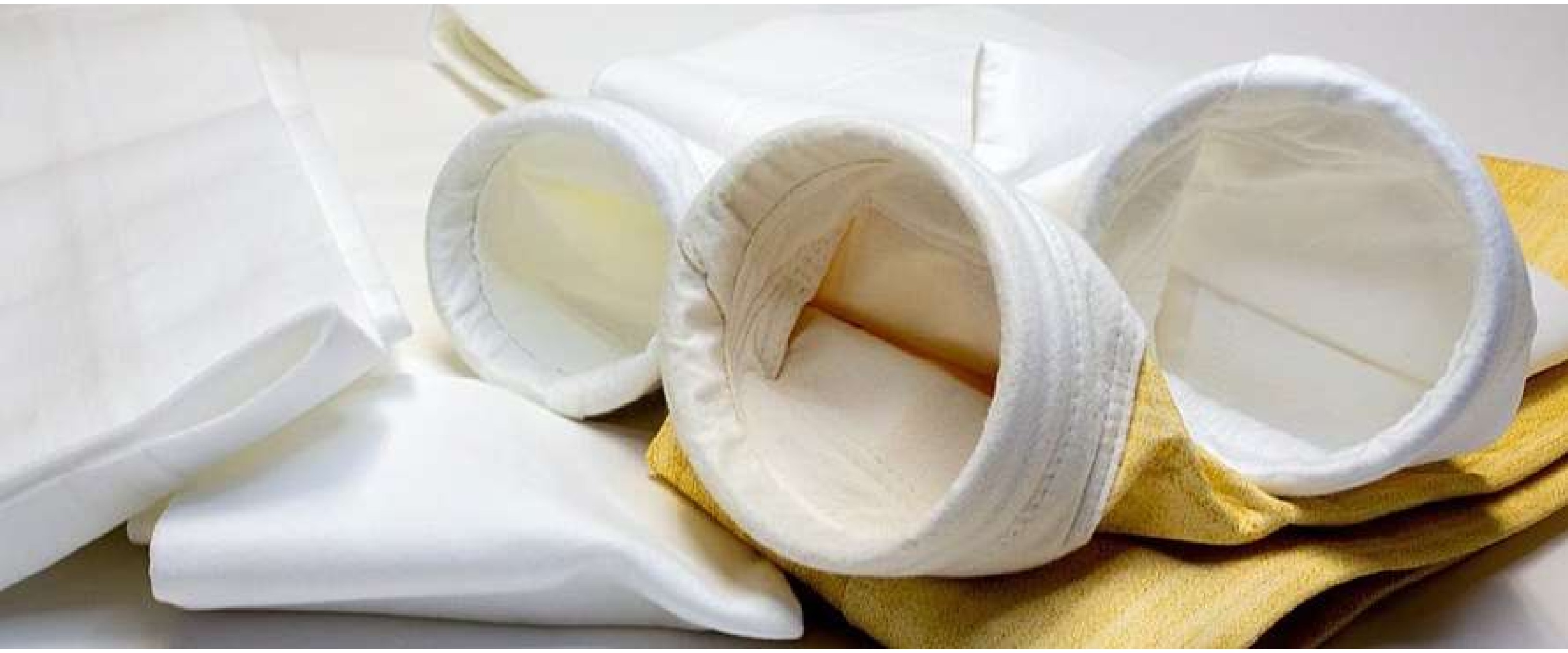
Filter media fabrics can be made from both natural and synthetic fibers, although synthetic fibers are more common today. As we have seen in the previous section, different fibers provide each media with different performance characteristics. Most medias today are pre-shrunk and include some type of finish to improve media performance. Finishes for felt and woven bags can be different as we will see below.

NAPPING

This process is the scraping of the filter surface across metal points or burrs on a revolving cylinder. Napping raises the surface fibers, creating a "fuzz", that provides a large number of sites for particle collection by interception and diffusion. Fabrics used for collecting sticky or oily dusts are sometimes napped so they can provide better collection and an easier cleaning process.

COATING

Coatings, or resin treating, involves immersing the filter material in a resin which can add certain characteristics to the filter media. For example, fiberglass threads can be coated with Teflon to prevent abrasion during bag cleaning and silicon graphite to aid in acid resistance.



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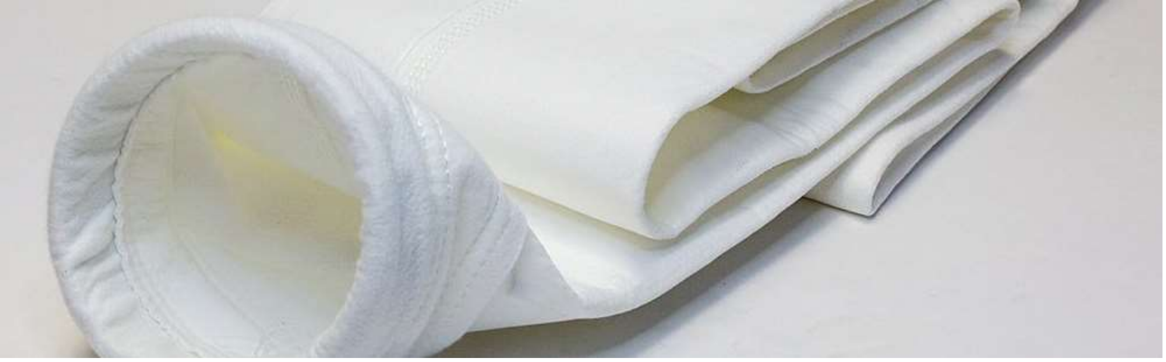
FILTER BAG CONSTRUCTION



The construction of your filter bags is dependent on your baghouse style, application, and other requirements specific to your facility. Below is a brief summary of how each type of baghouse works.

The three main baghouse styles available include:

- Pulse jet
- Reverse air
- Shaker

In each baghouse style there are a variety of filter top and bottom configurations that can be used. Some top and bottom configurations are meant for a specific baghouse style, and other configurations can be used across multiple baghouse styles.

PULSE JET

Pulse jet baghouses collect dust on the outside of the filter and clean filters from the inside out with a jet or pulse of clean air. Dirty air enters the baghouse and is forced to pass through the filter bags to exit the baghouse. As air pass through the bags, dust is filtered out and collects on the outside surface of the filter bags. This buildup of dust on the outside of the filters is known as a "filter cake." The filter cake aids in filtration by trapping smaller particles as the dirty air passes through the filter cake and bag. Pulse jet baghouses offer a wide range of filter media, making it an excellent fit for most applications.

REVERSE AIR OR SHAKER

In a baghouse using reverse air or shaker cleaning systems, the particulate is collected on the inside surface of the bag. The dust-laden gas enters the dirty side (inlet) of the collector and flows up through the bag. The particulate is filtered by the dustcake and the fabric, and clean air exits through the outside of the bag. Shaker and reverse air bag top and bottom designs vary by cleaning system and original equipment manufacturer.

Reverse air and shaker style baghouse both collect dust on the inside of the filter bag. Reverse air baghouses reverse the flow of air through the baghouse in order to clean the filter bags while shaker style baghouses clean the filter bags by moving them back and forth in a shaking motion. The buildup of a filter cake is important with these style collectors as it greatly aids in filter efficiency.

Both pulse jet and reverse air/shaker style baghouse come in a number of different bag constructions and understanding the requirements of your specific baghouse is important to ensure proper filter bag fit.

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AIR-TO-CLOTH RATIO

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AIR-TO-CLOTH RATIO

Dust collector air-to-cloth ratio is a critical measure to ensure your collector is performing efficiently.

Air-to-cloth ratio, also known as air to media ratio, is a measurement of the number of cubic feet per minute of air passing through one square foot of filter media.

Generally, a lower air-to-cloth ratio, the more effective your system is at removing dust from the work environment. When determining an appropriate air-to-cloth ratio, there are several factors to consider, including application, type of dust, moisture levels, inlet loading, etc. If the air-to-cloth ratio is higher than recommended, some common issues can arise, including increased differential pressure, frequent filter changeouts, and varying or reduced suction at pickup points. These issues are a result of not having enough filter media to handle the air flow and dust load effectively. As the dust cake builds on the filters, the airflow is restricted and slows, resulting in a decrease in air velocity and suction. From there it becomes a domino effect: air quality decreases, filters clog quicker requiring more changeouts, pulse valves see increased wear, and facility production may be impacted.

Why is the right Air-to-Cloth ratio important?

- Ensures dust collector is running efficiently
- Minimizes operating costs
- Maximizes filter life
- To meet air quality goals and requirements

What are the negative effects of an improper Air-to-Cloth ratio?

- Increases maintenance which can impact production
- Reduced air velocity resulting in poor ventilation at pickup points
- Increased compressed air consumption
- High differential pressure and increased system wear

The chart below provides a summary of recommended Air-to-Cloth ratio for a variety of industrial applications.

Dust Type	Explosive	Abrasive	Controlled Environment	Fire	A/C Ratio
Abrasive Blasting		√			
• Black Beauty		√			1.4
• All others		√			1.8
Activated carbon					2.5
Alfalfa	√			√	3.0
Alumina					2.5
Ambient air filtration					3.5
Arc washing (Gouging)				√	*
Asbestos					3.3
Baking powder			√		2.5
Barley (see Grain)				√	
Bauxite		√			2.0
Beet pulp	√	√		√	–
Bentonite		√	√		2.0
Beryllium					2.0
Boric acid					1.8
Bran	√			√	3.5
Brazing				√	2.2
Buffing & polishing				√	3.5*
Calcium carbonate					1.8
Carbon black	√			√	
• Fused	√			√	1.1
• Sintered	√			√	1.9
Cardboard					3.5
Cement		√			1.8
Ceramic		√	√		1.8
Chaff, grain	√	√		√	3.5
Chromium					1.5
Clay (& Brick & Marble)		√			1.8
Coal	√	√		√	1.8
Cocoa	√		√	√	1.8
Coffee	√			√	1.8
Coke	√	√		√	1.7
Composites					3.5
Corn meal	√			√	3.0
Corn starch	√		√	√	2.5
Corn sugar				√	2.0
Cutting				√	
• Laser				√	
Metal				√	1.1
Non-metal				√	1.1
• Oxyacetylene				√	1.4-1.7
• Plasma				√	1.1

Dust Type	Explosive	Abrasive	Controlled Environment	Fire	A/C Ratio
Detergents	√		√	√	2.2
Diatomaceous earth					2.5
Dyes	√			√	1.3
Fertilizer	√		√	√	2.2*
Fiberboard	√			√	3.0
Fiberglass					3.5
Flour	√		√	√	2.0
Fly ash		√			1.8
Frit		√			1.8
Furnaces					*
Grain	√			√	
• Corn	√			√	3.5
• Rice		√		√	3.5
Granite		√			2.0
Graphite				√	2.0
Grinding					
• Aluminum	√			√	2.0
• Bake shoe				√	3.5
• Cast iron		√		√	1.8
• Composites					3.5
• Rubber				√	3.8
• Steel		√		√	2.0
• Titanium		√		√	1.0
Gypsum					2.5
Iron oxide (Rust)					1.8
Kaolin					1.5
Lead oxide					1.1
Lead powder					1.5
Leather	√			√	3.5
Lime					2.5
Lime, hydrated					1.8
Limestone					2.5
Lignite	√			√	2.0
Malt	√		√	√	3.0
Meal	√			√	3.0
Metal, powdered					2.5
Metallizing				√	
•Electric arc spray				√	.04
• Plasma arc spray				√	1.2
• Powder flame spray				√	1.2
• Wire flame spray				√	1.2

* Check with Facility

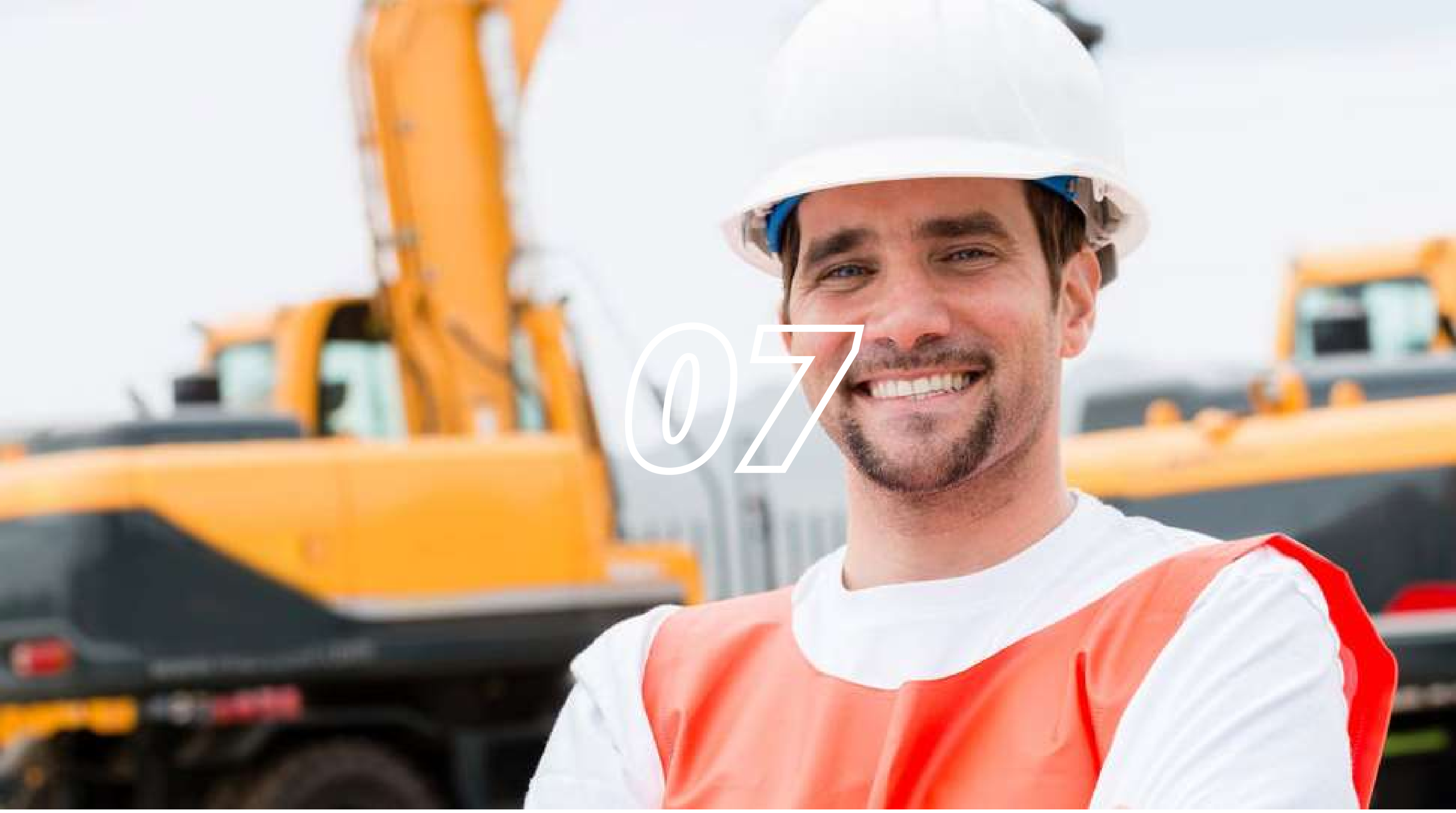
Recommended Air-to-Cloth ratio for a variety of industrial application: continued.

Dust Type	Explosive	Abrasive	Controlled Environment	Fire	A/C Ratio
Metallic fume					1.1
Mica (Rock)	√		√	√	2.0
Milk solids (Powders)					3.0
Oyster shell		√			1.8
Paint pigments	√			√	2.0
Paper	√			√	3.5
Pharmaceutical	√		√	√	
• Dry Powder	√		√	√	2.0
• Coating	√		√	√	2.0
Plaster			√		2.5
Powder coating	√	√		√	
• Black	√	√		√	1.0
• White & colors	√			√	2.5
• Teflon	√			√	1.8
Quartz		√			3.0
Rice	√	√		√	2.0
Rock, mineral					3.0
Rubber	√			√	1.8
Rye (Grain)	√			√	3.5
Salicylic Acid	√			√	1.8
Salt (Mineral)		√	√		3.5
Sand (Non foundry)		√			2.2
Sand (Foundry)		√			2.0
Selenium					1.8
Shale (Rock)		√			2.0
Silica		√			2.5
Silica, fumed					0.8
Silicates					2.2
Slate (Rock)		√			2.0
Soapstone					2.2
Soda ash		√			2.0

Dust Type	Explosive	Abrasive	Controlled Environment	Fire	A/C Ratio
Soldering (Welding)					1.8
Soybean (Grain)	√			√	3.0
Soybean meal	√			√	3.0
Starch	√		√	√	2.4
Surgical starch	√		√	√	1.0
Sugar (Glazed bags)	√		√	√	2.0
Talc					2.0
Talcum powder					2.0
Titanium (see application)	√	√		√	1.8
Titanium dioxide					2.2
Tobacco	√			√	3.0
Toner	√			√	1.2
Weld fume				√	1.8
• Source capture				√	1.7
Laser welding				√	1.7
Plasma arc welding	√			√	2.2
All others				√	3.5
• Ambient				√	2.1
Laser welding				√	2.1
Plasma arc welding				√	2.8
All others				√	2.2
Weld fume, soldering				√	3.0
Wheat (Grain)	√			√	
Woodworking	√			√	
• Sanding	√			√	4.0
• High speed cutting	√			√	4.0
• Low speed cutting & paning				√	-

Controlled Environment = 70° F (21° C). 40% RH
Explosive = Vents Required
Abrasive = AR Inlets Required
Fire = Sprinkler Header / Fire Media

* Check with Facility



07

SUMMARY

Selecting the right filter bags will keep your employees and your operation safe and at peak performance. We hope this information is a helpful resource for you.

If you have specific questions about your application and filtration needs, give us a call today at 888-221-0312 or email us at info@usairfiltration.com. One of our dust collection specialists can assist you with your dust control challenges.