



Gas-Phase Loose Fill Media

Bringing clean air to life.™

History of Gas-Phase Filtration

History

The first documented use of activated carbon (commonly known as charcoal) can be traced back to around 3750 B.C., when it was first used by the Egyptians for smelting ores to create bronze. By 1500 B.C., the Egyptians had expanded its use to healing intestinal ailments, absorbing unpleasant odors, and for writing on papyrus. By 400 B.C., the Ancient Hindus and Phoenicians recognized the antiseptic properties of activated charcoal and began using it to purify their water.

Between 400 B.C. and the 1800s, activated charcoal was used to remove odors from wounds, preserve water during ocean voyages, and by the military to treat battle wounds by removing toxins.

The earliest use of activated carbon for gas-phase contaminant removal dates back to 1854, when a Scottish chemist invented the first mask that utilized activated carbon to remove noxious gases. Wood was originally used as the base material for gas masks, since it was good at capturing poisonous gases when converted to activated carbon. By 1918, it was determined that shells and nuts converted to activated carbon performed even better than wood.

Around this same time, activated carbon began to be produced on a large scale, and its use spread to decolorization in the chemical and food industries. In the later 1900s, other industries such as corn and sugar refining, gas adsorption, alcoholic beverage production, and wastewater treatment plants began to use activated carbon.

Today, activated carbon is available in many different shapes and sizes, and its applications are growing every day. For air filtration, the most common types of activated carbon are granular activated carbon (GAC), pelletized activated carbon (PAC), and structured activated carbon. In addition, other substrates such as alumina and zeolite are used in lieu of activated carbon due to their tremendous pore structures. The most common applications of these different media types include corrosion control, odor control, and protection from toxic gases.



Standards

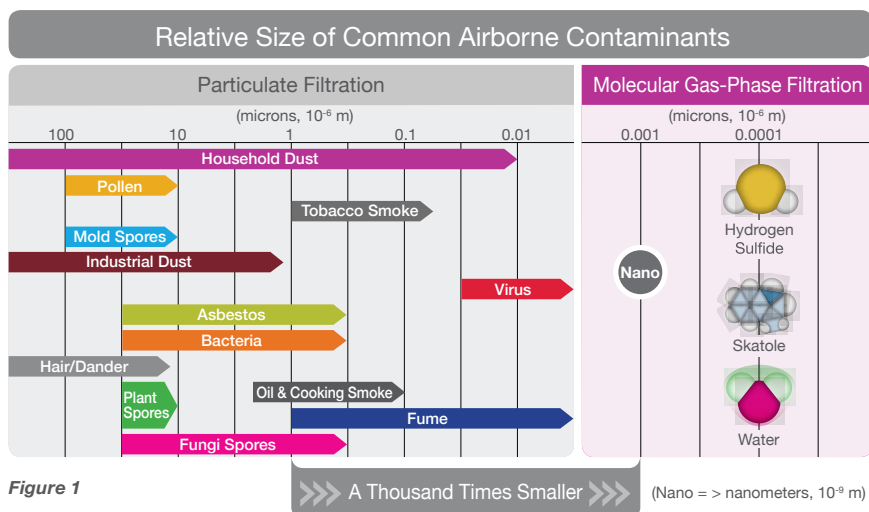
Each gas-phase loose media undergoes a respective quality control test that is based on internationally accredited testing standards.

STANDARD	PURPOSE	CONDITIONS
ASTM D2854 Apparent Density of Activated Carbon	Establish apparent density for granular or pelletized activated carbon	Determining mass volume using a vibrating feeder and an appropriately sized graduated cylinder
ASTM D2862 Particle Size Distribution of Granular Activated Carbon	Establish particle size distribution of activated carbon in granular or pelletized form	Determining major particle size distribution using a set of U.S. Standard sieves and shaken under a specific time and condition
ASTM D2866 Total Ash Content of Activated Carbon	Establish total ash content of activated carbon in granular or pelletized form	Continuous heating in a controlled-temperature muffle furnace in a specific time and condition
ASTM D2867 Moisture In Activated Carbon	Establish total moisture content inactivated carbon in granular or pelletized form	Continuous heating in a pre-heated oven
ASTM D3802 Ball-Pan Hardness of Activated Carbon	Establish ball-pan hardness number for granular or pelletized activated carbon	Combined rotating and tapping of activated carbon with stainless steel balls in a special hardness pan and determining the total amount of degradation
ASTM D4607 Determination of Iodine Number of Activated Carbon	Establish relative adsorption capacity of activated carbon in granular or pelletized form in terms of aqueous iodine solution	Titration on carbon treated solution to determine residue iodine concentration reported as iodine number
ASTM D6646 Standard test method for determination of the accelerated hydrogen sulphide breakthrough capacity of granular and pelletized activated carbon	Establish relative breakthrough performance of activated carbon in granular or pelletized form in terms of removal of hydrogen sulphide	Elevated challenge concentration and humidified gas stream that does not stimulate actual conditions in typical applications
ASTM D5742 Determination of the Butane Activity of Activated Carbon	Establish relative breakthrough performance of activated carbon in granular or pelletized form in terms of removal of butane	Elevated challenge concentration and humidified gas stream that does not stimulate actual conditions in typical applications

Gaseous Contaminant Guidance

What are Gaseous Contaminants?

Gaseous contaminants are undesirable airborne molecules mixed with the normal molecular oxygen and nitrogen in the atmosphere. Because of their molecular size, in the sub-nano range, they are not visible, but present in air as desirable water molecules, which is known as humidity. Some common offensive undesirable gaseous contaminants are hydrogen sulfide, the rotten egg smell, or skatole, the dirty diaper smell. Many gases that evolve from combustion are considered to be contaminants, such as carbon monoxide, oxides of nitrogen, oxides of sulphur, and polyaromatic hydrocarbons.



Size – Gaseous and Particulate Contaminants

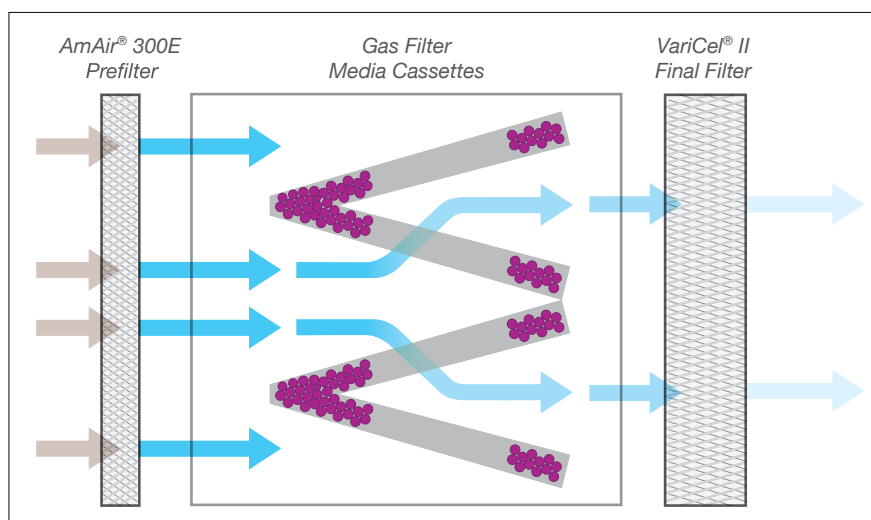
The graphic in Figure 1 illustrates the relative size differences of airborne contaminants. Some particulate contaminants, such as viruses and bacteria, although not visible, have a mass size large enough to be filtered with specialized particulate filters. Gaseous contaminants can only be effectively removed using molecular gas-phase filtration technologies.

Types and Sources of Gaseous Contaminants

Gaseous contaminants are generally classified as Odorous, Corrosive, or Harmful/Toxic. Examples of their sources are shown in Figure 2.

Control of Gaseous Contaminants

The principle of specialized gas-phase filtration systems, as seen in Figure 3, most often in combination with particulate filters, are used to remove molecular gaseous contaminants.

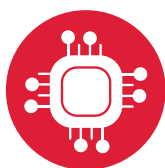


Gas-Phase Standards

Application



Hospitals



Microelectronics



Schools



Airports



Pulp & Paper



Hotels



Commercial
Buildings



Restaurants



Salons



Museums &
Historic Storage



Waste
Management



Data
Centers

SAAF™ Media Environment Applications

TARGET CHEMICALS	Formaldehyde	Ammonia	Chlorine	Hydrocarbon	Hydrogen Sulphide	Mercaptans	Nitrogen Dioxide	Sulphur Dioxide	VOCs
SAAFCarb™			●	●		●	●		●
SAAFCarb™ MA			●	●	●	●	●	●	●
SAAFCarb™ MB		●	●	●		●	●		●
SAAFOxidant™	●				●			●	
SAAFBlend™ CC	●		●	●	●	●	●	●	●
SAAFBlend™ GP	●		●	●	●	●	●	●	●
SAAFBlend™ WS	●		●	●	●	●	●	●	●

SAAFCarb™

ENGINEERED CHEMICAL MEDIA



Features

- Quick and easy media changeovers
- Resists a wide range of impure gases
- Low pressure drop and high adsorptive capacity
- Compatible for use in all carbon-based air filtration systems
- Target contaminants include:
 - Toluene (C₇H₈)
 - Chlorine (Cl₂)
 - Nitrogen Dioxide (NO₂)
 - Volatile Organic Compounds (VOCs)

Engineered Media

SAAFCarb™ engineered gas removal chemical media is designed to efficiently remove gaseous contaminants from airstreams.

SAAFCarb™ media is a pelletized activated carbon media that removes toxic and impure contaminants from the atmosphere. The activated carbon is produced using selected grades of bituminous coal and steam activated for optimum adsorption capacity.

Adsorptive Process

SAAFCarb™ media removes toxic and impure gases primarily by adsorption. In this process, the gases are held in the pellet pore volume by Van der Waals' forces, as well as other forces.

Typical Properties SAAFCarb™

Raw Material	Virgin Coal
Shape	Cylindrical Pellet
Apparent Density (ASTM D2854)	0.5 g/cc (~30 lb/ft ³) ± 10%
Pellet Diameter (ASTM D2862)	4mm ± 10%
Total Ash Content (ASTM D2866)	< 12 wt. %
Moisture Content (ASTM D2867)	≤ 5 wt. %
Hardness (ASTM D3802)	≥ 95%
Abrasion	< 1%
Iodine Number (ASTM D4607)	≥ 1000 mg/g
CTC Rating (ASTM D5742)	≥ 60 wt. %
Removal Capacity	≥ 24 wt. % Butane, C ₄ H ₁₀



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SAAFCarb™ MA

ENGINEERED CHEMICAL MEDIA



Features

- Provides targeted contaminant removal capacity for acid gases
- Provides extended equipment protection with infrequent media changeovers
- Compatible for use in all carbon-based air filtration systems
- Low pressure drop and high adsorptive capacity
- Target contaminants include:
 - Hydrogen Sulphide (H₂S)
 - Sulphur Oxide (SO_x)
 - Nitrogen Dioxide (NO₂)
 - Volatile Organic Compounds (VOCs)

Engineered Media

SAAFCarb™ MA engineered gas removal chemical media is designed to efficiently remove specific gaseous contaminants from airstreams.

SAAFCarb™ MA media contains a basic impregnant to enhance the capacity for removal of gaseous acid compounds in acidic corrosive environments. The base material includes selected grades of bituminous coal chosen for superior physical properties.

Chemisorptive Process

SAAFCarb™ MA media chemisorptive process removes impure gases by adsorption, absorption, and chemical reaction. In this process, the gas is trapped within the pellet, where a chemical reaction changes the gases into harmless solids and thereby mitigates the possibility of desorption.

Typical Properties SAAFCarb™ MA

Raw Material	Impregnated Coal
Shape	Cylindrical Pellet
Apparent Density (ASTM D2854)	0.6 g/cc (~40 lb/ft ³) ± 10%
Pellet Diameter (ASTM D2862)	4mm ± 10%
Total Ash Content (ASTM D2866)	< 12 wt. %
Moisture Content (ASTM D2867)	≤ 15 wt. %
Hardness (ASTM D3802)	≥ 95%
Abrasion	< 1%
Iodine Number (ASTM D4607)	≥ 1000 mg/g
Gas Capacity (ASTM D6646)	0.12 - 0.15g, H ₂ S/cc media
CTC Rating (ASTM D5742)	≥ 60 wt. %
Impregnation (AAF 392-800-002-0)	≥ 6%, KOH
Removal Capacity	≥ 23 wt. %, H ₂ S



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SAAFCarb™ MB

ENGINEERED CHEMICAL MEDIA



Features

- Specifically impregnated media
- Provides effective removal of ammonia gas
- Provides extended equipment protection with infrequent media changeovers
- Compatible for use in all carbon-based air filtration systems
- Low pressure drop and high adsorptive capacity
- Target contaminants include:
 - Ammonia (NH₃)
 - Volatile Organic Compounds (VOCs)
 - Amines (-NH₂)

Engineered Media

SAAFCarb™ MB engineered gas removal chemical media is designed to efficiently remove specific gaseous contaminants from airstreams, it targets airborne contaminants that contains ammonia.

SAAFCarb™ MB media contains acid impregnant enhancing the capacity for removal of ammonia and other basic gaseous compounds. The base material includes selected grades of bituminous coal chosen for superior physical properties.

Chemisorptive Process

SAAFCarb™ MB media chemisorptive process removes impure gases by adsorption, absorption, and chemical reaction. In this process, the gas is trapped within the pellet, where a chemical reaction changes the gases into harmless solids and thereby mitigates the possibility of desorption.

Typical Properties SAAFCarb™ MB

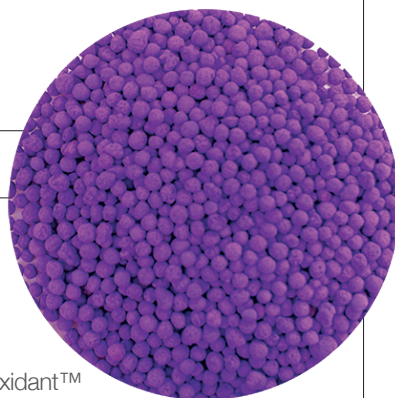
Raw Material	Impregnated Coal
Shape	Cylindrical Pellet
Apparent Density (ASTM D2854)	0.6 g/cc (~40 lb/ft ³) ± 15%
Pellet Diameter (ASTM D2862)	4mm ± 10%
Total Ash Content (ASTM D2866)	< 12 wt. %
Moisture Content (ASTM D2867)	≤ 25 wt. %
Hardness (ASTM D3802)	≥ 95%
Abrasion	< 1%
Iodine Number (ASTM D4607)	≥ 1000 mg/g
Gas Capacity (ASTM D6646)	0.02 - 0.05g, NH ₃ /cc media
CTC Rating (ASTM D5742)	≥ 60 wt. %
Impregnation (AAF 392-800-002-0)	≥ 15%, H ₃ PO ₄
Removal Capacity	≥ 4 wt. %, NH ₃



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SAAFOxidant™

ENGINEERED CHEMICAL MEDIA



Features

- Non-flammable and non-toxic
- Accurate service life testing
- Does not support bacterial and fungal growth
- Removes and holds contaminants by chemical conversion
- Patent pending high capacity formulation

Target contaminants include:

- Formaldehyde (CH₂O)
- Hydrogen Sulphide (H₂S)
- Lower molecular weight aldehydes and organic acids
- Nitric Oxide (NO)
- Sulphur Dioxide (SO₂)

Engineered Media

SAAFOxidant™ engineered gas removal chemical media is designed to efficiently remove gaseous contaminants from airstreams.

Manufactured as spherical, porous pellets, SAAFOxidant™ engineered media is composed of a combination of activated alumina, binders, and potassium permanganate. Potassium permanganate is applied uniformly during pellet formation and is distributed throughout the pellet volume to create a completely homogenous particle. This process provides the maximum amount of impregnant for chemical reaction and optimal performance.

Chemisorptive Process

The SAAFOxidant™ media chemisorptive process removes the contaminant gases by adsorption, absorption, and chemical reaction. In this process, the gas is trapped within the pellet, where oxidation changes the gases into harmless solids and thereby mitigates the possibility of desorption.

Typical Properties SAAFOxidant™ 8%

Raw Material	Chemical
Shape	Sphere Pellet
Apparent Density (ASTM D2854)	0.8 g/cc (~50 lb/ft ³) ± 10%
Pellet Diameter (ASTM D2862)	2.83 - 5.66 mm
Moisture Content (ASTM D2867)	≥ 15 wt. %
Crush Strength (AAF 392-800-002-4)	≥ 50N
Abrasion	≤ 4.5%
Gas Capacity (ASTM D6646)	0.07 - 0.10g H ₂ S/cc media
CTC Rating (ASTM D5742)	N/A
Impregnation (AAF 392-800-002-0)	≥ 8%, KMnO ₄
Removal Capacity	≥ 14 wt. %, H ₂ S



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SAAFBlend™ CC

CORROSION CONTROL CHEMICAL MEDIA

Features

- Targets reactive compounds and Volatile Organic Compounds (VOCs)
- Suitable for use in all carbon-based air filtration systems
- Composed of SAAFCarb™ MA media and SAAFOxidant™
- Low pressure drop and high adsorptive capacity
- Provides extended equipment protection with infrequent media changeovers
- Target contaminants include:
 - Hydrogen Sulphide (H₂S)
 - Sulphur Dioxide (SO₂)
 - Nitric Oxide (NO)
 - Nitrogen Dioxide (NO₂)
 - Formaldehyde (CH₂O)
 - Hydrocarbons
 - Lower molecular weight aldehydes and organic acids

Engineered Media

SAAFBlend™ CC engineered gas removal chemical media is designed to efficiently remove gaseous contaminants from airstreams.

SAAFBlend™ CC media is produced from an equal volumetric mix of SAAFCarb™ MA and SAAFOxidant™ media. Manufactured of spherical and porous pellets, SAAFOxidant™ engineered media is composed of a combination of activated alumina and other binders. Potassium permanganate is applied uniformly during pellet formation and is distributed throughout the pellet volume. This process provides the maximum amount of impregnant for chemical reaction and optimal performance.

SAAFCarb™ MA media is manufactured of pelletized activated carbon media that is composed of high quality virgin substrates, in order to provide optimum adsorption for various gaseous contaminants.

Adsorptive Process

SAAFCarb™ MA media removes toxic and impure gases primarily by adsorption. In this process, the gases remain on the surface of the pellet.

Chemisorptive Process

The SAAFBlen™ CC media chemisorptive process removes the contaminant gases by adsorption, absorption, and chemical reaction. In this process, the gas is trapped within the pellet, where oxidation changes the gases into harmless solids and thereby mitigates the possibility of desorption.



Typical Properties SAAFBlend™ CC

	SAAFCarb™ MA	SAAFOxidant™
Raw Material	Impregnated Coal	Chemical
Shape	Cylindrical Pellet	Sphere Pellet
Apparent Density (ASTM D2854)	0.6 g/cc (~40 lb/ft ³) ± 10%	0.8 g/cc (~50 lb/ft ³) ± 10%
Pellet Diameter (ASTM D2862)	4mm ± 10%	2.83 - 5.66 mm
Total Ash Content (ASTM D2866)	< 12 wt. %	N/A
Moisture Content (ASTM D2867)	≤ 15 wt. %	≥ 15 wt. %
Crush Strength (AAF 392-800-002-4)	N/A	≥ 50N
Hardness (ASTM D3802)	≥ 95%	N/A
Abrasion	< 1%	≤ 4.5%
Iodine Number (ASTM D4607)	≥ 1000 mg/g	N/A
Gas Capacity (ASTM D6646)	0.12 - 0.15g, H ₂ S/cc media	0.07 - 0.10g, H ₂ S/cc media
CTC Rating (ASTM D5742)	≥ 60 wt. %	N/A
Impregnation (AAF 392-800-002-0)	≥ 6%, KOH	≥ 8%, KMnO ₄
Removal Capacity	≥ 23 wt. %, H ₂ S	≥ 14 wt. %, H ₂ S



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SAAFBlend™ GP

GENERAL PURPOSE CHEMICAL MEDIA

Features

- Targets reactive compounds and Volatile Organic Compounds (VOCs)
- Accurate service life testing
- Composed of SAAFCarb™ media and SAAFOxidant™
- Suitable for use in commercial and industrial applications
- Target contaminants include:
 - Hydrogen Sulphide (H₂S)
 - Sulphur Dioxide (SO₂)
 - Nitric Oxide (NO)
 - Nitrogen Dioxide (NO₂)
 - Formaldehyde (CH₂O)
 - Hydrocarbons
 - Lower molecular weight aldehydes and organic acids

Engineered Media

SAAFBlend™ GP engineered gas removal chemical media is designed to efficiently remove gaseous contaminants from airstreams.

SAAFBlend™ GP media is produced from an equal volumetric mix of SAAFCarb™ and SAAFOxidant™ media. Manufactured of spherical and porous pellets, SAAFOxidant™ engineered media is composed of a combination of activated alumina and other binders. Potassium permanganate is applied uniformly during pellet formation and is distributed throughout the pellet volume. This process provides the maximum amount of impregnant for chemical reaction and optimal performance.

SAAFCarb™ media is manufactured of pelletized activated carbon media that is composed of high quality virgin substrates, in order to provide optimum adsorption for various gaseous contaminants.

Adsorptive Process

SAAFCarb™ media removes toxic and impure gases primarily by adsorption. In this process, the gases remain on the surface of the pellet.

Chemisorptive Process

The SAAFOxidant™ media chemisorptive process removes the contaminant gases by adsorption, absorption, and chemical reaction. In this process, the gas is trapped within the pellet, where oxidation changes the gases into harmless solids and thereby mitigates the possibility of desorption.



Typical Properties SAAFBlend™ GP

	SAAFCarb™	SAAFOxidant™
Raw Material	Virgin Coal	Chemical
Shape	Cylindrical Pellet	Sphere Pellet
Apparent Density (ASTM D2854)	0.5 g/cc (~30 lb/ft ³) ± 10%	0.8 g/cc (~50 lb/ft ³) ± 10%
Pellet Diameter (ASTM D2862)	4mm ± 10%	2.83 - 5.66 mm
Total Ash Content (ASTM D2866)	< 12 wt. %	N/A
Moisture Content (ASTM D2867)	≤ 5 wt. %	≥ 15 wt. %
Crush Strength (AAF 392-800-002-4)	N/A	≥ 50N
Hardness (ASTM D3802)	≥ 95%	N/A
Abrasion	< 1%	≤ 4.5%
Iodine Number (ASTM D4607)	≥ 1000 mg/g	N/A
Gas Capacity (ASTM D6646)	N/A	0.07 - 0.10g H ₂ S/cc media
CTC Rating (ASTM D5742)	≥ 60 wt. %	N/A
Impregnation (AAF 392-800-002-0)	N/A	≥ 8%, KMnO ₄
Removal Capacity	≥ 24 wt. %, C ₄ H ₁₀	≥ 14 wt. %, H ₂ S



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SAAFBlend™ WS

WIDE-SPECTRUM CHEMICAL MEDIA

Features

- Targets acidic gases, Volatile Organic Compounds (VOCs), reactive low molecular weight organics
- Accurate service life testing
- Composed of SAAFCarb™, SAAFCarb™ MA and SAAFOxidant™
- Target contaminants include:
 - Hydrogen Sulphide (H₂S)
 - Sulphur Dioxide (SO₂)
 - Nitric Oxide (NO)
 - Nitrogen Dioxide (NO₂)
 - Formaldehyde (CH₂O)
 - Hydrocarbons
 - Lower molecular weight aldehydes and organic acids

Engineered Media

SAAFBlend™ WS engineered gas removal chemical media is designed to efficiently remove gaseous contaminants from airstreams.

SAAFBlend™ WS media is produced from an equal volumetric mix of SAAFCarb™, SAAFCarb™ MA, and SAAFOxidant™ media. Manufactured of spherical and porous pellets, SAAFOxidant™ engineered media is composed of a combination of activated alumina and other binders. Potassium permanganate is applied uniformly during pellet formation and is distributed throughout the pellet volume. This process provides the maximum amount of impregnant for chemical reaction and optimal performance.

SAAFCarb™ media is manufactured of pelletized activated carbon media that is composed of high quality virgin substrates, in order to provide optimum adsorption for various gaseous contaminants.

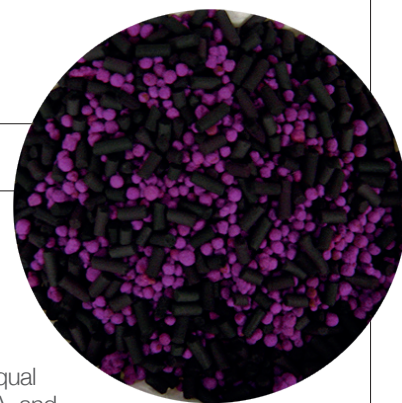
SAAFCarb™ MA media is composed of pelletized activated carbon media suitably impregnated for the removal of acid gases.

Adsorptive Process

SAAFCarb™ media removes toxic and impure gases primarily by adsorption. In this process, the gases remain on the surface of the pellet.

Chemisorptive Process

The SAAFOxidant™ and SAAFCarb™ MA media chemisorptive process removes the contaminant gases by adsorption, absorption, and chemical reaction. In this process, the gas is trapped within the pellet, where oxidation changes the gases into harmless solids and thereby mitigates the possibility of desorption.



Typical Properties SAAFBlend™ WS

	SAAFCarb™	SAAFCarb™ MA	SAAFOxidant™
Raw Material	Virgin Coal	Impregnated Coal	Chemical
Shape	Cylindrical Pellet	Cylindrical Pellet	Sphere Pellet
Apparent Density (ASTM D2854)	0.5 g/cc (~30 lb/ft ³) ± 10%	0.6 g/cc (~40 lb/ft ³) ± 10%	0.8 g/cc (~50 lb/ft ³) ± 10%
Pellet Diameter (ASTM D2862)	4mm ± 10%	4mm ± 10%	2.83 - 5.66 mm
Total Ash Content (ASTM D2866)	< 12 wt. %	< 12 wt. %	N/A
Moisture Content (ASTM D2867)	≤ 5 wt. %	≤ 15 wt. %	≥ 15 wt. %
Crush Strength (AAF 392-800-002-4)	N/A	N/A	≥ 50N
Hardness (ASTM D3802)	≥ 95%	≥ 95%	N/A
Abrasion	< 1%	< 1%	≤ 4.5%
Iodine Number (ASTM D4607)	≥ 1000 mg/g	≥ 1000 mg/g	N/A
Gas Capacity (ASTM D6646)	N/A	0.12 - 0.15g, H ₂ S/cc media	0.07 - 0.10g H ₂ S/cc media
CTC Rating (ASTM D5742)	≥ 60 wt. %	≥ 60 wt. %	N/A
Impregnation (AAF 392-800-002-0)	N/A	≥ 6%, KOH	≥ 8%, KMnO ₄
Removal Capacity	≥ 24 wt. %, C ₄ H ₁₀	≥ 23 wt. %, H ₂ S	≥ 14 wt. %, H ₂ S



Bringing clean air to life.™

Proven Expertise of AAF

AAF offers the most comprehensive air filtration portfolio in the industry, including particulate and gas-phase filters, to provide a customized clean air solution. Each product is carefully designed, manufactured, and tested in full compliance with all applicable standards to meet the most challenging demands with the lowest Total Cost of Ownership.

Asia Sales Office

American Air Filter Manufacturing Sdn. Bhd.

(HQ - Malaysia)
(Penang - Malaysia)

AAF Australia Pty. Ltd.

(NSW HQ Sales Office)
(VIC Sales Office)

AAF International (Thailand) Co., Ltd.

AAF Singapore Pte. Ltd.

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AAF has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

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