THE AGE OF PTFE
FILTRATION MEMBRANE

Presented by:

IAC – The Leading U.S. and International Baghouse OEM

4800 Lamar Ave
Mission, Kansas 66202

PP033 R1 02-14-12

Summation: APC (Baghouse) Fabric Filter Marketplace

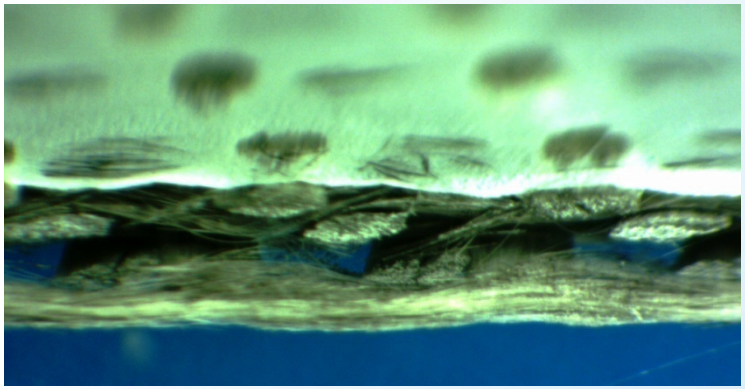
With the release, in 2011, of new, more restrictive dry particulate emission regulations by the EPA, such as Boiler MACT, CSAPR, and other, tighter EPA emissions mandates, it is incumbent on dry filtration media technology to keep pace with these new lower restricted dry particulate emission requirements.

A high-tech PTFE membrane supplier, TTG, Inc., has developed and supplies a state-of-the-art advanced filtration-efficiency, expanded PTFE filtration membrane. The TTG PTFE membrane can be laminated to a wide range of filtration substrates, such as Polyester; Acrylic; PPS (Ryton); Nomex; and Fiberglass filtration medias. A unique property of the TTG PTFE media is an enhanced ability to release the dust cake during baghouse pulse cleaning, which enables the filter bags constructed with the TTG PTFE membrane to run at a 2.0" to 2.5" w.c. lower differential pressure drop (DP) when compared to other traditional PTFE membrane constructed filter bags. Refer to the attached VDI test report in IAC's brochure (page 11).

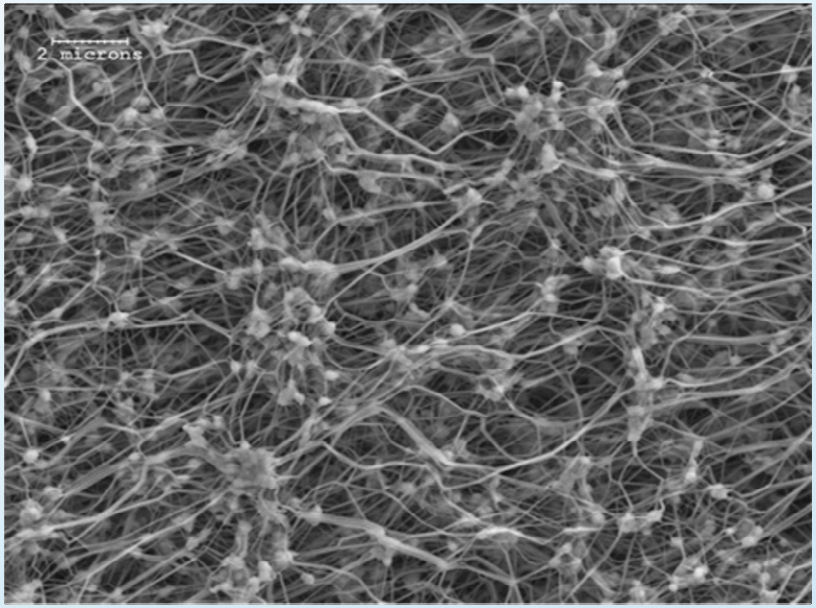
Recently, a leading OEM supplier of large gas volume baghouse systems stated, "It is not a difficult choice to make in selecting the TTG membrane filter bag as our filter media when I can be assured of achieving the new EPA-mandated 0.008 lbs/MMBtu dry particulate emission standard, and as a bonus our baghouse systems perform at a 2" to 3" w.c. lower differential pressure across the filter bags by simply replacing the current PTFE membrane bags with the new TTG PTFE membrane constructed filter bags?

Call IAC's Glenn A. Smith, Jr. or email gsmith@iac-intl.com to discuss further PTFE membrane baghouse performance enhancement options.

TTG Membrane Technology



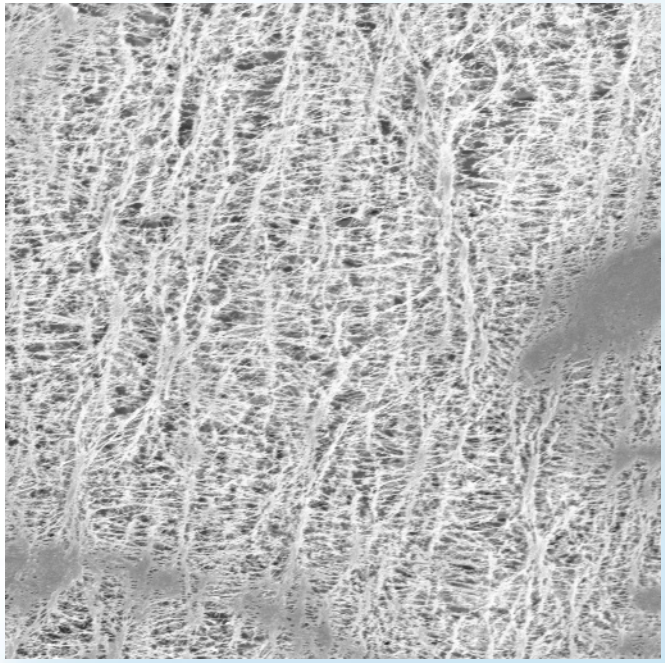
ePTFE Membrane on Glass



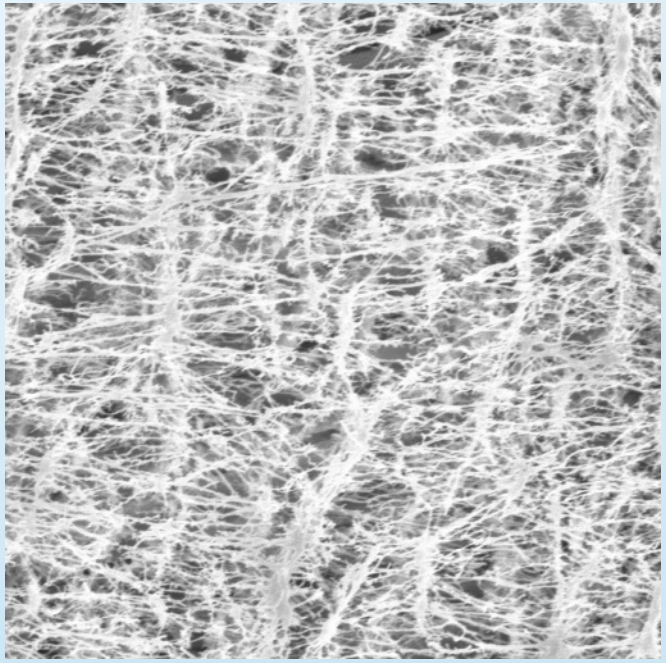
ePTFE Membrane Structure

TTG Inc Membrane Products CTQ's For Proper Lamination

TTG Glass Laminate at 1000 X

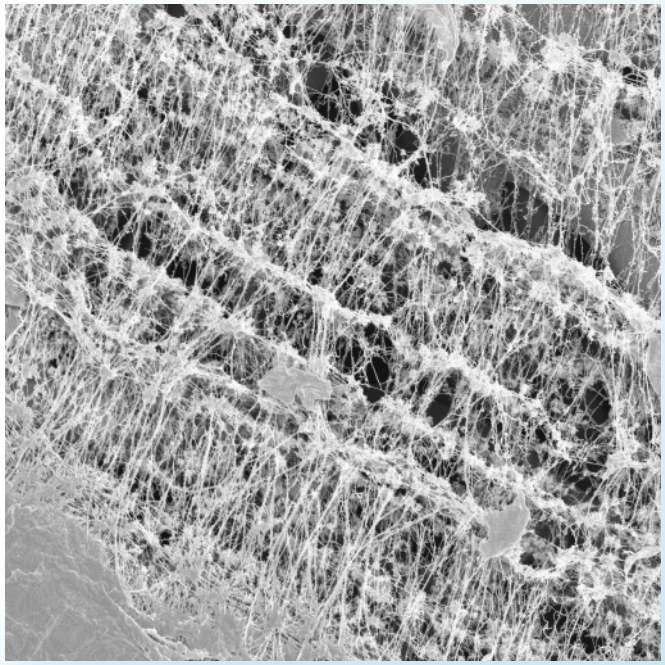


TTG Glass Laminate at 2500 X

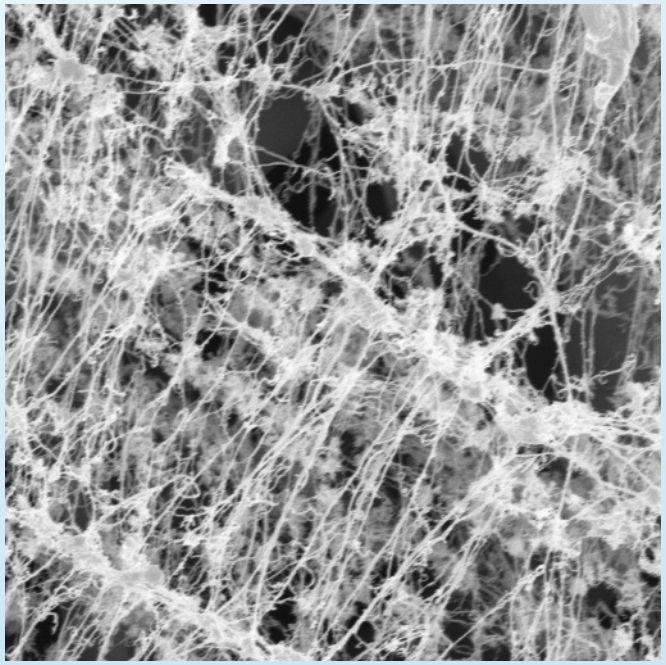


TTG Market Place Competitors

US East Coast Competitive Laminate at 1000 X

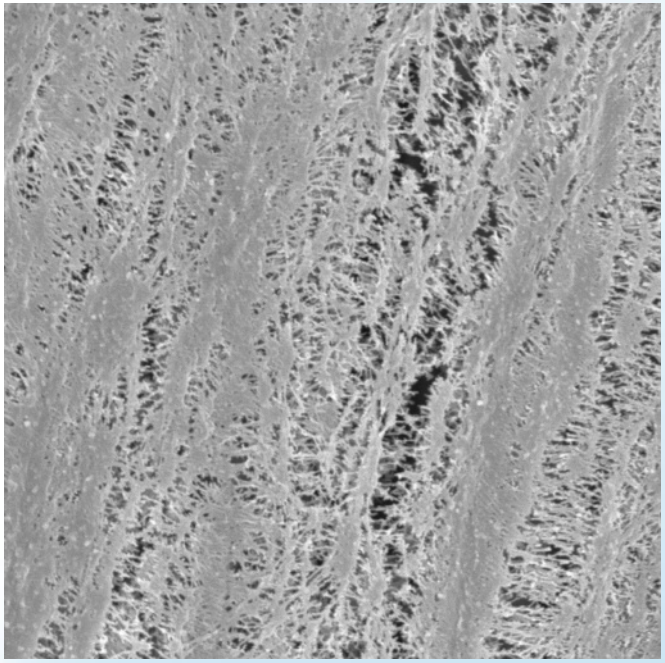


US East Coast Competitive Laminate at 2500 X

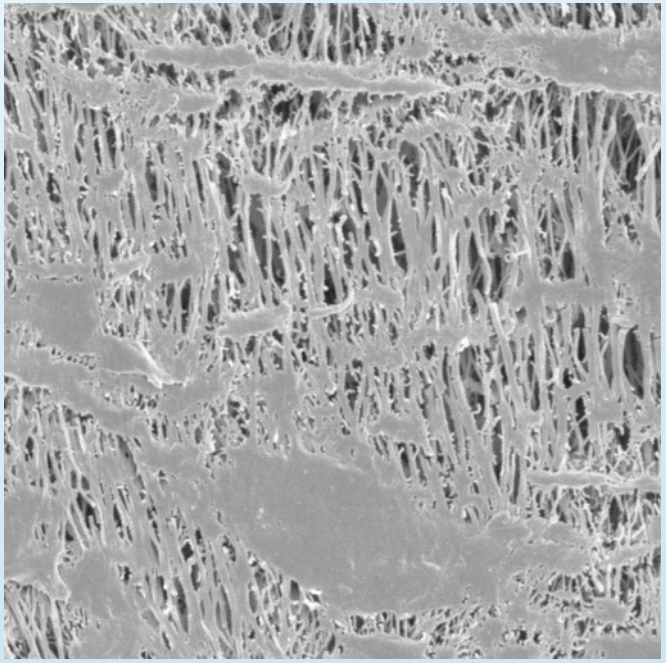


TTG Market Place Competition Microscope Images of Lamination

Central US Laminate at 1500 X

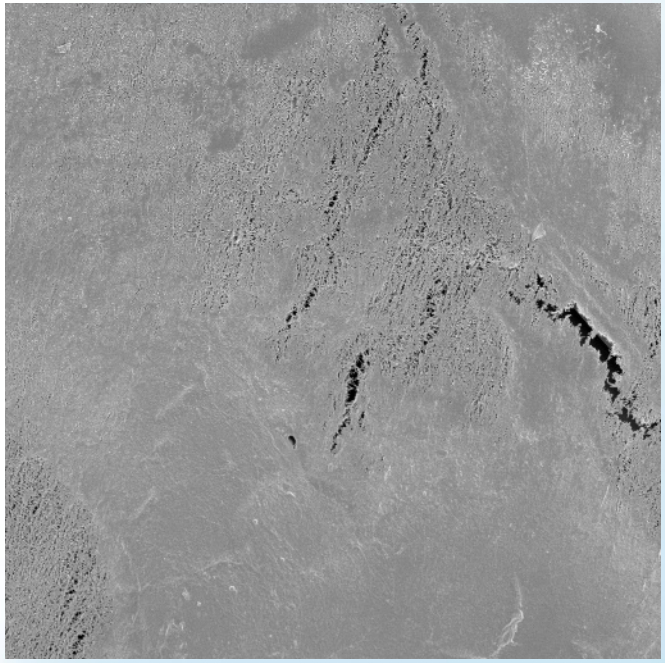


Central US Laminate at 2500 X

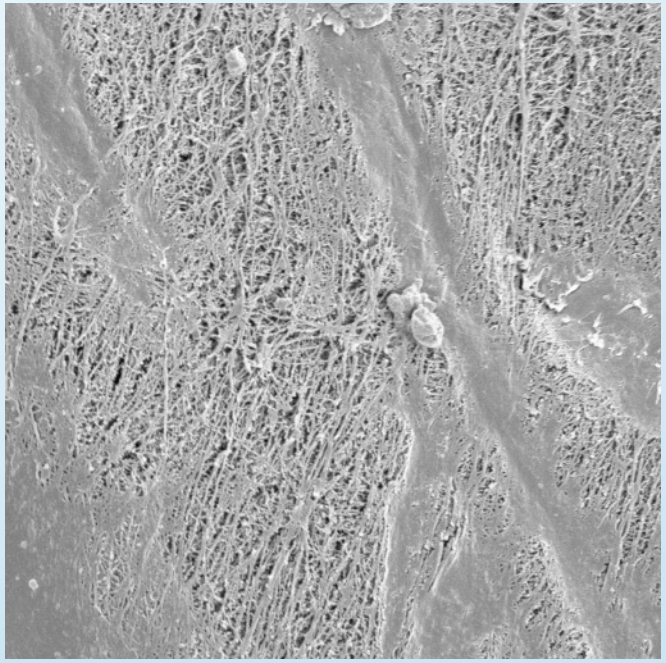


TTG Off Shore Market Competition
Microscope Images of Lamination

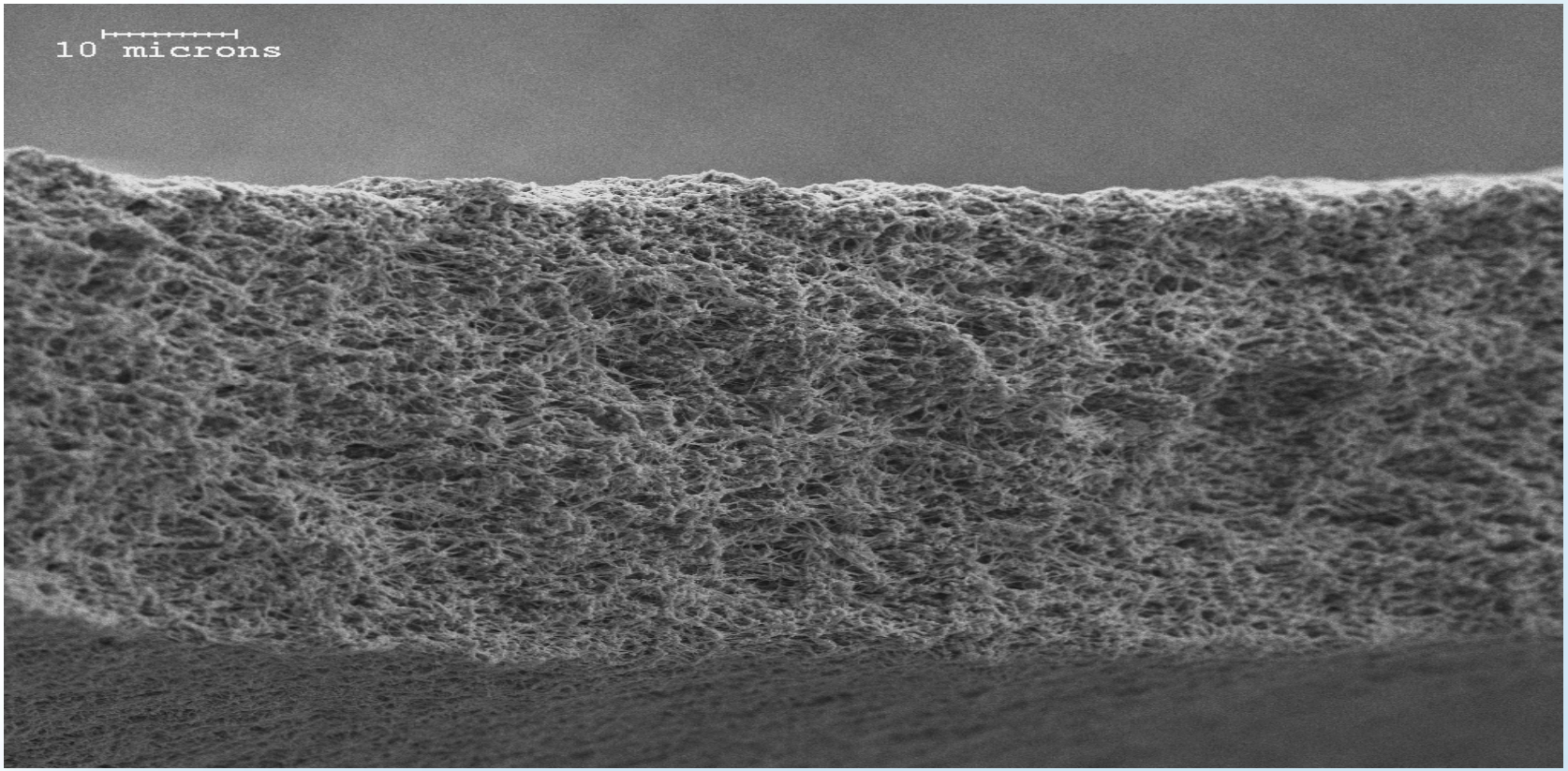
Chinese Laminate at 1000 X



Chinese Laminate at 2500 X



Cross Section of an ePTFE Film



1000 X

ePTFE Membrane Technology
Improved dust cake management via fabric filter technology can control operating pressure over filter life.

Membrane Surface Filtration

Non Membrane Depth Filtration

Baghouse Processed Materials

COMBUSTION PROCESSES
Co-Generation Facilities
Soil Remediation Plants
Incinerators
Utility Boilers

CHEMICAL
Soaps
Herbicides/Pesticides
Detergents
Fertilizers

PLASTICS/SPRAY DRYERS
PVC
Polypropylene
Polyester
Polystyrene
Polyethylene

CEMENT AND ROCK DUST
Collectors Venting:
Kiln
Dock Unload
Clinker Cooler
Finish Mill
Hydrators
High Efficiency Separator
By-Pass
Dryer
Coal Mill
Raw Mill
Calciners

FOOD/PHARMACEUTICAL
Sugar
Dried Milk & Eggs
Protein
Food Additives
Pill Coatings

PAINT/PIGMENTS
Carbon Black
Toner
TiO2
Cosmetics

METALS
Ferro Alloy
Foundry
Battery Manufacturers
Secondary Zinc Smelters
Steel
Lead Smelters

US EPA ETV Data to Support PM 2.5 Particulate Emissions

TTG VDI results of filtration fabrics comparative to W.L. Gore & Donaldson

Verification Parameters	TTG Polyester	TTG Fiberglass	W L Gore Fiberglass	Donaldson Fiberglass	TTG PPS Utility Fabric
Outlet Particle concentration at standard conditions					
PM 2.5g/dscm	<.0000167 g/dscm	<.0000167 g/dscm	<0.0000167	0.000021	<.0000167 g/dscm
(gr/dscf)	(<0.0000073)	(<0.0000073)	(<0.0000073)	(<0.000009)	(<0.0000073)
Total mass, g/dscf	.000169 g/dscm	<.0000167 g/dscm	<0.0000167	0.000021	<.0000167 g/dscm
(gr/dscf)	(<0.0000073)	(<0.0000073)	(<0.0000073)	(<0.000009)	(<0.0000073)
Average residual pressure drop, cm w.g. (in w.g.)	1.93 cm (0.76)	1.91 cm (0.77)	2.45 (0.96)	3.47 (1.37)	2.25 (.89")
Initial residual pressure drop, cm w.g. (in w.g.)	1.91 cm (0.76)	1.90 cm (0.76)	2.36 (0.93)	3.31 (1.30)	2.19 (.88")
Residual pressure drop increase, cm w.g. (in w.g.)	0.05 cm (.02)	0	0.18 (0.07)	0.30 (0.12)	.05 cm (.02")
Filtration cycle time	325 seconds	318 seconds	251 seconds	136 seconds	301 seconds
Mass gain of test sample filter, g (gr)	0.12 grams	0.14 grams	0.09 (1.39)	0.11 (1.65)	0.13 grams
Number of cleaning cycles	86	87	87	159	71
Perm after Testing	5.05	4.14			4.28

TTG Inc.
ASTM D6830-02

- TTG Inc. testing was conducted at ETSI in accordance with ASTM Test Method D6830-02 and with the test specifications and conditions as detailed in Generic Verification Protocol for Baghouse Filtration Products (BFP) developed by the Air Pollution Control Technology Verification Center (APCTVC) which is part of the U.S. EPA's Environmental Technology Verification (ETV) Program and is operated in partnership between RTI and EPA.

- A 6.0" diameter fabric filter sample is challenged with a standard dust (particulate matter) under simulated baghouse conditions at specified rates for air and dust flow. The test consists of three test runs. Each run consists of three sequential phases or test periods during which dust and gas flow rates are constantly maintained to test specification. The test phases are:

- A conditioning period consisting of 10,000 rapid pulse filtration cycles (every 3 seconds).

- A recovery period to allow the test sample to recuperate from rapid pulsing where the filter is pulsed only when the differential pressure reaches 4" w.c.

- A 6-hour performance test period, consisting of normal filtration cycles, during which measurements for particulate emissions are determined by gravimetric measurement of the particulate matter that passes through the sample.

IAC Representative DSI Installations

Plant	Unit	MW	Pollutant	DSI Location	Sorbent	Date
OG&E; Sooner Station	Unit 1	550	SO2	AH Inlet	Trona; SBC	Nov-11
Constellation Energy	Crane 2	200	HCL	AH Inlet & Outlet	Trona; Hydrated Lime	Sep-11
Constellation Energy	Wagner 2	130	HCL	AH Inlet & Outlet	Trona; Hydrated Lime	Aug-11
Constellation Energy	Wagner 3	325	HCL	AH Inlet & Outlet	Trona; SBC	Aug-11
OG&E; Sooner Station	Unit 1	550	SO2	AH Inlet	Trona; SBC	Jul-11
GRE, Stanton Station	Unit 1	188	SO2	AH Inlet	Trona; SBC	Jul-11
Luminant, Sandow Station	Unit 4	550	SO3	AH Inlet	MgO	May-10
Constellation Energy	Wagner 2	130	Hg & SO2	AH Inlet & Outlet	PAC; Trona	Apr-09
Constellation Energy	Wagner 3	325	Hg & SO2	AH Inlet & Outlet	PAC; Trona; SBC	Apr-09
Temple Inland	N/A	Steam	SO3	N/A	Trona	Feb-09
GRU; Deerhaven Gen. Sta.	Unit 2	238	As	Coal Belt Feed	Pebble Lime	Nov-08
Heron Lake Bio Energy,		Steam	SO2	AH Inlet	Trona	Nov-08
Constellation Energy	Wagner 3	325	HCL	AH Inlet & Outlet	PAC; Trona; SBC	Apr-08
Constellation Energy	Crane 1	200	HCL	AH Inlet & Outlet	PAC	Apr-08
Lincolnway Energy		Steam	SO2		Trona	Apr-08
Red Trail Energy, LLC		Steam	SO2		SBC	Jun-07
Constellation Energy	Wagner 2	130	Hg	AH Outlet	PAC	May-07
Constellation Energy	Wagner 3	325	Hg	AH Outlet	PAC; Trona; SBC	May-07
Constellation Energy	Crane 1	200	Hg	AH Outlet	PAC	May-07
Corning		N/A	HCL & HF	N/A	Hydrated Lime	Nov-04
Wabash Alloys	Dickson, TN	N/A	HCL	Baghouse Inlet	Enviroblend	Jul-01
Wabash Alloys	Cleveland, OH	N/A	HCL	Baghouse Inlet	Enviroblend	Jul-01
Wabash Alloys	Tipton, IN	N/A	HCL	Baghouse Inlet	Enviroblend	Jul-01
Wabash Alloys	Wabash, IN	N/A	HCL	Baghouse Inlet	Enviroblend	Jul-01
Excel Energy; Red Wing	Unit 2	N/A	SO2	Boiler	Limestone	May-00
Excel Energy; Red Wing	Unit 1	N/A	SO2	Boiler	Limestone	May-99

IAC Intermediate "M-Pulse" Baghouse Installations

•Lincolnway Energy- Nevada, IA	Coal Fired Boiler	220,000 ACFM	400F
•Corn Products- LP Goldfield, IA	Coal Fired Boiler	220,000 ACFM	400F
•Red Trail- Richardton, ND	Coal Fired Boiler	220,000 ACFM	400F
•Heron Lake Bio Energy, MN	Coal Fired Boiler	220,000 ACFM	400F
•Caterpillar- Mapleton, IL	Foundry Melt Shop	240,000 ACFM	250F
•Nucor Steel-Blytheville, AR	LMF and Meltshop	200,000 ACFM	250F
•Drake Cement, Drake, AZ	Raw Mill / Kiln	206,000 ACFM	482F
•Drake Cement, Drake, AZ	Clinker Cooler	98.100 ACFM	392F
•Nucor Steel, Decatur, AL	Electric Arc Furnace	1,200,000 ACFM	250F

IAC Intermediate "M-Pulse" Installations in India

•Dalmia Cement Ltd.	Cement Mill	443,200 ACFM	194F
•Krupp Polysius India Ltd.	Kiln / Raw Mill	80,046 ACFM	464F
•Birla / Satna Cement	ESP Conversion	40,023 ACFM	203F
•Birla / Satna Cement	ESP Conversion	22,366 ACFM	203F

IAC Representative Hi-Pulse Baghouse Installations

•Ashgrove Cement- Springfield, MO	Lime Kiln	30,000 ACFM	400F
•Cemex- Louisville, KY	Clinker Hot Tank	25,000 ACFM	400F
•IAT Incineration- Richmond, WA	Medical/Bio-Waste	5,000 ACFM	500F
•Continental Carbon- Ponca City, OK	Carbon Black Reactor	20,000 ACFM	500F
•PPG- Lake Charles, LA	Glass Furnace	35,000 ACFM	480F
•Phila Electric- Eddystone, PA	Magnesium Oxide	225,000 ACFM	450F
•Carbo Ceramics- Toomsboro, GA	Lime Kiln	87,000 ACFM	450F
•Ashgrove Cement- Portland, OR	Lime Kiln	20,000 ACFM	425F
•BMH/James Hardie- Nashville, AR	Gypsum Dryer	120,000 ACFM	400F
•BMH/Ga Pacific-	Gypsum Dryer	80,000 ACFM	400F
•Reynolds Metals-	Anode Bake Fce	141,000 ACFM	450F
•Intalco Aluminium- Ferndale, WA	Anode Bake Fce	168,000 ACFM	450F
•Cemex- Fairborn,OH	Alkali By-Pass	65,000 ACFM	500F
•Clow Corp- Oskaloosa, IA	Electric Arc Furnace	2x27,500 ACFM	250F
•Drake Cement, AZ	Coal Mill	20,598 ACFM	194 F
•Vienna Correctional Inst.	Coal Fired Boiler	2x25,000 ACFM	450 F
•Carbo Ceramics- Toomsboro, GA	Lime Kiln#1	80,000 ACFM	425 F
•Carbo Ceramics- Toomsboro, GA	Lime Kiln#2	80,000 ACFM	425 F
•Carbo Ceramics-Toomsboro, GA	Lime Kiln#3	80,000 ACFM	425 F
•Victaulic Foundry, Easton, Pa	Induction Furnaces	80,000 ACFM	250 F
•Victaulic Foundry, Chihuahua, MX	Induction Furnaces	86,000 ACFM	250F

Contact Information

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