

# Filter Media Selection for Coal Fired Plants

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# Filter Media Options

- Pulse Jet
  - ◆ PPS Felt
  - ◆ P-84® Felt
  - ◆ Woven Fiberglass
  - ◆ Woven Fiberglass with PTFE membrane
  - ◆ Teflon® Felt
  - ◆ PPS Felt / P-84® Blends
- Reverse Air
  - ◆ Woven Fiberglass
  - ◆ Woven Fiberglass with PTFE membrane



# PM<sub>2.5</sub> Impacts

- On May 16<sup>th</sup>, 2008 the EPA published the final new source review (NSR) standard for fine particulate matter.
- The rule finalizes several NSR requirements for stationary sources that emit PM<sub>2.5</sub> and other pollutants that contribute to fine particulate.
- The new rule defines a major source as “*one of 28 specific categories listed in the current federal prevention of significant deterioration requirements and (the source) emits more than 100 tons per year (tpy); or if (more than one source) emits 250 tpy or more of fine particulates.*”
- The rule became effective as of July 15<sup>th</sup>, 2008.



# State Rules

- SCAQMD rule in fall 2005 reduced the frequency of compliance tests when verified fabrics are used in the cement industry. They are considering expanding this approach to other sources.
- EPA OAQPS sent a memo in September 2007 to the Regional Offices encouraging actions similar to SCAQMD's rule.



# The Environmental Technology Verification Program (ETV)

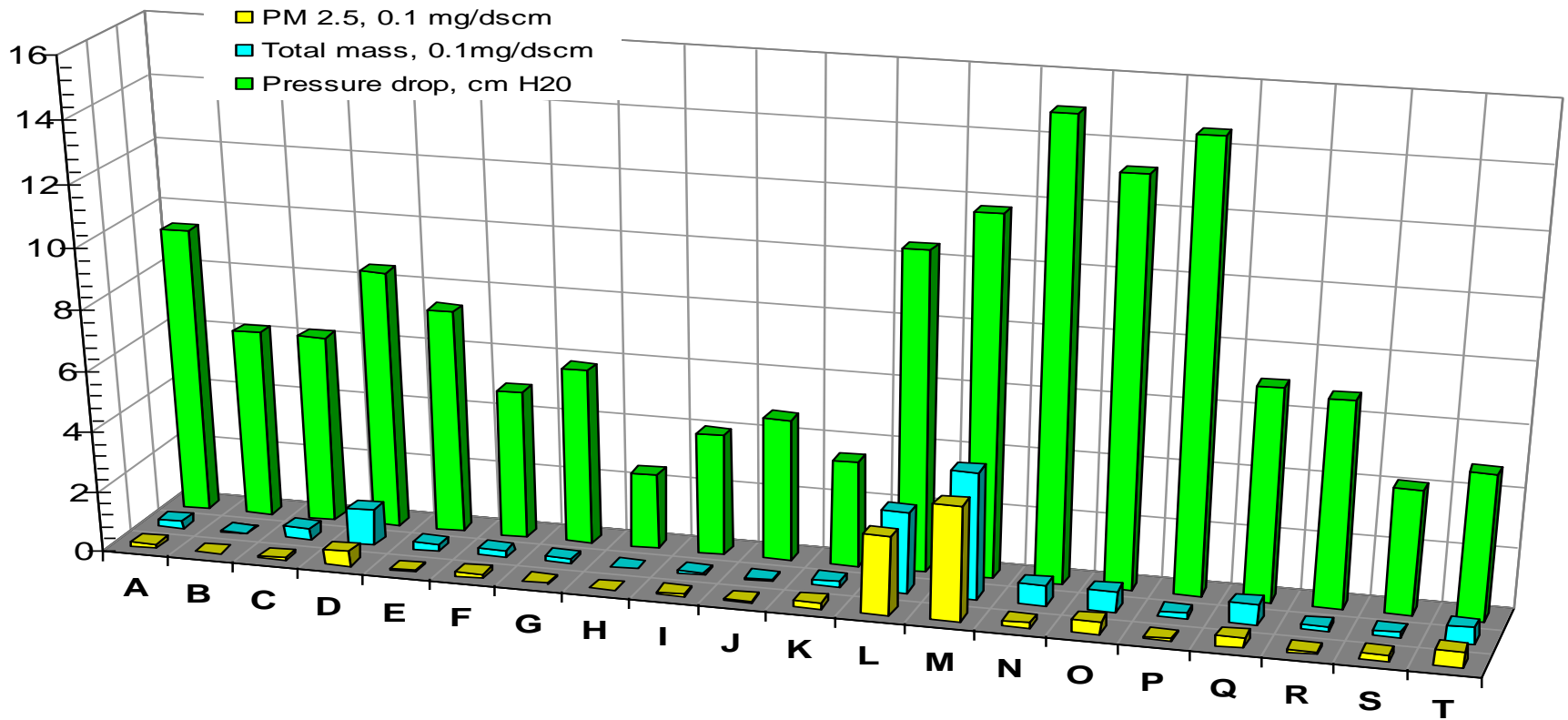
- Started by the U. S. Environmental Protection Agency in October 1995
- Generate independent & credible data on the performance of innovative technologies
- Help organizations, industries, business, states, communities, and individuals make more informed decisions when selecting new environmental technologies.



# Environmental Technology Verification (ETV) Results

A-K membrane

L-T non-membrane



# ETV Future Programs

- Vendors/developers will benefit in that a favorable verification will expedite market penetration for their new and innovative filtration products.
- End users will find the verification statements to be a valuable resource in comparing filter media alternatives and will specify filtration products having favorable verification statements.



# ETV Future Programs

- Products:
  - ◆ Reverse air cleaning
  - ◆ Bonded (vs sewn) bags
  - ◆ Pleated (cartridge) filters
  - ◆ High temperature ceramics and metals
  - ◆ Coated media; e.g., activated carbon
- Vendor specified test conditions:
  - ◆ Dust type
  - ◆ Gas temperature
  - ◆ Gas/cloth ratio





# Typical QA/QC Programs

- What should be done in a typical QA/QC Program for BFPs?
  - ◆ Dimensional and construction inspection of prototype & production bags to verify product specifications
  - ◆ Lab validation of mechanical & physical properties of fabric
  - ◆ Filtration performance testing



# Bag Quality Control Program

## Fabric

- Construction
- Tensile
- Permeability
- Burst
- Flex
- Finish
- Filtration Performance

## Thread

- Material
- Strength

## Hardware

- Caps
- Rings
- Bands

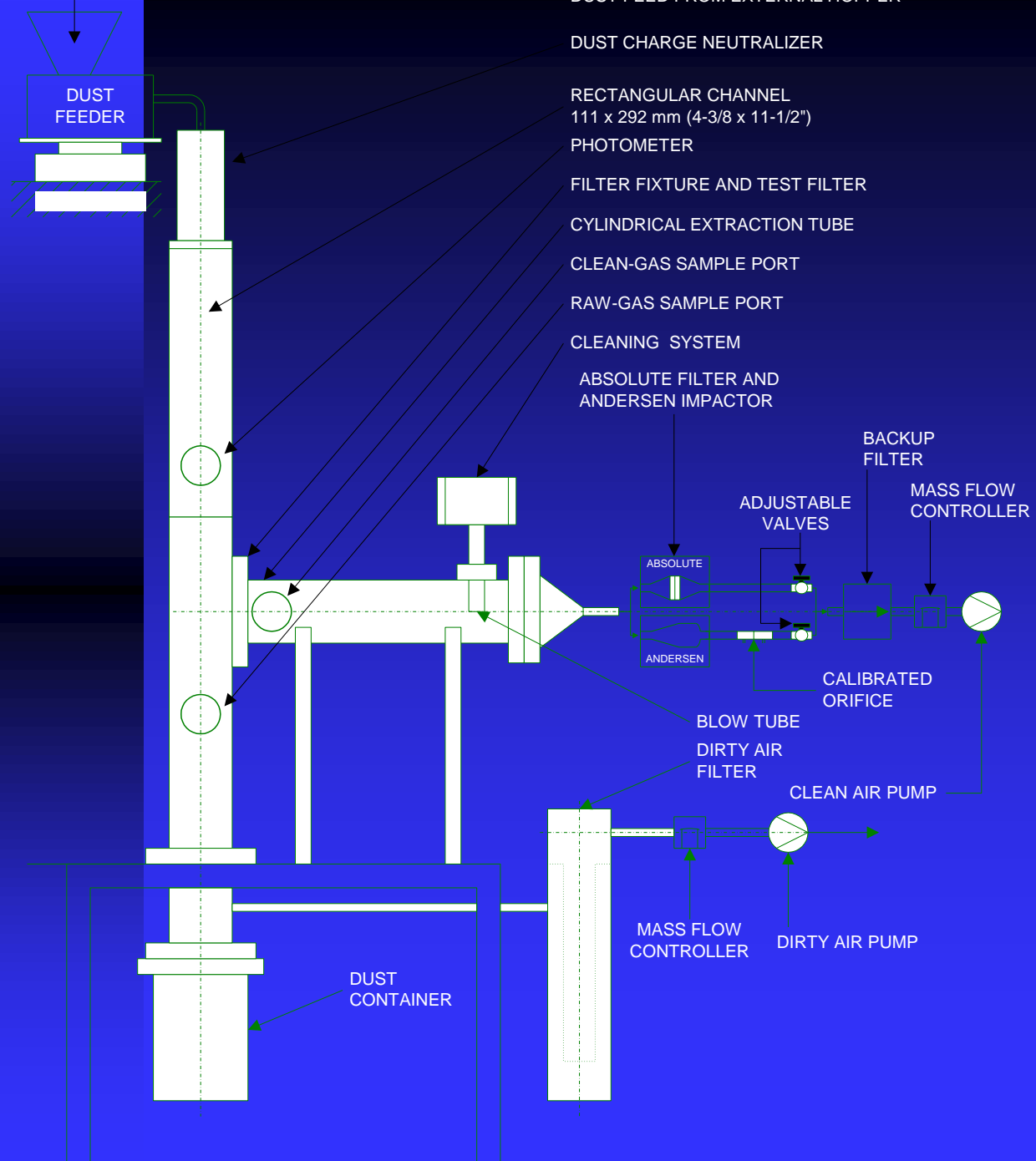
## Bags

- Inspect for general quality of workmanship
- Length as fabricated
- Length under tension
- Cuff to thimble & cap mate



# BFP Test Apparatus

- DUST FEED FROM EXTERNAL HOPPER
- DUST CHARGE NEUTRALIZER
- RECTANGULAR CHANNEL  
111 x 292 mm (4-3/8 x 11-1/2")
- PHOTOMETER
- FILTER FIXTURE AND TEST FILTER
- CYLINDRICAL EXTRACTION TUBE
- CLEAN-GAS SAMPLE PORT
- RAW-GAS SAMPLE PORT
- CLEANING SYSTEM
- ABSOLUTE FILTER AND  
ANDERSEN IMPACTOR



# BFP Verification Parameters

- Outlet fine particle concentration, PM 2.5
- Outlet total particle concentration, total mass
- Residual pressure drop increase
- Average residual pressure drop
- Average filtration cycle time
- Mass weight gain of sample



# PPS Media Specification Example

**Fabric filter bags shall be:**

- PPS felt
- Weight min. 17.0 ounces/yd<sup>2</sup>
- Heat set, calendared & smooth faces
- Mullen burst strength min. of 500 psi
- Shrinkage max 2% (@ 400 °F for 2 hours)
- Permeability 30 ± 8 cfm (@ 0.5 in. H<sub>2</sub>O)
- Filtration Performance



# Filter Bag Quality Assurance/Control

TEST	ASTM METHOD	TEST LEVEL		
		1	2	3
FABRIC				
Thickness	D1777	YES	YES	YES
Tensile Strength	D1682-64	YES	YES	
Warp Fill		YES		
Mullen Burst	D3787-80A	YES	YES	YES
Permeability	D737-75	YES	YES	YES
Organic Content (LOI)	D578-83	YES	YES	YES
MIT Flex	D2176-69	YES		
Warp Fill		YES		
Filtration Performance*	D6830-02	YES	YES	
Microscopic				
THREAD				
Tensile Strength	D4030-83	YES		
Organic Content (LOI)	D4030-83	YES		
* All testing will be in accordance with the EPA Environmental Technology Verification (ETV) protocol for Baghouse Filtration Products (BFP) using ASTM Method D6830-02.				



# Summary & Recommendations

- ETV/BFP has proven to be a very valuable tool for:
  - ◆ facilitating market entry of commercial ready filtration fabrics
  - ◆ verifying vendor filtration performance & pressure drop claims
- ASTM 6830 with more than 100 tests conducted has proven to be:
  - ◆ an essential component of QA/QC programs when purchasing new bag sets
  - ◆ an excellent tool for filtration performance screening of development stage fabric
  - ◆ a suitable test for monitoring long term performance deterioration



# Summary & Recommendations

- There have been a limited number of cases where ETV/BFP & ASTM 6830 have successfully proven to be a regulatory tool in lieu of stack emission testing.
- Both PM 2.5 and total emission test results have consistently shown that the fundamental filtration capability of the vast majority of fabrics tested far exceeds any existing emission control requirement.

