Filter Media Selection for Coal Fired Plants

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October 16, 2008
McIlvaine Company Hot Topic Hour
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$_{2.5}$ Impacts**

- On May 16$^{th}$, 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$_{2.5}$ 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$^{th}$, 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

- PM 2.5, 0.1 mg/dscm
- Total mass, 0.1mg/dscm
- Pressure drop, cm H20
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.

Courtesy of Andrew Trenholm, RTI International
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

Courtesy of Andrew Trenholm, RTI International
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 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$^2$
- 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$_2$O)
- Filtration Performance
## Filter Bag Quality Assurance/Control

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* 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.