

REINHOLD ENVIRONMENTAL Ltd.



2011 APC Round Table & Expo Presentation

July 11-12, 2011, in Cleveland, OH / Hosted by FirstEnergy

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Filter Media Considerations for EGU MACT Compliance

Reinhold Environmental

APC Round Table

Cleveland, OH

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Agenda

- Overview of NESHAPs for Electric Utilities (Simplified)
- Effect on Filter Media
- Achievable PM Limits
- Summary & Conclusions

Overview of NESHAPs for EGUs

Emission Limits for Existing Coal-Fired Boilers (proposed)

Subcategory	Total Particulate Matter	Hydrogen Chloride	Mercury
Coal-fired units designed for coal > 8,300 Btu/lb	0.03 lb/MMBtu	0.0020 lb/MMBtu	1.2 lb/TBtu
Coal-fired units designed for coal < 8,300 Btu/lb	0.030 lb/MMBtu	0.0020 lb/MMBtu	4.0 lb/TBtu (beyond the floor limit)

Emission Limits for New Coal-Fired Boilers (proposed)

Subcategory	Total Particulate Matter	Hydrogen Chloride	Mercury
Coal-fired units designed for coal > 8,300 Btu/lb	0.05 lb/MWh	0.3 lb/GWh	0.00001 lb/GWh)
Coal-fired units designed for coal < 8,300 Btu/lb	0.05 lb/MWh	0.3 lb/MWh	0.04 lb/GWh

NESHAP Summary

- As a result of some plants will have to reduce emission rates
- Companies may have to upgrade or add new air pollution control equipment
 - For PM control, some may need to add fabric filter
 - Some already using fabric filters may need to upgrade to a better performing filter media

Effect on Filter Media

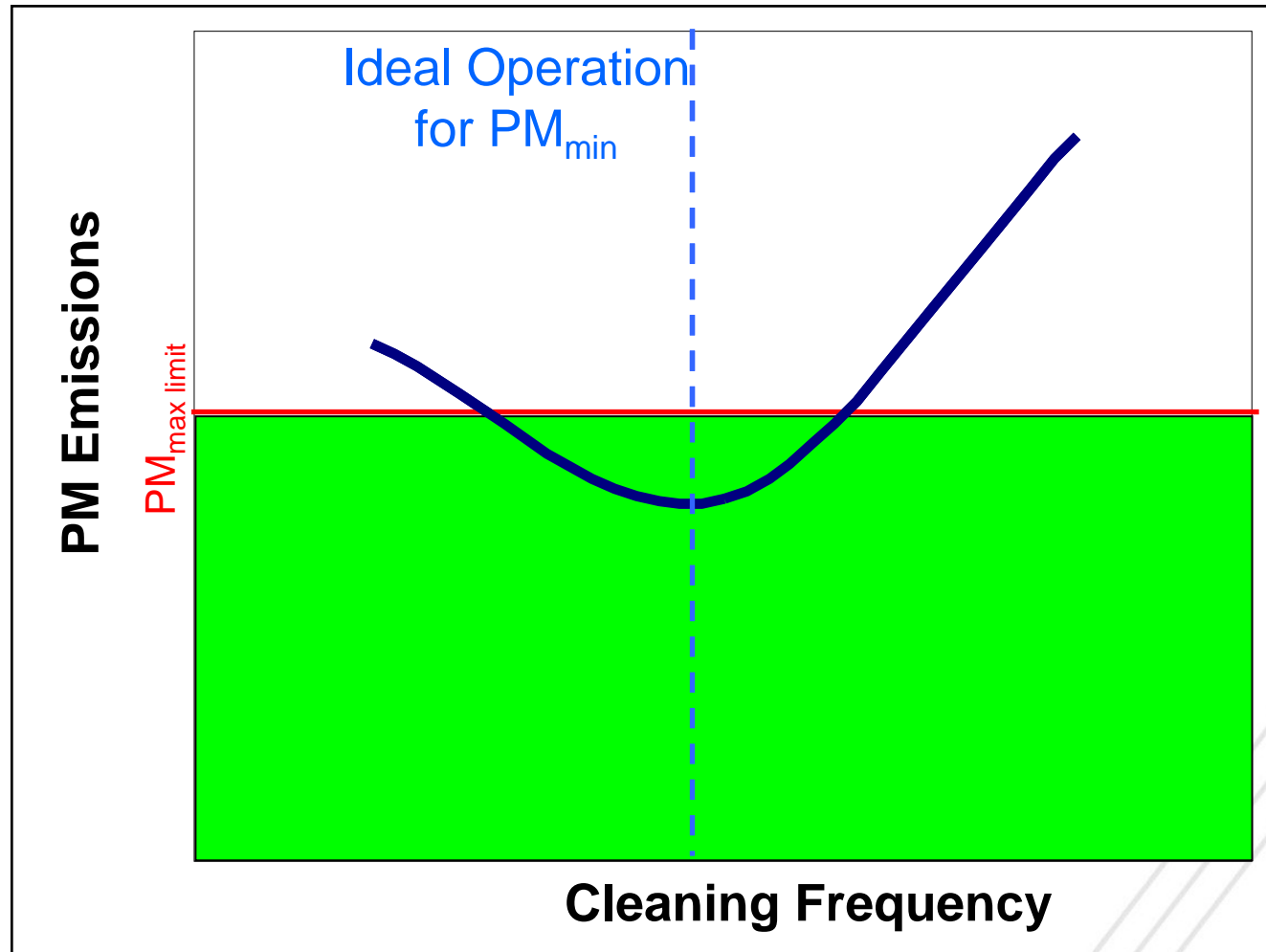
Baghouses on Existing Coal Fired Boilers

- Current filter media should be able to meet the proposed PM standards in a well maintained baghouse
- Marginally performing BH (or FF) systems may have to upgrade to a high performance filter media
 - EPTFE membrane laminate
 - Blended fiber felts
 - Other surface treatments

Dry Sorbent Injection with Existing BH (or FF)

- The addition of Dry Sorbent Injection for HCl control will increase the dust loading to the baghouse and lead to more frequent cleaning
 - More cleaning cycles will lead to shorter bag life
 - PM emissions may increase as a result of increased cleaning frequency
- Need to evacuate hoppers more often or even increase the capacity of the ash conveying system

PM Emission Rate vs. Cleaning Frequency



Activated Carbon Injection for Hg Control

- Use the existing BH (or FF) and lose the revenue from fly ash sales?
- Add a new FF after existing BH (or FF) for ACI system?
- May need to evacuate hoppers more often to avoid hopper fires related to storing PAC in hoppers

Achievable PM Limits

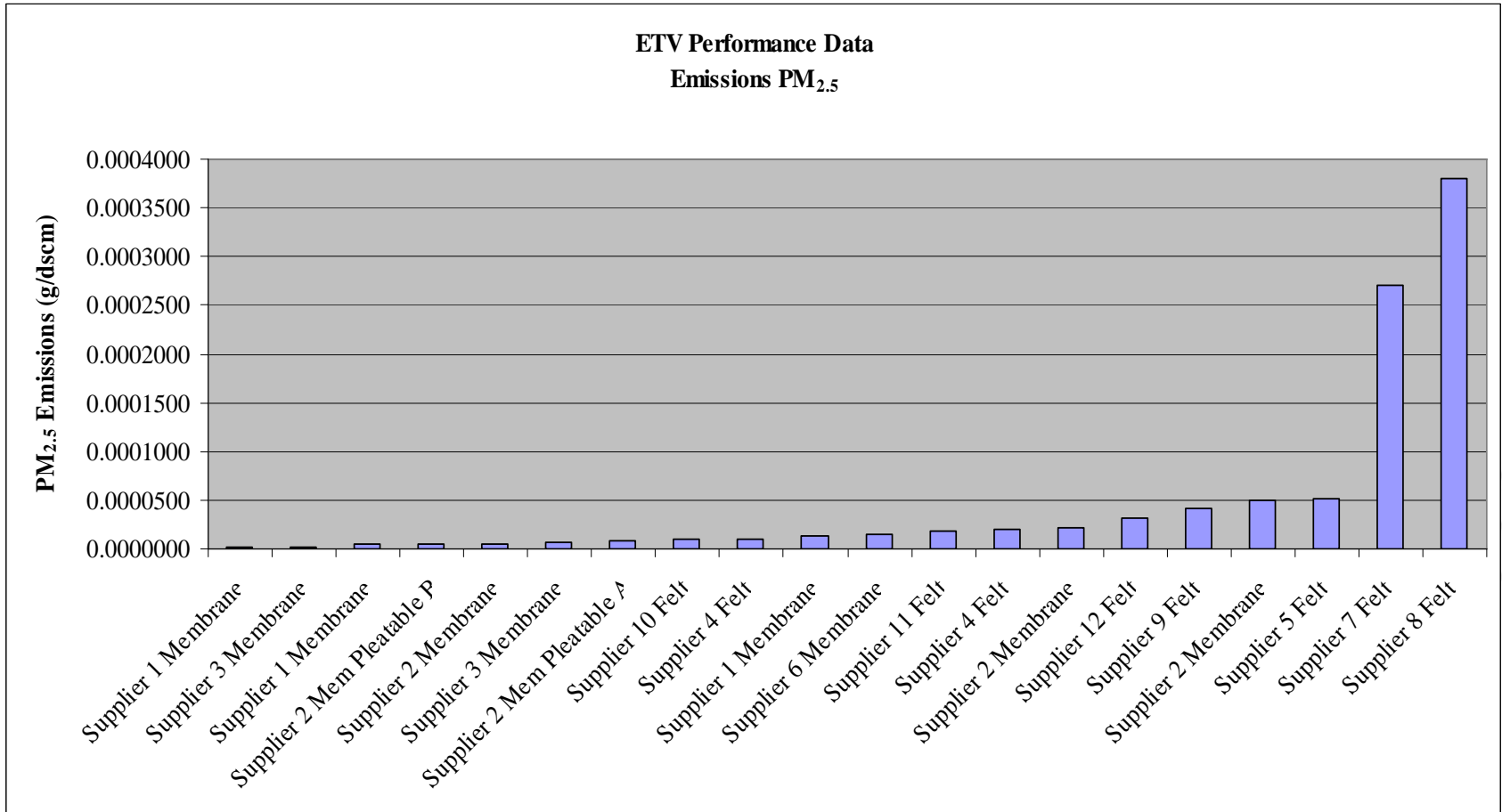
Achievable Emissions with Filter Media

- Sample calculation for an **existing** coal fired 500 Mw boiler (assume 10,000 BTU/KWh & 2,000,000 acfm)
 - Heat Input = 5,000 MMBTU/hr
 - Allowable PM = (.03 lb/MMBTU x 5,000 MMBTU/hr)
= 150 lb/hr
 - $[150 \text{ lb/hr} \times 7000 \text{ grains/lb} \times (1 \text{ hr}/60 \text{ min})] / 2,000,000 \text{ ft}^3/\text{min} = 0.0088 \text{ gr/acf}$ (approx 20 mg/m³)
- Common filter media should be able to achieve less than 10 mg/m³ of “solid” particulate

Achievable Emissions with Filter Media (Cont'd)

- Sample calculation for an **new** coal fired 500 Mw boiler (assume 9,000 BTU/KWh & 2,000,000 acfm)
 - Heat Input = 4,500 MMBTU/hr
 - Allowable PM = (.05 lb/MWh x 500 MW) = 25 lb/hr
 - $[25 \text{ lb/hr} \times 7000 \text{ grains/lb} \times (1 \text{ hr}/60 \text{ min})] / 2,000,000 \text{ ft}^3/\text{min} = 0.0014 \text{ gr/acf}$ (approx 3 mg/m³)
- Common filter media should be able to achieve less than 10 mg/m³ of “solid” particulate;
3 mg/m³ may be a challenge

US EPA ETV – PM_{2.5} Emissions for all verified products



Achievable Emissions with Filter Media (Cont'd)

- The problem is the new PM emission standards are based on total PM (solid and condensables)
- No “normal” filter media (by itself) will capture gases or vapors that can react or condense in the back half of the testing train
- If you need to reduce the condensables, you need to control the precursors (NH_3 , NO_x , SO_x , VOCs)

Achievable Emissions with Filter Media (Cont'd)

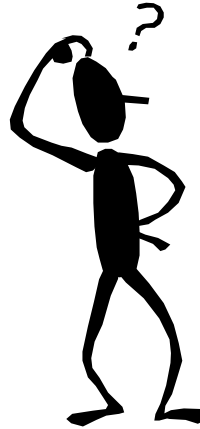
- EPTFE membrane is capable of achieving PM emissions to levels less than 1 mg/m³ (solid PM)
- This lower “front half” catch may provide additional margin for condensables
- EPTFE membrane will not capture gases or vapors that can react or condense in the back half of the testing train
- If you need to reduce the condensables, you need to control the precursors (NH₃, NO_x, SO_x, VOCs)

Summary & Conclusions

Summary & Conclusions

- USEPA EGU NESHAPS will likely lead to upgrading air pollution control systems (including PM control) for some existing power plants
 - Some existing systems will need to upgrade to a higher performing filter media
 - Some will need to add new BH (or FF) systems
 - Some may switch to alternative fuels or shutdown
- New PM standards will be based on total (solid and condensable) PM
- High performance filter media may provide some margin for condensables
- No normal filter media will capture gases or vapors
- If you want to reduce condensables you will need to reduce the precursors

Questions?



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