Improving ESP Performance

Introduction

• This presentation will focus on evaluating existing precipitators ability to meet proposed Utility MACT regulations.

• The majority of existing ESP’s are not operating under their original design basis.

• Numerous operating ESPs have not been upgraded with modern operating philosophies or equipment.

• A holistic approach in evaluating the precipitator’s current operating parameters to permit a viable plan forward.

• Many Important operating parameters have been modified as additional post combustion control equipment like SO3, NOx, and Hg control have been incorporated over the last few years.
Evaluate Existing ESP

- Original Design
  - Fuel, Gas Flow, Efficiency
  - Velocity, Treatment Time, Aspect Ratio
  - Electrical Energization and Sectionalization
  - Rapping Sectionalization
  - Basic Footprint
- Establish current baseline flow conditions with flow model
Evaluate Existing ESP

• Current Process
  • Fuel, Gas Flow, Efficiency
  • Any upgrades to ESP?
  • Review recent stack tests
  • Review/Perform complete Internal Inspection
  • Has equipment been added:
    • SCR, FGD, FGC
  • Particle Size Distribution
  • Review maintenance program
  • Quantify performance impacts in computer model
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To Achieve 0.020 lb/mmBtu Efficiency

• Improve Uniformity of Gas Entering Precipitator
• Increase Migration Velocity of Particle
• Increase Gas Treatment Time/Decrease Gas Velocity
• Reduce Reentrainment from Rappers, Hoppers, etc.

Quantify performance impacts with models for each option or combined options
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Improve Uniformity of Gas Entering ESP

• Establishes foundation for all other improvements to be maximized

• Internal Inspection
  • Review Flow Patterns on Devices
  • Record Data

• Physical Model Study
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Increase Migration Velocity of Particle

• Voltage and Voltage – Increase Voltage

• Mechanical Limitations
  • Improve Clearances
  • Increase Plate Spacing

• Electrical Limitations
  • Improve Power Supply (new high frequency power supplies)
  • Improve Electrical Sectionalization
  • Upgrade Discharge Electrodes

• Gas Conditioning in high resistivity cases
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Increase Gas Treatment Time/Decrease Gas Velocity

• Reduce Excess Air
  • Door Gaskets
  • Casing Holes
  • Duct Holes

• Review/Lower Gas Temperature

• Increase Length or Height
Reduce Reentrainment

- Optimize Rapping Sequence
- Increase Sectionalization
- Upgrade Rapper Style
- Review Hopper Evacuation System
- Improve Gas flow in hopper areas
- Gas Conditioning
Conclusion

• No “one size fits all” approach to proposed Utility MACT

• New Technologies and Philosophies are available

• Whether considering a new ESP chamber or upgrading an existing ESP, if properly sized and maintained it will provide for many years of reliable operation in meeting ever increasing regulation.

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