Flue Gas Testing and Probes

WPCA Seminar
August 24, 2016
Agenda

- Introduction
- Test Methods
- Velocity, Pressure, Temperature
- Particulate Sampling
- Gas Sampling
- Specialty Applications
Many aspects of plants require flow testing
- Air, gas, liquid, steam, particulate
- Fans, ducts, air heaters
- Mills, coal pipes, burners, boiler
- ESPs, PJ FFs, SCRs, FGD, stack
- Fan to stack and beyond ...

Many reasons to test
- Performance optimization
- O&M Cost reduction
- Diagnostic, solving problems
- Emissions compliance
Flow Testing Focus

- Performance
  - Flow uniformity, mixing
  - Combustion optimization
  - Ash capture / deposition / pluggage

- O&M Costs
  - Pressure drop
  - Chemical / sorbent costs

- Maintenance
  - Erosion / corrosion
  - Pluggage
  - Vibration

- Compliance
  - Stack testing
  - CEMS calibration
Test Methods

- Flow basics
  - Pressure, Velocity, Temperature
  - Particulate Sampling
  - Gas Sampling / Chemical Species

- Industry test codes
  - ASTM
  - ASME
  - EPA
  - ISO

- Specialty tests
  - Variations of above
  - Performed for diagnostic/optimization, not compliance
Velocity, Pressure, Temperature

- EPA Method 1 - Test port location, quantity of traverse points
- EPA Method 2 - Velocity with S-type pitot probe
Velocity, Pressure, Temperature

- EPA Method 2F - Velocity with 3D pitot
  - Increased accuracy over 1-D probe
  - Subject of current EPRI and NIST research

- Automated test systems
  - Reduce user influence and biases
Purpose of 3D testing versus 1D
- Flow misalignment with probe can mean velocity measurement is biased
- Has direct impact on measured flow rate
- Flow rate has linear impact on emissions rate
Particulate Sampling

- EPA Method 5 and 17
  - Simultaneous velocity & sampling
  - Isokinetic sampling
- ESP/PJ FF performance testing
- Stack PM testing, PM CEMs cal
Particulate Sampling

- Coal pipe testing / combustion optimization
  - Velocity with Dirty Air Pitot probe
  - Sampling with Isokinetic Extraction probe
- Manual or Automated methods
- ISO or ASME procedure
Gas Sampling

- Boiler tuning
- Inleakage detection
- SCR tuning
- Compliance / stack testing
Specialty Applications

- Water cooled probes for high temperature
- Gas sampling - HVT probe
- 3D pitot
Specialty Applications

- Online inspection cameras
  - Inspections
  - Diagnosing issues
Conclusions

- There are many test methods, probes, and options
- Choose wisely
- Go for extra accuracy and repeatability
- Minimize user error and bias
- Automate where possible
- If not an official compliance test, make up a better method
Questions

- Thank you

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