
Field Test Programs to Evaluate EGU MACT Compliance Strategies

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The Quote of 2012 will be...

- ◆ “Hmmm, I’ve never seen it act like that before.”
- ◆ May not need to test every unit, but some testing is strongly encouraged.

Designing an AC/DS Test Program

- ◆ Design a test program that fits the source
- ◆ Design a Program that will yield results applicable to other units
 - May have some restrictions that will limit the applicability of some or all test results
 - May still need to test other units.

Designing the Test Program

◆ Must Consider:

- Types of units
- Size of units
- Types of fuel(s) combusted
- Possible injection locations
- Existing and planned control devices
- Types of dry sorbents (DS), activated carbon (AC) and fuel additive materials

AC and Fuel Additives

- ◆ Calcium Bromide - (CaBr_2)
 - ~50% Solution fuel additive
- ◆ Powdered Activated Carbon - (PAC)
- ◆ Brominated PAC - (BPAC)
 - Milled BPAC - (MBPAC)

DS Additives

- ◆ Hydrated Lime – $[\text{Ca}(\text{OH})_2]$
- ◆ Sodium Bicarbonate $[\text{NaHCO}_3]$
 - Always milled – otherwise it's too granular
- ◆ Trona – $[\text{Na}_3(\text{CO}_3)(\text{HCO}_3) \cdot 2\text{H}_2\text{O}]$
 - Milled and unmilled
- ◆ Typically takes 30 – 50% more unmilled trona to match the performance of milled trona.

Factors Impacting Results

◆ Unit Configuration

- Residence Time
- Mixing
- Control Devices

◆ AC/DS Materials

- Type of Sorbent
- Size (milled or unmilled)
- Injection Rates
- Use of a Fuel Additive

Factors Impacting Results

- ◆ Fuel/Exhaust Gas Compositions
 - Acid Gas Concentrations
 - Metals Content
 - LOI (Carbon Content)

Prevailing Thoughts and Observations

- ◆ Fuel Additives are not for everybody
 - Not very promising for bituminous coals
 - If LOI in fly ash is very low
- ◆ For some Subbituminous sources (with low SO_3), fuel additives with PAC may be effective -- injected upstream of a scrubber and maybe upstream of DS.

Prevailing Thoughts and Observations

- ◆ Head-to-head, sodium bicarbonate should perform better than trona; however, ...
 - Sodium bicarbonate decomposes at higher temperatures – cannot be used upstream of the air preheater.
 - With good mixing and longer residence times using trona – SO₂ removals ~95%
 - With limited mixing and shorter residence times using sodium bicarbonate - SO₂ removals ~80%.

Prevailing Thoughts and Observations

- ◆ Inject DS first
- ◆ Then, inject AC – especially for bituminous coal
- ◆ Should have a 1 second (minimum) residence time between injection locations
- ◆ DS appears to affect AC performance
- ◆ Have not found any Hg in DS materials
 - Had heard from others that this might be an issue

Prevailing Thoughts and Observations

- ◆ Try to limit projects to “best” options
- ◆ If possible test fewer options for longer periods of time.
- ◆ It takes awhile for the process and emissions to settle after changing the test conditions.
- ◆ Long-term effects on ESP performance and ID fan O&M are really unknown at this point
- ◆ Trona and hydrated lime are “softer” and will cause less wear on fan blades

Emissions Test Planning

- ◆ Hg CEMS data are often not very good at low concentrations (e.g., $<1.0 \mu\text{g}/\text{scm}$)
- ◆ Still – Hg CEMS serve as a good, real-time indicator
- ◆ Must pay attention to the details
 - Zero and span drift – Periodic Hands-off cals
 - Hg^{2+} calibrations
 - NIST traceable standards
 - Air/ N_2 Quality, pressure and temperature stability

Emissions Test Planning

- ◆ RM 30B testing at high temperatures (> 400 °F, or so) and/or high particulate matter (PM) concentrations will not yield useful results.
 - Even with an air cooled probe.
 - The analyzer is temperature sensitive
- ◆ Recommend running RM 30B tests at the stack in conjunction with the Hg CEMS
- ◆ Speciated and total gaseous Hg traps will work well at the stack

Emissions Test Planning

- ◆ Confirm PM and Metals emissions
- ◆ PSD considerations for PM
 - Depending on control device performance
 - With DS, may increase PM inlet loadings by 50 – 100% or more.
- ◆ Extended metals tests are required (typically 4 to 6 hours is needed)
- ◆ Comprehensive fuel and ash sample collection

Other Considerations

- ◆ Could a plant use DS in conjunction with a “marginal” scrubber
- ◆ Give yourself time to optimize the AC/DS system following permanent installation
- ◆ Must consider the impact on ash quality
 - Sellability
 - Disposal

Ash Leaching Issues

- ◆ Sodium in the ash may increase metals leaching by 10 – 20%
 - Probably not an issue with subbituminous
 - For bituminous coals, if the leaching is already close to being an issue, you may have a problem – especially with As and Se