MACT/MATS Compliance

- Limit of 0.03 lb/Mbtu for filterable particulate
  - EPA excluded condensable fraction
- ESP performance at these low emissions levels dependent on a number of factors
  - ESP Optimization must approach ideal conditions more closely than for previous requirements
  - Upstream equipment dictate inlet conditions
  - Injected sorbents can have a significant effect

Observed ESP Performance

- Most Effective ESP Upgrades
  - Installing high frequency power supplies
  - Increasing the degree of electrical sectionalization
  - Optimizing the gas flow distribution for an ESP
- ESP performance insensitive to plate spacing
  - 9 inch rebuilds are producing very low emissions
  - 16 inch rebuilds are producing very low emission
- The “size” of an ESP needed to meet the new limit keeps getting smaller

SO_3/Sorbent Related Issues

- Upstream equipment impacts ash layer resistivity
  - SO_3 concentration a major factor controlling resistivity
  - Allowable SO_3 "window" dictated by:
    - SCR catalyst's SO_2 oxidation can produce high SO_3 levels
    - Hg sorbent (ACI) efficiency begins to drop at about 3 ppm of SO_3
    - Depending on moisture, ash type, temperature, 3 ppm of SO_3 is close to the minimum required for ash conditioning
    - Accurate SO_3 control, probably by sorbents, is imperative
  - Sorbents incident on ESP a secondary issue
    - Sorbent particle size generally large, easy to capture
    - ACI injection rates minimal, generally don't impact ash resistivity, re-entrainment from hoppers can be an issue however
    - Sodium based sorbents appear to enhance ash conductivity
    - Calcium sorbents only an issue if SO_3 drops too low

Sectionalization

- Good sectionalization is a common characteristic of all small, highly efficient ESPs
  - For any given SCA, increased efficiency is realized by increasing sectionalization
  - This correlation holds for both 60Hz and HF power supplies
- Sectionalizing with respect to gas flow preferred
  - Allows energization to more closely follow grain loading
  - Electrically extends the effective length of the ESP
  - Minimizes rapping losses

Gas Flow Optimization

- Non-ideal ESP factors previously tolerated must be optimized
  - Sneakage above and below collecting electrodes, hopper re-entrainment
  - Non-uniform velocity profiles across ICAC plane, should be within 10% RMS
  - Temperature & particulate stratification (mixing)
- ESP performance at low emission rates is inherently limited by the worst actor of the above factors

Summary

- ESPs significantly smaller than 300 SCA on a 9” center basis have been demonstrating sub-MATS emissions
- Keeping ash resistivity in the 10^9ohm-cm range common to most small, high performers
- Intermittent energization with HF power supplies is beginning to show promise with higher resistivity ash
- PCT is uniquely positioned to evaluate all these factors and predict performance and available improvement potential for your ESP