Modifying Ash Resistivity and Improving ACI Performance for Mercury Control with Liquid Flue Gas Conditioning

McIlvaine Hot Topic
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ADA Environmental Solutions creates and delivers cutting edge technical and chemical solutions to reduce emissions from coal-fired power plants, Portland cement kilns and industrial boilers, helping customers meet environmental goals while balancing their business needs.

NASDAQ: ADES
ADA Experience with FGC and ESPs

• Have been providing flue gas conditioning systems for ESPs since 1997
• Recognized experts in ESP troubleshooting and performance evaluations
  – In house tools for resistivity measurement and ESP modeling
  – Provide support with specification, selection and start-up of ESPs and baghouses on utility boilers
Typical Temperature Resistivity Relationship

- Surface Resistivity
- Volume Resistivity
- Optimum
- Too Low
- Too High

Resistivity (ohm.m)

Temperature (°F)
FGC: How It Works

• Resistivity modification of particulate layer
  – Resistivity mid-$10^9$ to $<10^{11}$ ohm-cm is optimal
  – Too high ($>10^{11}$ ohm-cm yields poor charging and/or back corona
  – Below $10^9$ yields maximum ESP power but can increase reentrainment

• Provides ability to vary injection rate with varying ash characteristics and operating conditions

• Liquid spray injection of chemical additives
  – Flash evaporation of additive spray droplets
  – Co-deposition onto ESP collection plates
  – Electrical conductivity through surface moisture on particles improved via chemical alteration
Liquid FGC Chemical (ATI-2001™)

- Effective resistivity modifier w/PRB or bituminous fly ash
- As-needed injection for problem coals
- Long-term conditioning as SO₃ replacement
- Effective temperature range 250 to 500°F
- Does not interfere with activated carbon for Hg control
- Does not affect the ability to sell the fly ash
ESP Response with LFGC

- Precip Opacity
- Total Sec KW
ESP Response with LFGC

Load (MW/100) and Opacity (%)

Precipitator Amps

Precipitator amps - Opacity - Load

LFGC on
Impact of SO$_3$ on PAC Performance

![Graph showing the impact of SO$_3$ on PAC performance. The graph plots the percentage removal against injection concentration (lb/MMacf) for different SO$_3$ concentrations: 0 ppm, 5 ppm, and 10 ppm. Each concentration line shows the trend of % removal with increasing injection concentration.](image-url)
Chemical Injection Skid
Liquid Distribution Manifold
Injection Lance Grid
LFGC as Replacement for SO$_3$

- ATI-2001 designed for utility ESPs and has been in commercial use for over 10 years
- Recently completed several successful demos with ATI-2001 LFGC as an SO$_3$ replacement
- Low cost, small foot print injection equipment
- One customer using ATI-2001 with activated carbon and achieving > 90% Hg control
  - Opacity levels maintained
  - Activated carbon usage reduced for mercury control
Summary

- SO$_3$ impacts the performance of PAC for Hg control
- ADA offers an alternative resistivity modifying chemical and injection system
  - Demonstration equipment available for short-term tests
  - Equipment lease w/purchase option
  - Permanent injection system
Creating a Future with Cleaner Coal

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Equipment

- Low cost, small footprint
- Low utility power requirements
- Injection equipment connected to plant controls
- Includes: chemical storage tank, injection skid, transport piping, chemical and compressed air distribution manifold, injection lances, shield air blower