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New SO₃ Issues In Dry Electrostatic Precipitators

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Eastern Plants with SCRs Firing Medium to High Sulfur Fuels

- Cause high SO_3 levels at DESP inlets
- Even after 25% to 35% is removed in the Air Heater
- SO_3 levels vary across the inlet of the DESP due to the temperature profile



Result in the Following:

- Increased opacity readings at several sites even prior to quenching in the Wet FGD System

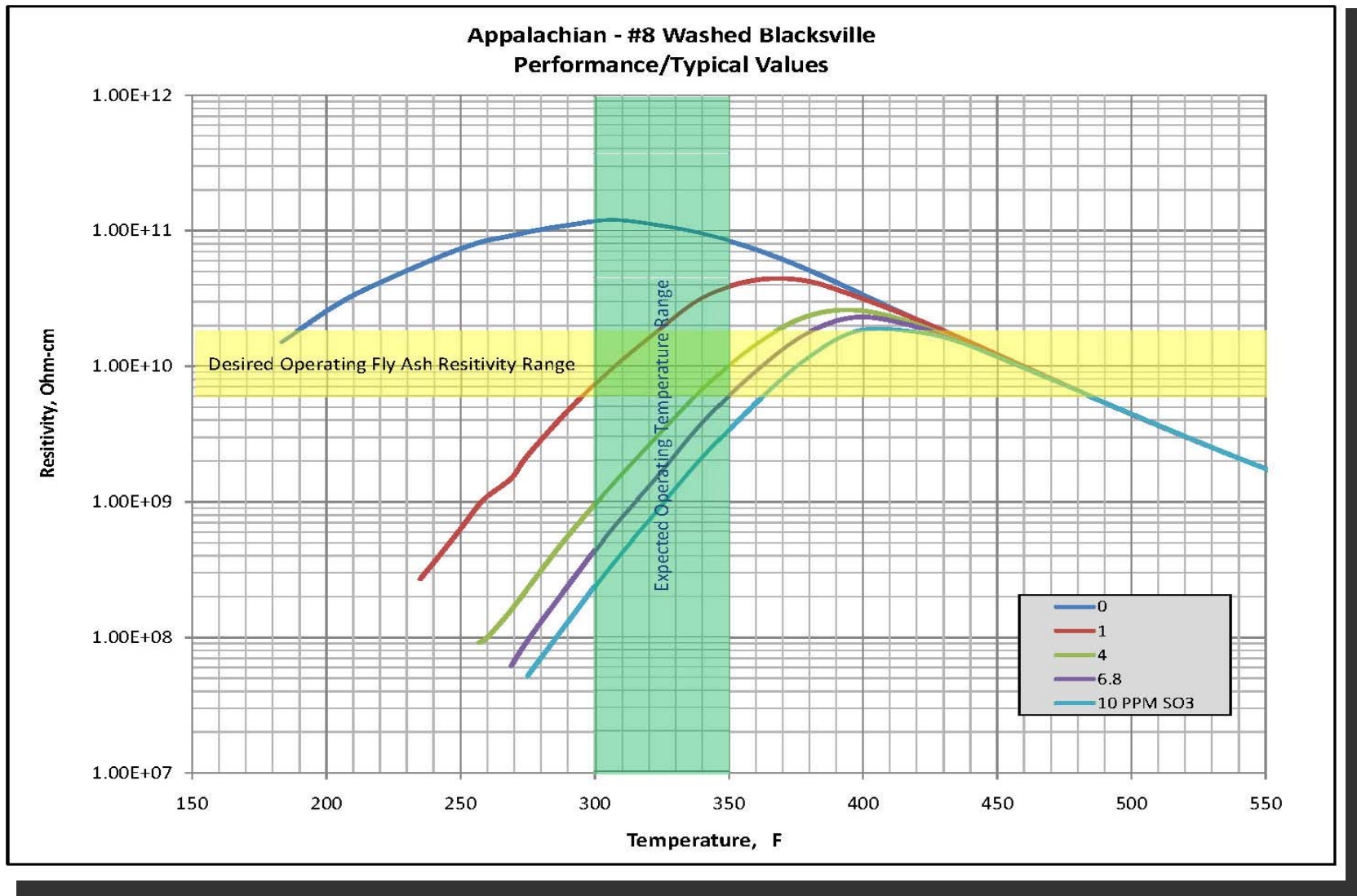
Average Coal and Ash Analysis

Parameter	Performance
Ultimate Analysis	
Ash, % weight	7.73
Moisture, % weight	5.71
Carbon, % weight	72.67
Hydrogen, % weight	4.89
Oxygen, % weight	4.96
Nitrogen, % weight	1.38
Sulfur, % weight	2.56
Chlorine, % weight	0.10
Total, % weight	100.0
HHV, Btu/lb	13,100
Proximate Analysis	
Ash, wt. %	7.73
Volatiles, wt. %	35.73
Fixed Carbon, wt. %	50.84
Sulfur, wt. %	2.56
Moisture, wt. %	5.71
Lb SO ₂ /MMBtu	3.91

Ash Analysis	Typical
SiO ₂ , % wt.	43.17
Al ₂ O ₃ , % wt.	21.95
Fe ₂ O ₃ , % wt.	21.17
CaO, % wt.	5.18
MgO, % wt.	0.90
Na ₂ O, % wt.	1.06
K ₂ O, % wt.	1.45
TiO ₂ , % wt.	0.93
P ₂ O ₅ , % wt.	0.59
SrO, % wt.	
MnO ₂ , % wt.	
SO ₃ , % wt.	4.28
BaO, % wt.	
Undetermined, % wt	0.0

Example

- Using a 1% conversion in the boiler and 1% conversion in the SCR results in a value of 32 ppm SO₃ at the inlet of the Air Heater
- Estimated SO₃ capture in the Air Heater is approximately 30%.
- Therefore 22 ppm SO₃ is expected at the DESP inlet





Analysis of Resistivity Curve

- The resistivity curve shows expected resistivity values at various SO_3 levels and temperatures
- Remember that SO_3 levels follow the temperature gradient in the DESP
- Therefore, it can be understood that the most probable cause of higher opacity levels is low resistivity in some or all sections of the DESP



Possible Solutions for Opacity Issues

- Raise the average inlet temperature for the DESP
- Possible mixing of the flue gas maybe possible on some plants to raise the temperature to the DESP
- Add sorbent injection to reduce the SO_3 concentration
- Larger current density T/R sets may be beneficial



Other Potential Operating Problems

- Higher currents required for low resistivity operation
- Potential corrosion issues on cold areas and clean surfaces in the DESP
- Potential insulator tracking due to higher SO_3 levels in the DESP



Ways to Minimize Corrosion Issues

- Operate at higher DESP inlet temperatures
- If the DESP is conservatively sized, spoiling the performance of early fields could provide more active sites to absorb SO_3 in later fields
- Use sorbent injection to reduce SO_3 levels
- Review the condition of the DESP insulation and details for adequacy



Insulator Tracking Potential

- Review insulator purge system for adequacy based on the fuel being fired
- Proper flow distribution, air filter cleanliness and piping insulation are essential



Thank You!

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