



 ALBEMARLE® | Sorbent Technologies



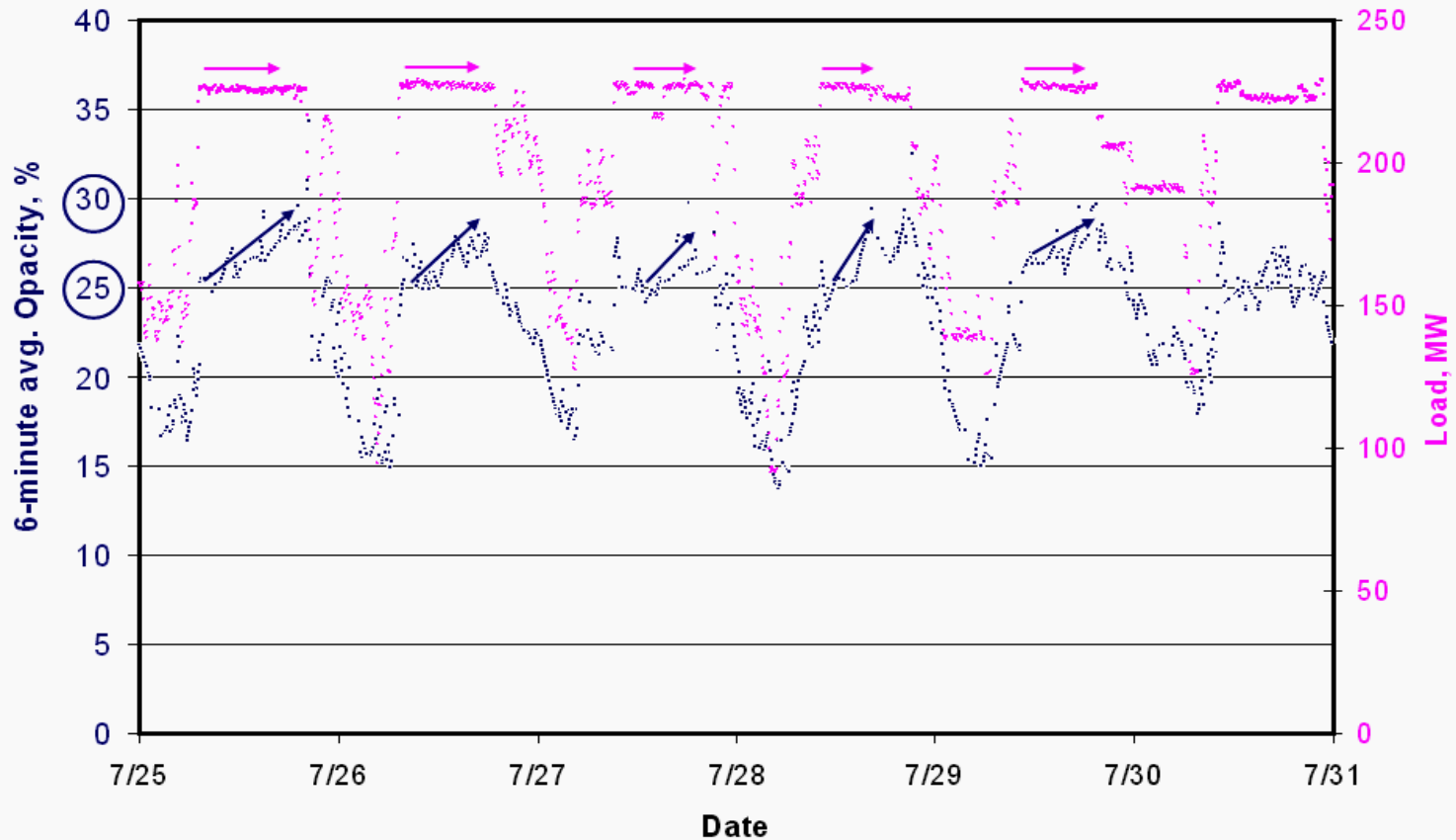
Gas-Phase Brominated PAC for ESP Performance Improvement

Baseline Opacity



Opacity vs Load - Illinois Crawford 7 - late July 2006

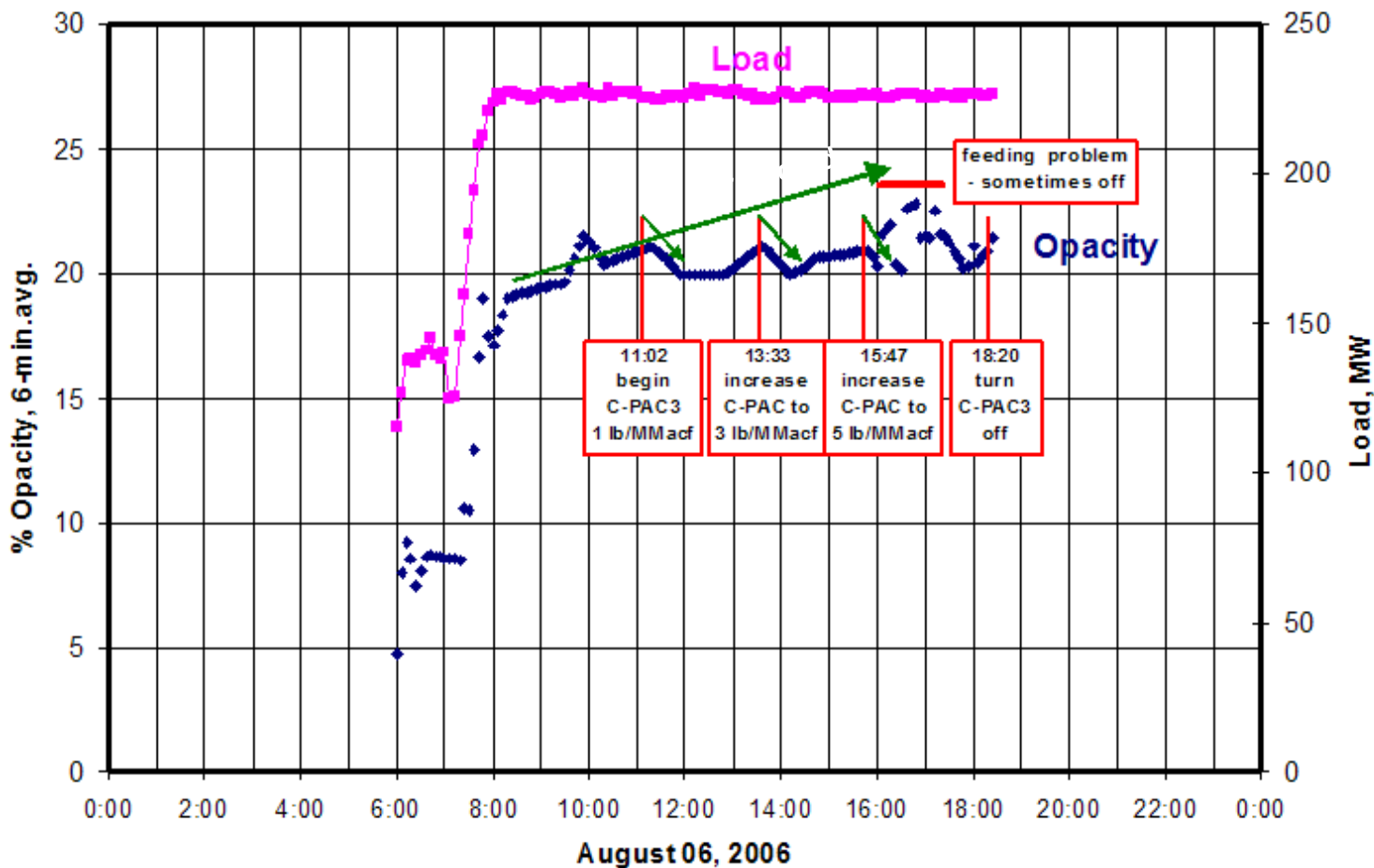
opacity tends to increase ~4% with time at full load [DOE preliminary]



Opacity with B-PAC Improved

Hg

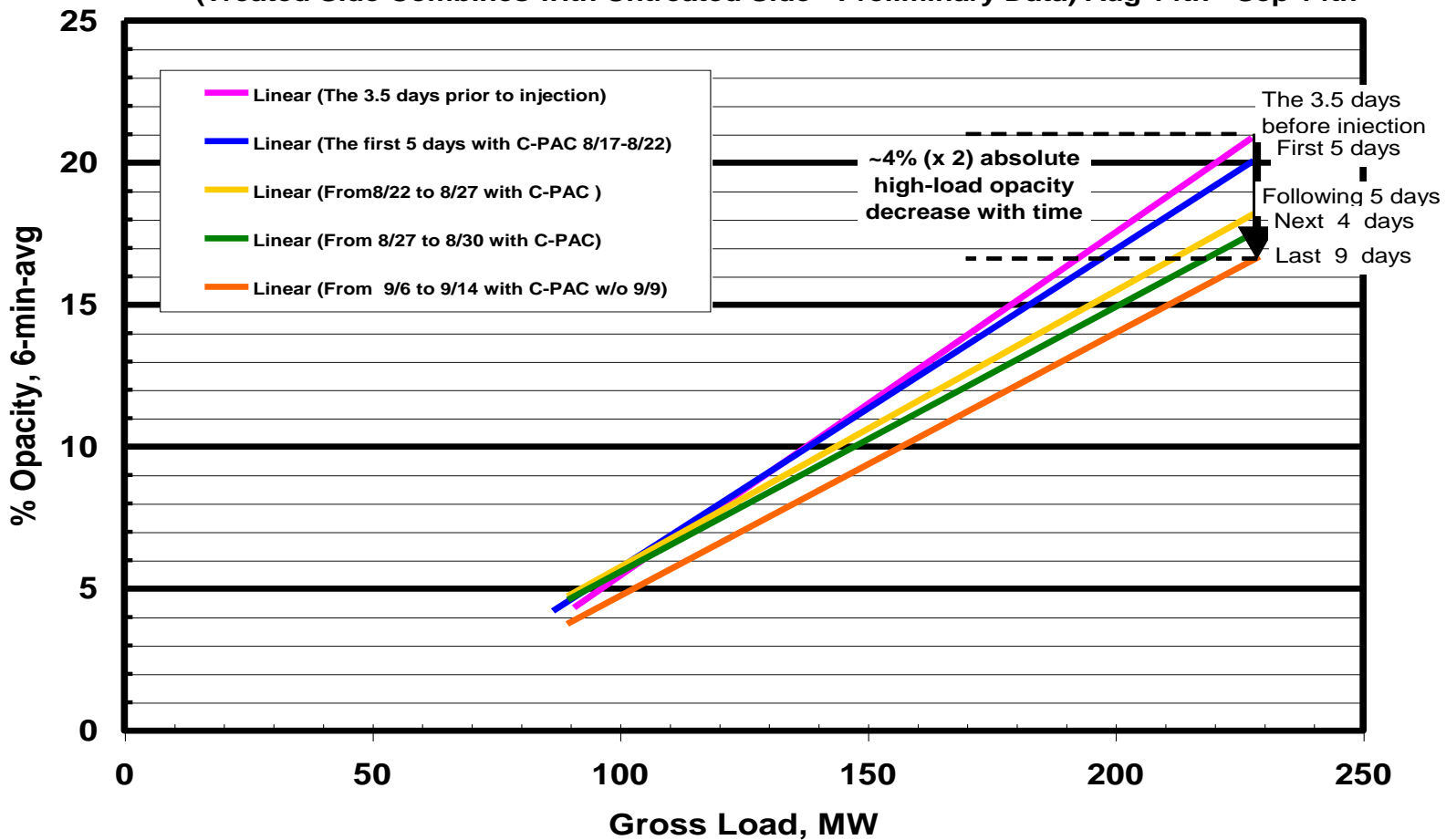
Opacity vs Load, MWGen Crawford Plant, Illinois, Parametrics



8% Abs. Opacity Improvement



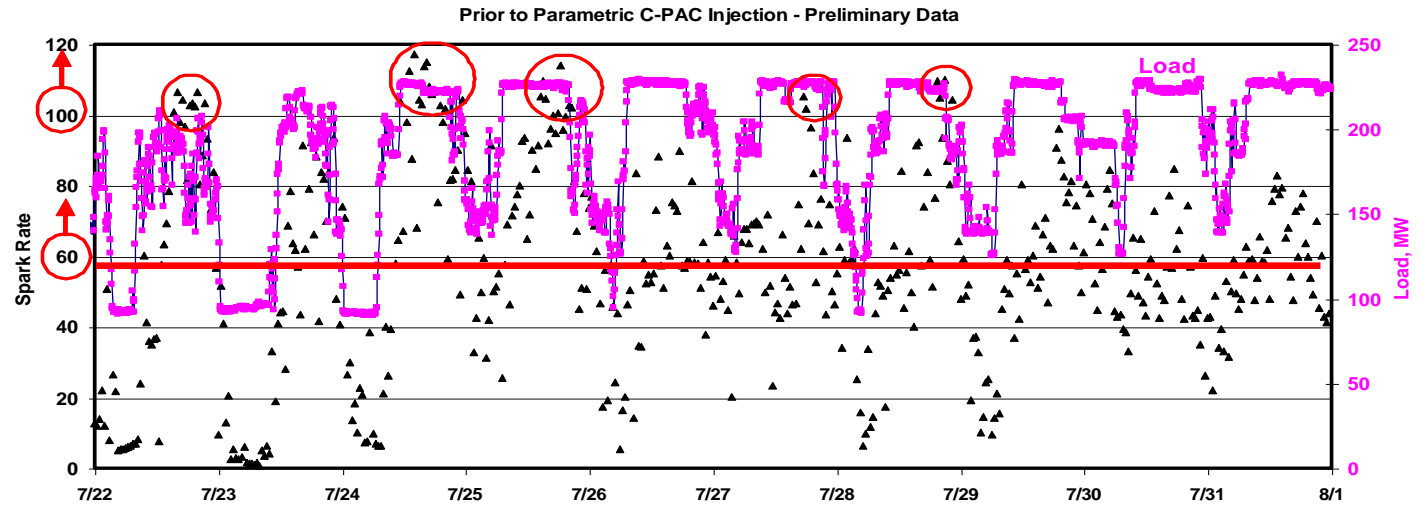
Regression Lines of Opacity vs Load with C-PAC Injection,
Midwest Generation Crawford Station Unit 7, PRB Coal & 120 SCA ESP
(Treated Side Combines with Untreated Side - Preliminary Data) Aug 14th - Sep 14th



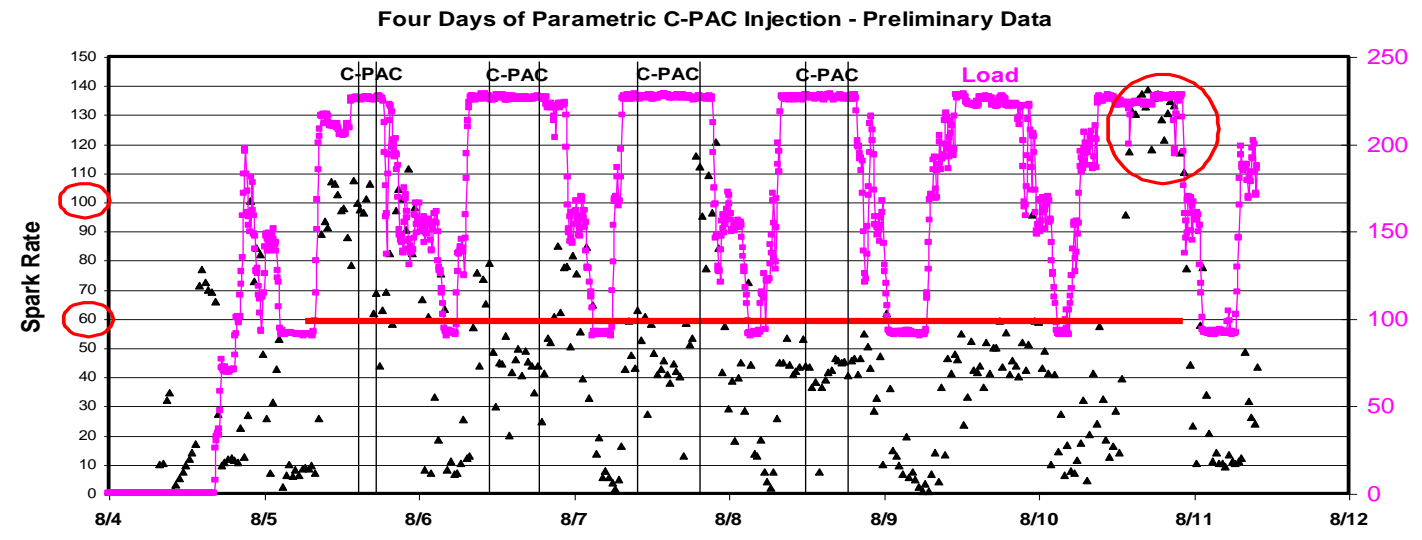
Spark Rates - First Two Fields



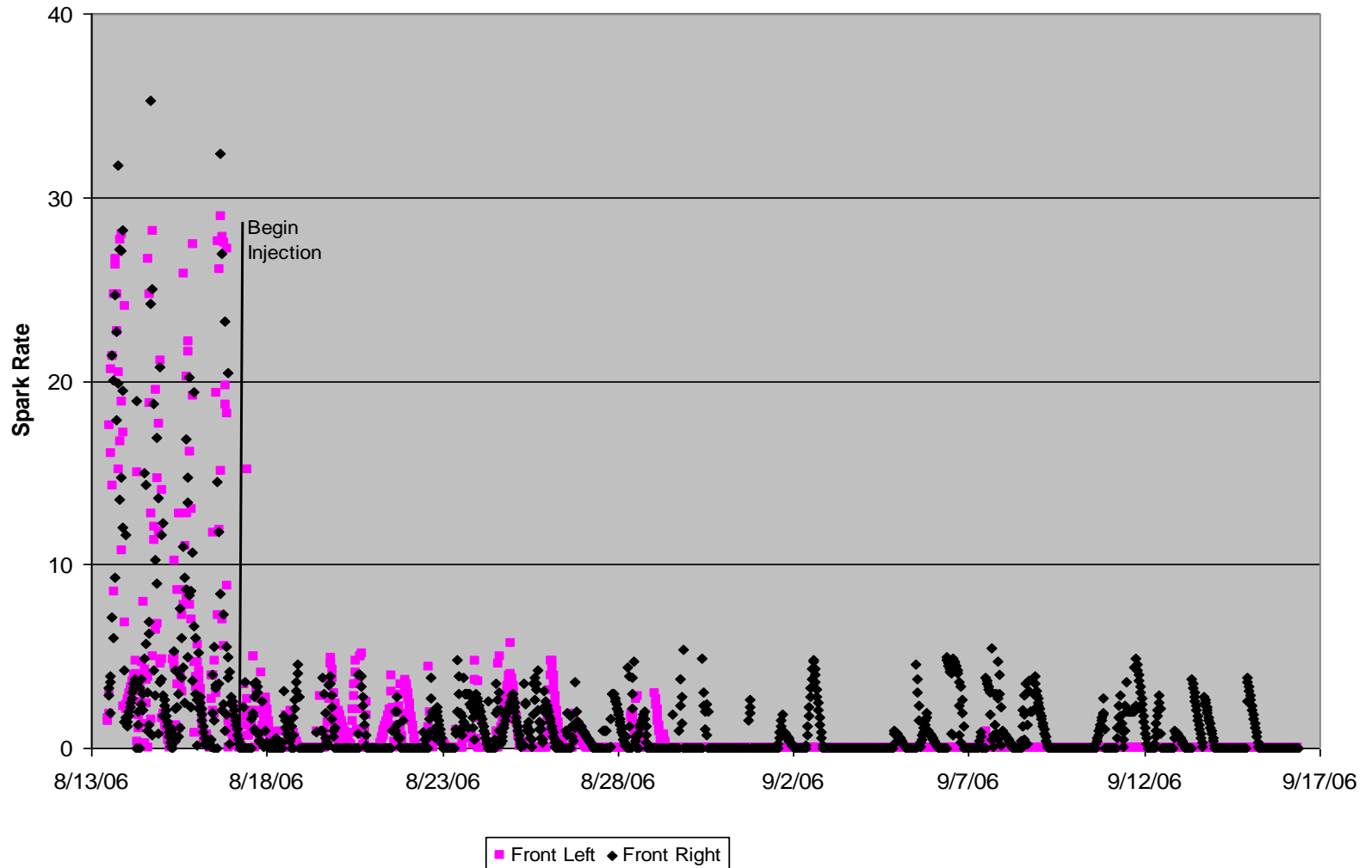
Baseline



Parametrics



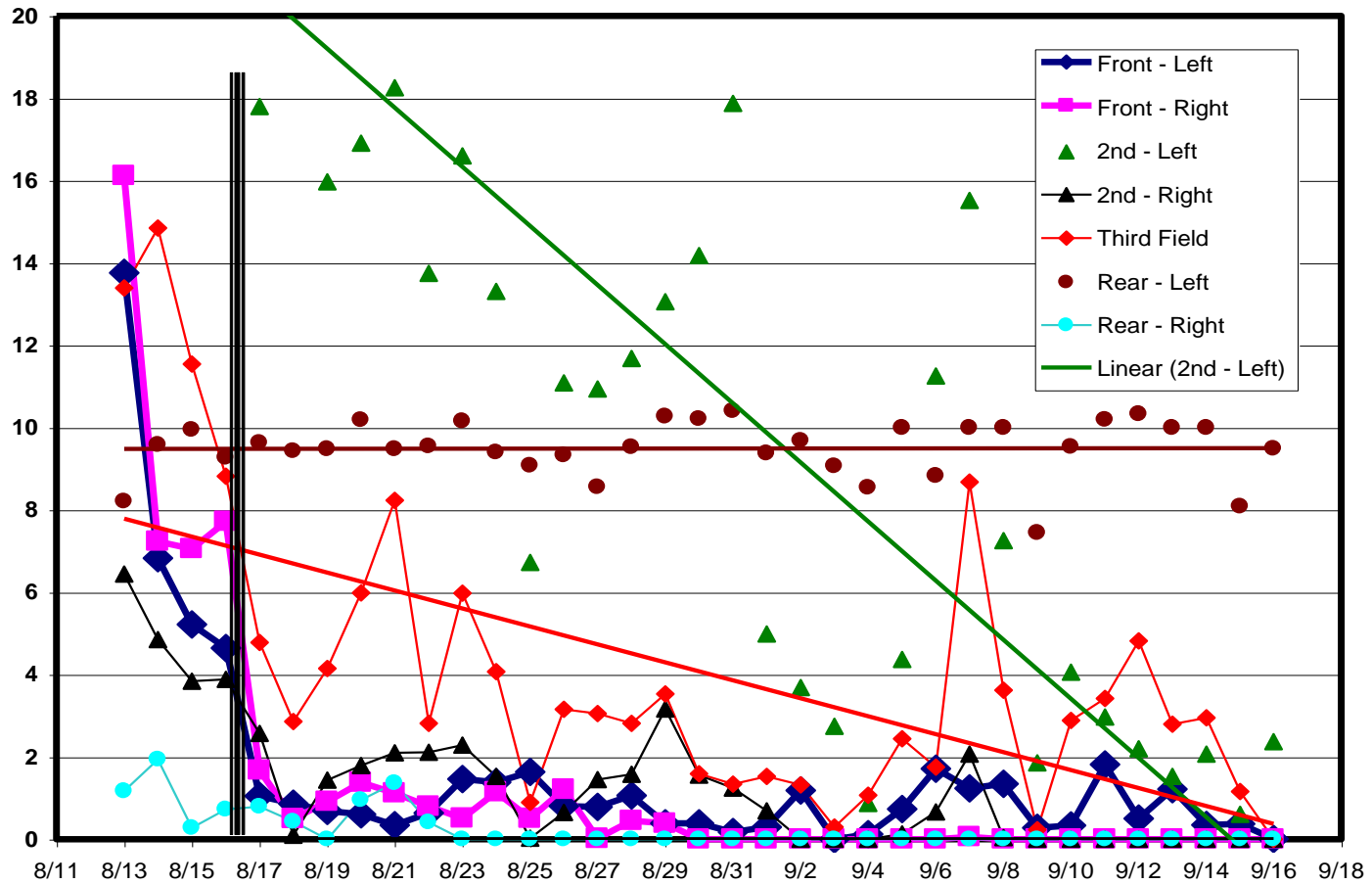
1st-Field Sparking During the LT Run



Spark Rates - All Fields



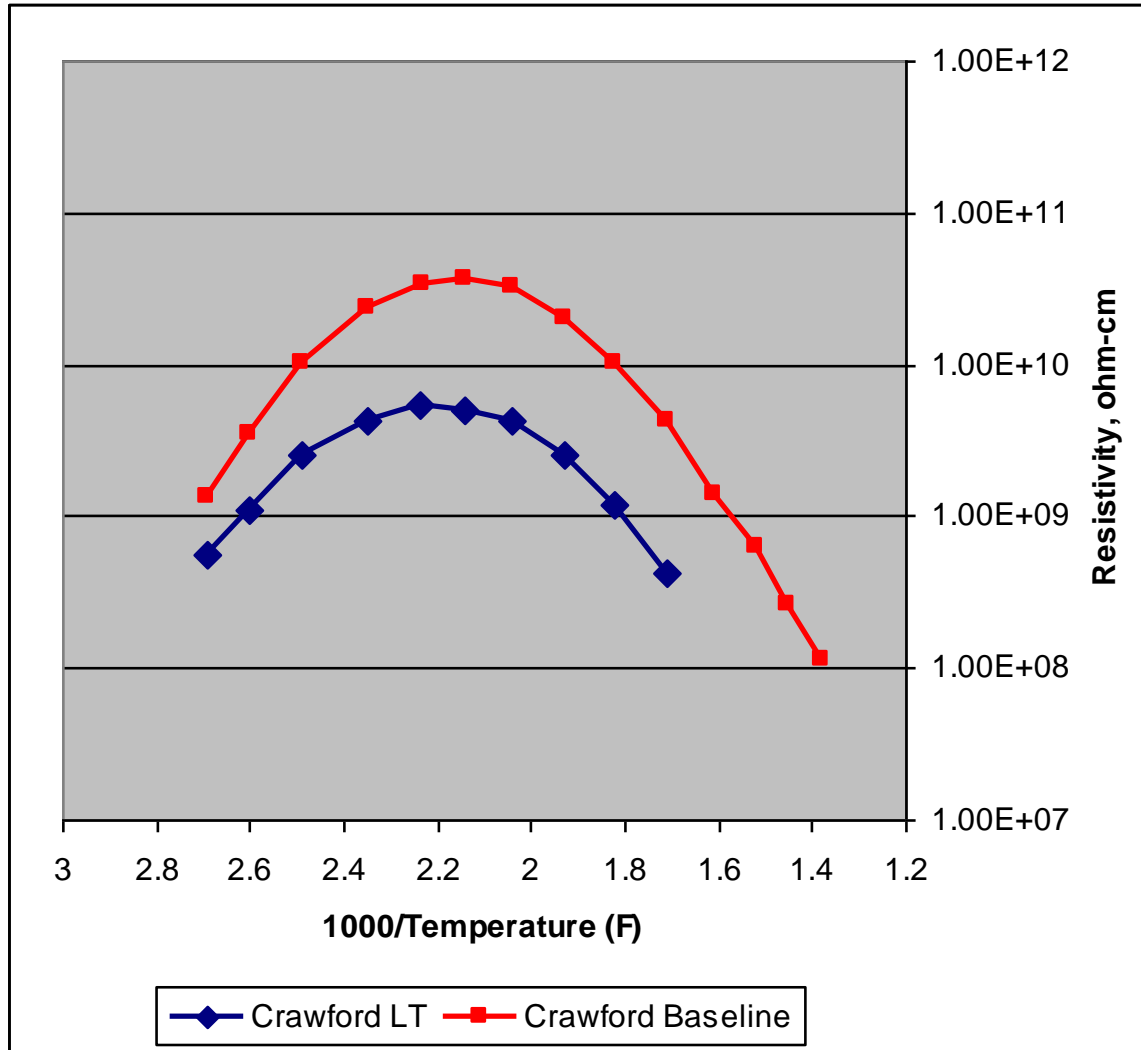
Average Spark Rate - C-PAC Side



How Does Sparking Lead to Emissions?

- **How do we believe it works?**
 - » Gas-phase bromination alters the PAC surface charge characteristics
 - » Lowers the net resistivity of the plate ash-cake
 - 1) Raised power levels possible for collection of all ash
 - 2) No more “puffing off” of ash without sparking
- **A whole new product category (Patent Pending):**
 - » Anti-sparking agents / ash-cake conditioners

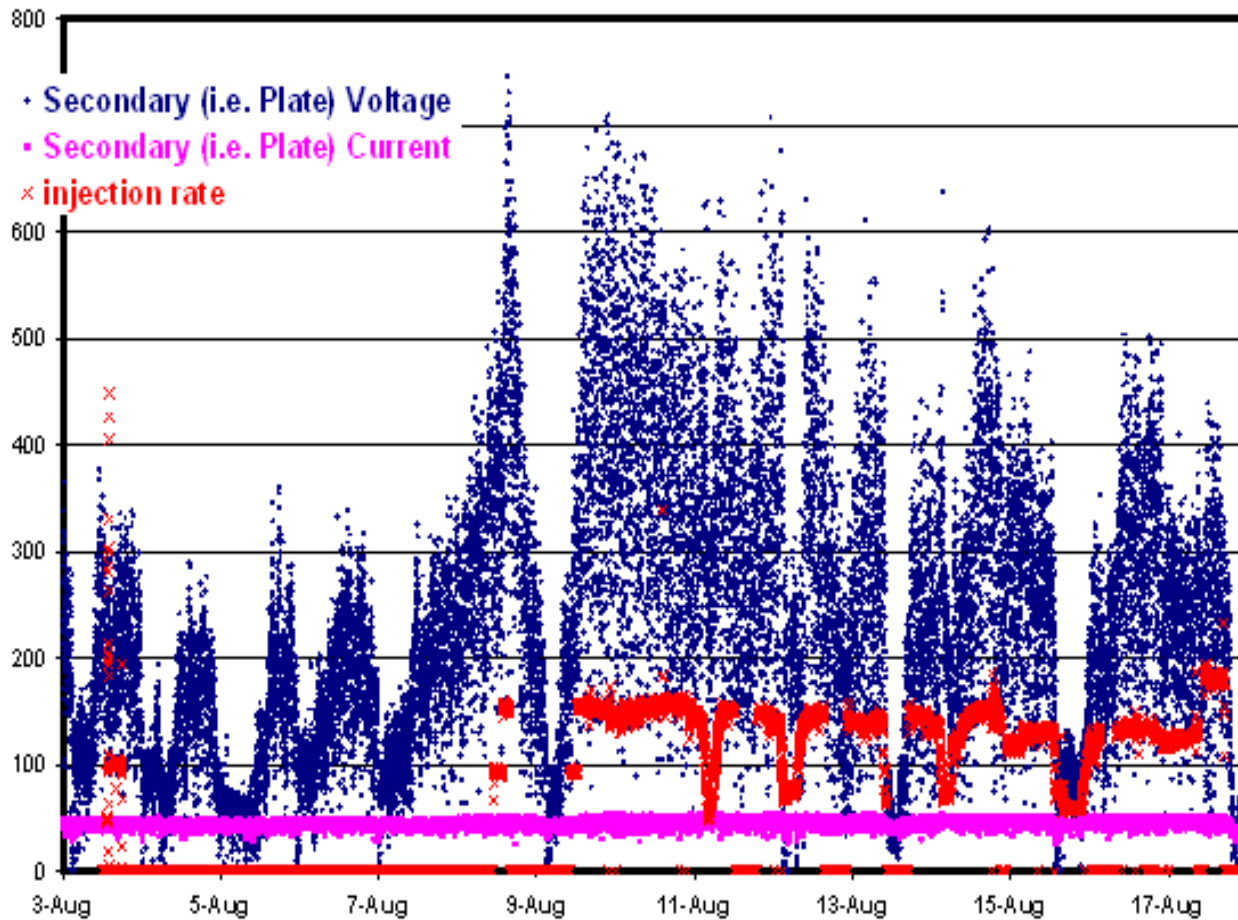
Lower Fly Ash Resistivity



Higher Power Levels Possible

Hg

Will County - Hot-Side ESP First Feld - Side D1 - C-PAC & H-PAC





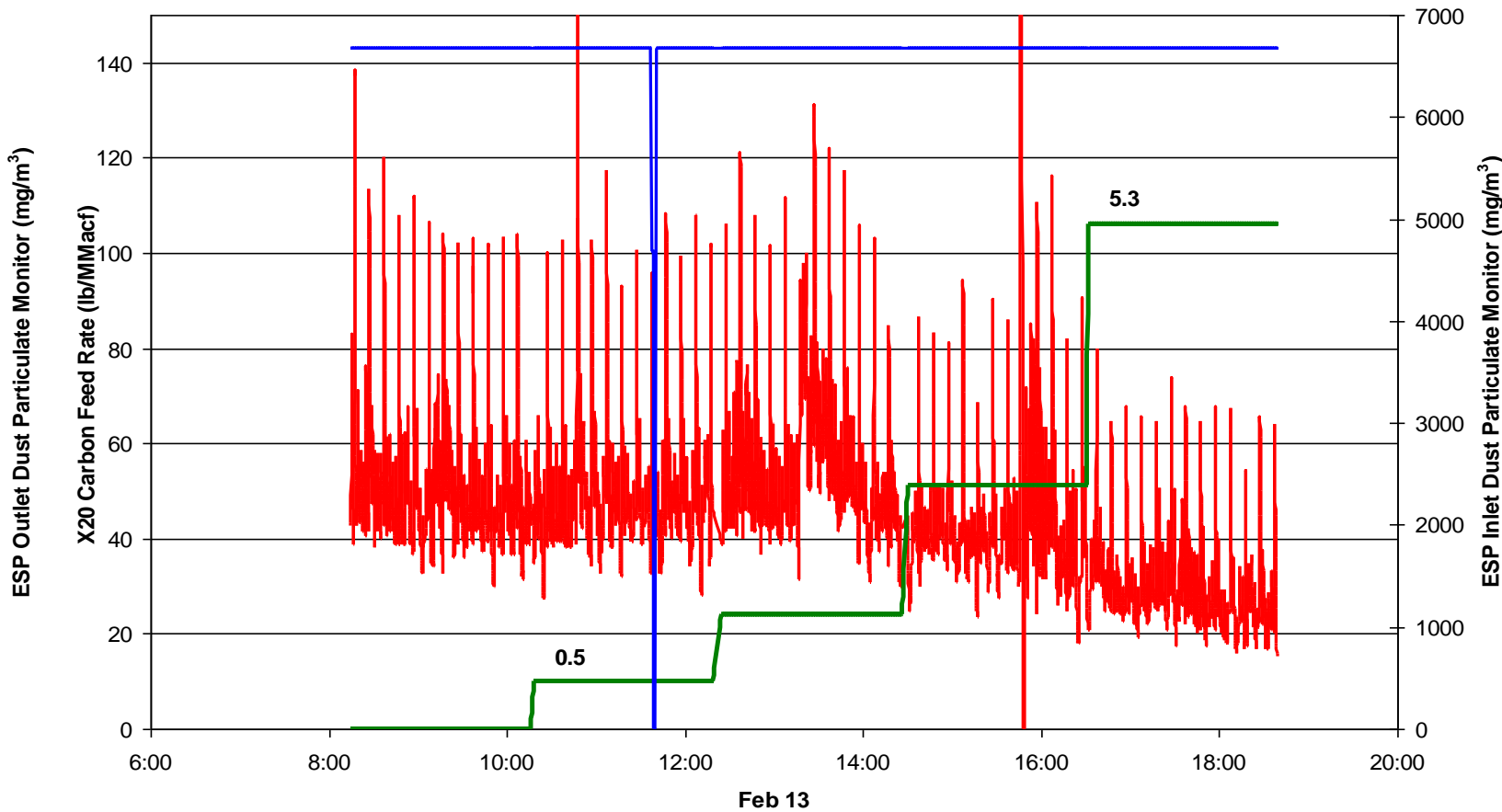
Hg

**Does the impact on opacity
translate to a reduction in
particulate matter emissions?**

ESP Particulate Emissions

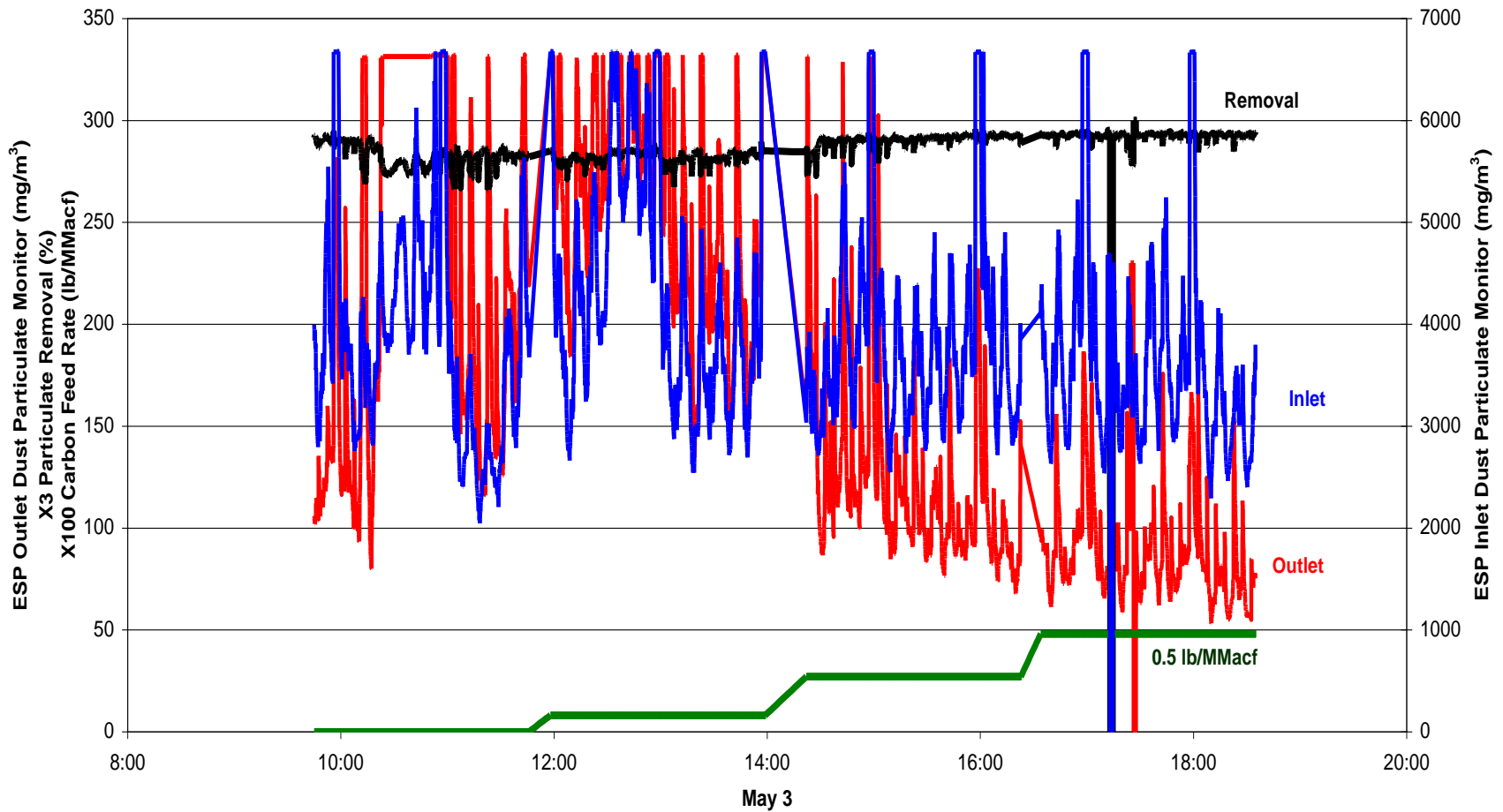


B-PAC into a PRB Slipstream ESP



— ESP outlet dust part monitor (mg/m3) — PAC Feed Rate lb/MMacf — ESP inlet dust part monitor (mg/m3)

ESP Particulate Emissions



— ESP outlet dust part monitor (mg/m³) — Percent Particulate Removal — PAC Feed Rate lb/MMacf — ESP inlet dust part monitor (mg/m³)



- **Plain PACs**

- » We have never observed the same effect

- **Bromine-Salt PACs**

- » Fundamentally different from Bromine-Gas PACs (e.g. Norit Darco Hg-LH vs. B-PAC™)

- » Never seen mention of significantly-improved ESPs

- » Possibly slightly positive, but a matter of degree