



 ALBEMARLE® | Environmental Division

McIlvaine Hot Topic Presentation

Meeting the Challenge of Utility Hg Control

Presented by Dr. Ronald Landreth

April 12, 2012



The Clock is Ticking!

The challenge can be met but >

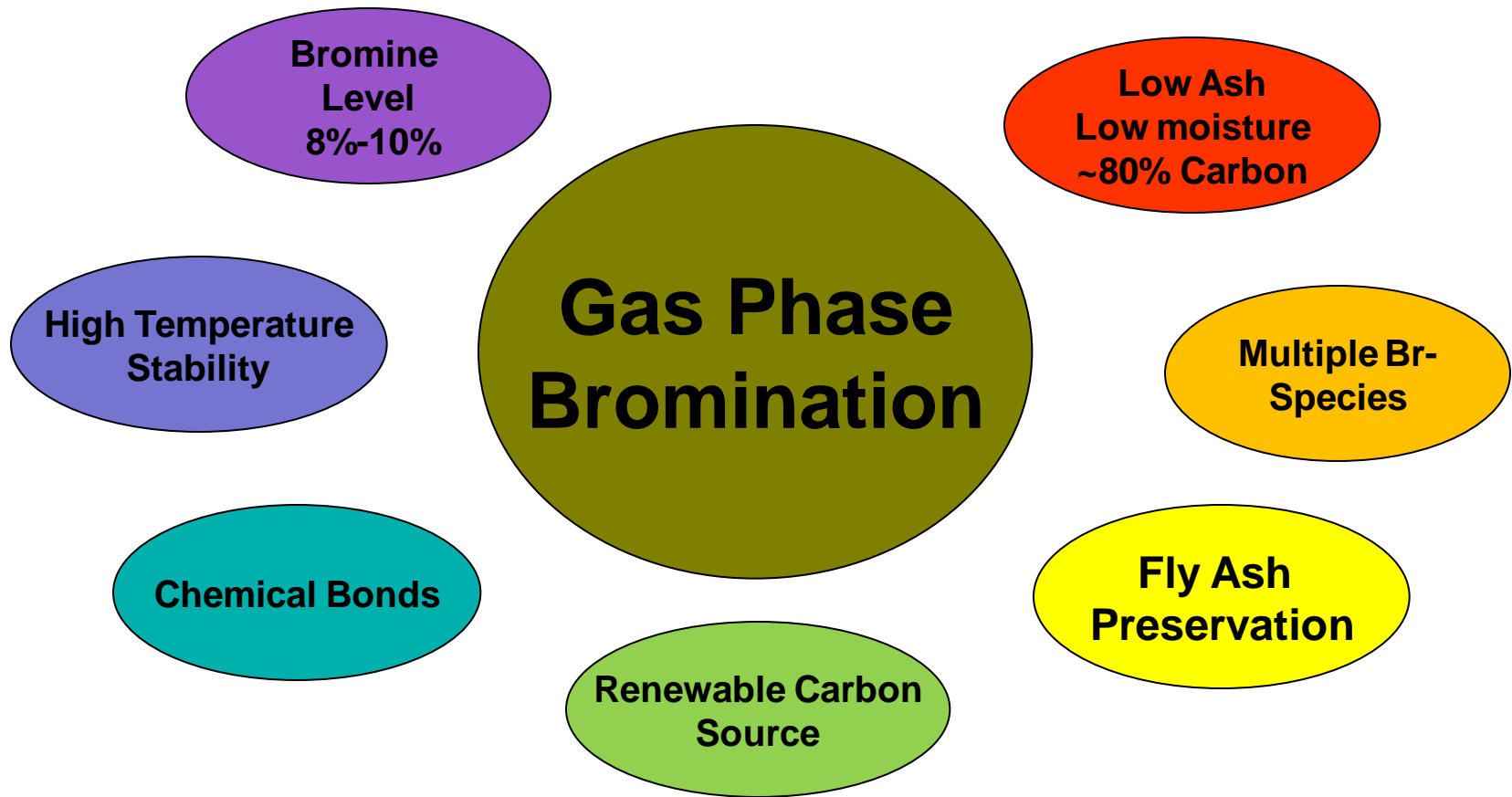
Robust sorbents, concrete-friendly sorbents and thermally stable sorbents will be required.

Bromide addition will play a role but even these applications may require a sorbent to fix the Hg.

Flexible, less costly ACI systems will be needed to inject the lower amounts of sorbent required.



Gas Phase Bromination



Base Carbon Selected Based upon Use

Renewable and Sustainable activated carbon raw materials



Coconut Shell



Sawdust



Wood Chips

Coal-based activated carbon raw material



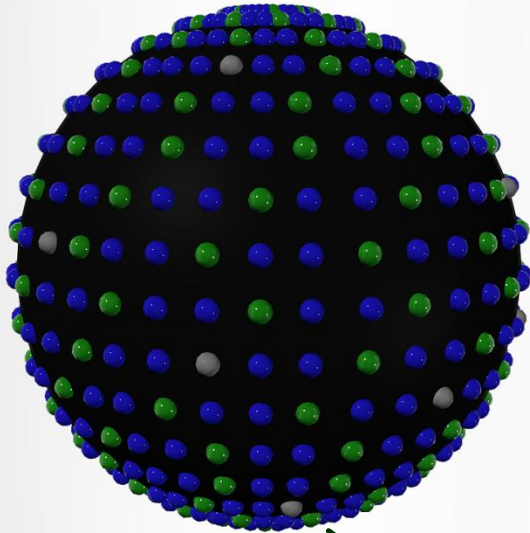
Anthracite



Bituminous Coal

How Active is your PAC ?

Albemarle's Gas-Phase Bromination



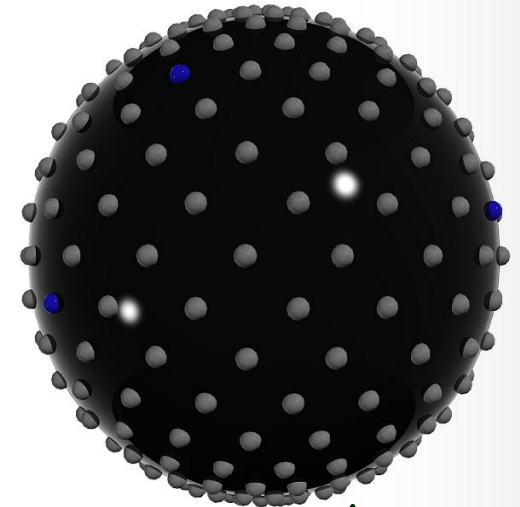
Types of Bonds

- Covalent
- Elemental
- Ionic

	<u>High</u> <u>Activity</u>	<u>Strong</u> <u>Bound to</u> <u>Carbon</u>
Covalent	✓	✓
Elemental	✓	✓
Ionic	✓	✗

Not only is there Twice as much Bromine, the Bromine is much more **ACTIVE**

Competitor's Salt impregnation



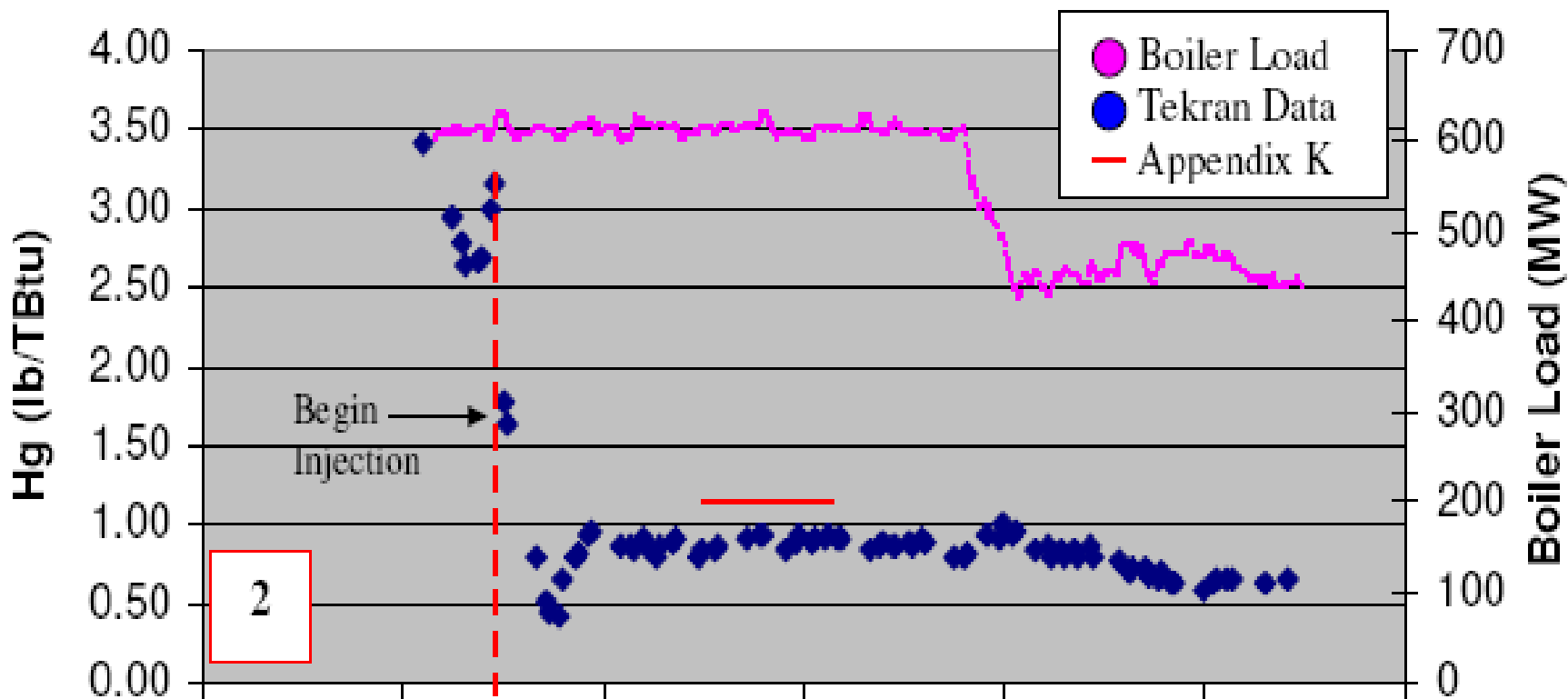
The bromine salt is not bound to the carbon and can easily **wash off**

Concrete-Friendly Sorbents

- 600 MW
- ESP
- PRB Coal
- LOI = 1.6% (composite avg.)
- 3.5 – 5.5 lb/TBtu uncontrolled mercury emission
- Composite foam index (FI) of ash
 - Baseline = 5 drops
 - LOI/FI variable
 - Salable

Concrete-Friendly Sorbents

1 lb/MMacf (66 lb/hr) of C-PAC™



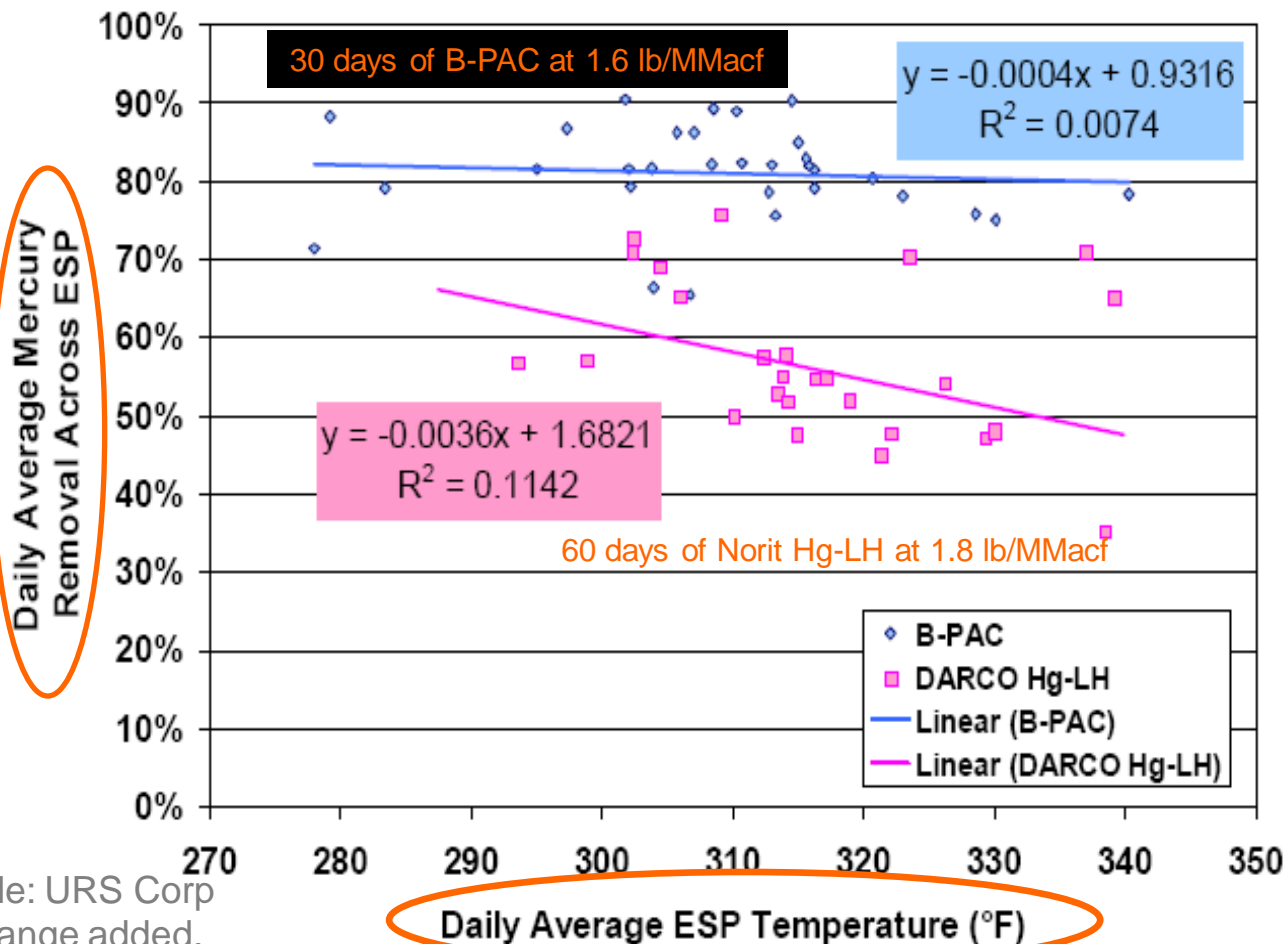
Concrete-Friendly Sorbents

- Baseline Foam Index (FI) = 5 drops (composite)
- At optimal C-PAC™ Rate, 1 lb/MMacf – 8 drops
 - Increase to 8 drops will not change salability

What is Concrete-Friendly™ Ash?

Fly ash that does not significantly increase the amount of AEA (air entrainment admixture) required for concrete as per the foam index test. Also, ash which has stable FI values from load to load.

Thermally Stable Sorbents



Slide: URS Corp
Orange added.

Bromides will Play a Role

Bromides are effective agents to oxidize Mercury (Hg) and allow for easier capture.

However, bromides do not provide Hg capture and fixation.

Albemarle is the largest manufacturer of bromine and bromine chemicals in North America and provides these chemicals to this market.

Flexible, Less Costly ACI Systems

Albemarle M-PACT™ System



- M-PACT™ system injects up to 500 lb/hr of PAC per feeder (2 feeders possible).
- Minimal field erection time or expense.
- Gravimetric feeders provide same Metering Accuracy & Reliability as a quality silo based ACI System.



Albemarle Duct Injection Unit at PDC in Baton Rouge, LA



Summary

For mercury control, the utility industry requires:

- Robust, Concrete-Friendly and Thermally Stable Sorbents
- Bromides to enhance Hg oxidation
- Flexible, less costly ACI systems to meet the lower sorbent injection rates.



Questions

Ron.Landreth@Albemarle.com