Panel Discussion - Sorbents for Mercury Control

A Commercial Update on

B-PAC™, C-PAC™, H-PAC™, F-PAC™

Can Fully Supply Your Hg Sorbent Needs Today

- >15,000,000 annual pounds of existing bromination capacity
- 4 day-to-day customers currently for B-PAC™
- in contract negotiations for 3 additional boilers, including C-PAC™ & H-PAC™
- plus numerous plants are testing truckload quantities

Also Sorbent Injection Systems

8 Systems Sold Already

- 4 systems delivered
- 4 for 2008 delivery
- 2 of a revolutionary design
- silo partner: 30 MSW trains

- New X-a-Lances™ reduce sorbent consumption
  - operating on 2 ESPs

- Also: miniature M-PACT™ system

Begun planning a 40 Million lb/yr site next

50	800	Midwest	Wheelabrator	E. Bit	Lime Inj./ESP/WFGD/WESP	ACI	New	Construction Permit
51	350	Midwest	ADA-ES	PRB	ESP	ACI	Retrofit	Construction Permit
52	568	Southwest			CFB Boilers/SNC			
53	248	Midwest						
54	590	Midwest						
55	608	Midwest						
56	110	Midwest						
57	272	Midwest						
58	375	Midwest						
59	100 ea. 200 Total	Northeast						
60	200 ea. 400 Total	Northeast						
61	200 ea. 400 Total	Northeast						
62	300	Midwest						

31	850	Midwest	Alstom/ADA-ES	PRB	SCR/FF/WFGD	ACI	New	Construction Permit
32	167	East	Sorbent Tech	E- Bitum	ESP/WFGD	ACI	Retrofit	Consent Decree
33	108	Midwest						
34	159	Midwest						
35	348	Midwest						
36	237	Midwest						
37	347	Midwest						
38	341	Midwest						
39	566	Midwest						
40	561	Midwest						
41	850	Midwest						
42	850	Midwest						
43	359	Midwest						
44	385	Midwest						
45	281	Midwest						
46	551	Midwest						
47	400	Southwest						
48	495	Alberta Canada						
49	800	Midwest						

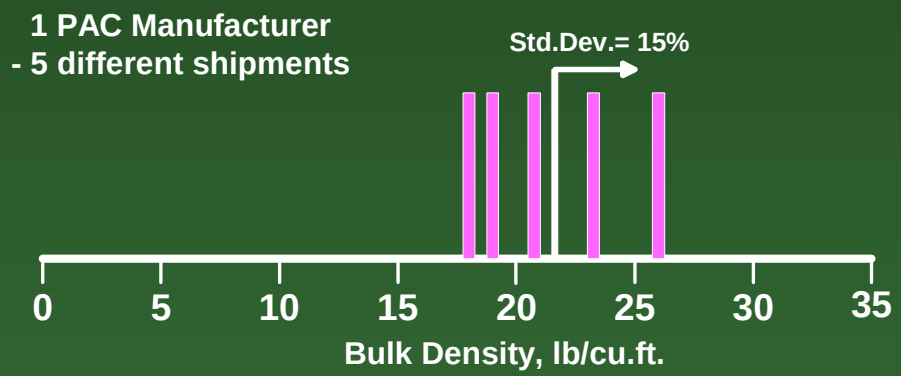
14	650	Midwest	Alstom (ADA-ES)	PRB	SDA/FF	ACI	New Plant	New Construction Permit
15	156 MW ea. 315 Total	Midwest	Powerspan	Bituminous	Multi-pollutant	ECO	Retrofit	Construction Permit
16	750	Midwest	Wheelabrator	High Sul. Bit	ESP/WFGD/WESP	ACI	New Plant	Construction Permit
17	680	South						
18	107	East						
19	860	South						
20	860	South						
21	220	West						
22	575	Southwest						
23	575	Southwest						
24	335	Northeast						
25	880	South						
26	350	Midwest						
27	650	Southwest						
28	628	Southwest						
29	855	Southwest						
30	670	Midwest						

	Plant Size (MW)	Location	Prime OEM Contractor	Coal	APC Configuration	Hg Control	New Plant or Retrofit	Regulatory Driver
1	90 MW ea. 270 Total	Midwest	Wheelabrator (Norit/ADA-ES)	PRB	TOXECON	ACI	Retrofit	Consent Decree
2	250	East	Wheelabrator	Bituminous	SDA/FF	ACI	Retrofit	State Regulatory
3	250	East	Wheelabrator	Bituminous	SDA/FF	ACI	Retrofit	State Regulatory
4	650	East	Wheelabrator	Bituminous	ESP	ACI	Retrofit	State Regulatory
5	740	Midwest	B&W (ADA-ES)	PRB	SDA/FF	ACI	New Plant	New Construction Permit
6	550	Midwest	B&W (ADA-ES)	PRB	SDA/FF	ACI	New Plant	New Construction Permit
7	350	West	B&W (ADA-ES)	PRB	SDA/FF	ACI	Retrofit	Consent Decree
8	350	West	B&W (ADA-ES)	PRB	SDA/FF	ACI	Retrofit	Consent Decree
9	800	West	B&W (ADA-ES)	PRB	SDA/FF	ACI	New Plant	New Construction Permit
10	350	East	ADA-ES	Bituminous	ESP	ACI	Retrofit	Consent Decree
11	350	East	ADA-ES	Bituminous	ESP	ACI	Retrofit	Consent Decree
12	204	Midwest	Dustex	PRB	TOXECON	ACI	Retrofit	Consent Decree
13	375	East	Wheelabrator	Bituminous		ACI	Retrofit	Consent Decree

- We expect to have the raw PAC supply as well
- Only a 1-year lead-time: by mid 2009

High-Quality Chinese Base Carbons

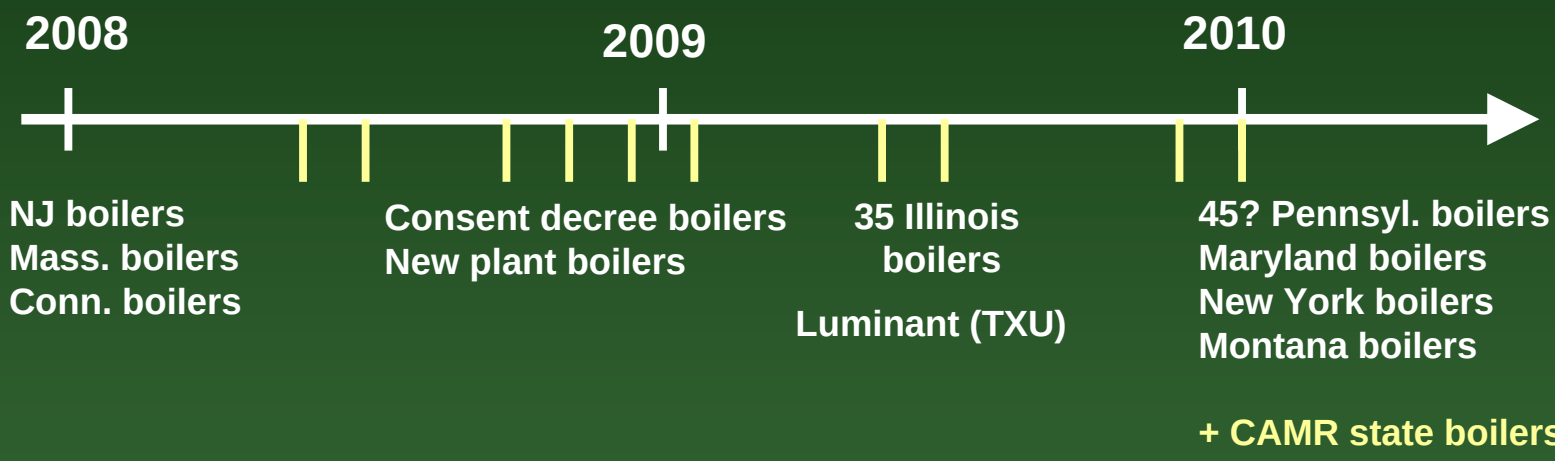
- Calgon is, by far, the biggest importer of Chinese AC
- Very consistent qualities from our supply partners
- Previous U.S. domestic PACs were highly variable:



- Then patented gas-phase bromination, not salt-phase
  (all brominated carbons are not the same)

Demand Projections

Forecast: Big Crunch Jan.1, 2010 (or Nov. 2009)



- 10% of U.S. capacity *already* has ACI systems ordered and likely 20% by next year
- These plants need compliance *before* any new U.S. plant
- Sorbent availability 1Q 2010 & earlier may be an issue

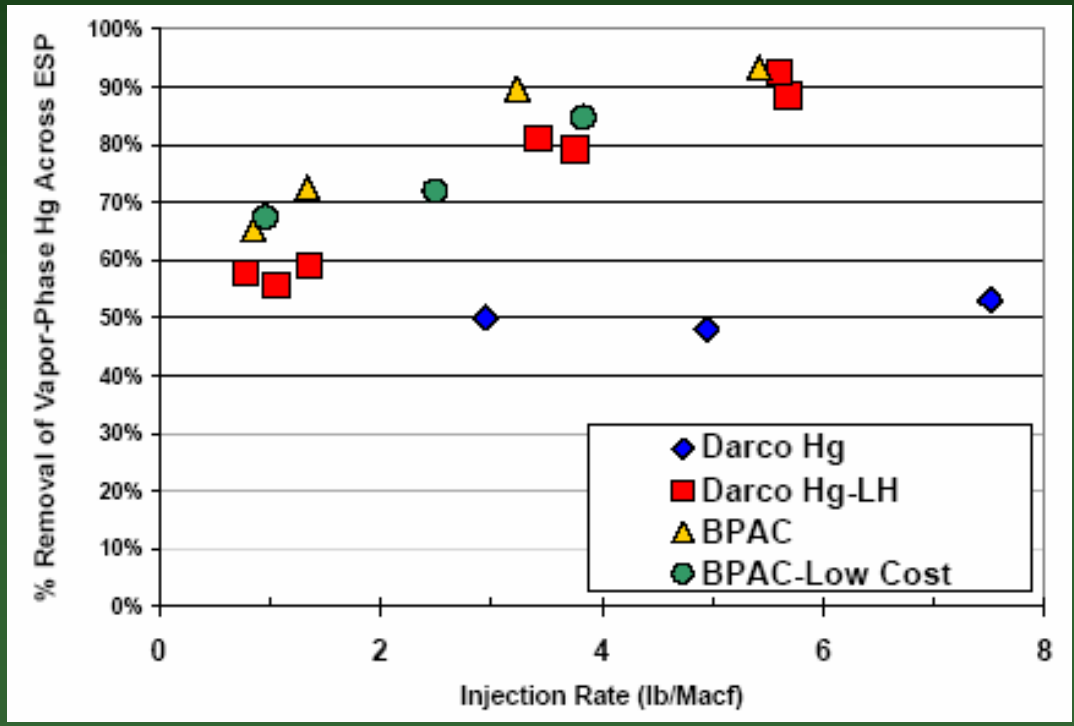
Pricing

- Varies with the length of the contract
- Dedicated production capacity means take-or-pay
- Currently north of $1.00/lb FOB for gas-phase B-PAC™
- Modest premium for C-PAC™ or H-PAC™
- AC prices jumped 70% courtesy of Norit & Calgon
- Don’t be surprised if $2.00/lb or more come 2010

Pricing: Need to Discern 0.1 lb/MMacf Differences

- Once the ACI system is installed, you are free to test & determine which sorbent is the most cost-effective & there can be big differences
- Deceptive: a sorbent can cost 20% more $/lb & still save you 40%
- So spot purchases while testing? Multiple suppliers rather than sole-sourcing? And constant performance monitoring for supplier QC

Subbituminous Coal & Cold-Side ESP at Great River Energy's Stanton Station Unit 1



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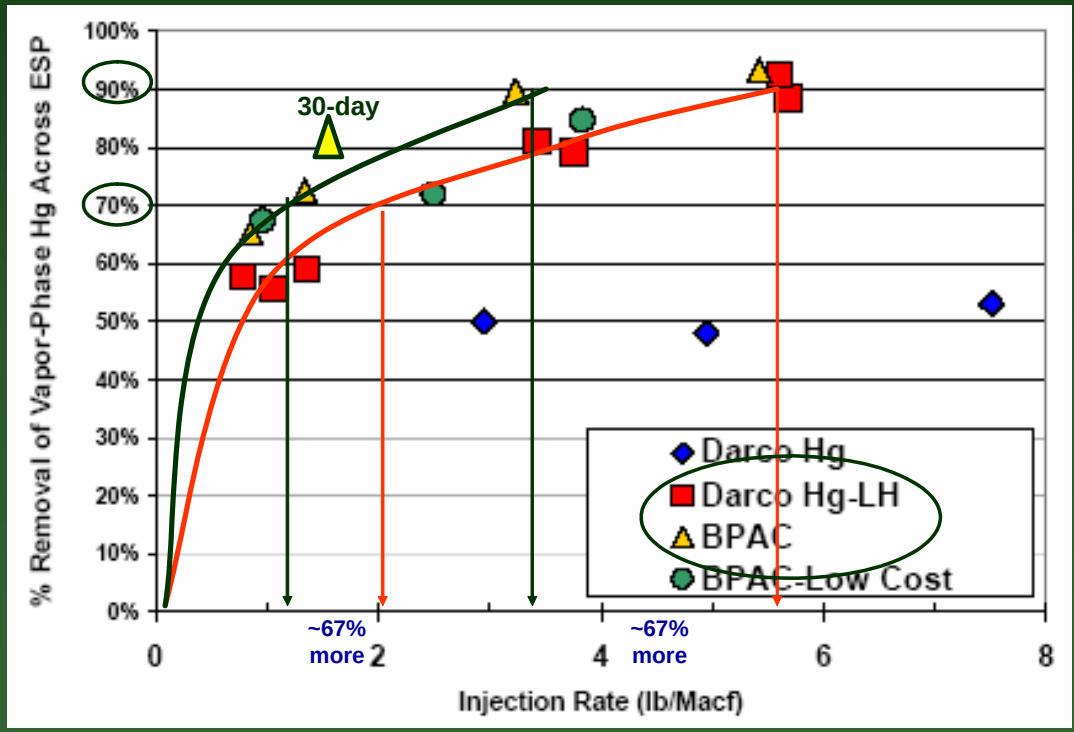

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Specifying Mercury Sorbents: e.g. B-PAC™

- **Carbon:** 100% Virgin
- **Particle size:** > 90% < 325 mesh
- **Moisture:** < 6 wt%
- **Bromine:** > 4 wt%
- **Hg performance:**

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  molasses number?
  iodine number? benzene number?

Specifying Mercury Sorbents: e.g. C-PAC™

- **Carbon:** 100% Virgin
- **Particle size:** > 90% < 325 mesh
- **Moisture:** < 6 wt%
- **Bromine:** > 4 wt%
- **Hg performance:** ~~surface area or pore volume?~~
  ~~molasses number?~~
  ~~iodine number? benzene number?~~
  proprietary metric
  pilot plant performance
  continuous CMM monitoring
- **Concrete:** Foam index

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3. Increased Particulate Emissions
- Plant Yates was not unique, but plant & coal specific
- Triggers New Source Review
- Hopefully gas-phase brominated PACs can help

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- Validity of EPRI's U.S. 6,712,878 (2004)
  - looks like it covers *all sorbent injection into ESPs:*

"A method for removing a vapor-phase contaminant from a gas stream, comprising:
- coating a non-porous sorbent structure [ESP plate] positioned in a gas duct with a sorbent;
- passing a gas stream comprising a vapor-phase contaminant [Hg] through the gas duct;
- contacting the vapor-phase contaminant with the sorbent, thereby adsorbing the vapor-phase contaminant onto the sorbent [PAC];
- removing the sorbent having the adsorbed vapor-phase contaminant from the gas duct; and
- recoating the non-porous sorbent structure with fresh sorbent."

Sorbent Technologies Corp.

Sorbents & Systems

Ready to Serve You