How to Guarantee the Lowest Cost Activated Carbon Treatment Solution

McIlvaine Hot Topic Hour

2-28-2013

“Carbon Testing 101”

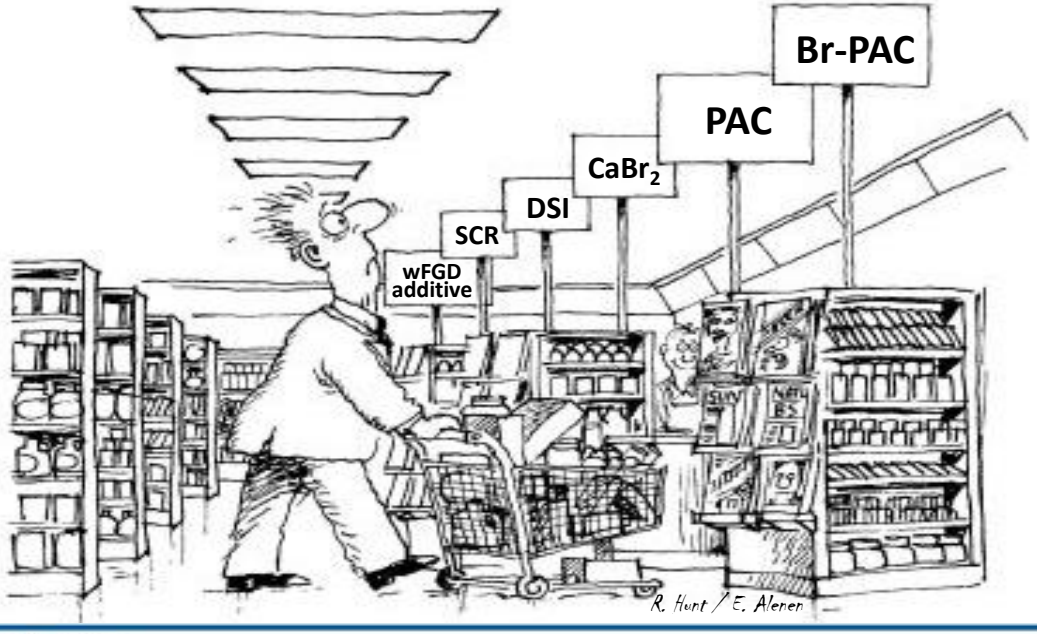
- A step by step discussion of how to design a test plan for ***your*** plant
- Additional variables to consider, and how to include them
- Actual case studies
- How to apply test results to a bid to ensure you arrive at the most cost-effective solution

Designing a Test Plan…

- Clearly define your goals and success criteria
  - MATS
  - Avoid a baghouse installation
  - Integrate SO_2 controls with ACI
  - Enable a fuel switch
  - Cost reduction
  - Ash sales

Designing a Test Plan…

- Assess your flue gas composition and collect any relevant existing data.
- Determine the technologies to be tested.
  - Carbon, brominated carbon, $CaBr_2$, DSI, wFGD additives …



Designing a Test Plan…

- Designate an ***experienced*** program manager
- Solicit vendors
- Draft a schedule and test plan and include contingency days
- Evaluate data (both during and after testing)

Additional Considerations…

- Opacity/PM – include stack testing?
- ACI injection points
- ACI testing at full and low load?
- SO_3 monitoring
- Silo vs. sack testing
- Ash sampling and testing
- Hg measurements
  - Traps vs. CEMs vs. coal analyses
  - Outlet ***and*** inlet

Case Study 1

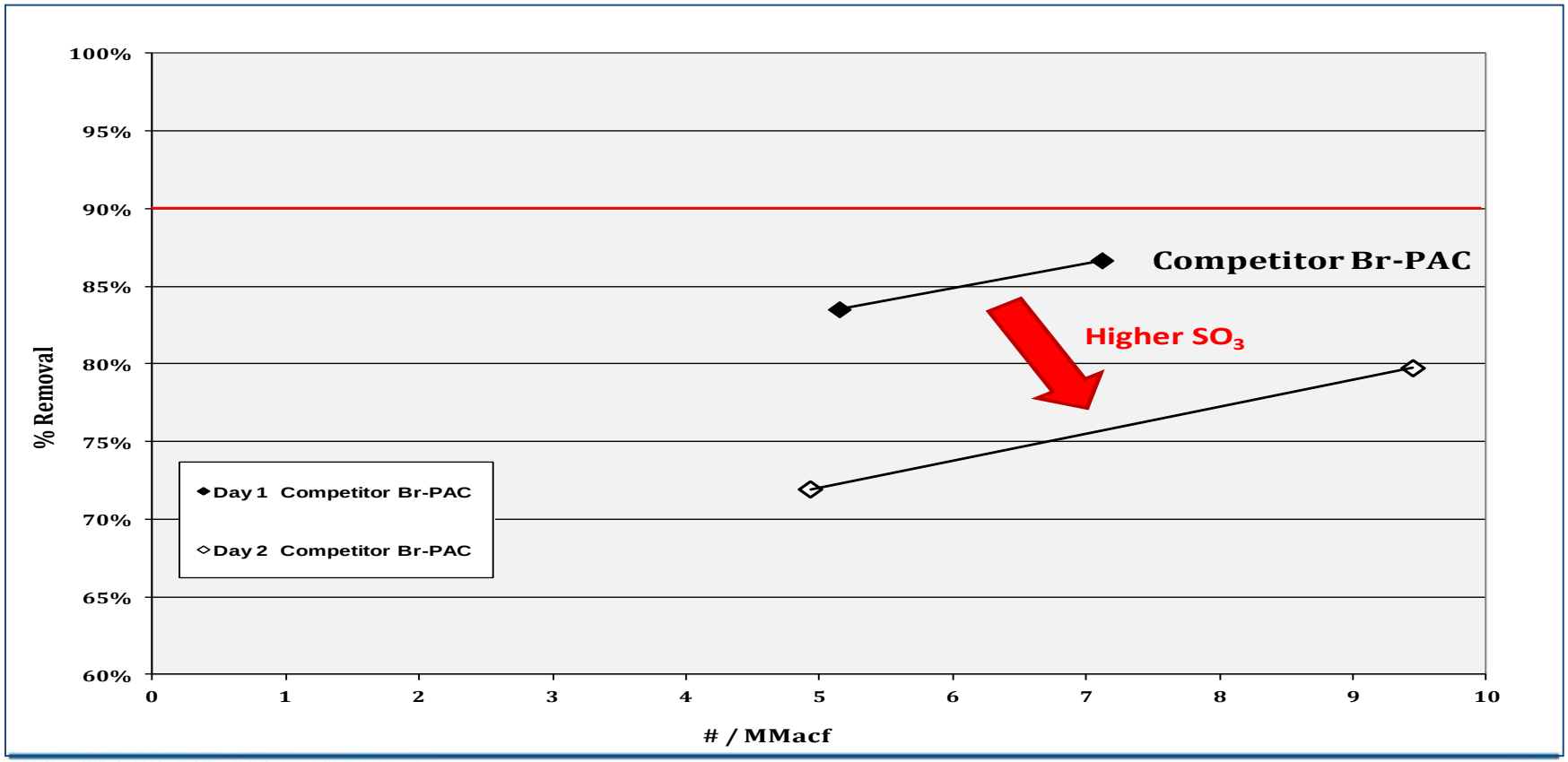
- 600 MW PRB-fired unit with a baghouse
- Goals of reducing treatment costs and preserving fly ash quality

Product	# / MMacf to 90%	# / hr
FLUEPAC® MC Plus	0.81	130.2
FLUEPAC® MC Plus	0.77	123.9
Competitor advanced product 1	0.79	126.0
Competitor advanced product 2	0.83	132.9
FLUEPAC® MC with 1.2 gph $CaBr_2$	0.39	67.0
FLUEPAC® MC Maxx with 1.2 gph $CaBr_2$	0.14	24.0

➢ Learned that the ACI system would need a much smaller feeder, and only 1 silo instead of 2

Case Study 2

- Unit with an ESP firing a bituminous/PRB blend
- Goal of 90% Hg removal, *without DSI for SO_3 control*



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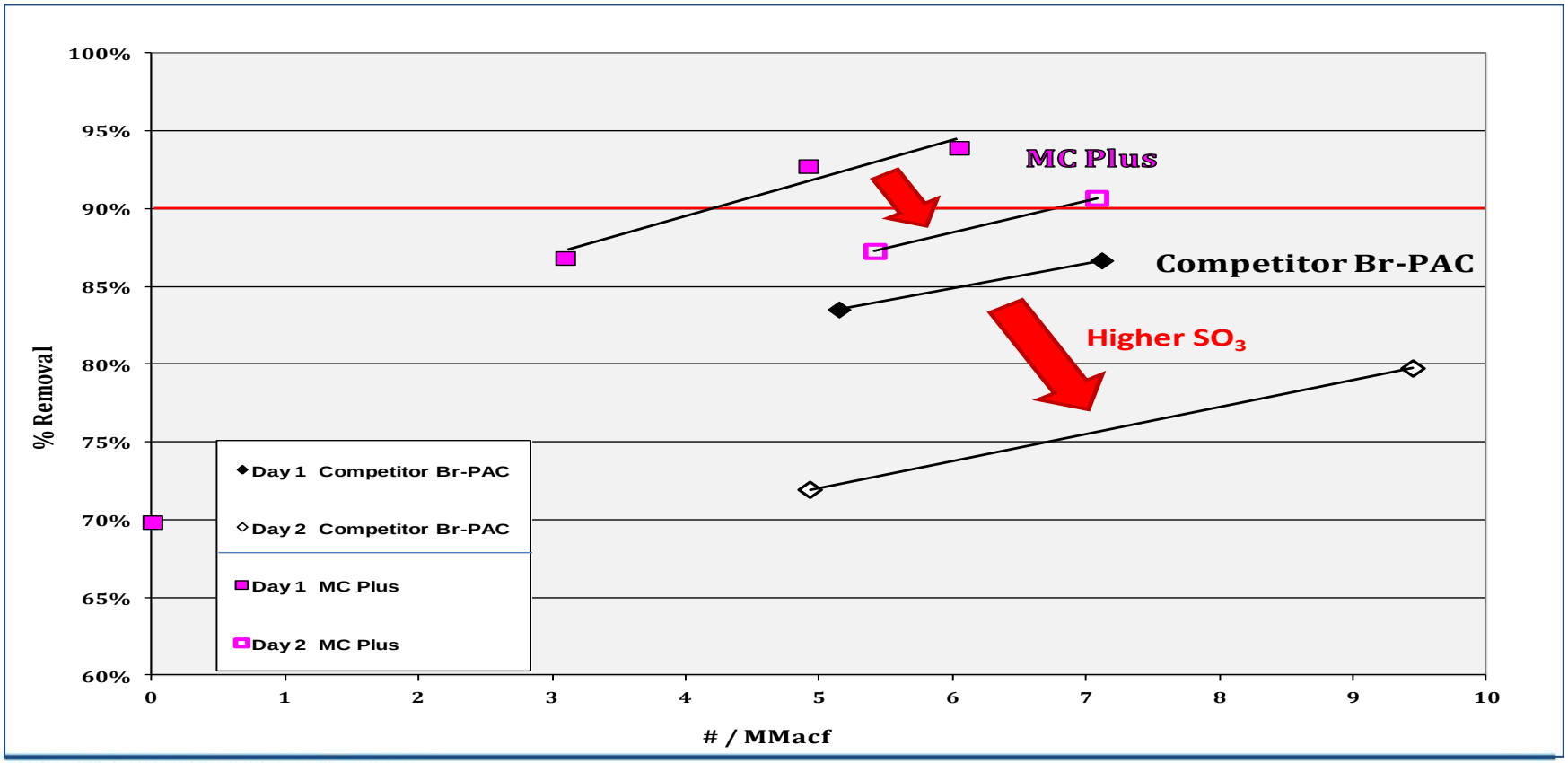

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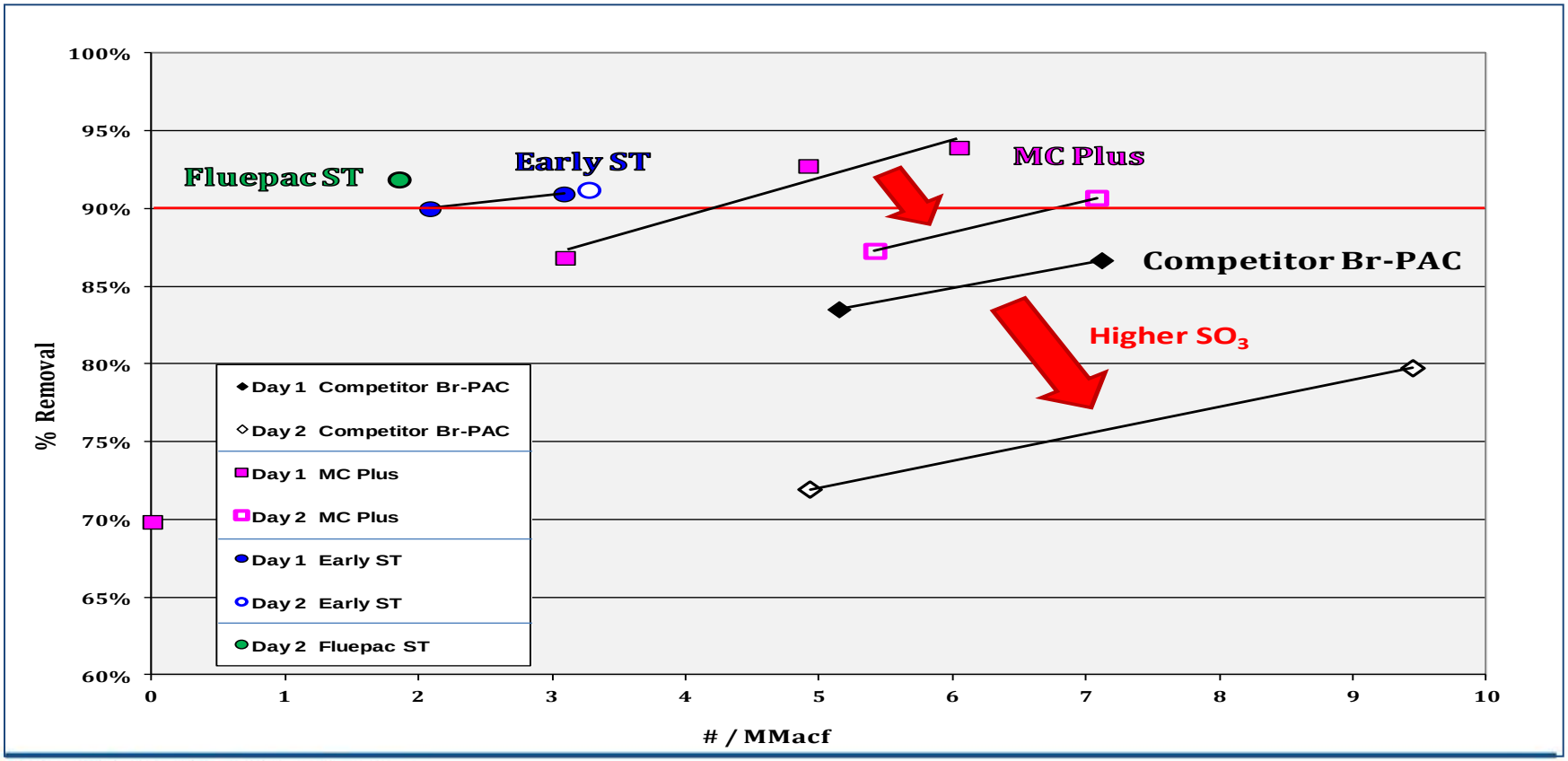

Applying Your Results to the Bid…

- ACI is not a commodity product. It is essential to look beyond simple $$/lb pricing.
- Normalize your results for each product by feed rate to obtain a Removal Efficiency Index (REI).
- Calculate freight costs using REI.
- Calculate costs of additional products such as $CaBr_2$ or DSI.
- Factor in ash sales or disposal where appropriate.
- Compute the total treatment cost.

Applying Your Results to the Bid…

Fictional Plant: 500 MW, PRB, SCR, ESP

REI Index	ACI Pounds/Hour	Boiler Additive (gal/hour)		
Product A	500			
Product B	225	1.5		
Product C	250			
Product Name	**REI**	**Annual Estimate (LBS)**	**Price Per Pound**	**Total Carbon Cost**
Product A	500	4380000	$0.70	$3,066,000
Product B	225	1971000	$1.00	$1,971,000
Product C	250	2190000	$1.50	$3,285,000
Product Name	**Pounds/TL**	**Trucks/YR**	**Freight Rate**	**Total Freight Cost**
Product A	40,000	110	$2,500	$273,750
Product B	44,000	45	$3,000	$134,386
Product C	46,000	48	$2,750	$130,924
Product Name	**Boiler Additive**	**gal/year**	**Cost/gal**	**Total Boiler Additive Cost**
Product A	NO	0	$0	$0
Product B	YES	13140	$10	$131,400
Product C	No	0	$0	$0
Product Name	**Salable Fly Ash**	**Tons/year**	**Price or Cost/Ton**	**Annual Rev/Exp**
Product A	NO	100,000	($5)	($500,000)
Product B	YES	100,000	$10	$1,000,000
Product C	YES	100,000	$10	$1,000,000
Product Name	**Annual Cost for Product**			
Product A	$3,839,750			
Product B	$1,236,786			
Product C	$2,415,924			

Summary

- A well executed ACI test is well worth the investment.
- Don’t rush into a contract without adequate testing. Allow yourself the time to test. And maybe even to test again….
- Activated carbon is not a commodity product. Look beyond simple $$/lb and focus on the big picture.

Acknowledgements

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