Sorbent Injection into a Slipstream Baghouse for Mercury Control: Long-Term Test Operations and Results

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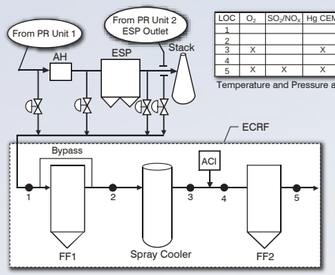
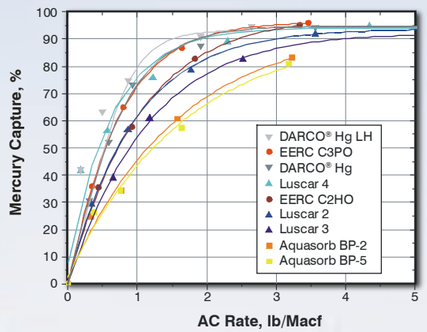


LOC	O_2	SO_2/NO_x	Hg CEM	Ports for OH	Dust
1				X	
2				X	
3	X		X	X	X
4				X	
5	X	X	X	X	

Temperature and Pressure at All Locations

Screening Results



- Screening summary – nine sorbents were evaluated – top four performers achieved ~90% mercury capture at an ACI rate of about 2 lb/Macf.

Fly Ash

Test Type	AC Type	AC Injection Rate, lb/Macf	Ash Loading, lb/Macf	LOI, %	24-hr pH	Total Hg, µg/g
Baseline	N/A	N/A	4.7	0.22	11.73	0.104
Midterm	Luscar 4	2.5	4.7	13.2	11.33	39.0
Midterm	Luscar 4	2.1	34	3.84	12.00	12.7
Midterm	DARCO®	2.0	4.7	9.45	11.41	35.9
Long-Term 1	DARCO®	1.8	34	3.18	11.99	12.6
Long-Term 2	DARCO®	2.0	4.7	9.68	11.36	44.5
Long-Term 2	DARCO®	2.0	4.7	11.7	11.37	64.5

- Moisture content, loss-on-ignition (LOI), and pH

- Leaching tests
  - Mercury leached below the detection limit (<0.01) for all samples.
  - Although the ACI fly ash had higher total Hg content, it is extremely unlikely that Hg will leach from the fly ash.

- Elevated-temperature mercury release tests
  - ACI increases the temperature at which Hg is released in elevated-temperature applications, indicating that AC has a stronger bond with Hg.
  - Unless fly ash is going to be used in cement production (at ~1100°C), there is little concern that the Hg will be released from fly ash at temperatures achieved in typical beneficial use applications.

- Ambient-temperature mercury release tests

- Microbial mercury release tests

Parametric Testing

Description/ Parameter	Sorbent	Temperature, °F	A/C, ft/min	Dust Load, lb/Macf
Temperature	EERC-C3PO	250, 300, 350	5	4.7
Temperature	Luscar 2	250, 300, 350	5	4.7
Temperature	Luscar 4	200, 300, 370	5	4.7
Temperature	DARCO® Hg	200, 300, 360	5	4.7
A/C	Luscar 2	300	4, 5, 7	4.7
A/C	Luscar 4	300	2, 5, 8	4.7
A/C	DARCO® Hg	300	2, 3, 5, 6, 7, 8	4.7
Dust Loading	Luscar 4	300	5	4.1, 4.7, 94

- Temperature
  - Temperatures from approximately 200°–350°F were tested.
  - Little if any effect on mercury capture for the four sorbents tested.

- Flue gas flow rate
  - A/C from 2 to 8 ft/min tested.
  - Little if any effect on mercury capture.
  - A/C significantly impacts baghouse operation, notably ΔP and required cleaning frequency.

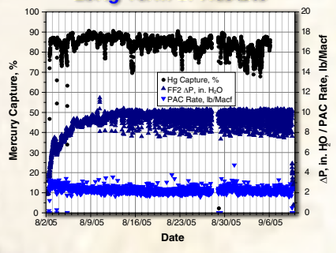
- Ash load
  - Testing was done for conditions from nominal TOXECON® (~4 lb/Macf) to full-scale baghouse (~250 lb/Macf).
  - Little if any effect on mercury capture.
  - Significant effect on ΔP and required cleaning frequency.

Long-Term Testing

Description	Sorbent	Dust Load, lb/Macf	Temperature, °F	A/C, ft/min	lb/Macf
LT1 – High Ash	Luscar 4/DARCO® Hg	34	300	6	2
LT2 – Low Ash	Luscar 4/DARCO® Hg	4.7	300	6	2
LT2.1 – High A/C	Luscar 4	4.7	300	8	2
LT3 – High Ash with High Perm.	Luscar 4	34	300	6	2

LT1 – completed, August 2 – September 9, 2005
LT2 – completed, October 24 – December 31, 2005
Additional tests (LT2.1) – completed, January 3–13, 2006
LT3 – completed, May 18 – June 26, 2006

Long-Term 1: Results



Summary of Long-Term Results

- Long-term tests generated operational data to determine sorbent effectiveness, emission variability, and sustainability of bag cleanliness.

- Good mercury capture (>80%) was obtained for all conditions.

- Long-Term 2 results indicate operation under low-ash conditions is sustainable at an A/C of ~6 ft/min using standard filter bags.

- Long-Term 1 and 2.1 operations were not sustainable for a high-ash loading or an A/C of 8 ft/min using standard filter bags.

- High-permeability bags were used to maintain pressure drop for the high-ash condition of Long-Term 3.

- Effective management of pressure drop and bag cleanliness across the fabric filter appear to be major issues, which could lead to significant increases in operational costs.

- Long-term testing generated data and operational information that have been evaluated for their economic impact on this technology.

Economics

- Economic analysis performed for a retrofit application with a range of capital, O&M, and annual levelized costs estimated based on parameters evaluated at the ECRF

- Principal model inputs and calculations included:
  - Boiler plant operating data
  - Retrofit control technology operating parameters
  - Economic or financial parameters

- Sensitivity analysis performed with respect to major operating variables

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