TOXECON™ Retrofit for Mercury and Multi-Pollutant Control

NETL Mercury Control Technology

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Pittsburgh, PA

Steven Derenne

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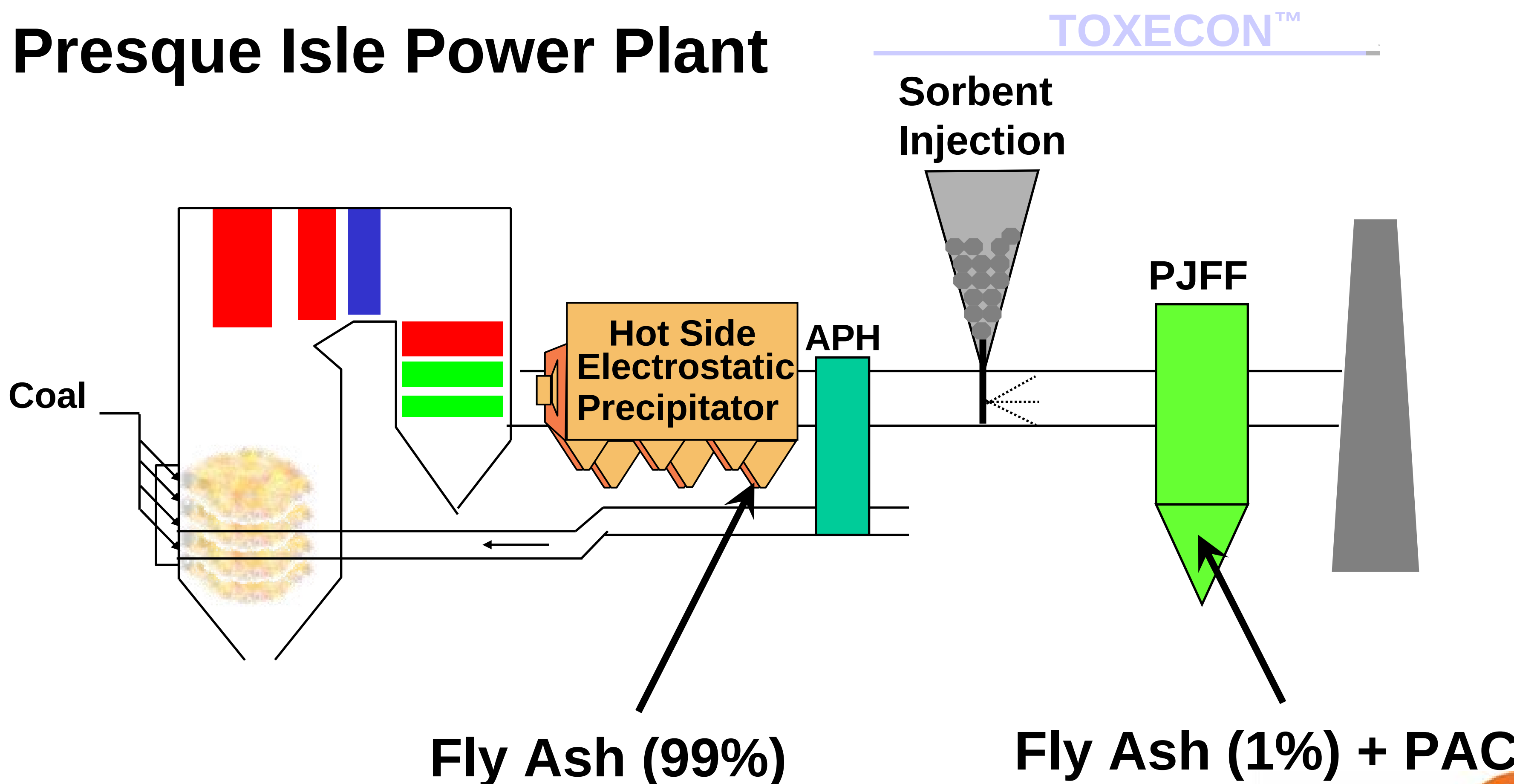
TOXECON™ – 270 MW Demonstration

- Presque Isle Power Plant, Marquette MI
  - Units 7-9
  - PRB Coal from Antelope and Spring Creek Mines
- $53.3M
  - $24.9M DOE
  - $28.5M We Energies
- 90% Hg Control
- 70% SO_2 Control*
- 30% NO_X Control*

* Potential

TOXECON™ Configuration

Presque Isle Power Plant



PIPP Baghouse Design

- Pulse-Jet Fabric Filter
  - Supplied by Wheelabrator
  - On-line cleaning
  - Ability for off-line cleaning
- Air-To-Cloth Ratio
  - 5.5 ft/min (gross)
  - 1,080,000 acfm
- 10 Compartments
  - 648 bags/compartment
  - PPS fabric

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Schedule – Baseline and Parametric

Date	Activity
2/13/06 – 2/17/06	Baseline Testing • Two CEMs sampling from inlet and outlet of baghouse • Stack sampling (Ontario Hydro Method, Method 17 for particulate, Appendix K Sorbent Trap Method, Method 26A for halogens) • Ash and coal sampling
2/20/06 – 3/2/06	Round 1 Parametric Testing • Injection concentrations • CEMs sampling from inlet and outlet of baghouse • Baghouse ash and coal sampling
8/20/06 – 11/7/06	Round 2 Parametric Testing • Injection concentrations • Sorbents • CEMs sampling from inlet and outlet of baghouse • Baghouse ash and coal sampling

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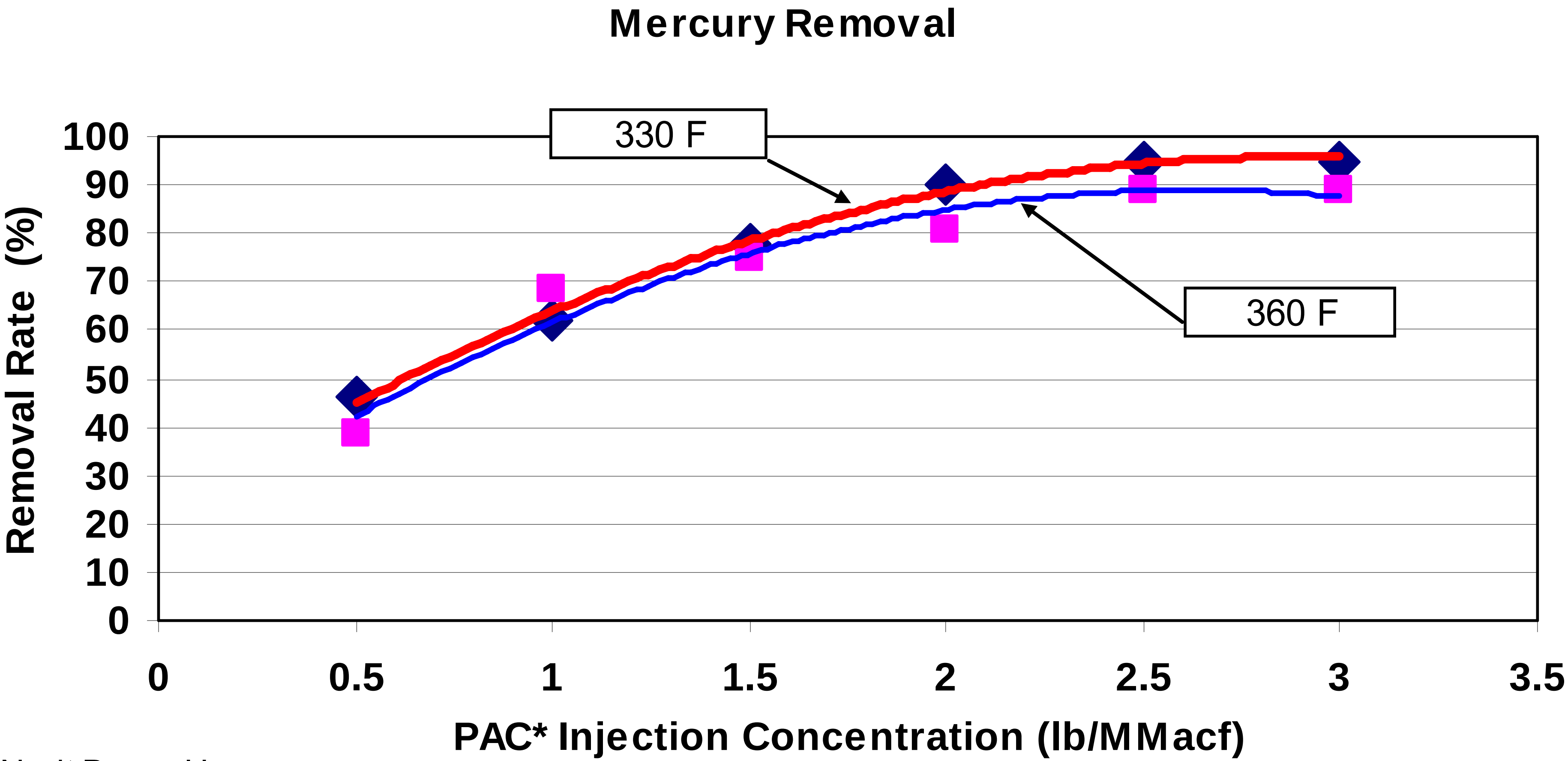
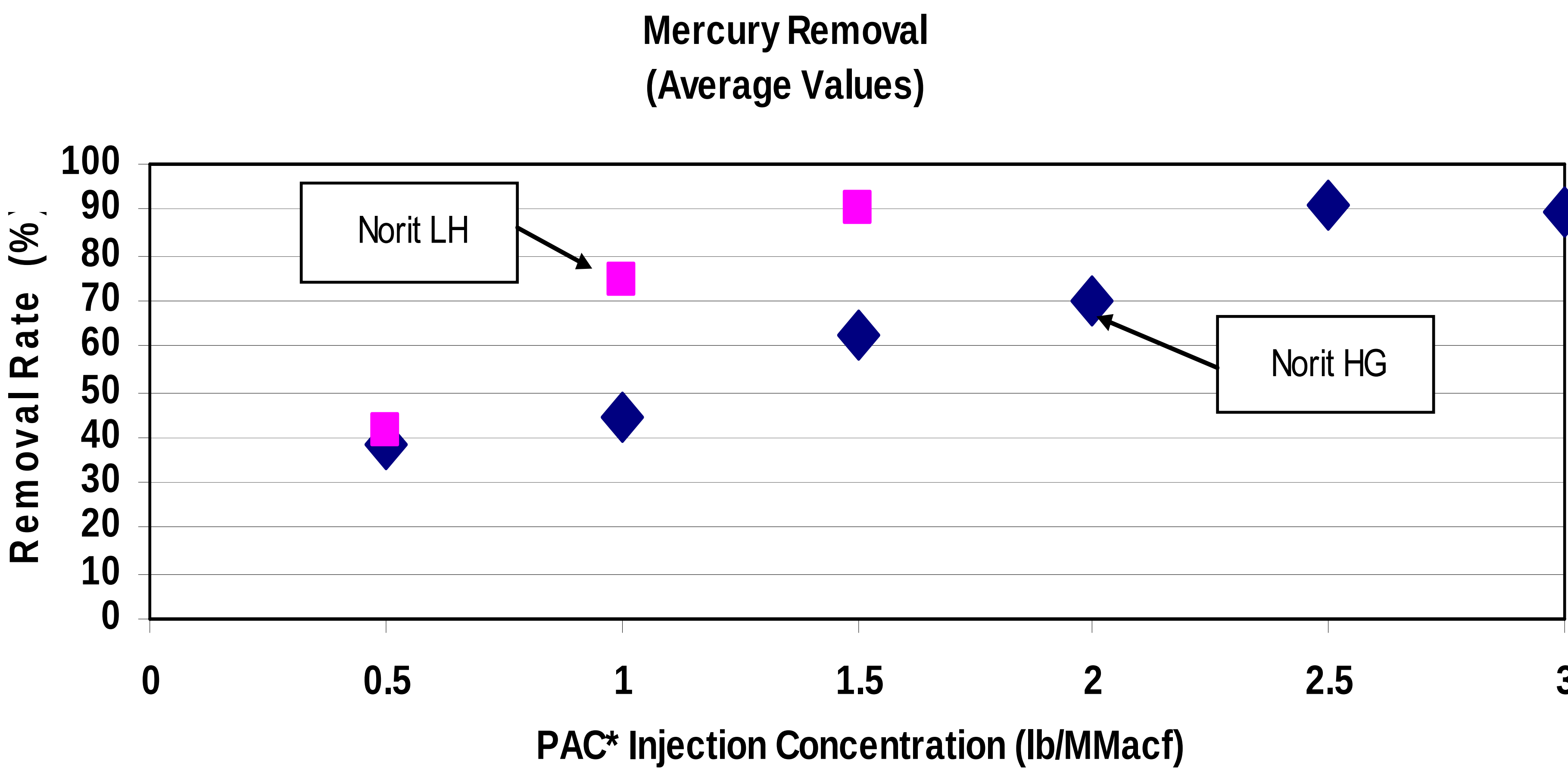
Preliminary Mercury Removal Results

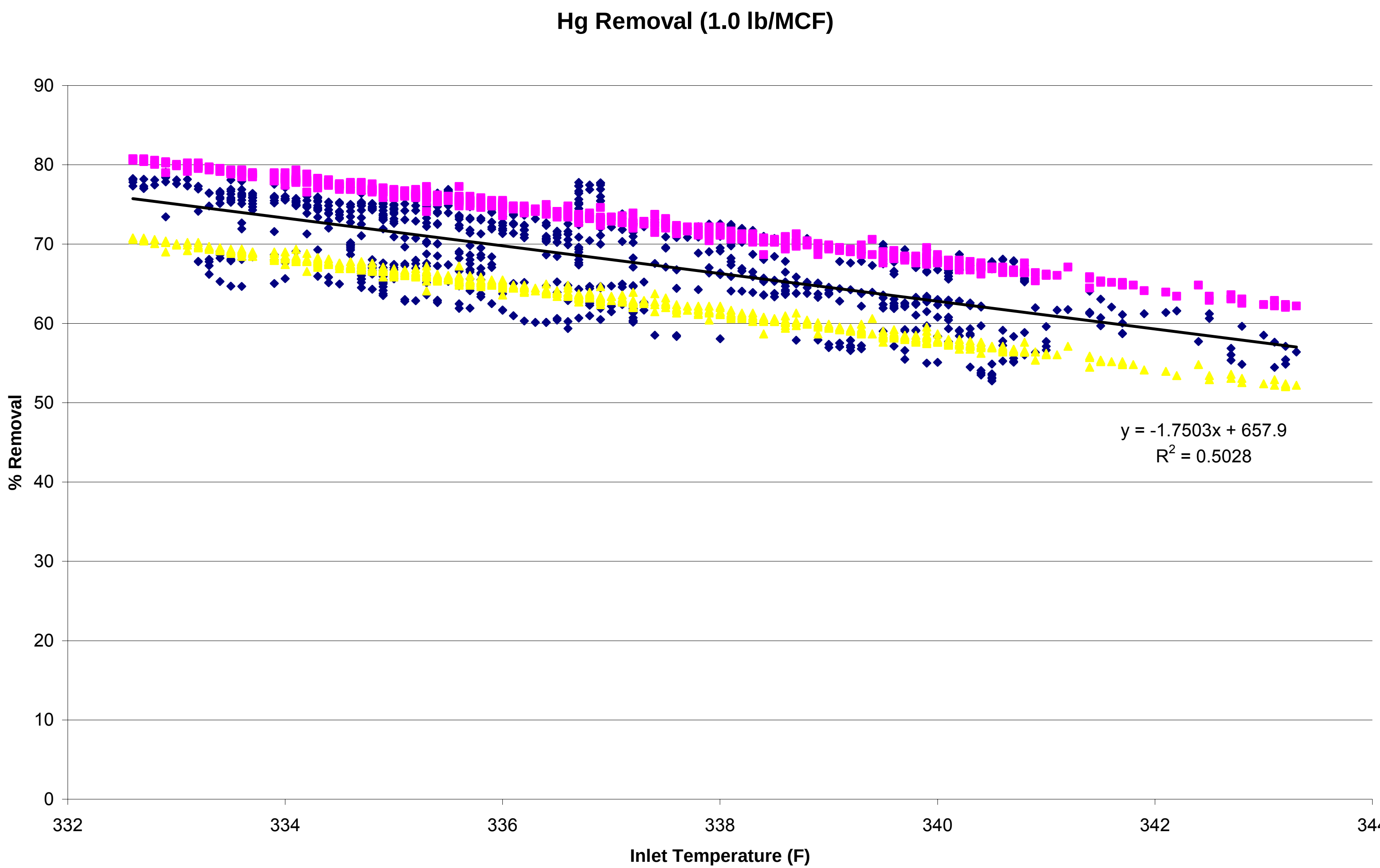


*Norit Darco Hg

Preliminary Mercury Removal Results



Effects of Flue Gas Temperature



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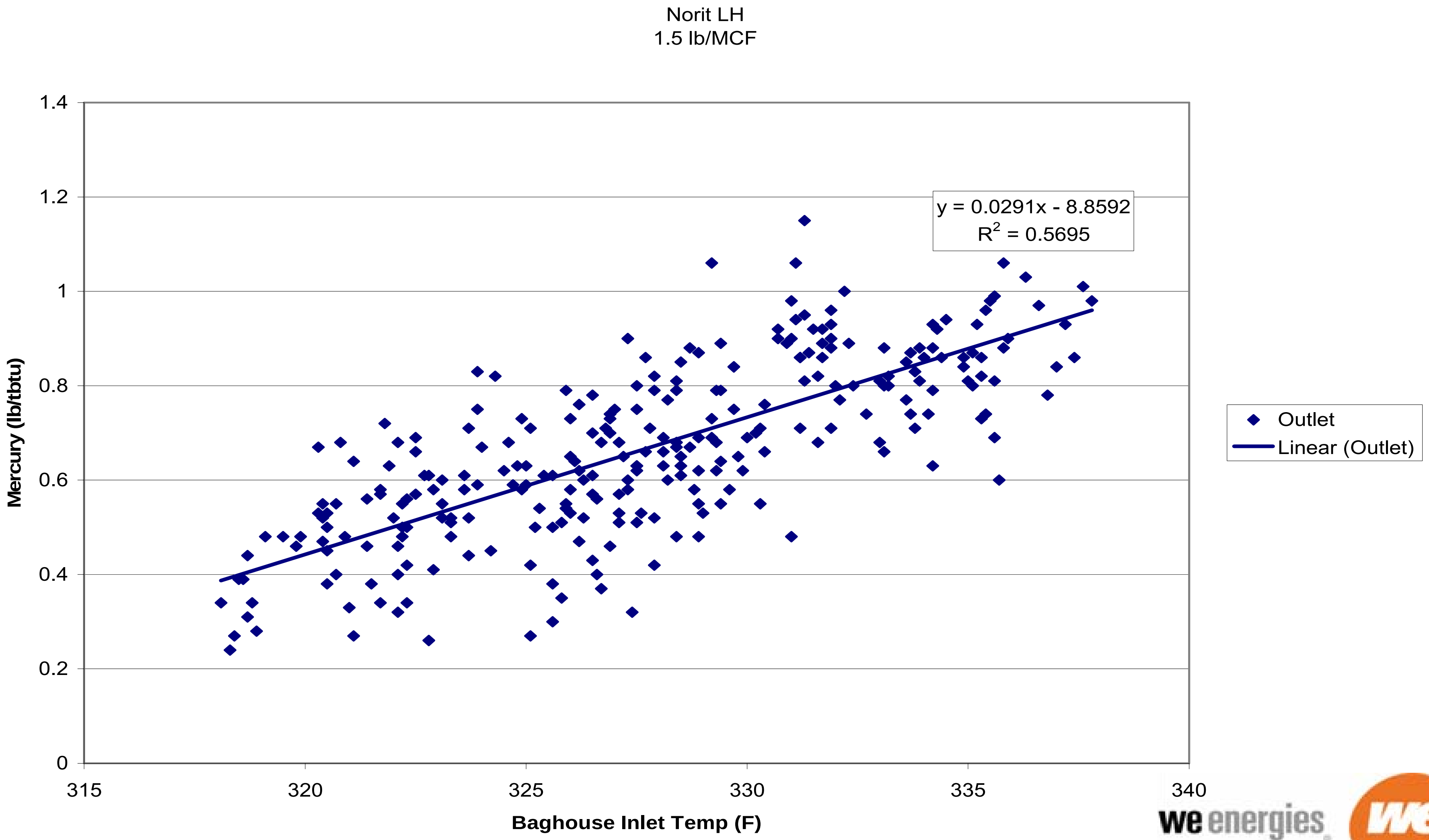
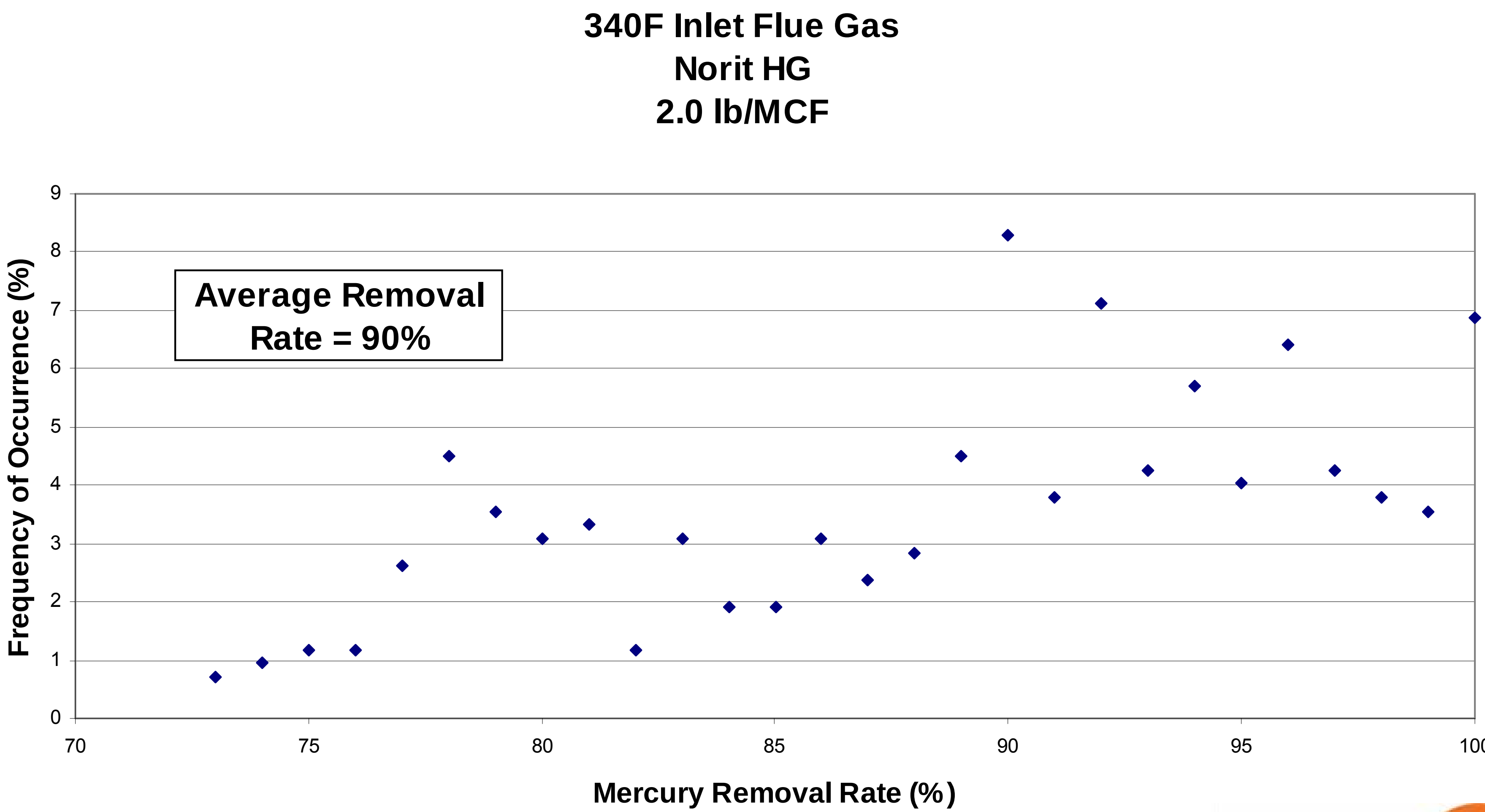
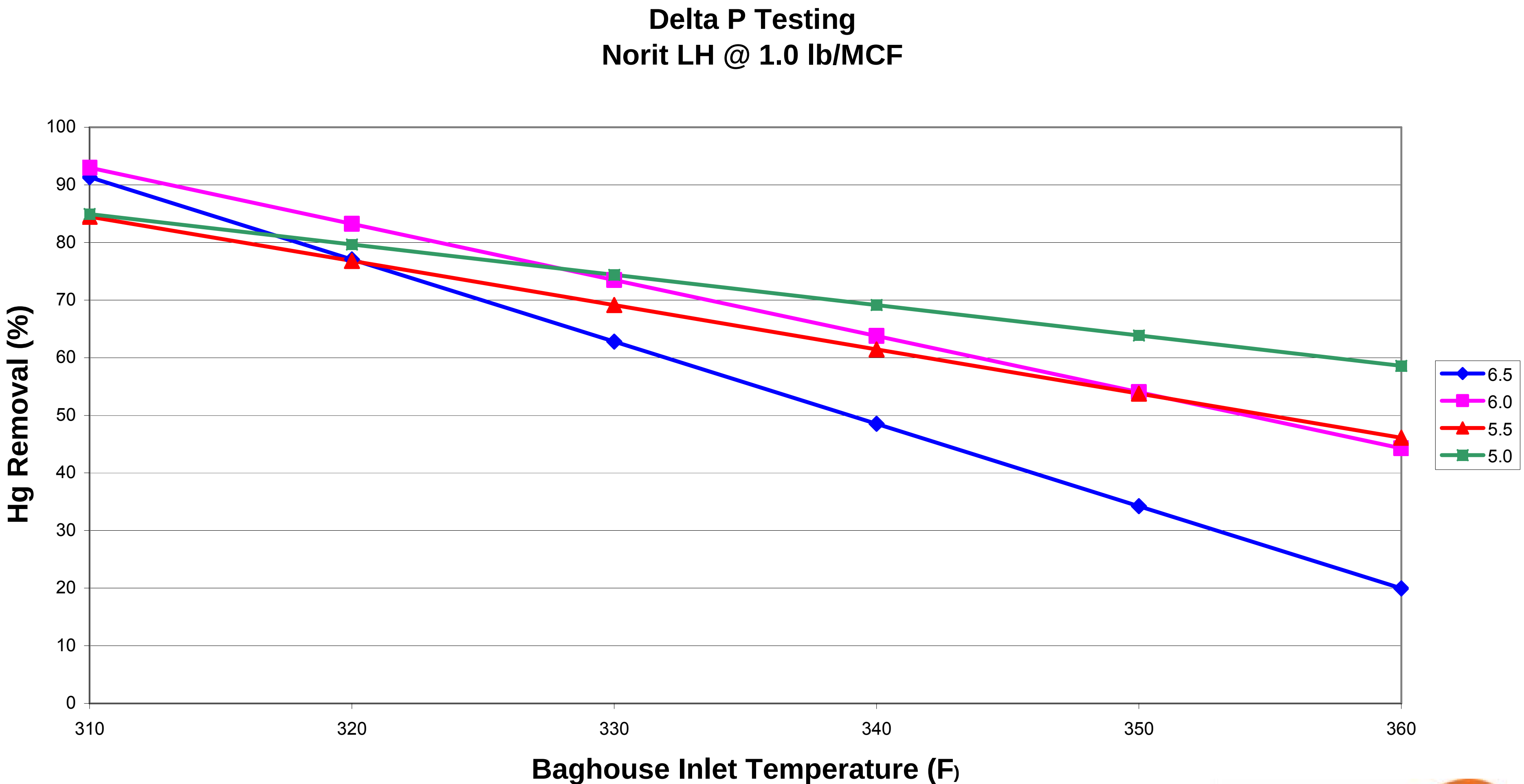


Mercury Removal Uncertainty



Effect of Baghouse ΔP



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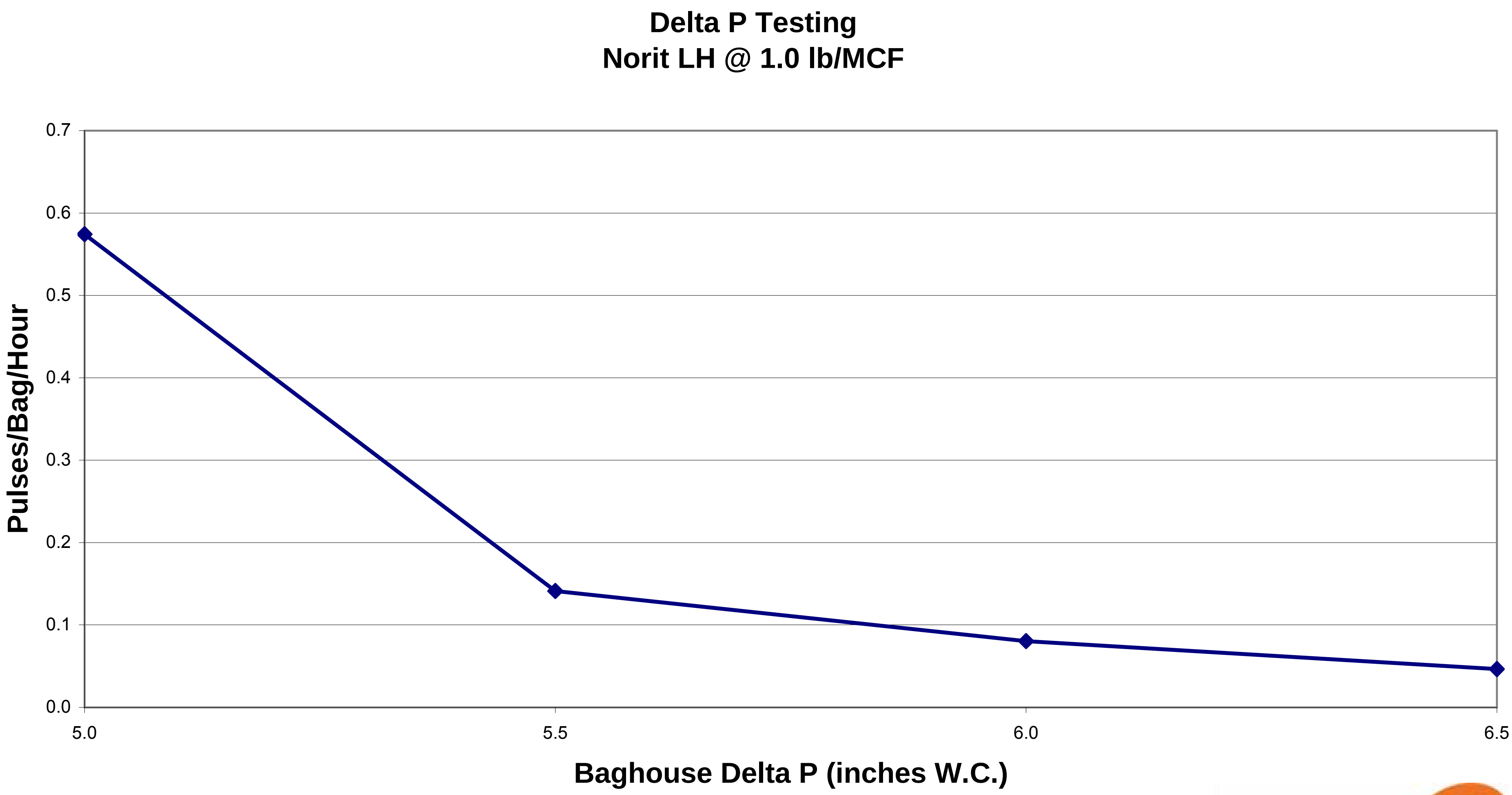

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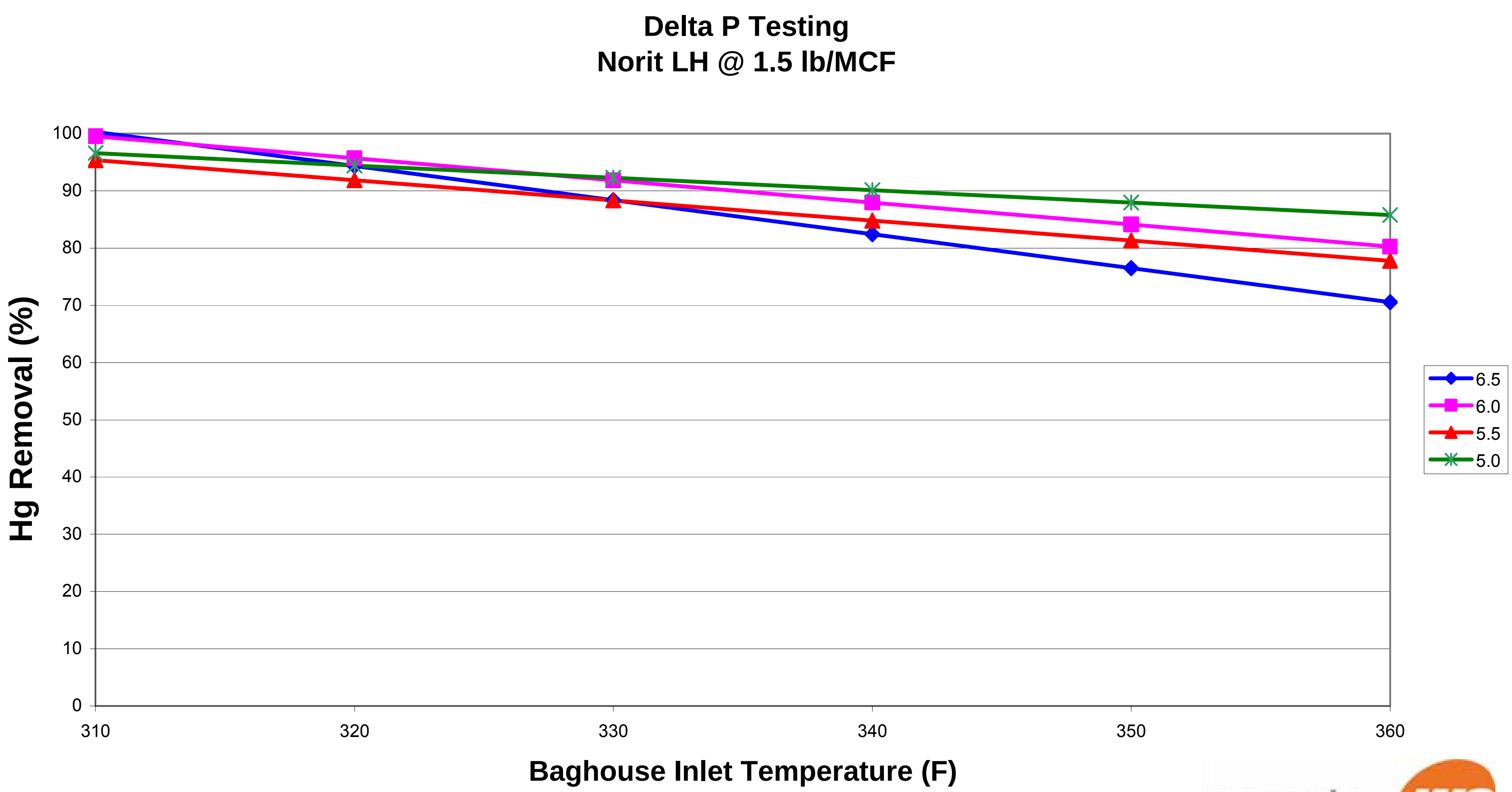
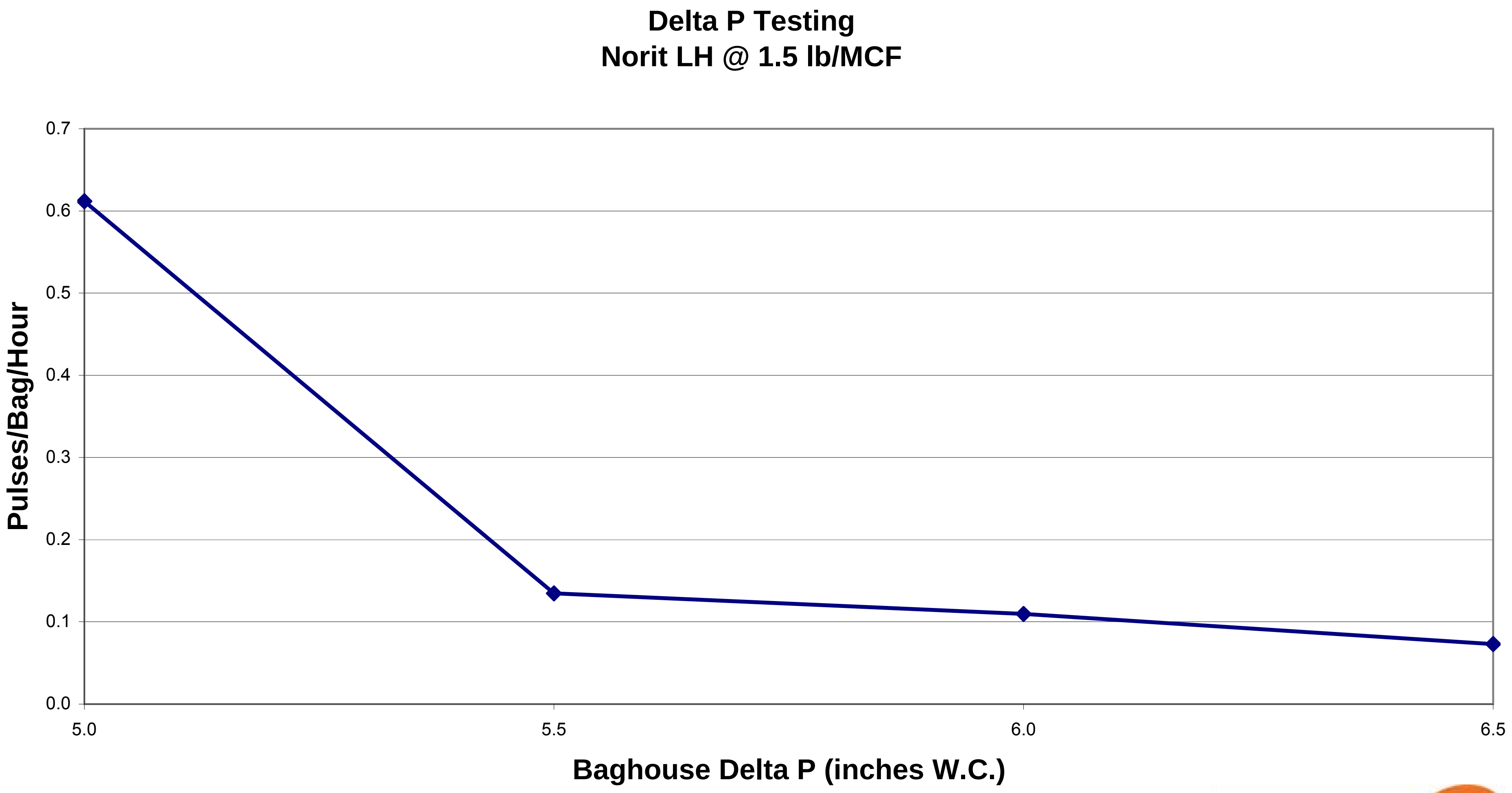
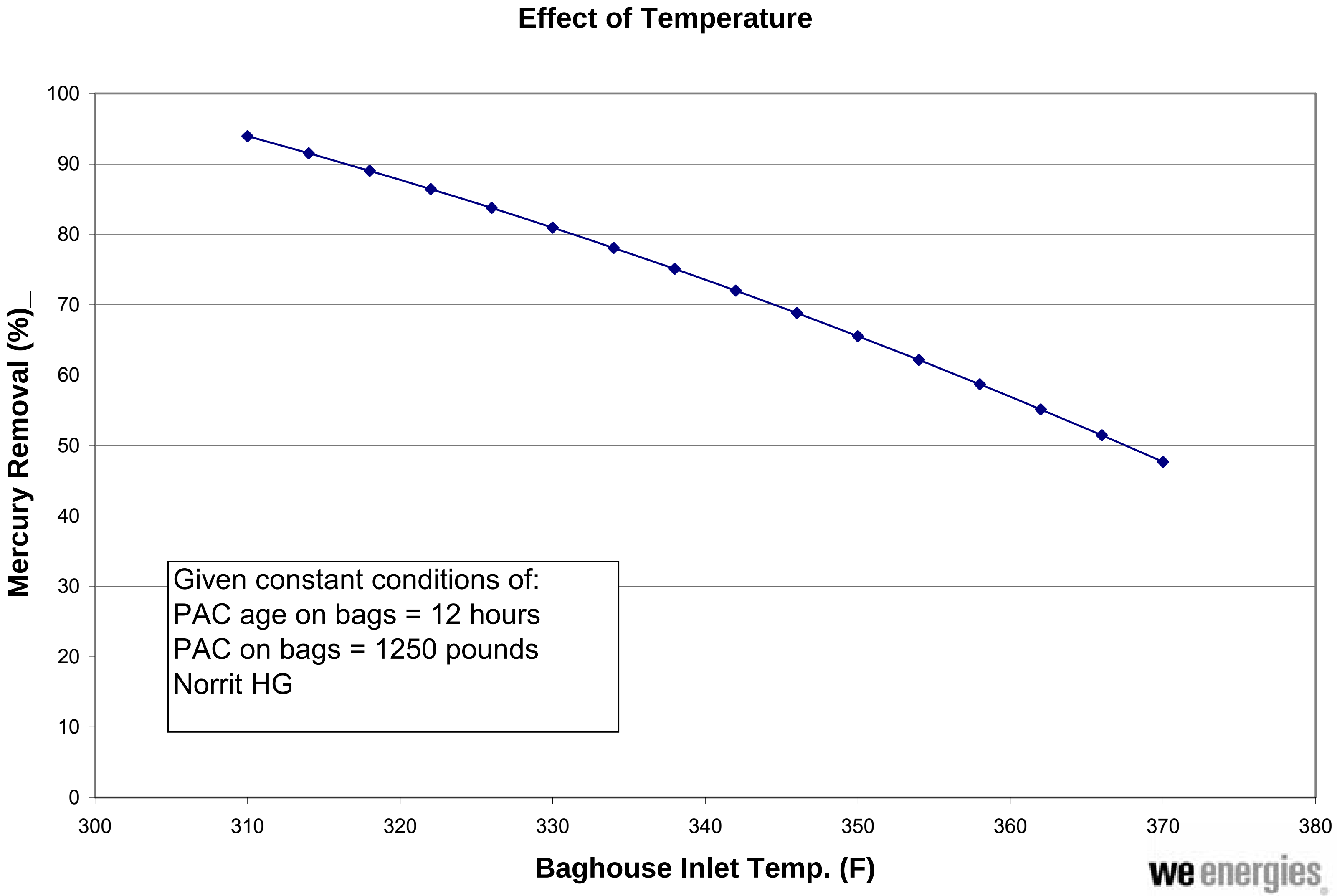


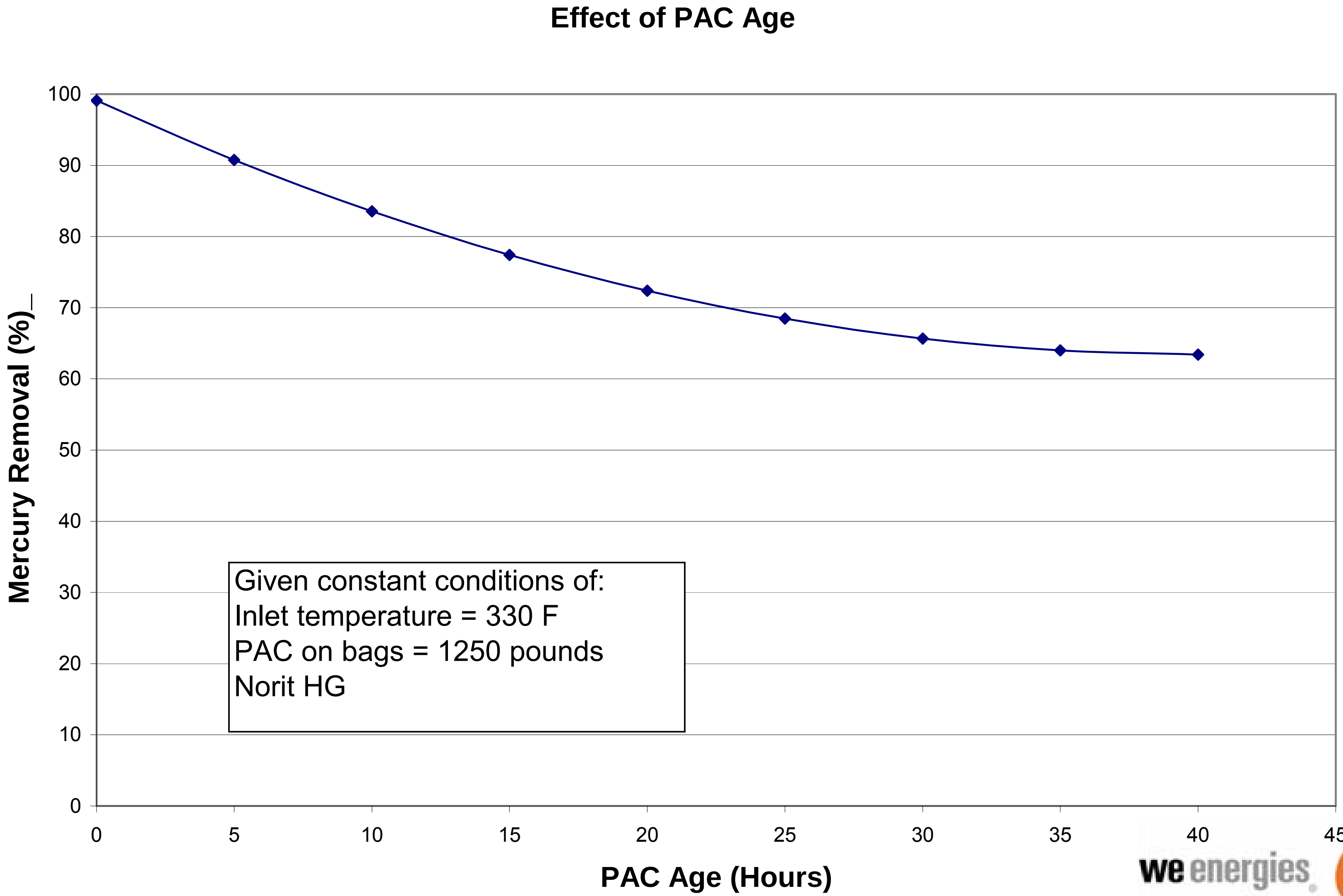
Effect of Baghouse ΔP



Effect of Temperature



Effect of PAC Age



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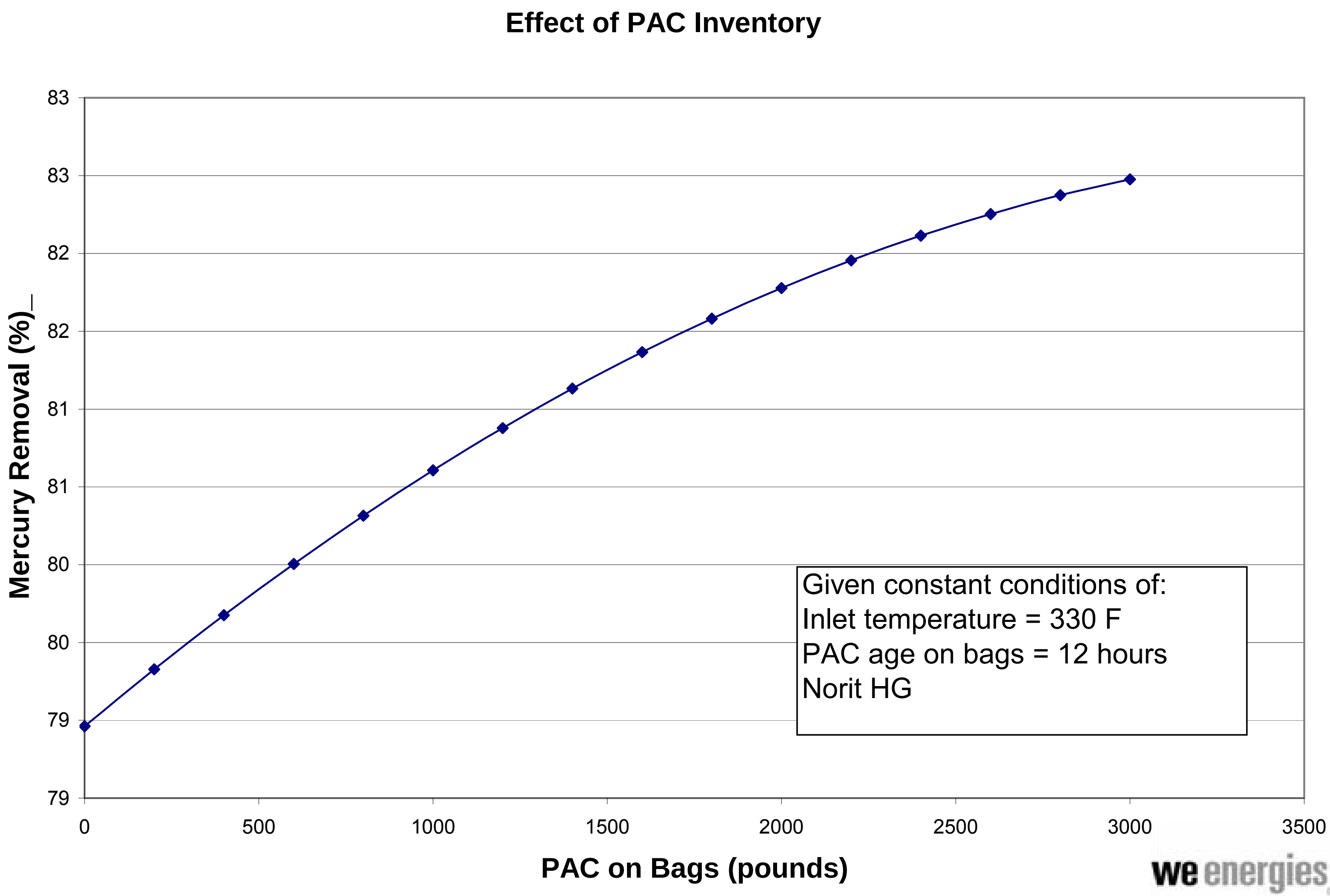
Effect of PAC Inventory



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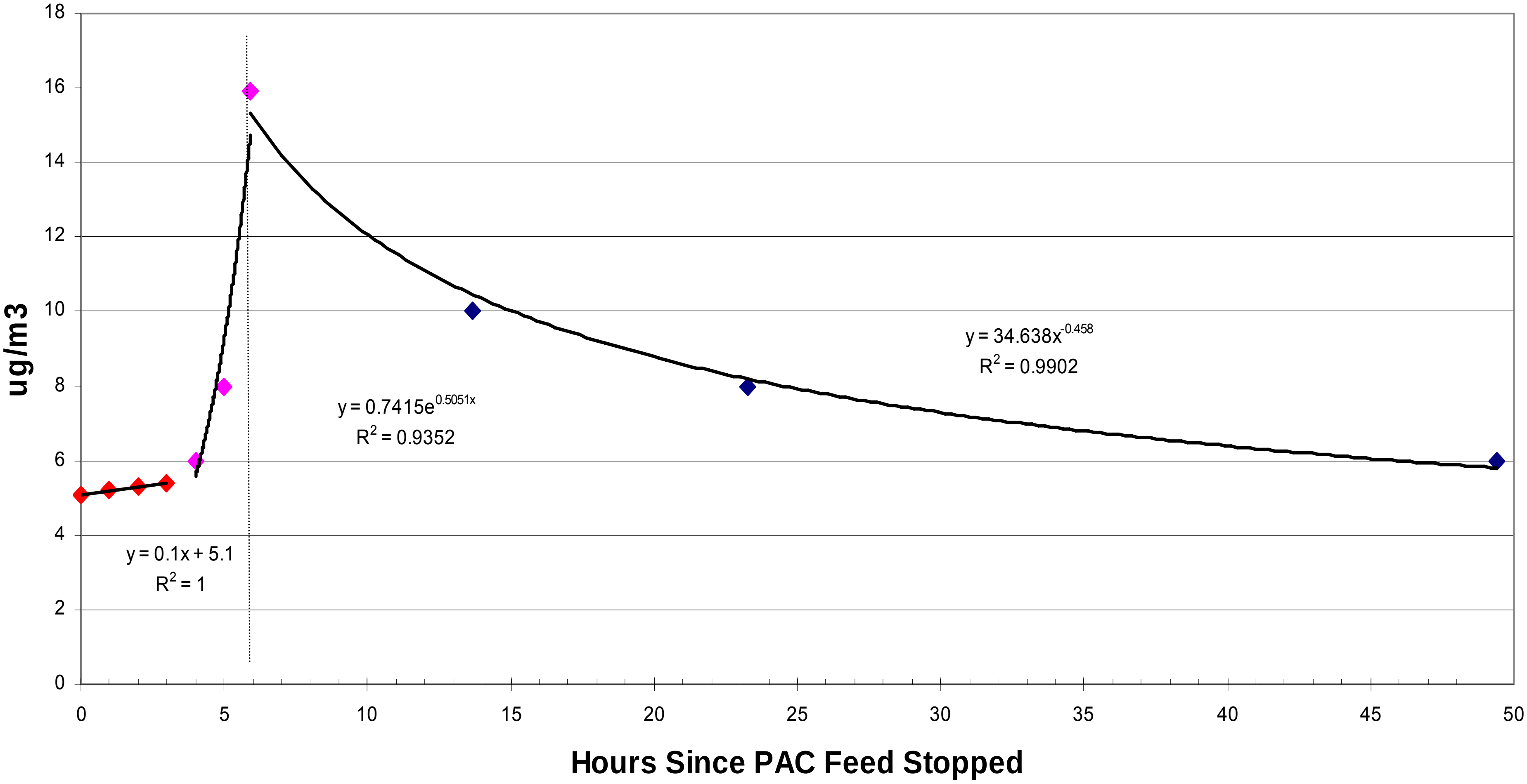
Mercury Outlet Without PAC Feed
9/22/06 to 9/24/06



Economics

	$/MWH	
PAC	0.33	
Fan Power	0.27	
Bag Replacement	0.09	
Ash/PAC Disposal	0.03	
Annual Scheduled Maintenance	0.02	
Miscellaneous	0.07	
TOTAL	**0.81**	
Annual mercury removed	82	pounds
Average cost (variable only)	16,000	$/lb

Economics

- Capital Costs
  - $34.4 million, 270 MW
  - $128/kw
- O&M Costs
  - $0.81/MWH
- Hg Removal (variable only)
  - $16,000/lb

Balance of Plant Issues

- Smoldering PAC/ash in hoppers
- Bag cage separation
- Condensation at startup
- Ash silo unloading
- Cold air on pulse header valves
- Air heater soot blowing

What We Learned So Far

- Carbon injection effectively removes mercury
- Standard activated carbon is sensitive to temperature at low injection concentrations
- Bag cleaning based on ΔP and time reduces temperature sensitivity
- PAC/ash mixture can ignite with sufficient time and quantities at temperatures above 400 °F
- PAC/ash mixture is “sticky” and hoppers tend to “rat-hole”
- Normal ash unloading equipment is not effective when handling PAC/ash mixtures

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Design Recommendations

- Minimize PAC/ash storage in baghouse hoppers
  - Evacuate hoppers often
  - Prevent material build-up
- Control hopper temperatures
  - Eliminate or minimize use of hopper heaters
  - Controls should provide narrow band
- Install additional thermocouples or CO monitor for early detection of fires

Conclusions

- CCPI demonstrations provide key support for the commercialization of new technologies
- Preliminary full-scale testing essential for establishing design basis and reducing risk
- First commercial mercury control system is now operational
  - Still some significant issues to resolve
  - The industry is closely watching this project

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