

Full-Scale Testing of Enhanced Mercury Control Technologies for Wet FGD Systems

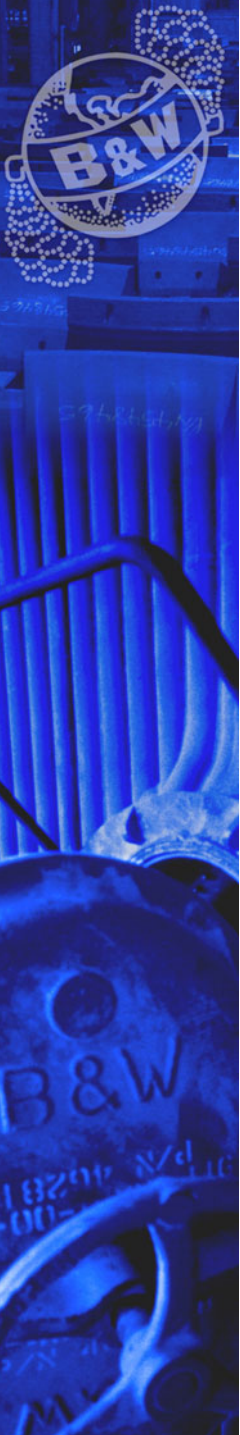
***Mercury Control Technology
R&D Program Review Meeting***

***George Farthing
August 12-13, 2003***



Babcock & Wilcox

a McDermott company



B&W Mercury Development

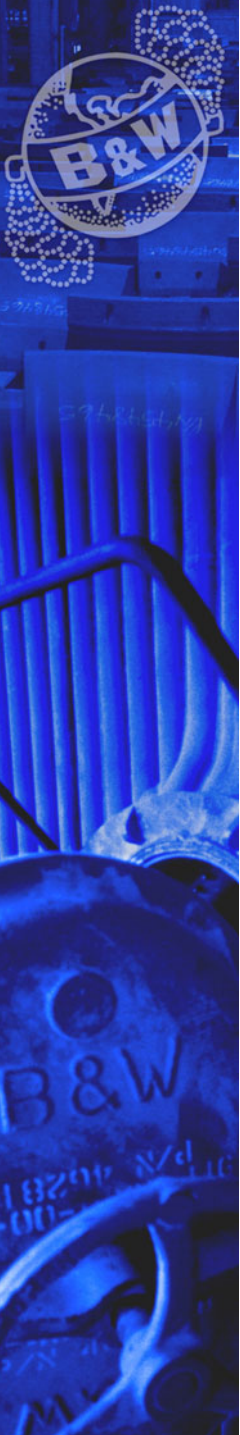
In-house R&D (1991-present)

Work with others

- Niro/Joy **Field Tests (1991 - 92)**
- DOE/OCDO **AECDP Project (1993 - 99)**
- DOE/Others **Clean Coal Projects (1993 - 98)**
- OCDO **CEDF Testing (1999 - 00)**
- DOE/OCDO/Utilities **Wet FGD Demos (2001 - 03)**

Key Development Partners

- National Energy Technology Laboratory
U.S. Department of Energy
- Ohio Coal Development Office
Ohio Air Quality Development Authority



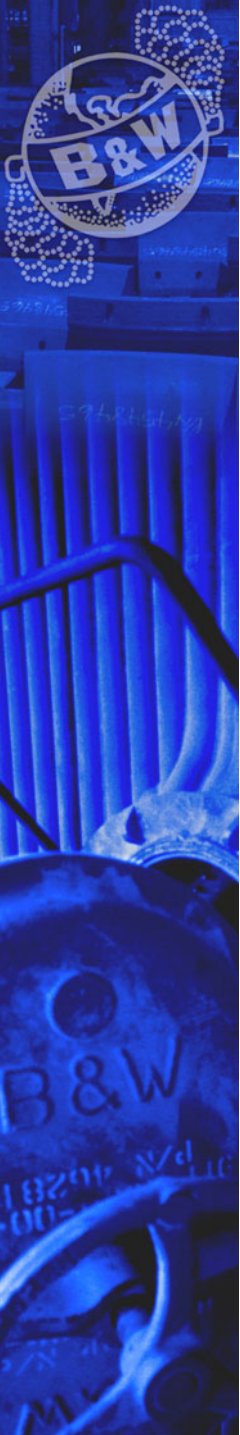
B&W Objectives

Mercury control options for our customers

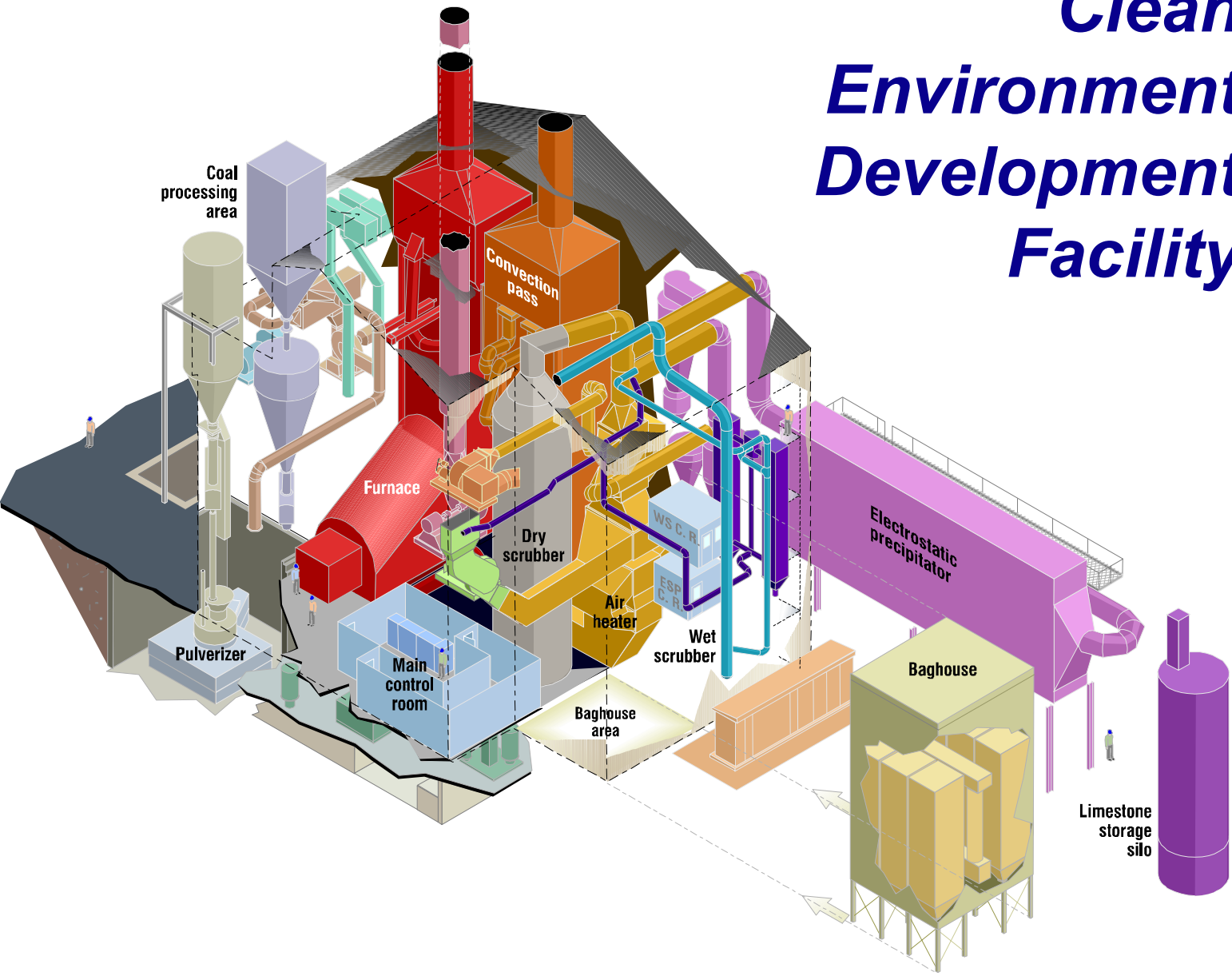
- **Cost-effective**
- **Reliable**
- **Environmentally-sound**

Scope

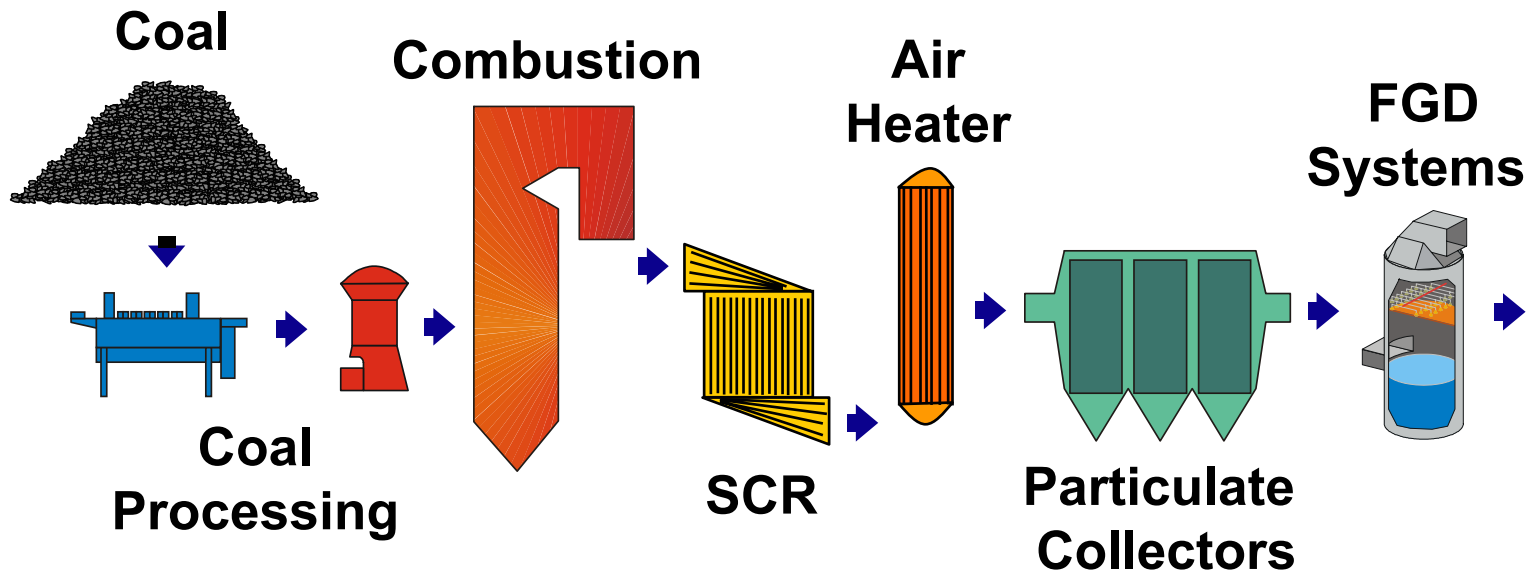
- **Coal-fired boilers**
- **Scrubbed and unscrubbed systems**
- **Eastern and western coals**

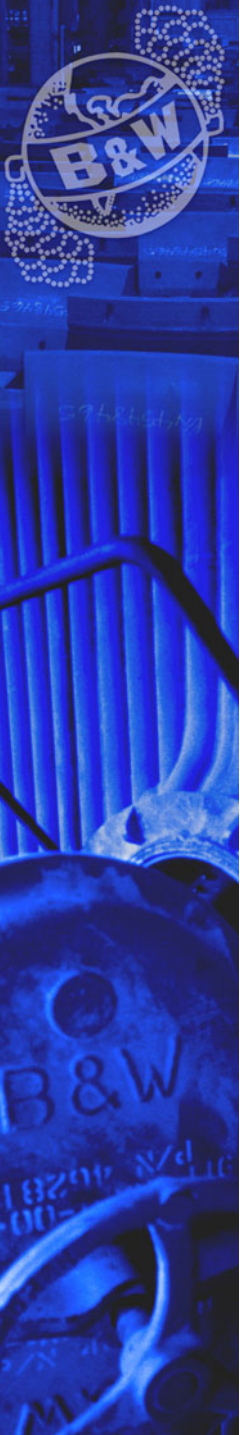


Clean Environment Development Facility

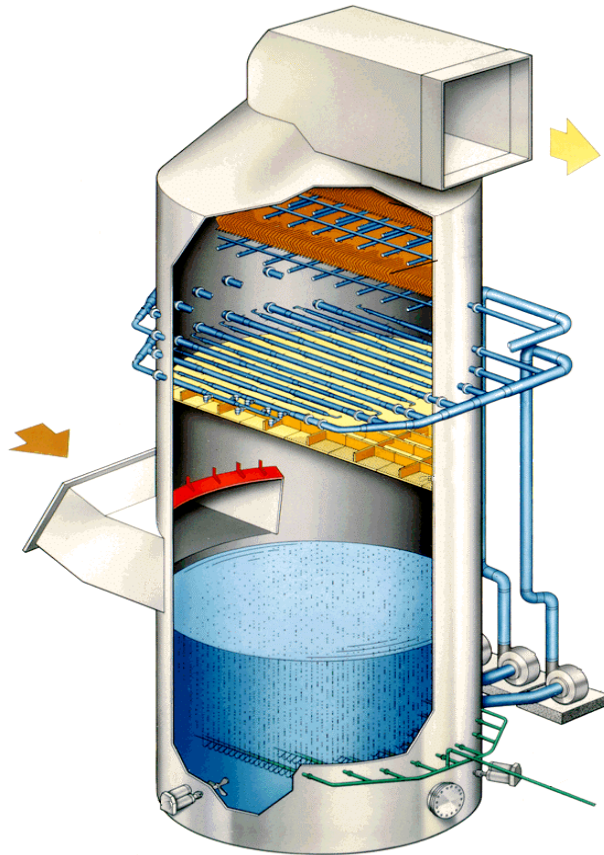


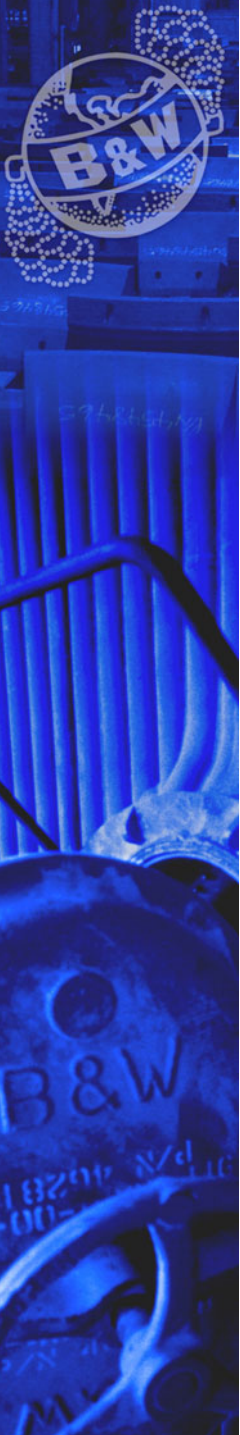
Mercury Emissions Control Opportunities



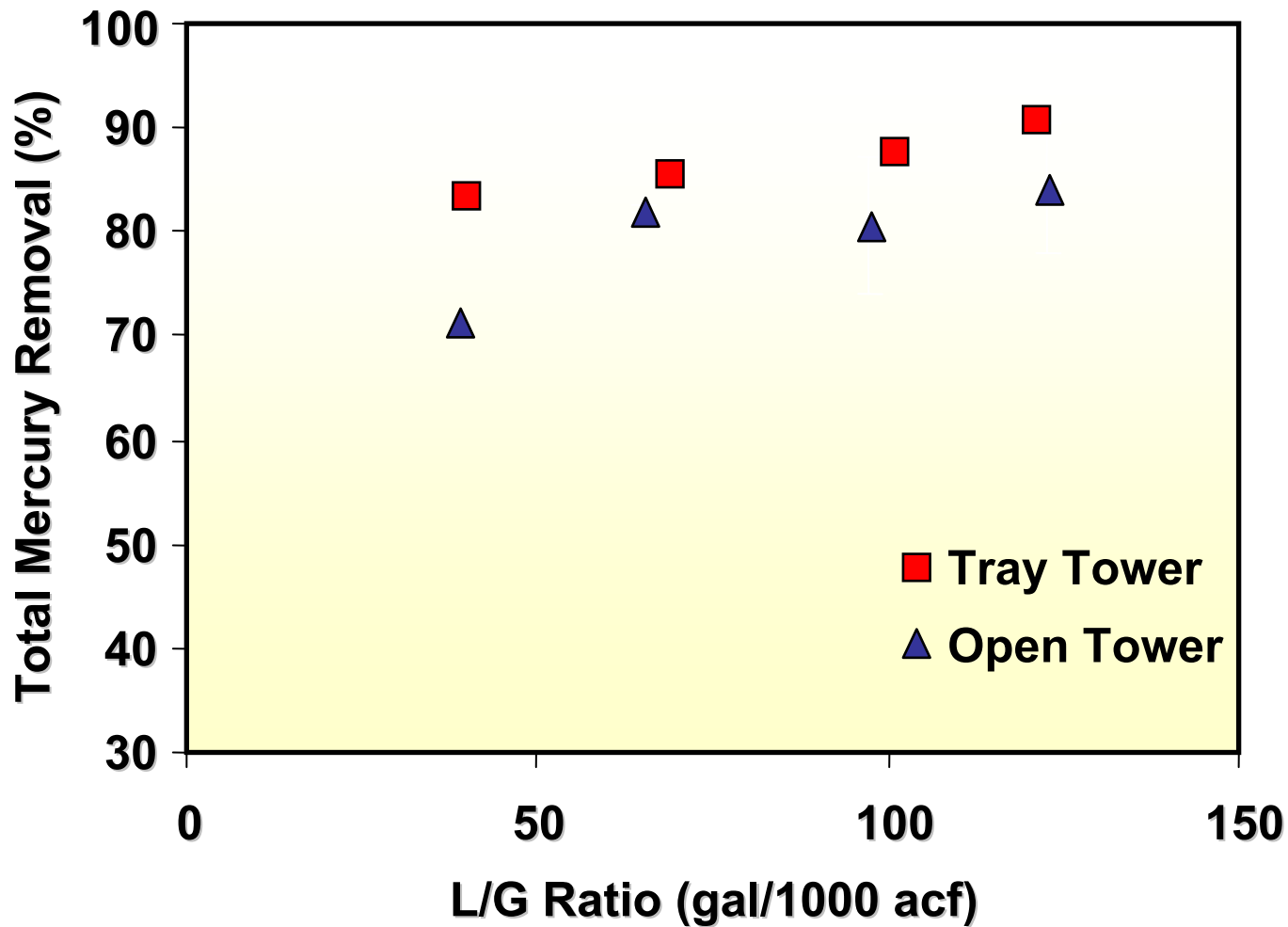


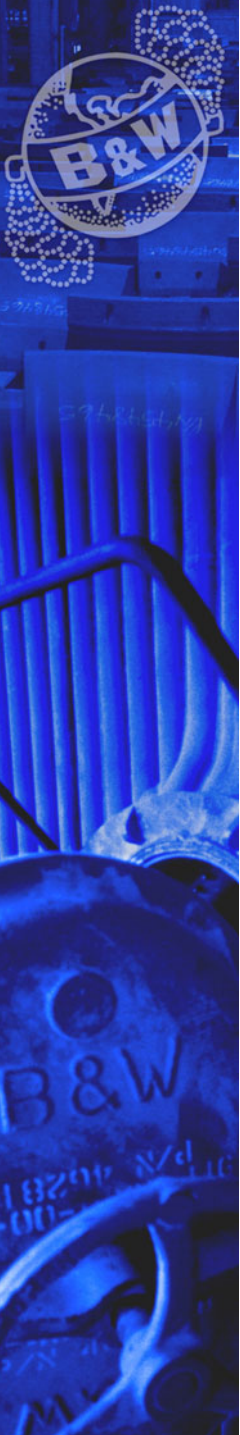
Wet FGD





Wet FGD





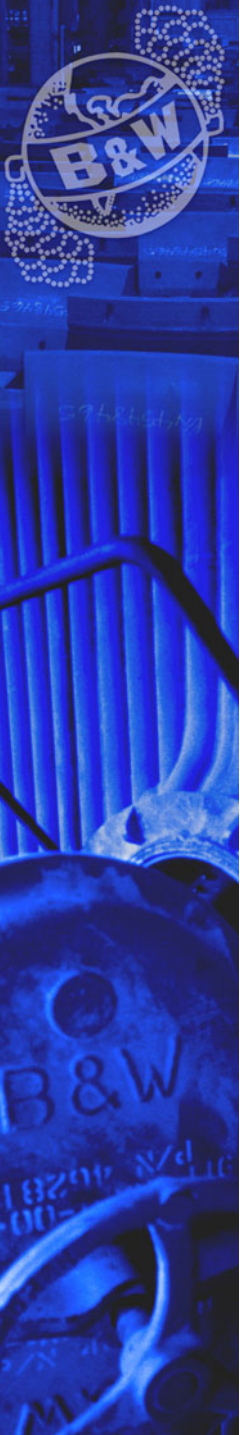
Forms of Mercury

Phase partitioning

Speciation

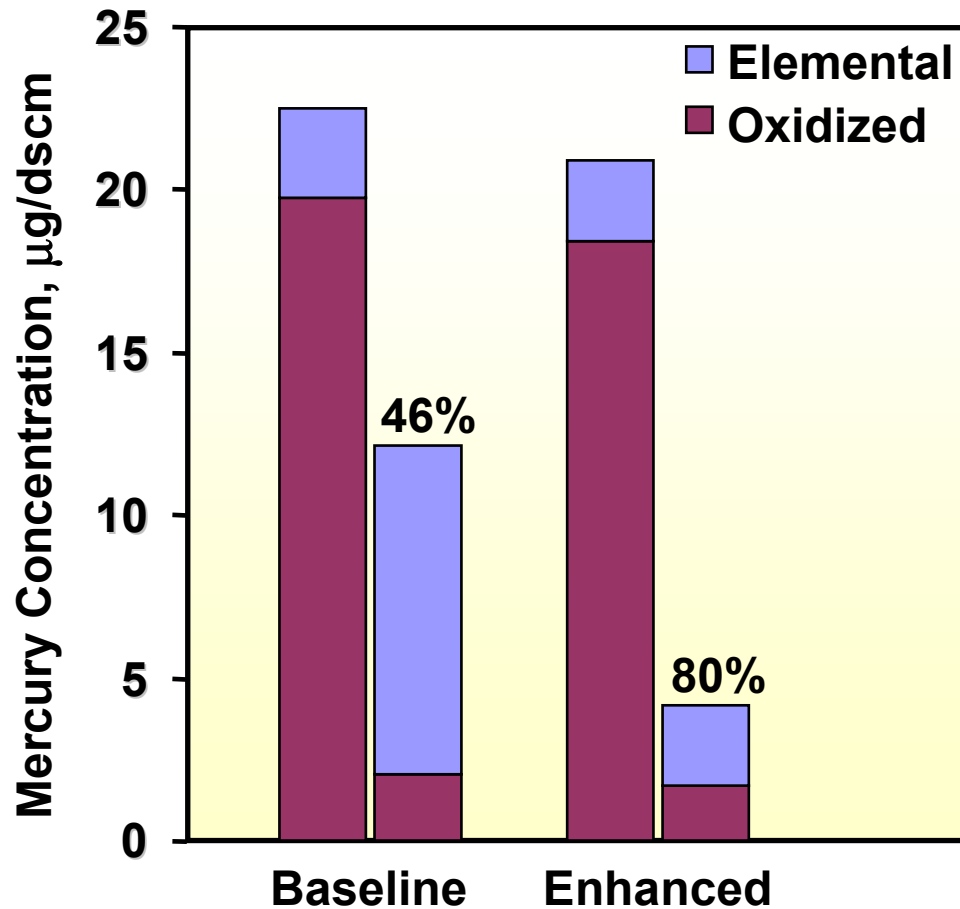
- **Elemental mercury**
- **Oxidized mercury**

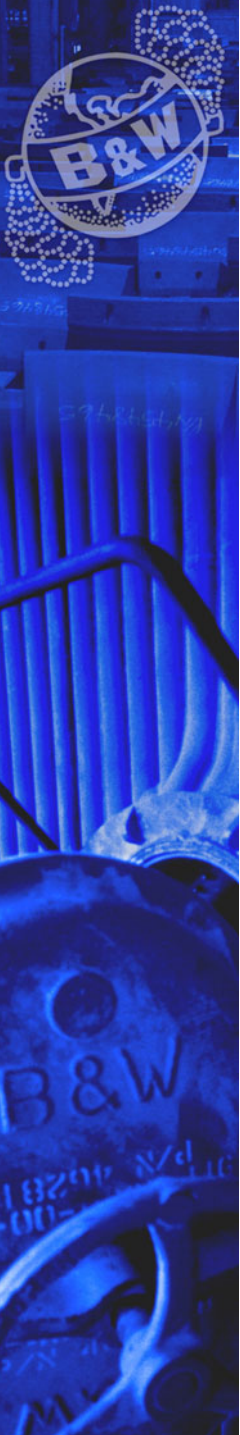
Form of mercury is critical for control



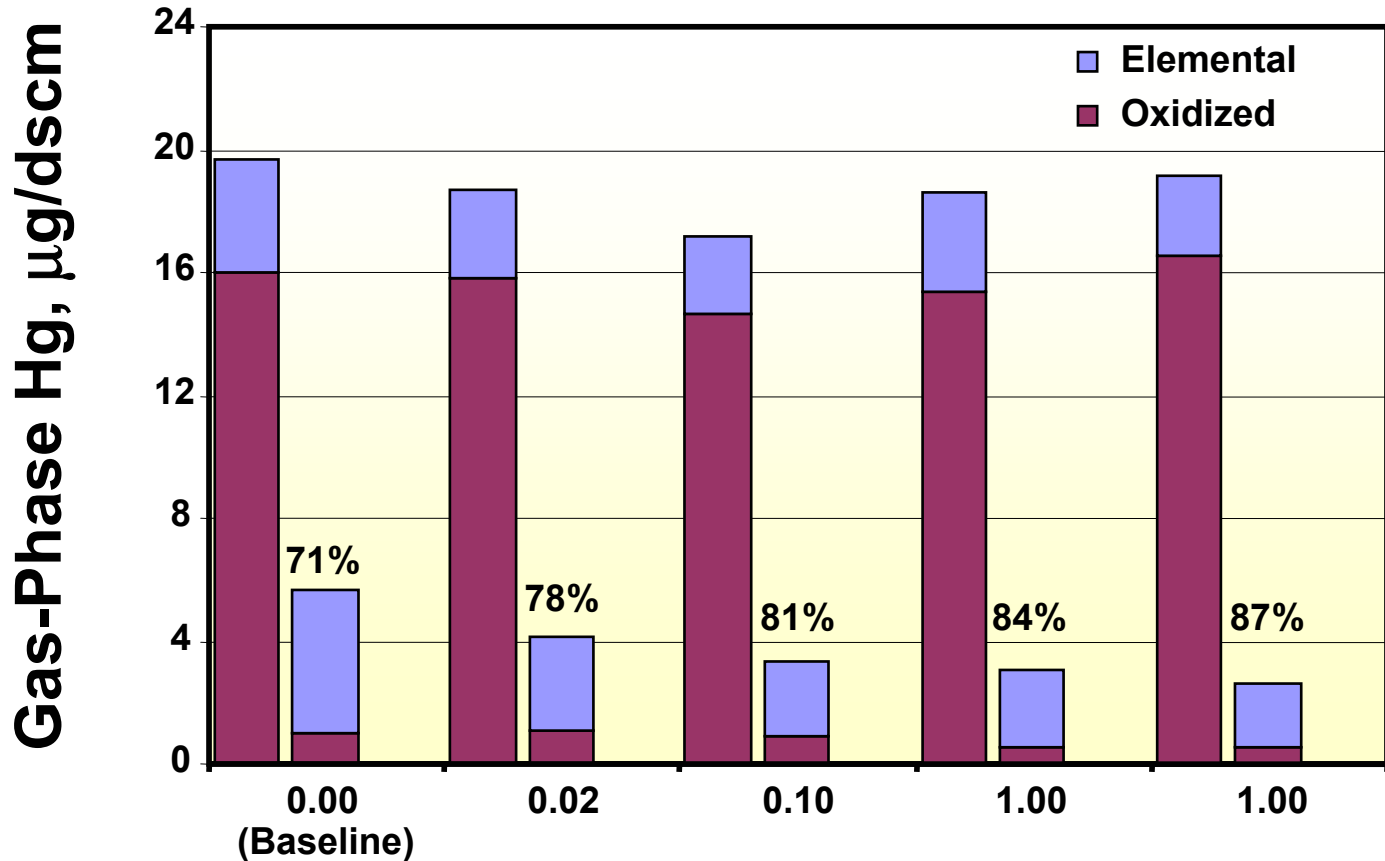
B&W Enhanced Wet FGD

Vapor-phase mercury at wet FGD inlet/outlet

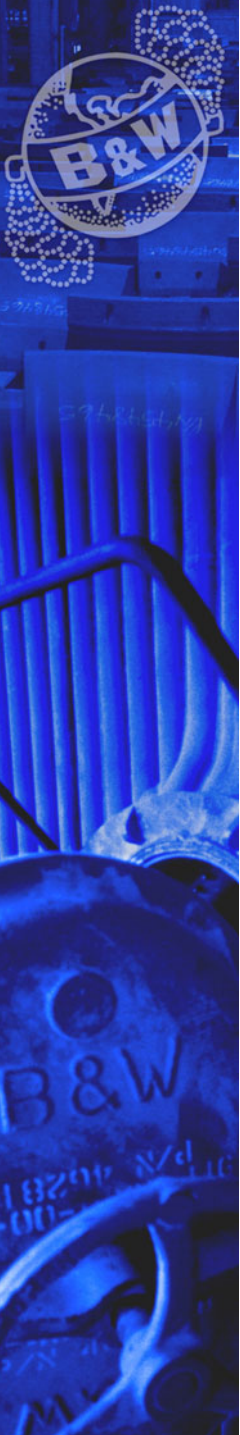




Pilot (CEDF) Tests



Normalized Reagent Flow



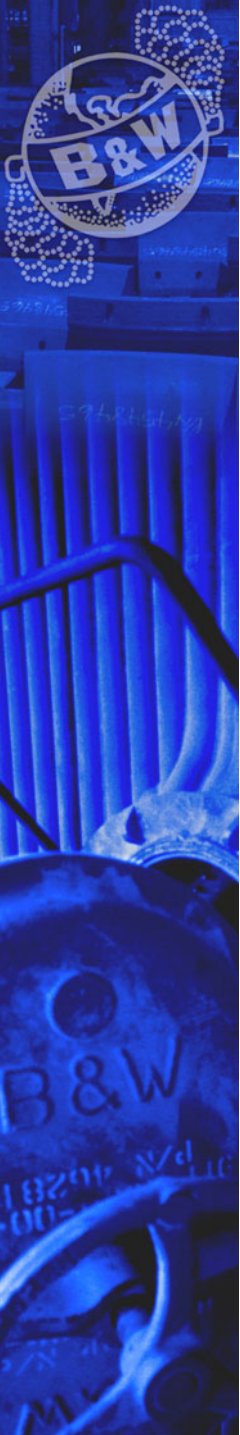
B&W Enhanced Wet FGD

Applies to plants with wet scrubbers

- Enhances mercury capture
- Prevents re-emission of captured oxidized mercury
- Applicable to new and retrofit units

Simple, cost-effective solution

- Minimal equipment required
- Readily available, inexpensive chemical reagent



Full-Scale Testing of Mercury Control for Wet FGD Systems

U. S. Department of Energy

- National Energy Technology Laboratory

Ohio Air Quality Development Authority

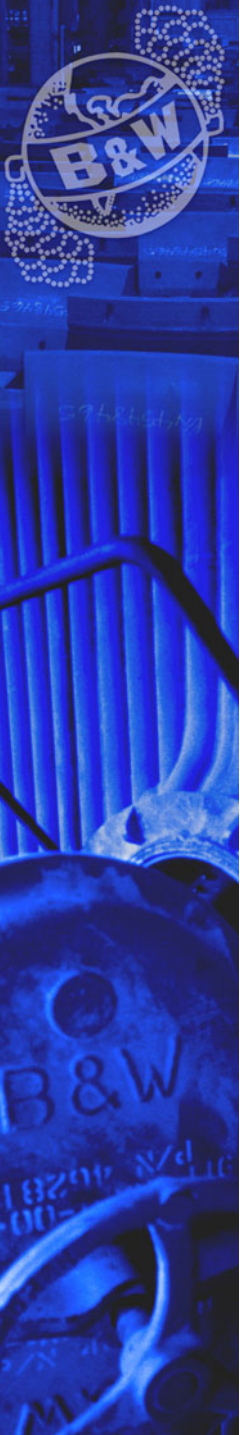
- Ohio Coal Development Office

Michigan South Central Power Agency

- Endicott Station

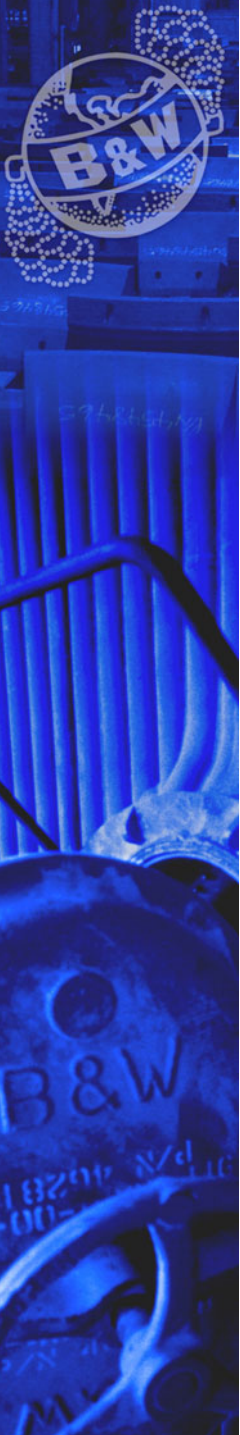
Cinergy

- Zimmer Station



Host Site Wet FGD Systems

	Endicott Station	Zimmer Station
Generating capacity	55 MW _e	1300 MW _e
Modules	1	6
Reagent	Limestone	Thiosorbic™ Lime
Oxidation method	<i>In situ</i>	<i>Ex situ</i>
L/G (gal/1000 acf)	78	21
pH	5.4 – 5.6	5.8 – 6.0
Inlet SO₂ (ppm)	3600 ppm	3300 ppm
Gypsum use	Cement	Wallboard



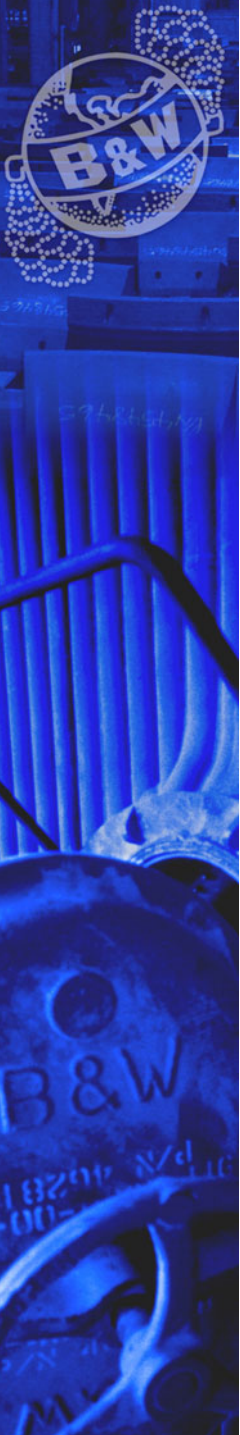
Test Plan

Endicott

- **Baseline and Parametric Tests**
- **Verification Tests**
 - 14 days
 - Baseline and 1 Ontario Hydro per day
- **Long-Term Tests**
 - 4 months
 - Ontario Hydro once every 2 weeks, Hg CEM

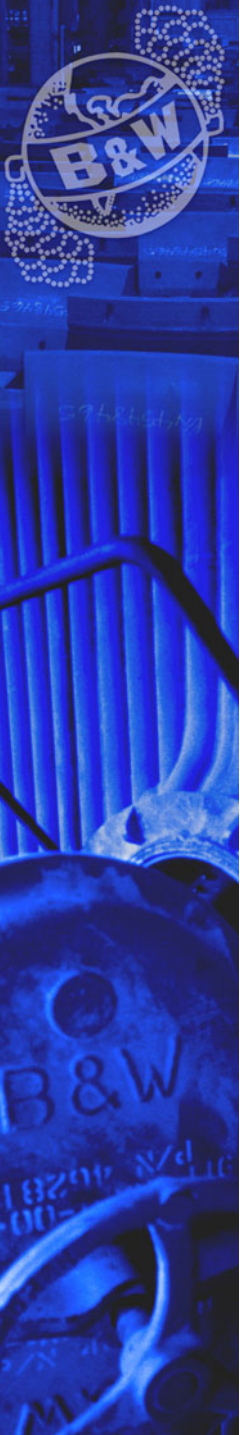
Zimmer

- **Verification**
 - 14 days
 - Baseline and 1 Ontario Hydro per day



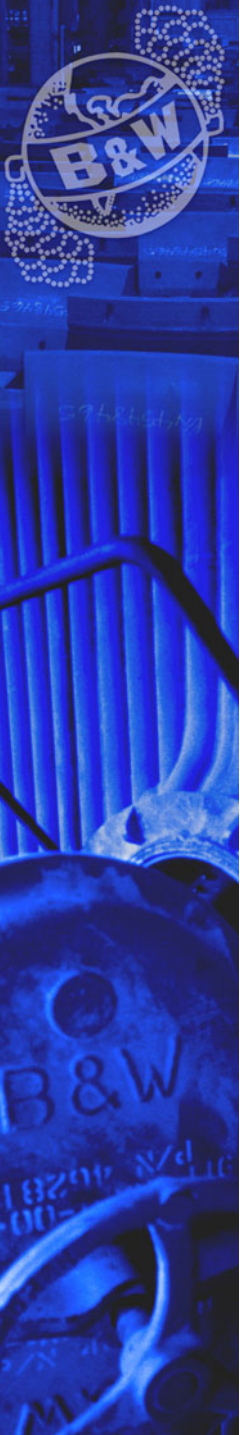
Reagent Supply System



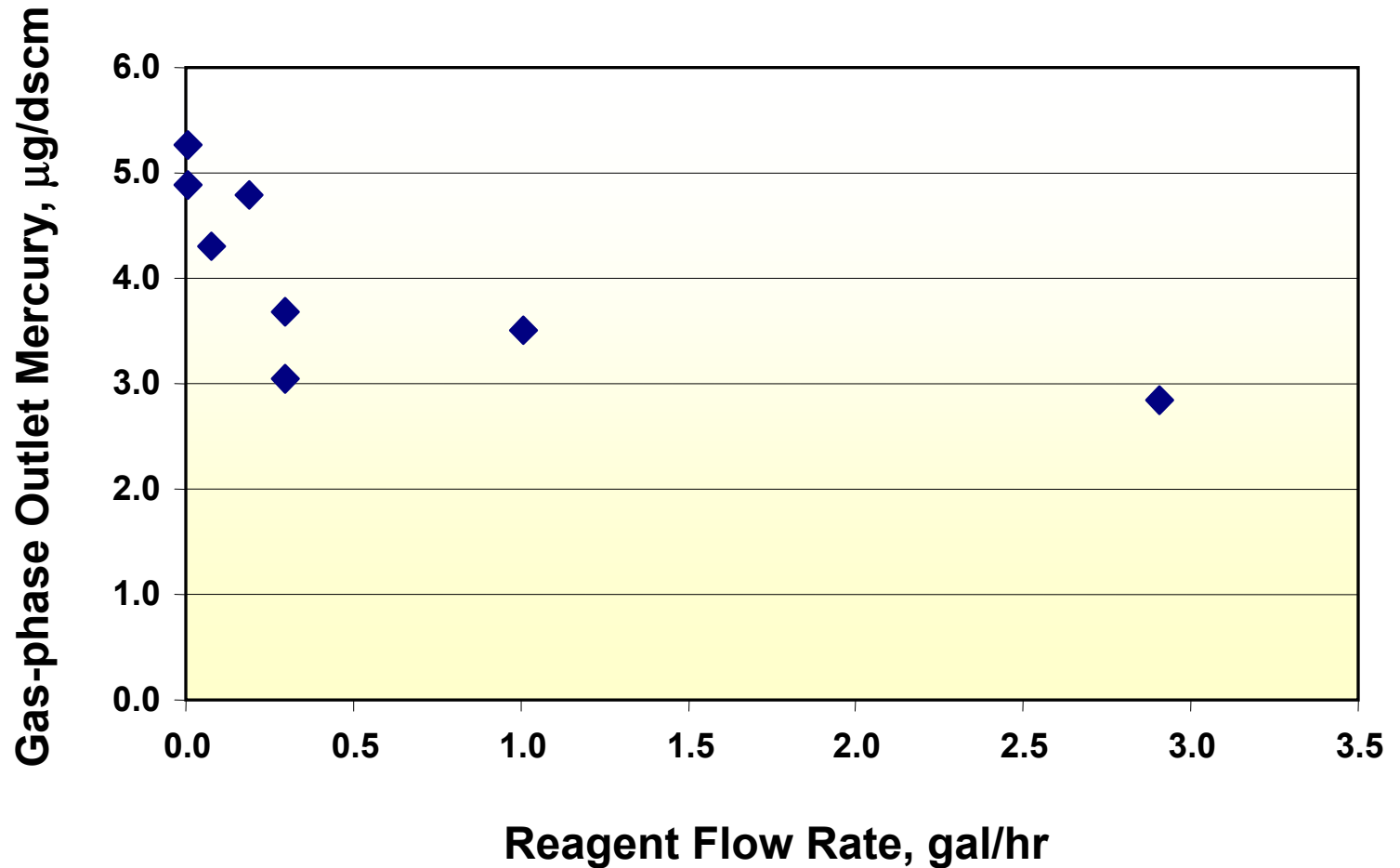


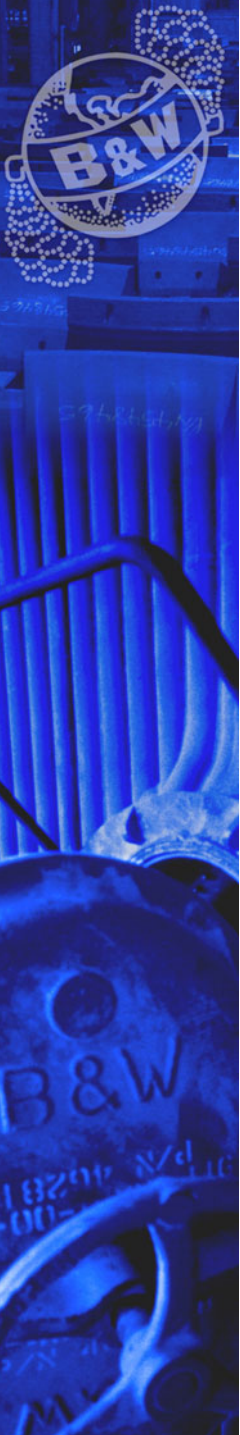
Ontario Hydro Stack Sampling



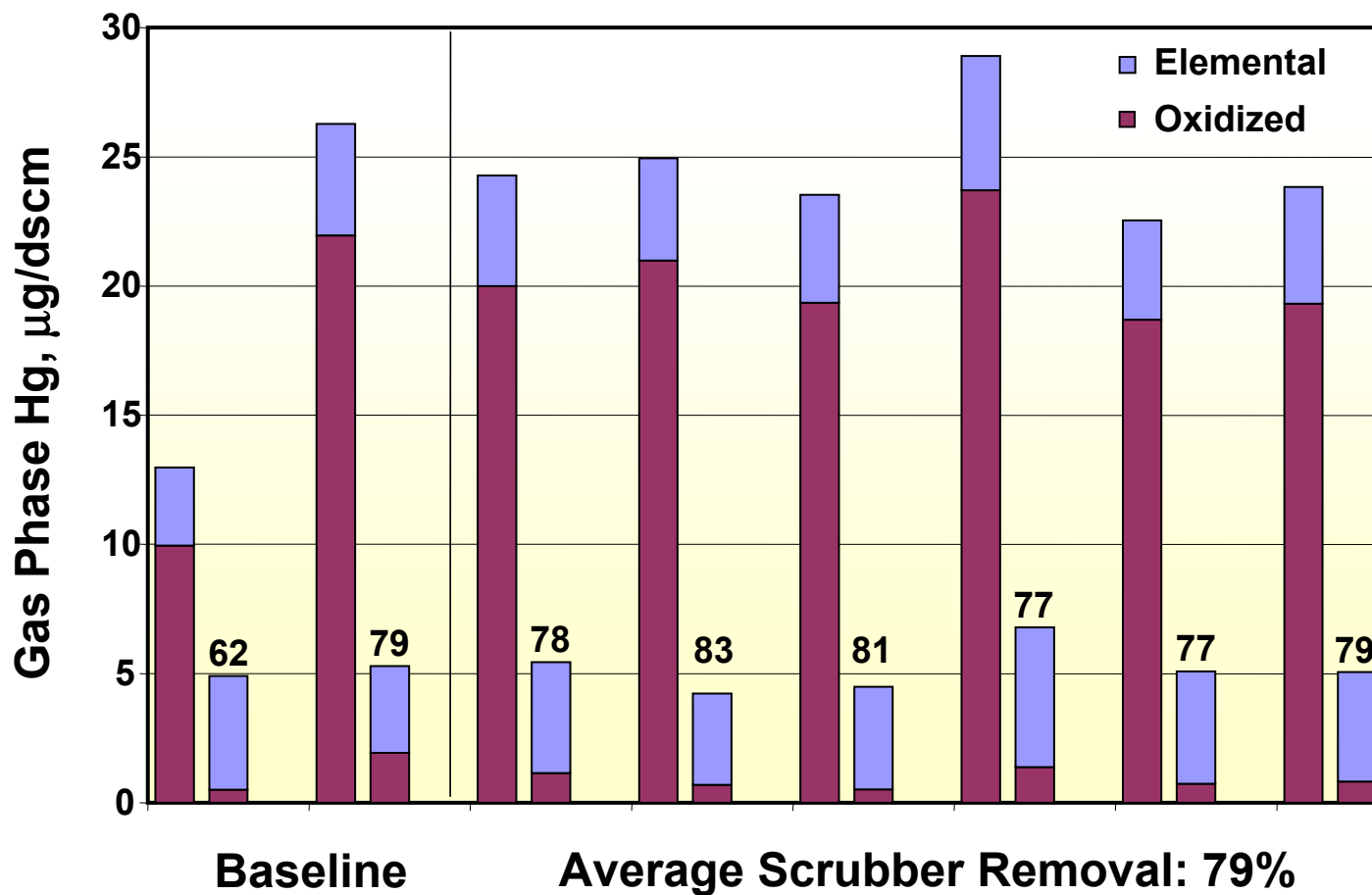


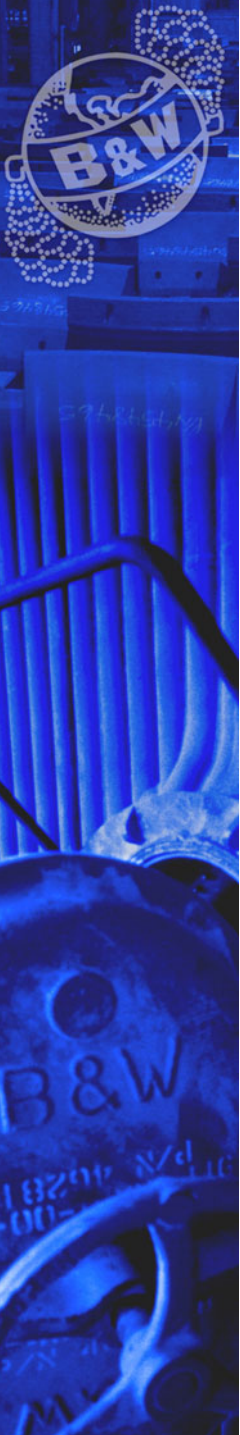
Parametric Tests – Effect of Additive Dosage



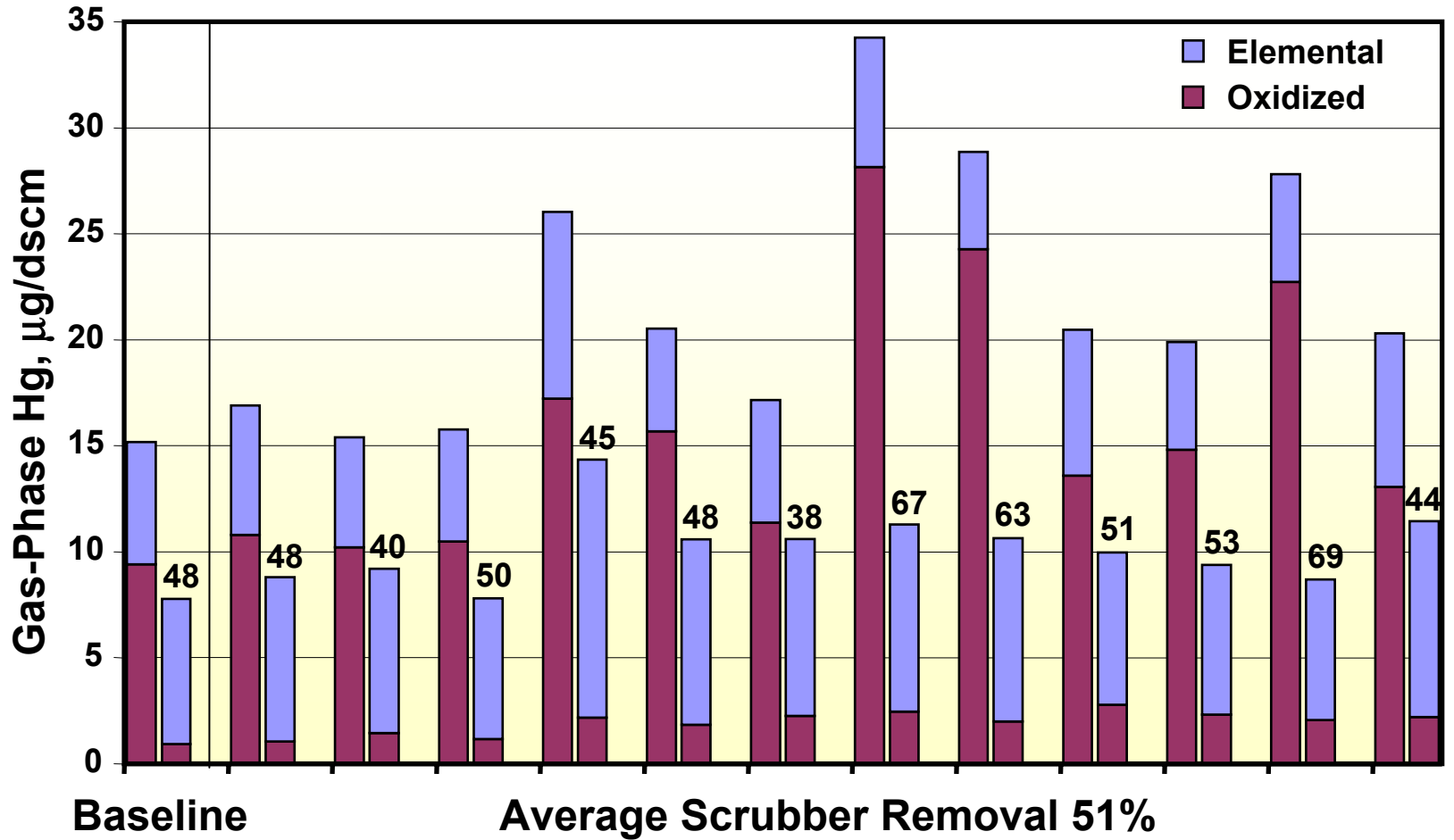


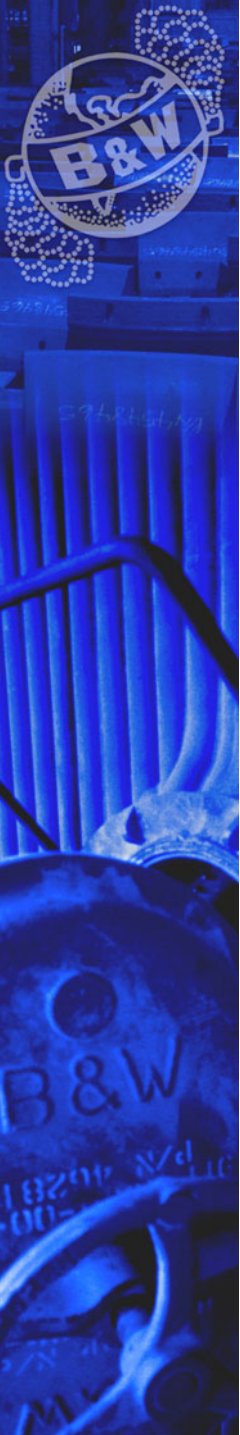
Long-Term Performance – Endicott



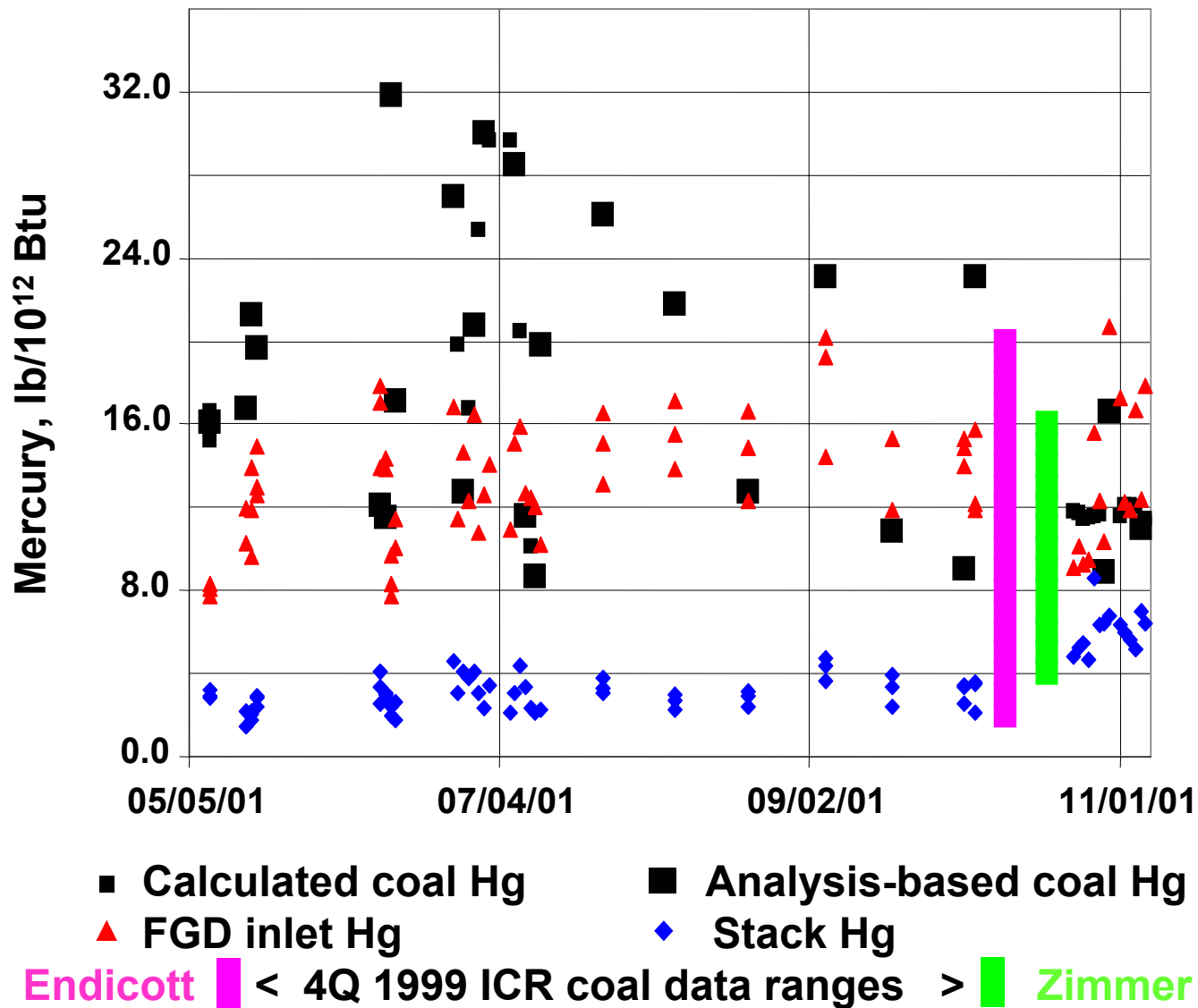


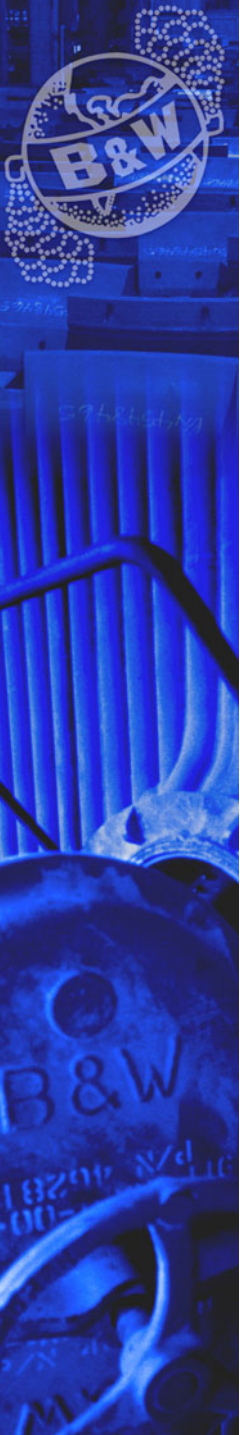
Verification Tests – Zimmer



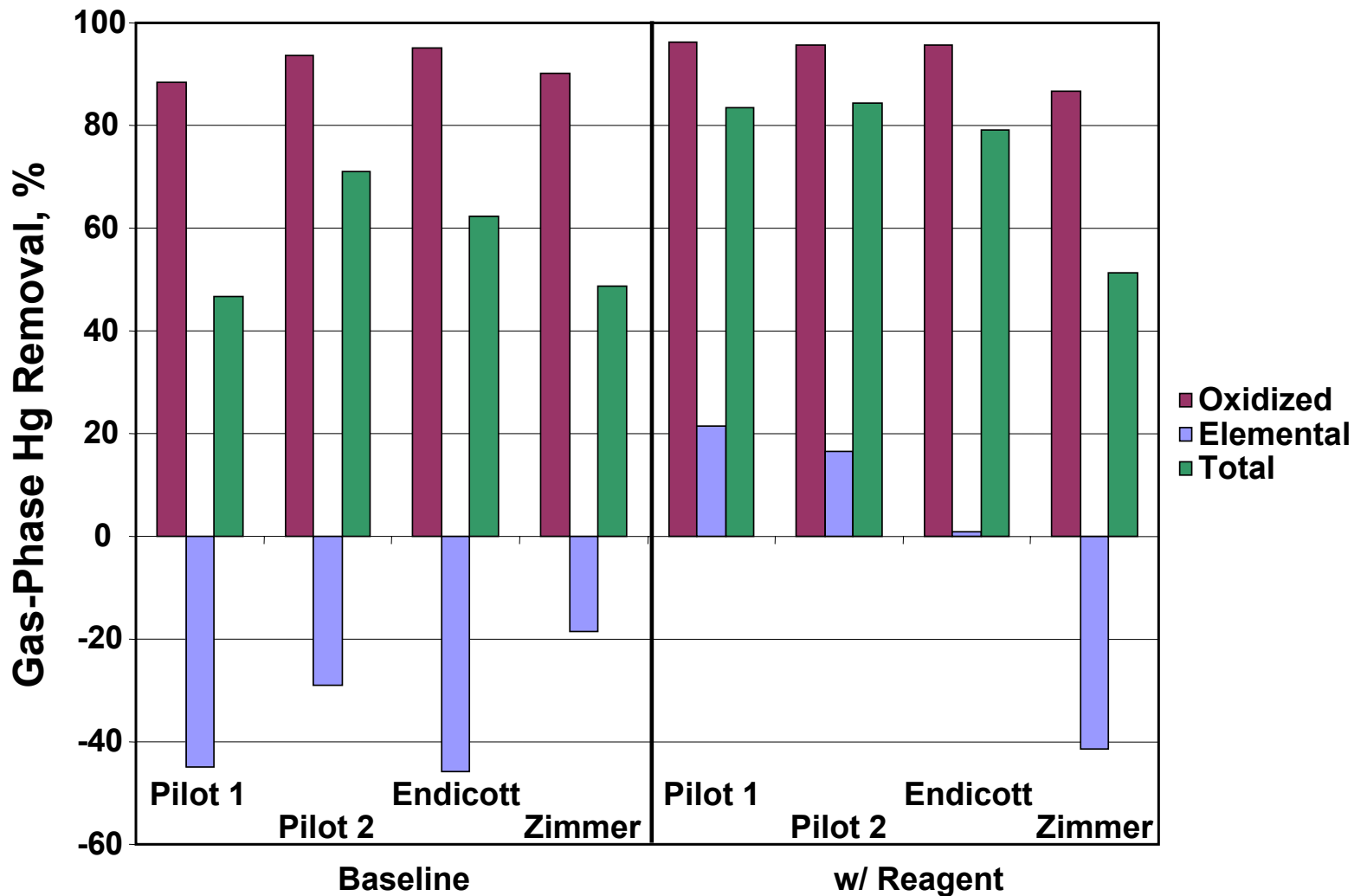


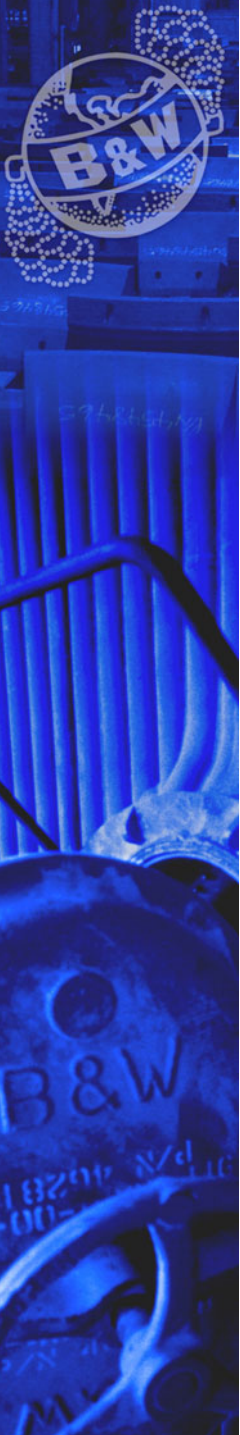
Coal Variability



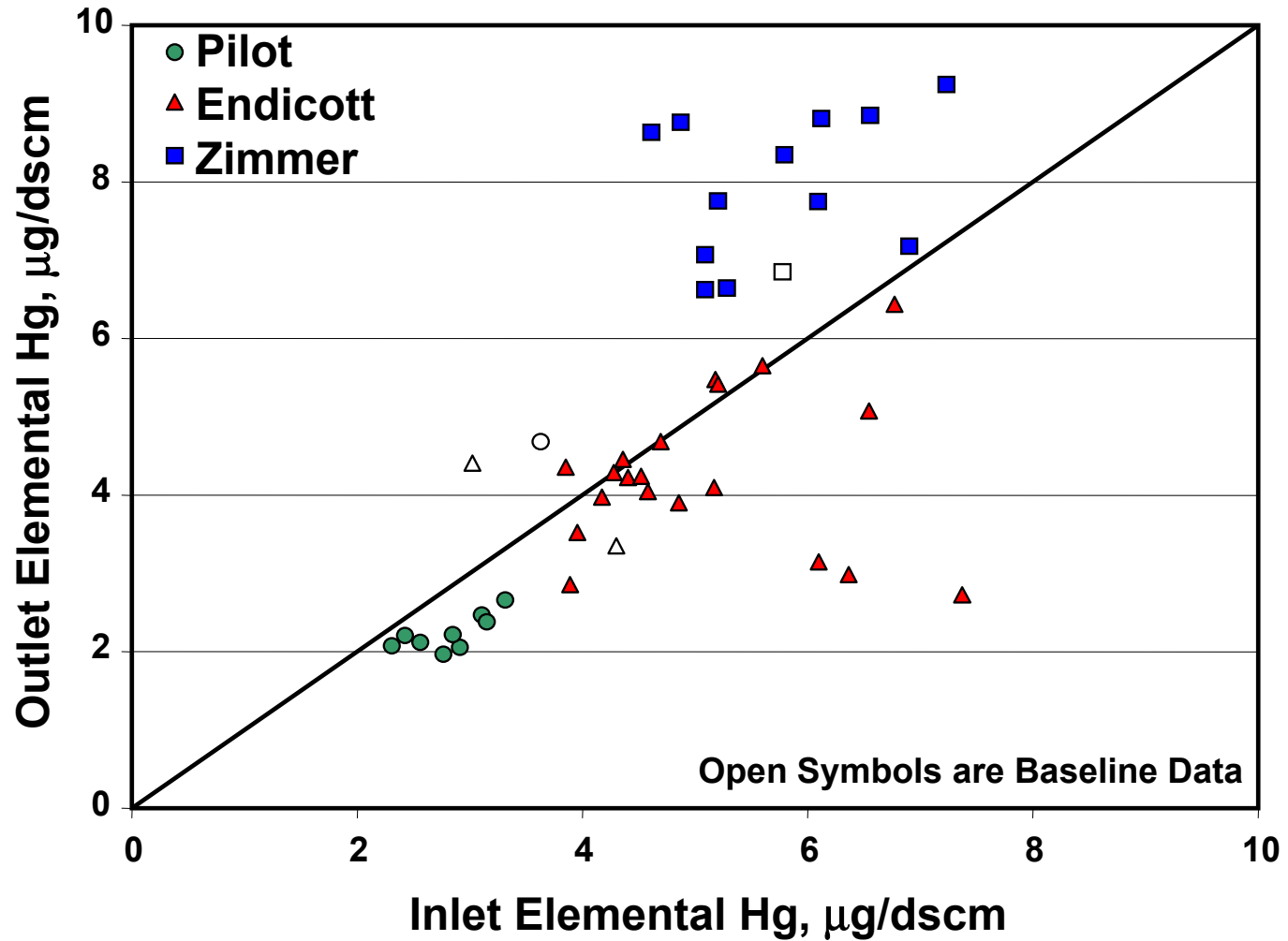


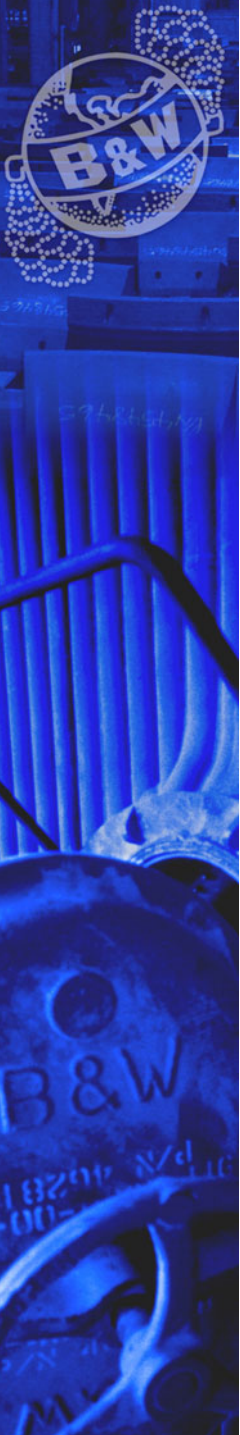
Effectiveness of Reagent





Effectiveness of Reagent





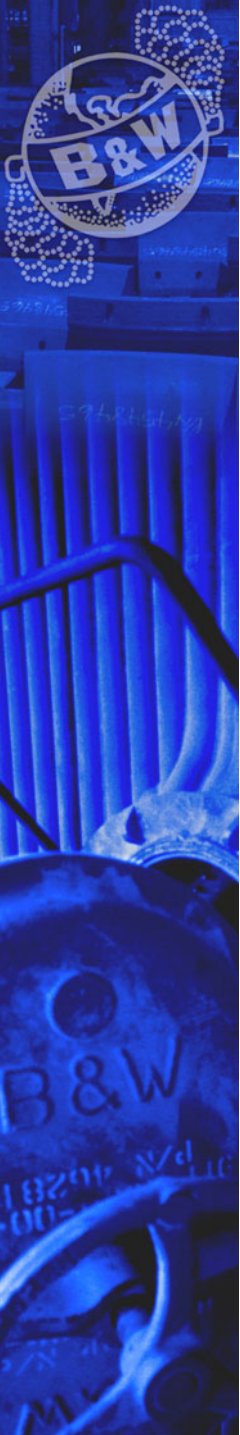
Summary

B&W Enhanced Wet FGD Process is effective in LSFO systems

B&W process has no effect on scrubber operation

Additional research is needed for non-LSFO

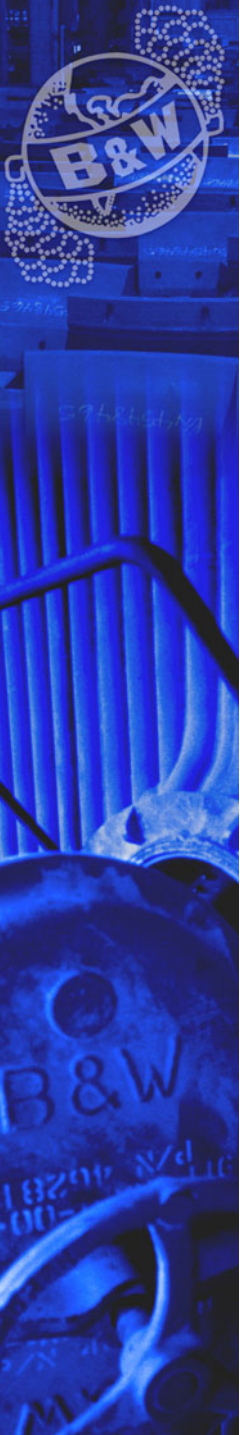
Scrubbers are very effective at removing oxidized mercury, but re-emission must be prevented



Fate of Mercury

All byproduct samples contained too little mercury to fail a TCLP test – even if it was all soluble

No mercury was detected in any liquid sample



Thank You!

