



ACHIEVING MERCURY EMISSION COMPLIANCE UNDER MATS

MATS compliance has been a challenge for the coal power industry since 2015.

The mercury emission-control systems implemented at many sites have been less reliable, more difficult, and more costly than expected based on pre-compliance testing.

With the expiration of Refined Coal tax credits, plant operators are reviewing once again total mercury control costs and their options for low-cost, reliable compliance.



WHY HAS MATS COMPLIANCE BEEN MORE DIFFICULT THAN EXPECTED?

Inadequate Testing Times

- Two weeks or even two months of pre-compliance process testing has proven insufficient to foresee accumulation of trapped mercury byproducts burdening many sites.

Treating Symptoms

- Common industry practice is to address mercury re-emission in FGD scrubbers to achieve stack mercury emission compliance.
- The actual problem is inadequate attention to successful partitioning of mercury into an acceptable FGD outlet stream.

Incorrect Assumptions

- Mercury absorbed from flue gas in a wet FGD exits the process as promised with the sulfur byproduct streams.
- Management of dissolved mercury inventory in wet FGD slurry is not required.
- Mercury accumulation in wet FGDs can be ignored when using an upstream mercury removal process such as ACI.

Regulatory Creep

- The push towards zero liquid discharge from FGD systems makes MATS compliance more difficult.

Piecemeal Solutions

- In response to all of these issues, piecemeal solutions have been pursued to continue achieving compliance.

IS THERE A BETTER WAY?

At MPS, we identify tailored solutions for customers based on our cumulative experience and proven, proprietary models to meet today's challenges with reliable, lower-cost solutions for mercury compliance.

A STEP AHEAD OF OUR COMPETITORS



The MPS Model

With over 70 years of chemical engineering experience, our fundamental approach provides a deeper understanding of the mercury capture capabilities of your existing process.



Proven Solutions

MPS provides the most effective wet-FGD mercury capture technology. Our customers enhance their capability to reduce costs, lower water purge rates, or successfully use higher mercury coal.



Beyond Compliance

MPS solutions can allow for novel opportunities with significant economic benefits above and beyond reliable MATS compliance.

COMPLETE SOLUTIONS | RELIABLE COMPLIANCE



THE MPS MODEL

MPS approaches mercury emission abatement as a two-dimensional (A-side, B-side) process.

The A-side increases the FRACTION OF MERCURY OXIDIZED in the flue gas (F_A) making the mercury available for capture.

The B-side increases the FRACTION OF OXIDIZED MERCURY CAPTURED (F_B).

The expected concentration of mercury in the stack gas can be calculated as:

$$Hg_{stack} = Hg_{coal} \times (1 - F_A \times F_B) \quad (1)$$

For example, a unit burning a coal with 10 #Hg/TBTU, achieving 90% mercury oxidation fraction, and achieving 100% mercury capture, the expected stack-gas mercury concentration would be calculated as follows:

$$\begin{aligned} Hg_{stack} &= 10 \text{ #Hg / TBTU} \times (1 - 0.9 \times 1.0) \\ &= 10 \times 0.1 = 1.0 \text{ #Hg / TBTU} \end{aligned}$$

Equation 1 has been plotted for different types of mercury emission control processes.

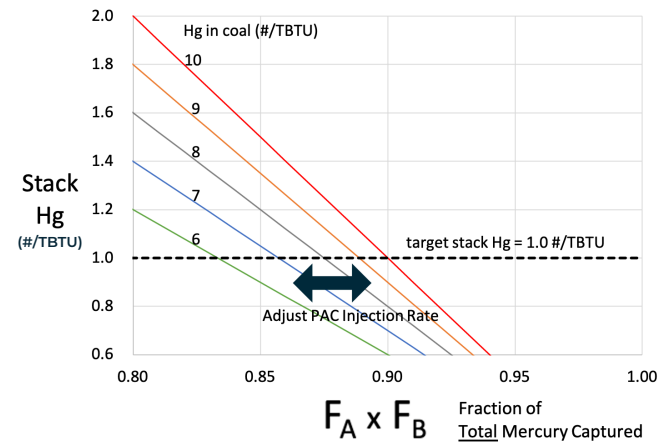


Chart 1: Processes With One Independent Variable (i.e. halogenated PAC)

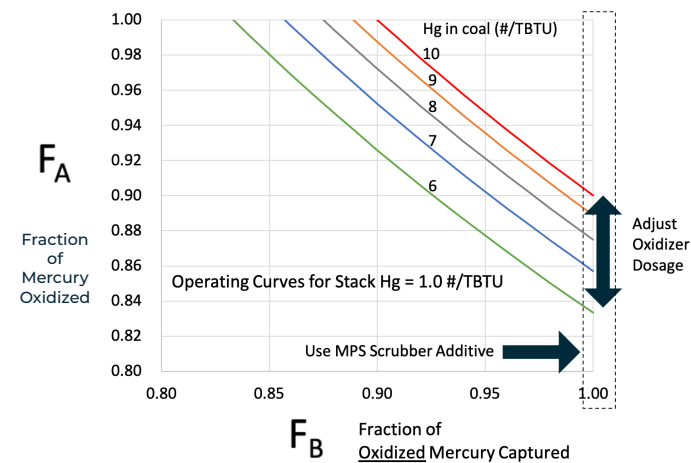
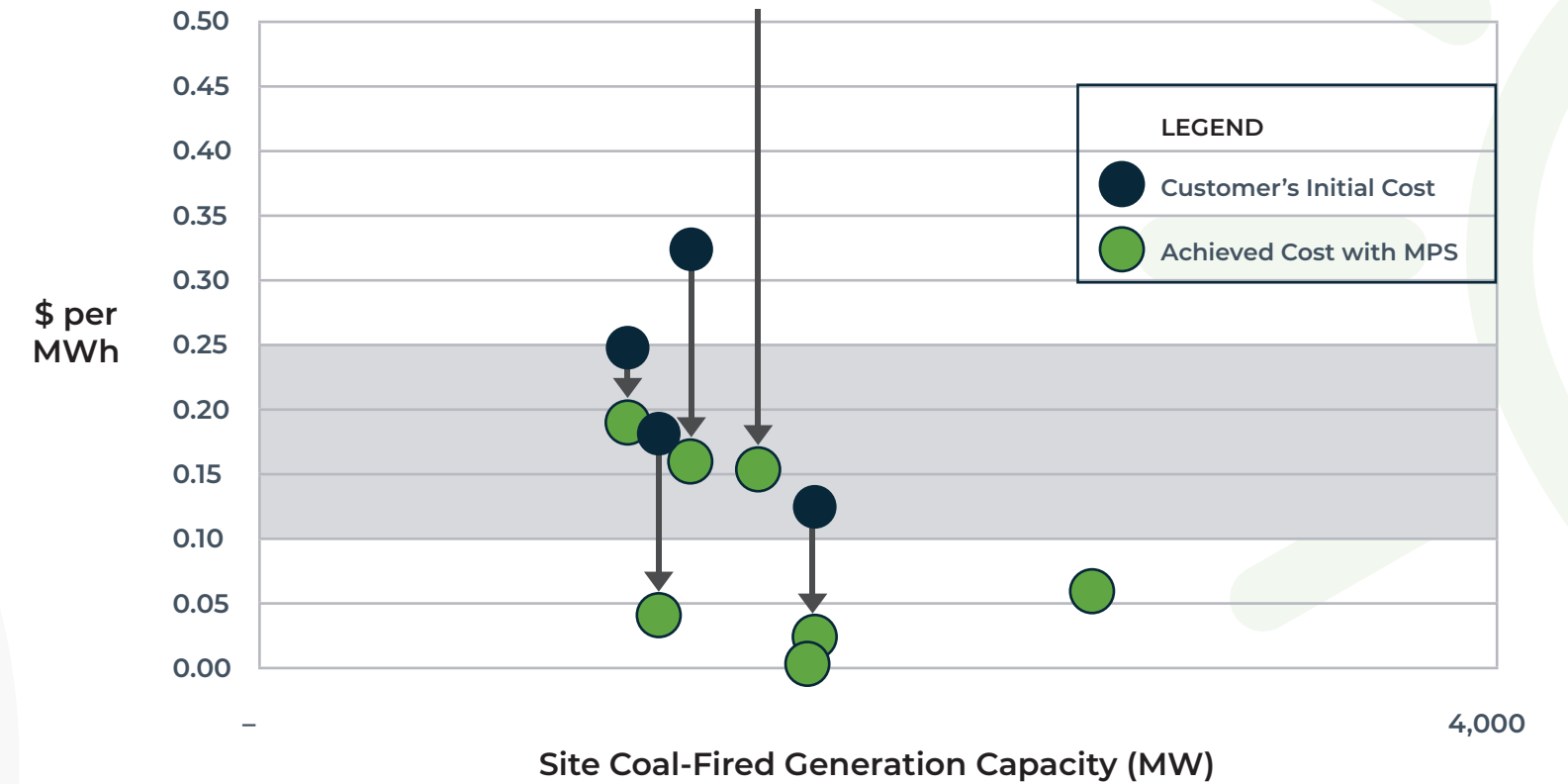


Chart 2: Processes with Two Independent Variables. The lowest-cost operating points are found by minimizing oxidizer usage with high capture efficiency.

MERCURY EMISSION COMPLIANCE COST ACHIEVED WITH ZERO CAPITAL SPEND BY CUSTOMER



The MPS approach for MATS compliance is both more efficient and more reliable. Customers typically save 30% or more compared to their prior MATS compliance costs.



PROVEN SOLUTIONS

CUSTOMER PROBLEMS SOLVED

ACI Mercury Capture Limitations

- ACI processes were not designed to capture 100% of oxidized mercury.
- Remaining oxidized mercury is captured in wet scrubbers.
- Periodic, uncontrolled mercury re-emission observed.

Accumulation of Mercury Reaction Products

- Washed gypsum process not designed to partition mercury-reaction products which accumulate over time.
- Accumulated mercury compounds decompose releasing mercury.
- Mercury emissions observed on start-ups before coal burn is initiated.

High-Mercury Coal

- The burning of high-mercury coal is limited by the capability of your mercury emission control process.
- Insufficient mercury-control capability can force derating of unit or use of higher-cost, lower-mercury coal.

Sustained Low-Load Operation

- Under normal load patterns, sufficient mercury capture is achieved without scrubber additives.
- The natural process for discharge of captured mercury is less effective under low-load conditions.
- Uncontrolled mercury re-emission is observed.

SCR Catalyst Limitations

- Mercury oxidation performance degrades as SCR catalyst layers age.
- Fouling, flow-channeling, or ammonia breakthrough may reduce mercury oxidation performance further.
- Elevated baseline mercury emissions are observed.

Slurry Water Quality

- Effectiveness of flue-gas mercury scrubbing is dependent on the solubilities of mercury components in scrubber slurry liquid.
- Scrubber slurry water is a poor mercury-scrubbing liquid at both very high and very low ionic strength.

Site Closure

- Elimination of all remaining coal inventory is required.
- Rainwater leaching has enriched mercury at bottom of the coal pile.
- Older coal inventory often acquired with minimal consideration of mercury content.
- Need to burn high-mercury coal without derating.

BENEFITS

Reliable, steady compliance	✓	✓	✓	✓	✓	✓	✓
Reduced mercury control costs	✓	✓	✓	✓	✓	✓	✓
Lower-cost coal			✓	✓			
Avoid derating		✓	✓	✓	✓	✓	✓
Other	Minimize ACI; fly-ash quality		Improved flexibility to use nearby coal		Extend useful life of SCR catalyst		Avoided transport and disposal costs



BEYOND COMPLIANCE

COMPLETE SOLUTIONS

- We listen as potential customers describe their processes and challenges with mercury emission control.
- We incorporate customer data to generate an insightful model for each customer's particular process configuration and specific raw materials.
- We explore the range of solutions which meet customer needs.
- Customer selects preferred options based on potential cost savings and other benefits.

RELIABLE COMPLIANCE

- MPS solutions achieve minimum inventory of water-soluble mercury in the scrubber system.
- Scrubbers cannot re-emit mercury that is not in inventory.
- MPS solutions avoid accumulation of captured mercury compounds in the scrubber slurry and associated process equipment.
- Solids not accumulated cannot decompose and release mercury back into the stack gas.

BETTER OUTCOMES

- COMPLETE SOLUTIONS empower operators to achieve RELIABLE COMPLIANCE at lower cost with less effort.
- MPS customers are positioned to better address ongoing and future regulatory challenges.
- Savings and benefits attainable with ZERO CAPITAL spend by customer.
- MPS solutions allow for substantial other benefits.

OTHER BENEFITS

- Process safety
- Lowest compliance cost
- Reliable partitioning of mercury reaction products
- Liquid reagents
- Reagent freeze point
- Shelf-stable reagents
- MPS custom application equipment
- Fly-ash quality
- Reduced ESP loading
- Avoided ACI O&M costs

PLEASE GET IN TOUCH WITH ONE OF OUR TEAM MEMBERS TO LEARN HOW OUR TAILORED SOLUTIONS CAN BETTER MEET YOUR MERCURY-CONTROL REQUIREMENTS.



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