



Prevent Adsorption of Mercury, Sulfur, and Nitrogen Compounds in Stack and Monitoring Equipment

Improve analytical reliability and prevent corrosion, using Siltek®/Sulfinert® treated components

In flue streams from coal-fired power generators, mercury exists in three forms: elemental, the +2 oxidation state (Hg⁺⁺), and

Mercury has a significant impact on human health, and mercury contamination in the environment is a growing concern. Coal-fired power generators are one of the major sources of mercury emissions into the environment.¹ The United States is actively developing regulations, limits, and control measures for mercury emissions from coal-fired power generators.

attached to particulate matter. In many instances, Hg⁺⁺ will react with sulfur compounds, nitrogen, chlorine, and/or oxygen, to produce sulfurous, nitrous, chloride, and oxide mercury species. Elemental and oxidized mercury easily can be lost to reactions and adsorption on the inner surfaces of monitoring equipment. In order to accurately sample and quantify mercury in all forms, it is important to use inert sample pathways. Laboratory testing and field results have proven that Sulfinert® treated sampling and testing equipment is essentially inert to active molecules⁴, and customer field testing has shown Sulfinert® treatment to greatly reduce interactions of steel components with mercury.

Improve reproducibility, protect equipment

Siltek®/Sulfinert® treatment adds value to your process:

- Improve analytical sensitivity and reliability for mercury, SO_x, or NO_x compounds.
- Eliminate costly retests.
- Maximize scrubber performance.
- Protect against corrosion—increase component lifetime.
- Apply to existing equipment; will withstand temperatures to 400°C.

As regulations and guidelines for monitoring and controlling mercury emissions are developed and implemented, proper equipment will be needed for accurate sampling and analysis. A typical coal-fired plant may spend up to \$62 million to meet emission regulations (Table I).² In addition, in many stack environments common to coal-fired power generators, monitoring equipment is exposed to sulfuric and hydrochloric acids, which leads to corrosion and damage. Regular upkeep and preventive maintenance of testing equipment is costly. Also, analytical testing costs can be substantial. Recent studies have shown a per-test cost of \$100-\$640 U.S. dollars (Table II).³ Finally, the costs of inaccurate analysis could have broad financial and environmental repercussions.

Table I Typical costs of adding air pollution controls to a 1969 vintage 75MW cyclone fired boiler (U.S. dollars, millions).²

Item	Wet Scrubber	Dry Scrubber
SCR	23.8	23.8
PJFF and scrubber	22.4	16.1
ACI	—	0.7
ID fans	2.6	2.6
Stack	2.8	2.8
Balanced draft conversion	7.7	7.7
Auxiliary power upgrades	0.9	0.85
Subtotal capital cost	60.2	51.75
Asbestos abatement	2.0	2.0
Total capital cost	62.2 million	53.75 million

Table II Typical costs of various sampling methods (U.S. dollars).³

Method	Approx. Cost of Analysis
US EPA 29	300
US EPA 101A	100
ASTM D6784-02	250
US EPA 324	430
FAMS	640

Siltek®/Sulfinert® treatment applies an inert barrier coating over the entire surface of a steel component, regardless of its geometry. It can be applied to many of the components in a mercury sampling stream, including probe tubing, impingers, fittings, filters, housings, and transfer tubing. A typical sampling train schematic is shown in Figure 1. Application of Siltek®/Sulfinert® treatment to all of the components of a stack or continuous emission monitoring system will greatly improve analytical reliability and sensitivity, and will be needed as regulations are brought on line and emission quotas are enforced.

Similarly, a Siltek®/Sulfinert® treated sampling system will improve the reliability of data for sulfurous and nitrous oxides (SO_x and NO_x). Emissions of SO_x and NO_x compounds from coal-fired power generators are stringently regulated, and there currently are many systems in the field to monitor these compounds. As with mercury, it is difficult to reliably transfer these compounds through untreated sampling equipment.

In addition to preventing adsorption of reactive compounds in sampling pathways, Siltek®/Sulfinert® treatment will act as a barrier, protecting the steel and prolonging the lifetime of the treated equipment. The value of Siltek®/Sulfinert® treated monitoring equipment

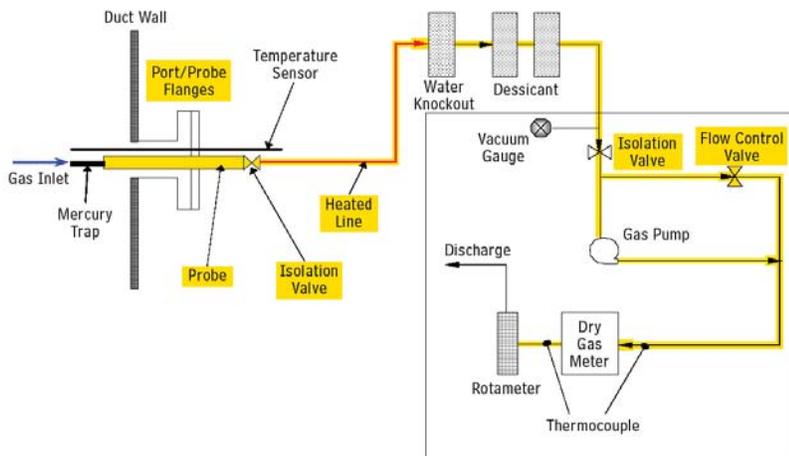


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Figure 1 Highlighted components of a mercury sampling train,⁵ and all tubing in the system, can be Siltek®/Sulfinert® treated.



is twofold. First, it will materially increase the accuracy of the analysis: fast and accurate completion of testing, without re-work, can save a great deal of time and money. Second, the protective nature of Siltek®/Sulfinert® treatment will increase the longevity and decrease the upkeep of sampling equipment.

References

1. Pottinger, M., S. Stecklow, and J.J. Fialka, *Invisible Export, A Hidden Cost of China's Growth: Mercury Migration* The Wall Street Journal Online, Dec. 17, 2004.
2. *Proposed National Emissions Standards for Hazardous Air Pollutants: and in the Alternative, Proposed Standards of Performance for New and Existing Stationary Sources, Electric Utility Steam Generating Units*; Comments from the American Public Power Association: Washington, D.C. 2005. p.10.
3. Serne, J.C. *An Overview and Comparison of Available Mercury Emission Test Methods for Boilers*; Symposium on Air Quality Measurement; Methods and Technology 2005, San Francisco, CA; Air & Waste Management Association. paper no. 439, pg. 9.
4. Barone, G., M. Higgins, D. Smith, S. Rowan, W.J. Gross, and P. Harris, *The Surface for Sulfiurs Hydrocarbon Engineering*, Dec. 2004 (pages 47-50).
5. *Proposed Method 324. Determination of Vapor Phase Flue Gas Mercury Emissions from Stationary Sources Using Dry Sorbent Trap Sampling*. United States Environmental Protection Agency. Washington, D.C. p. 5.

Product Listing

Restek offers a complete line of tubing, fittings, and valves not listed here, as well as many air sampling products such as passive air sampling kits, air sampling canisters and miniature air canisters, sample loops, and more. For more information, request our catalog or visit us online.

Siltek®/Sulfinert®-Treated Electropolished Tubing*

- Exceptional inertness.
- Improved reliability and reproducibility; longer lifetime.
- Use with treated fittings for the most inert sample pathway available.



ID	OD	cat.#	5-24 ft.	25-99 ft.	100-299 ft.	> 300 ft.
0.085"	1/8"	22538				
0.180"	1/4"	22539				



We offer a wide variety of **Sulfinert®-treated fittings** and custom treatment. For information and ordering, call us or visit us online.

Coiled Siltek®/Sulfinert®-Treated Seamless 316 Grade Stainless Steel Tubing*

ID	OD	cat.#	5-24 ft.	25-199 ft.	200-399 ft.	> 400 ft.
0.055" (1.40mm)	1/8" (3.18mm)**	22508				
0.180" (4.57mm)	1/4" (6.35mm)**	22509				

Sulfinert®-Treated Sample Cylinders

D.O.T. rated to 1800psi at room temperature.



Size	qty.	cat.#
75cc	ea.	24130
150cc	ea.	24131
300cc	ea.	24132
500cc	ea.	24133
1000cc	ea.	24134
2250cc	ea.	21394

Sulfinert®-Treated Sample Cylinder Valves

- All "wetted" parts are Sulfinert®-treated to make these valves inert and compatible with our inert sample cylinders.
- Stable storage of samples containing low concentrations of sulfur compounds.
- Maximum pressure rating, 5000psi.



Description	qty.	cat.#
1/4" NPT Exit, Kel-F® Stem Tip	ea.	24127
1/4" Compression Exit, Kel-F® Stem Tip	ea.	24128
1/4" Female NPT Outlet (built-in rupture disc)	ea.	21395

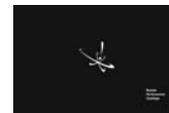
*1/4" OD: 5 ft. to 100 ft. in one continuous coil; 1/2" OD: 5 ft. to 300 ft. in one continuous coil. Longer lengths will be more than one coil.

**0.035" wall thickness

Note: (required length in meters) x (3.28) = length in feet.

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