



Innovative Chemistry for Energy Efficiency

KLeeNscrub[®] Mercury Precipitant

May 16, 2013



Environmental Energy Services Profile

- "Innovative Chemistry for Energy Efficiency"
- Improvements in coal and oil-fired boiler performance and emissions
- Office and systems fabrication in CT
- Established utility and industrial power boiler customer base



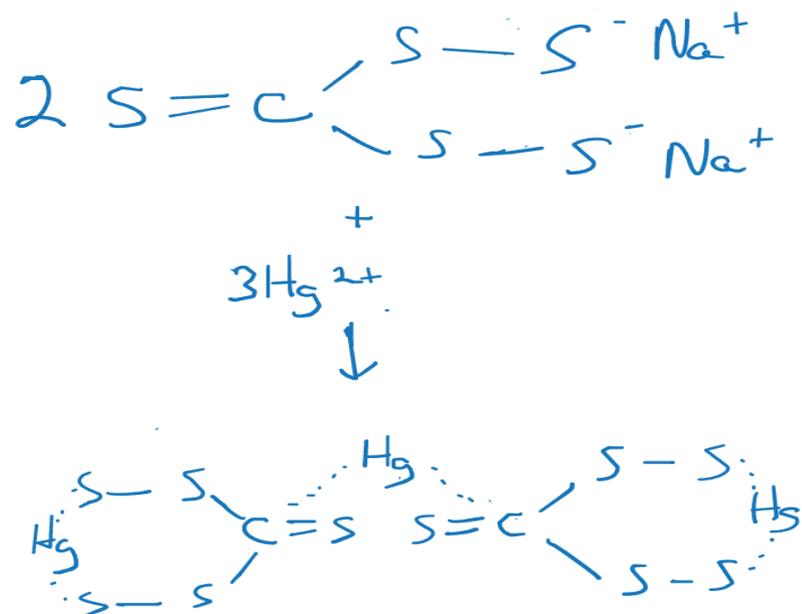


KLeeNscrub[®] Mercury and Heavy Metals Remediation

- KLeeNscrub is a high efficiency **organosulfide** that removes >99% of Hg from scrubber solution preventing re-emission
- Captures & remediates additional metals such as lead, copper, thallium, cobalt, cadmium, nickel, zinc, iron, silver, tin
- Forms **large polysulfide particle** for easy removal in absorber solids and **stable** enough for TCLP or wall board processing
- Reagent is **cost effective, non-corrosive, non-hazardous** and made in the USA
- Application equipment is low cost and easily maintained



KLeeNscrub Reaction



BAMBOOPAPER

- 28% aqueous solution of sodium polythiocarbonate
- 2 moles of KLeeNscrub react with 3 moles of Hg^{2+}
- Mercury is tightly held due to multiple bonding sites

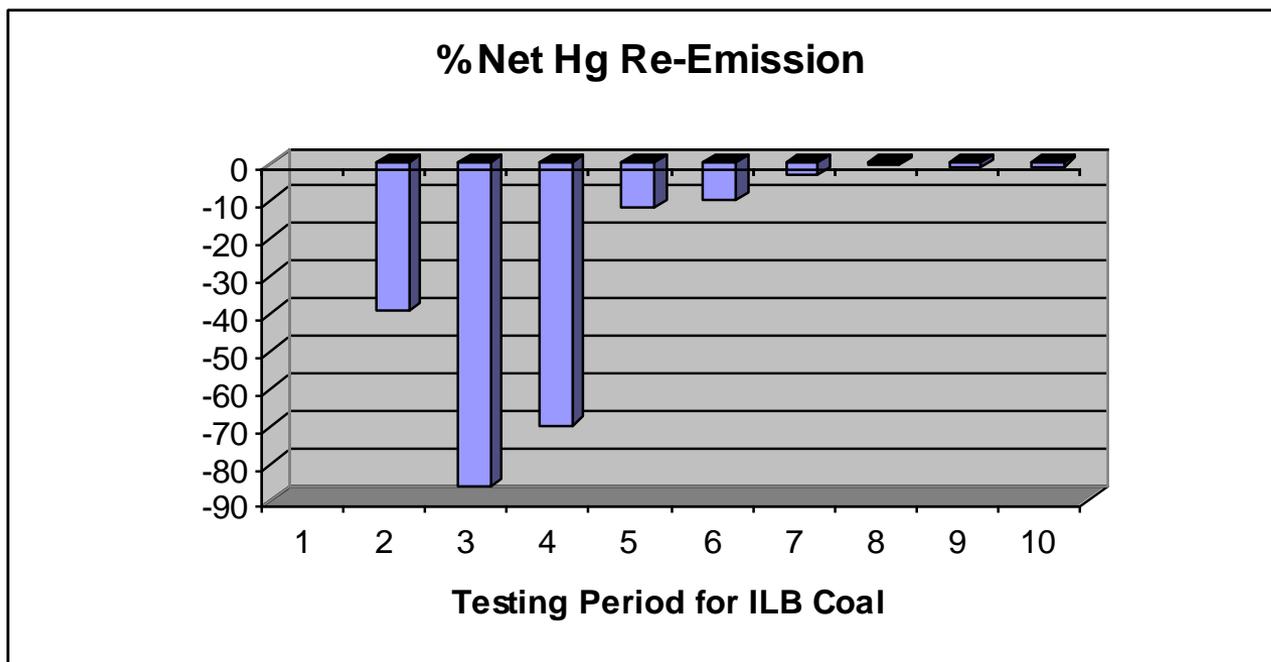


KLeeNscrub Injection Equipment





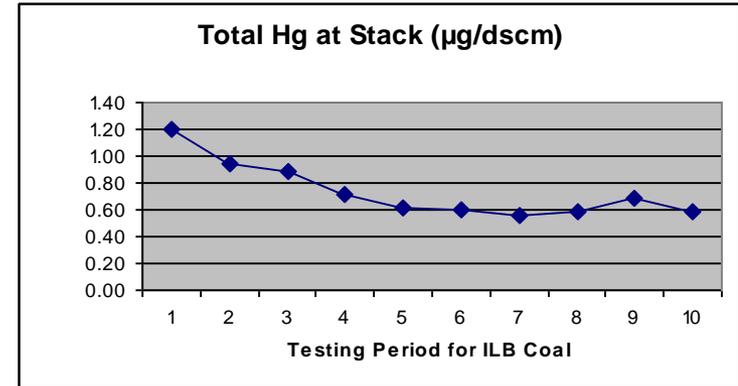
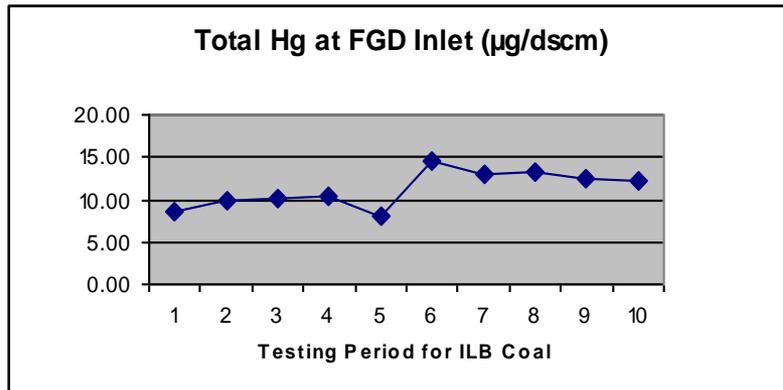
KLeeNscrub Re-Emission Results



Unit achieved excellent conversion in their process which allowed for removal of up to 99.8% of the divalent mercury (95.9% removal of total mercury).



Overall Mercury Reduction



KLeeNscrub™ was dosed at a rate of 5-10 gallons per hour. Initial conditioning of the absorber took 24-36 hours (1-2 times volume turnover) before mercury reductions were seen. Once our probe began recording detectable amounts of excess chemical (≈ 40 ppm) in the absorber solution mercury re-emission levels dropped dramatically and the targeted maximum for total mercury at the stack of $0.8 \mu\text{g}/\text{dscm}$ was easily achieved.



Our Approach

- Use KLeeNscrub to remove/stabilize metals in the absorber
- Further enhance metal removal as needed in wastewater
- KLeeNscrub can be used within your existing program or EES can recommend a complete treatment program
 - Customized coagulant blends to replace ferric
 - Flocculants
 - Defoamers
 - Low corrosivity acid replacements for pH adjustment to improve safety
 - Solidification chemistry if dewatering not available



KLeeNscrub®

Please contact me if you have any questions:

*Mark M. Keffer
Sales Manager, Clean Coal Solutions
Environmental Energy Services, Inc.
Cell: (724) 454-8655
Email: mkeffer@eescorp.com*