MERCURY RE-EMISSION RE-EXAMINED – A THERMODYNAMIC MODEL TO FOLLOW

McIlvaine Hot Topic Hour – Webinar
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Hg & WWT PRODUCT LINE MANAGER
ACHIEVING Hg MATS SUCCESS
B&W’s ABSORPTION PLUS™

Step 1:
Provide sufficient up-front Hg oxidation.

Step 2:
Add sulfide to precipitate the Hg from the aqueous phase.
ELEMENTAL Hg IS SOLUBLE

MORE THAN A DOZEN RESEARCHERS HAVE MEASURED Hg\(^0\) SOLUBILITY SINCE 1930.

Hg\(^0\) solubility = \(~120\) ppb @55C

Hg in stack flue gas = \(~1\) ppb

MERCURY CONTROL RIDES ON THE Hg MASS BALANCE
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MERCURY CONTROL RIDES ON THE Hg MASS BALANCE
B&W APPROACH IS PREFERRED – WHY?

B&W APPROACH
- Up-front Hg oxidation
- Inorganic aqueous sulfide (3)

LOWEST COST
- Most effective, except H$_2$S

MOST EFFICIENT
- Safe delivery of sulfide

NO RESIDUAL ORGANICS

WIDELY AVAILABLE
B&W APPROACH IS PREFERRED – WHY

PATENTED
Inorganic aqueous sulfide (3)

LOWEST COST
Most effective, except H₂S

MOST EFFICIENT
Safe delivery of sulfide

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WIDELY AVAILABLE

HgS: $\text{K}_{\text{sp}} = 10^{-53}$

Hg⁰ Solubility = 10⁻⁷

Add NaHS to Precipitate HgS
CHEMICAL SAFETY

<table>
<thead>
<tr>
<th>NFPA 704 DESIGNATION</th>
<th>NaHS – 3, 2, 1</th>
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<tbody>
<tr>
<td>0 – 4</td>
<td>Hydrogen - 0, 4, 0</td>
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<tr>
<td>0 – Minimal</td>
<td>NaOH – 3, 0, 2</td>
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<tr>
<td>1 – Slight</td>
<td>SO₂ – 3, 0, 0</td>
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<tr>
<td>2 – Moderate</td>
<td>Anhyd. Ammonia – 3, 1, 0</td>
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<td>3 – Serious</td>
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<td>4 - Extreme</td>
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Many Power Plant Chemicals carry a certain level of risk. That risk can be safely managed with proper training and the wearing of appropriate PPE.

Blue – Health
Red – Flammability
Yellow - Reactivity
Recent Mag-lime WFGD Testing

IF SULFITE CAUSED RE-EMISSION, MAG-LIME UNITS WOULD ALWAYS RE-EMIT.
Recent Mag-lime WFGD Testing
ESTIMATED COSTS

First Tier Sulfides
H₂S
NaHS – H₂S + NaOH (1st neut)
Na₂S – sodium sulfide

Second Tier Sulfides
Polysulfides made from CS₂ + NaHS,
ie., Na₂CS₃

Third Tier
Dithiocarbamates
DEA+CS₂+NaHS
Trimers (ie TMT-15)

Poor synthesis/conversion of the Polysulfide

NaHS Maintenance Dosages
Generally 0.02 gph/MW

500MW Unit ~ $350K/year
NaHS at 80% C.F.

Increasing cost
Understanding WFGD Hg Absorption

If you would like your WFGD Hg re-emission re-examined, and feel the concepts presented in this presentation may benefit you, we would welcome the chance to help you achieve Hg MATS success.

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