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

McIlvaine Hot Topic Hour – Webinar
February 26, 2015

STEVE FEENEY
Hg & WWT PRODUCT LINE MANAGER

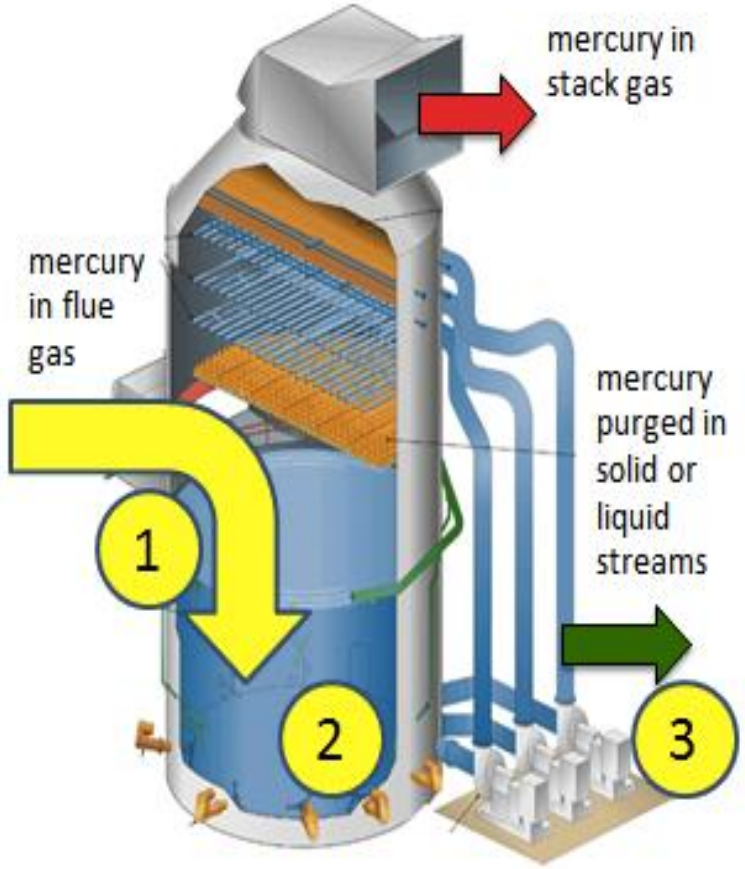
ACHIEVING Hg MATS SUCCESS
B&W's ABSORPTION PLUS™

Step 1:

Provide sufficient up-front Hg oxidation.

Step 2:

Add sulfide to precipitate the Hg from the aqueous phase.



ELEMENTAL Hg IS SOLUBLE

Hg^0 RE-EMISSION

$Hg^0_{LIQUID} \leftrightarrow Hg^0_{AQUEOUS}$

Hg^0 ABSORPTION

$Hg^0_{LIQUID} \leftrightarrow Hg^0_{AQUEOUS}$

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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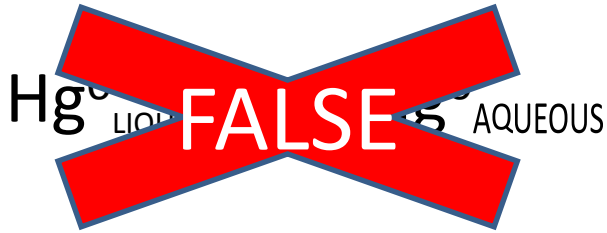

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MERCURY CONTROL RIDES ON THE Hg MASS BALANCE

B&W APPROACH IS PREFERRED – WHY?

B&W APPROACH

- **Up-front Hg oxidation**
- **Inorganic aqueous sulfide (3)**

LOWEST COST

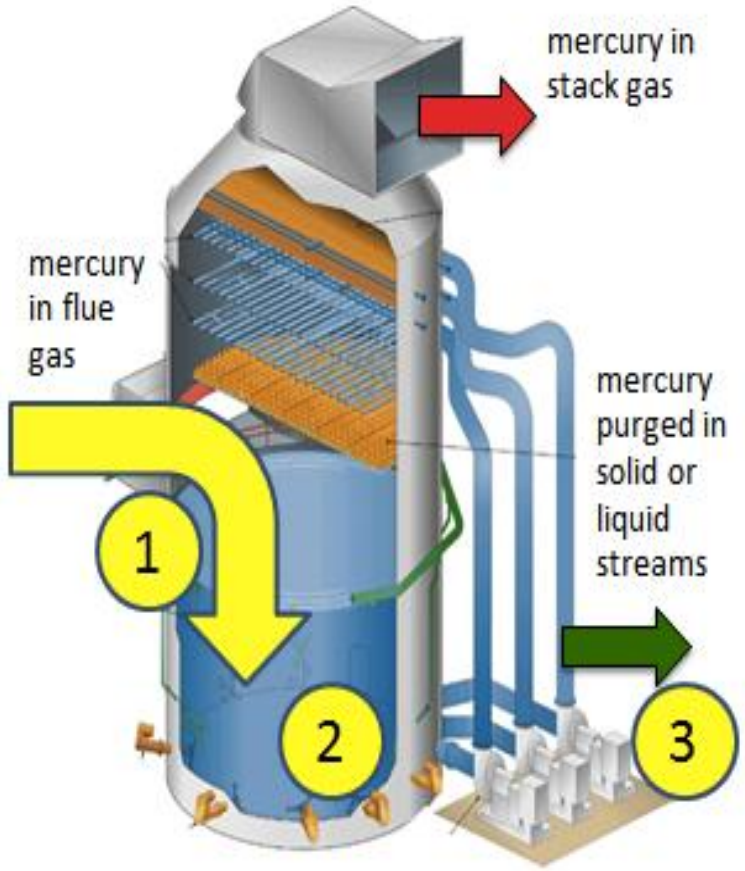
- **Most effective, except H_2S**

MOST EFFICIENT

- **Safe delivery of sulfide**

NO RESIDUAL ORGANICS

WIDELY AVAILABLE



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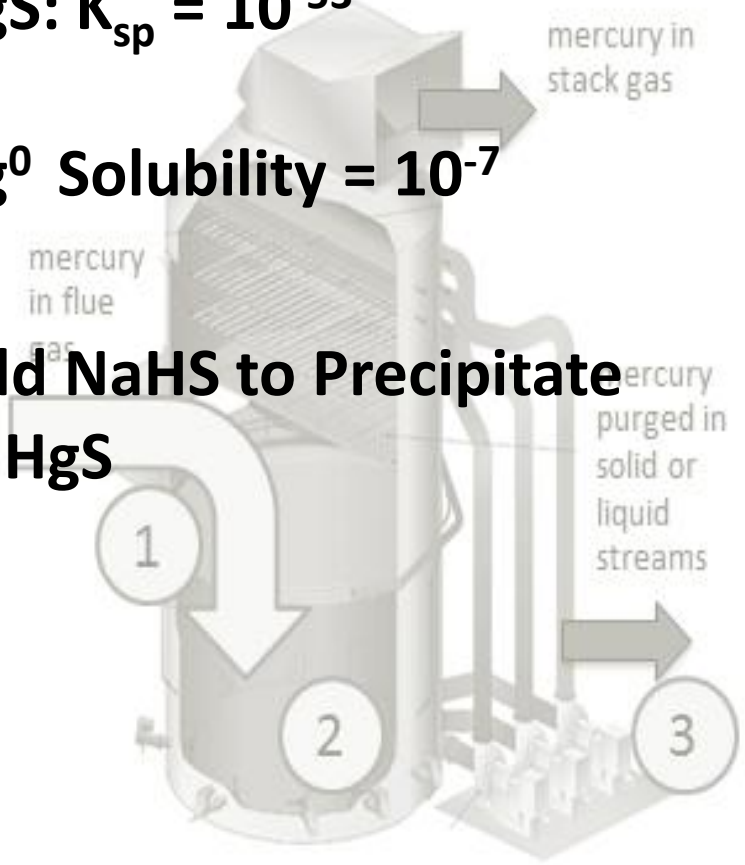
HgS: $K_{sp} = 10^{-53}$

Hg^0 Solubility = 10^{-7}

Add NaHS to Precipitate HgS



CHEMICAL SAFETY

NFPA 704 DESIGNATION

0 – 4

0 – Minimal

1 – Slight

2 – Moderate

3 – Serious

4 - Extreme

Blue – Health

Red – Flammability

Yellow - Reactivity

NaHS – 3, 2, 1

Hydrogen - 0, 4, 0

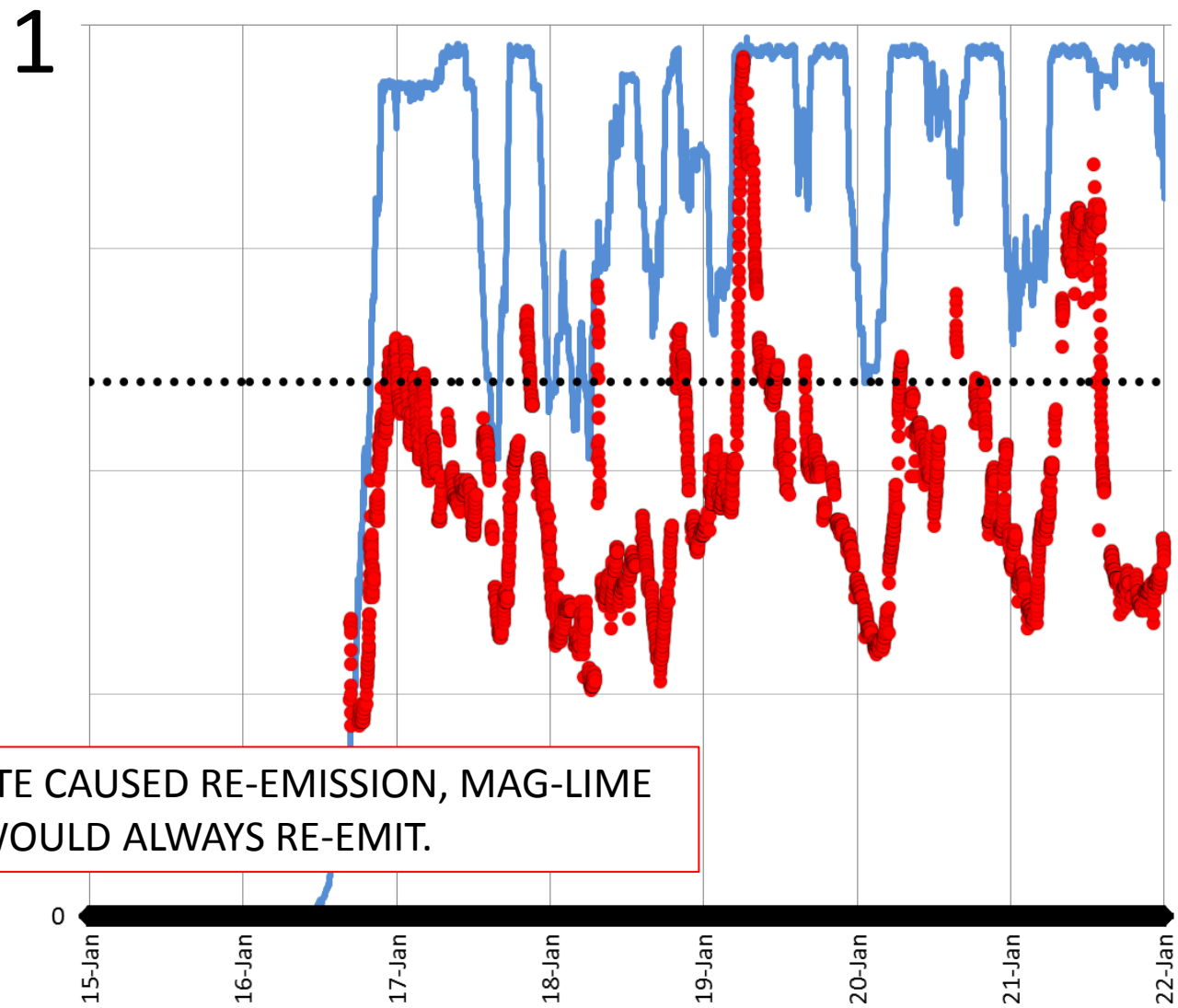
NaOH – 3, 0, 2

SO_2 – 3, 0, 0

Anhyd. Ammonia – 3, 1, 0

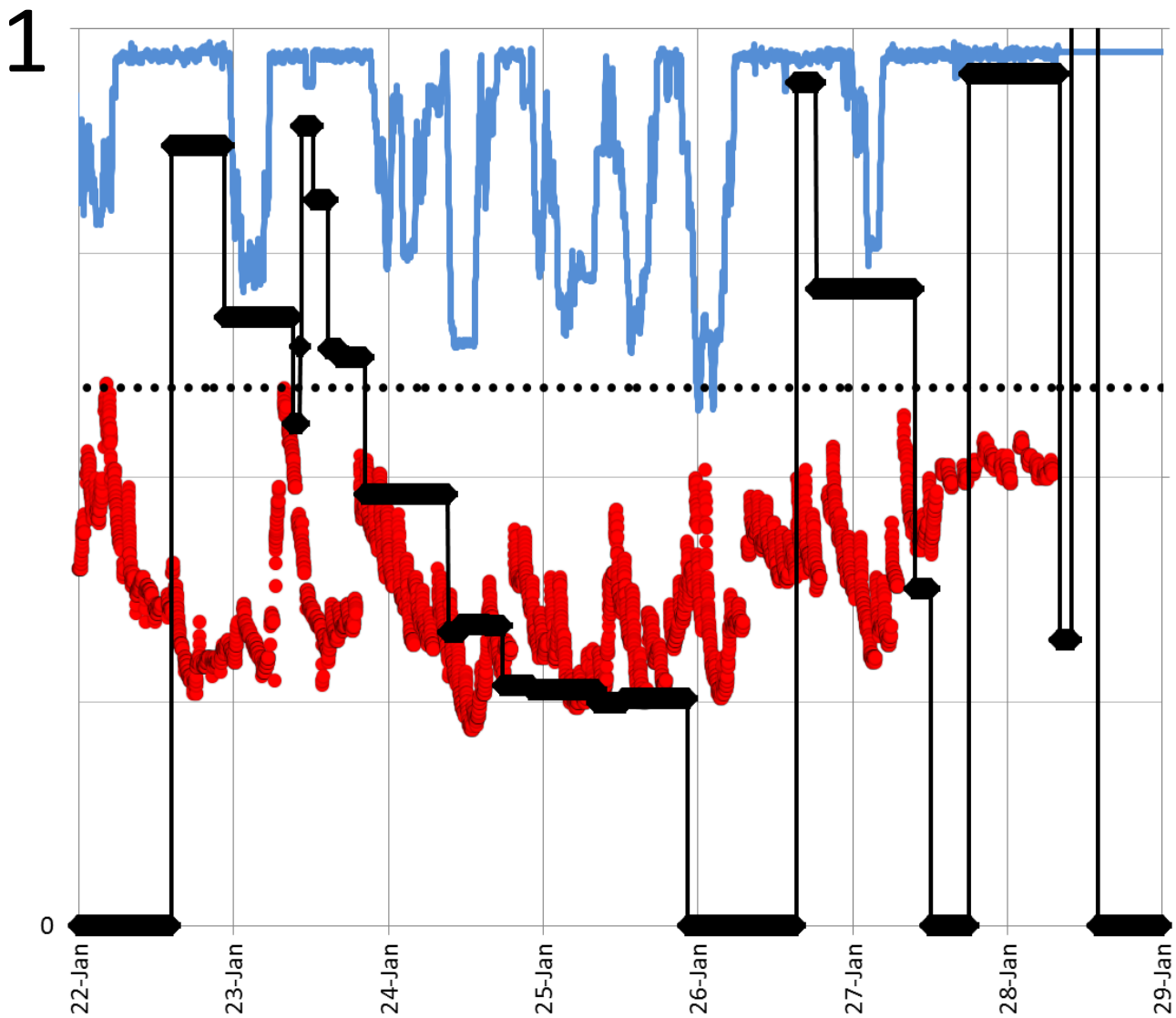
Many Power Plant Chemicals carry a certain level of risk. That risk can be safely managed with proper training and the wearing of appropriate PPE.

Recent Mag-lime WFGD Testing

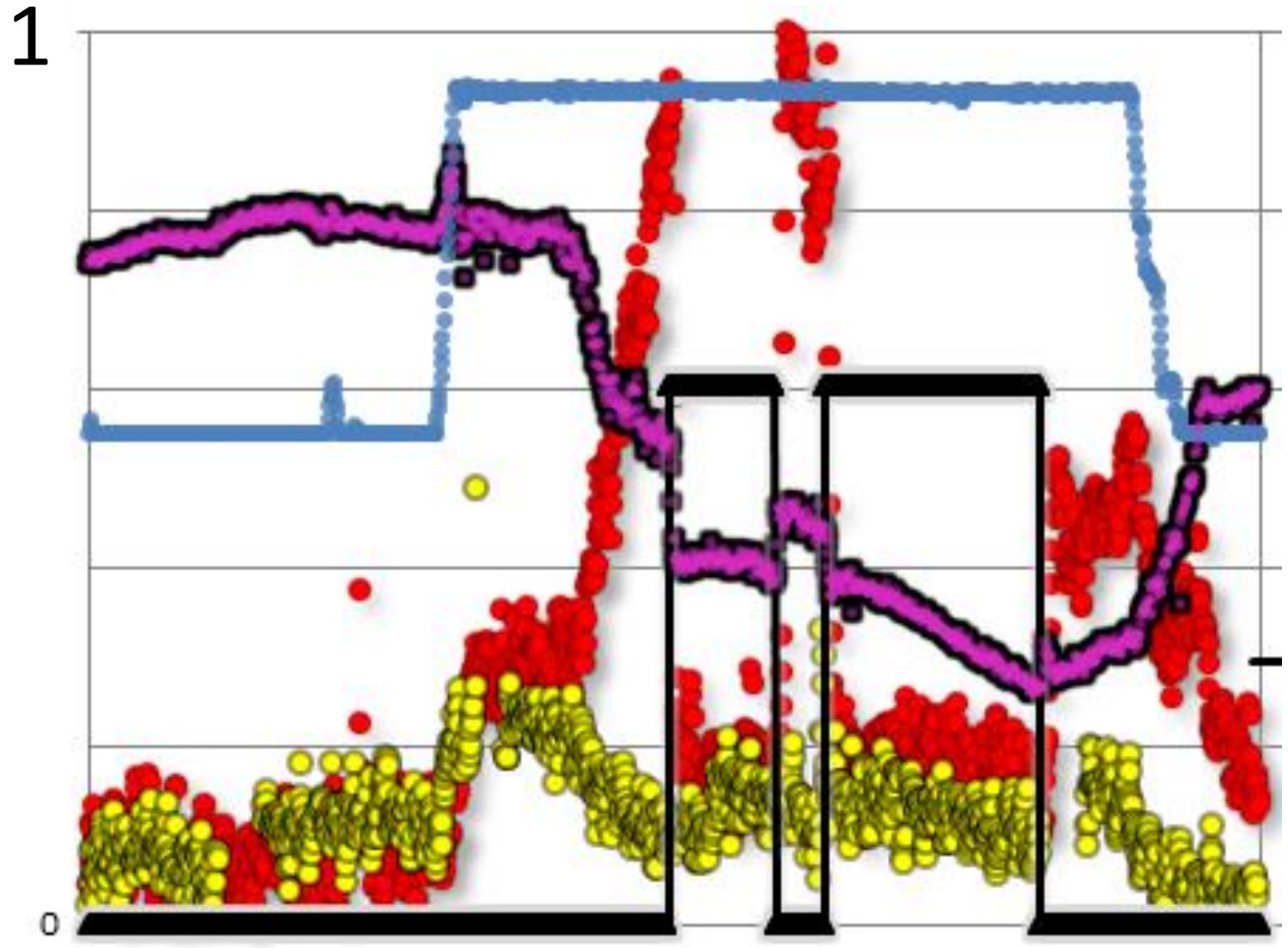


IF SULFITE CAUSED RE-EMISSION, MAG-LIME UNITS WOULD ALWAYS RE-EMIT.

Recent Mag-lime WFGD Testing



LSFO



ESTIMATED COSTS

First Tier Sulfides
H_2S
NaHS – H_2S + NaOH (1st neut)
Na_2S – sodium sulfide

Second Tier Sulfides

Polysulfides made from CS_2 + NaHS,
ie., Na_2CS_3

Third Tier
Dithiocarbamates
DEA+CS_2+NaHS
Trimers (ie TMT-15)

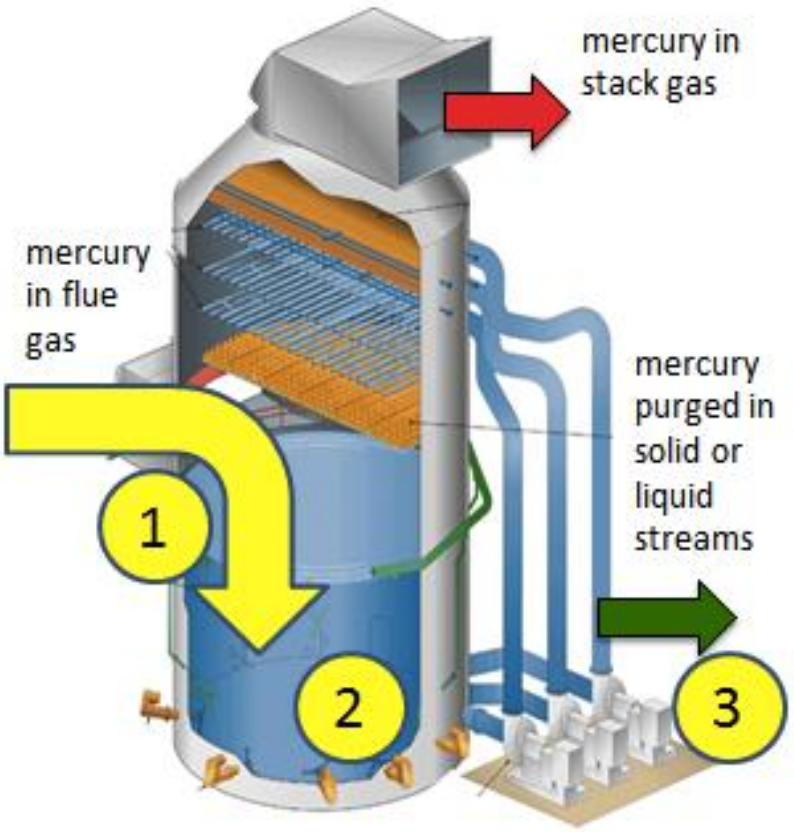
Increasing cost

Poor synthesis/conversion of the Polysulfide

NaHS Maintenance Dosages
Generally 0.02 gph/MW

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

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.

Steve Feeney

6147169952.