REINHOLD ENVIRONMENTAL Ltd.

2012 APC Round Table & Expo Presentation

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Maintaining High Level Mercury Capture in wFGD Absorber

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July 17, 2012

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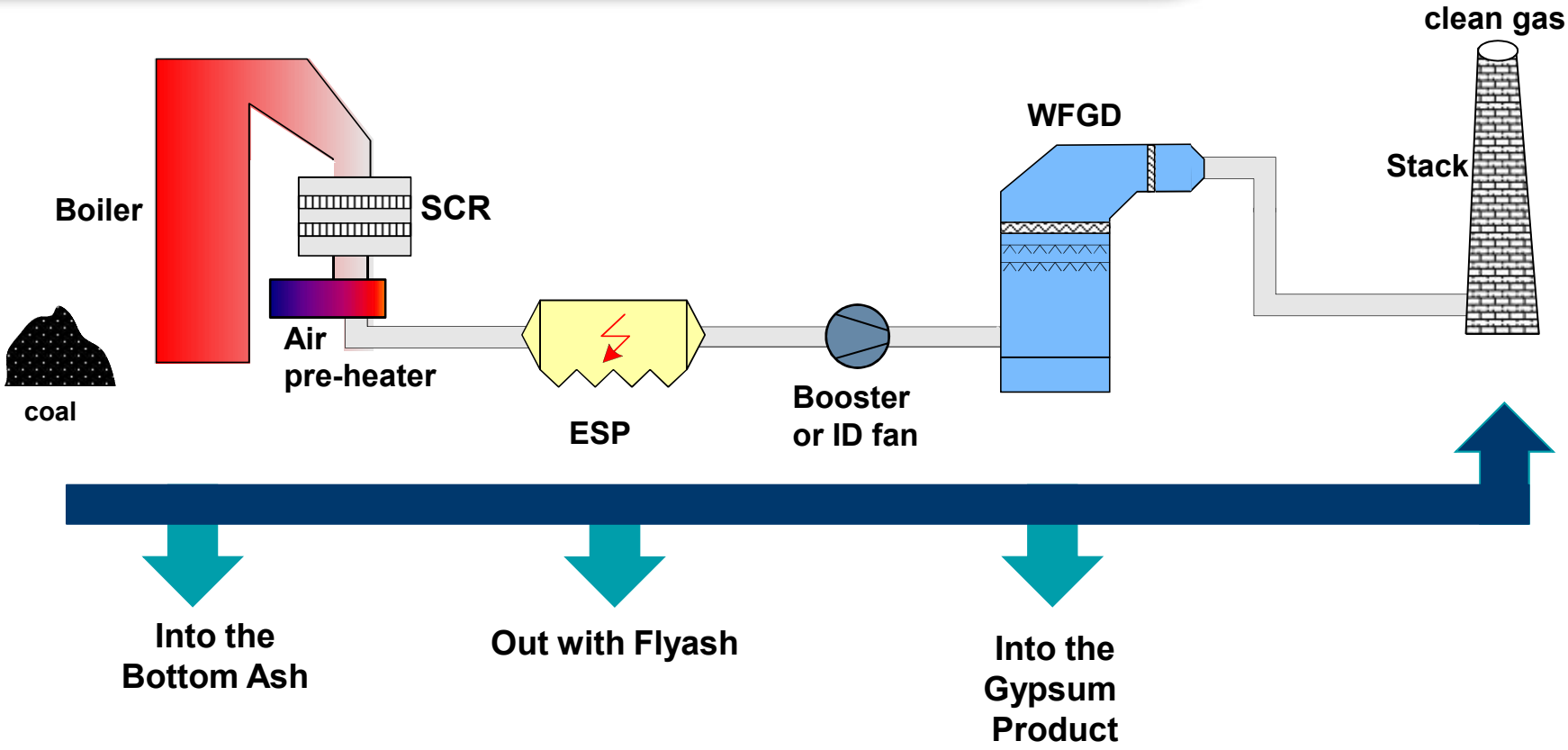
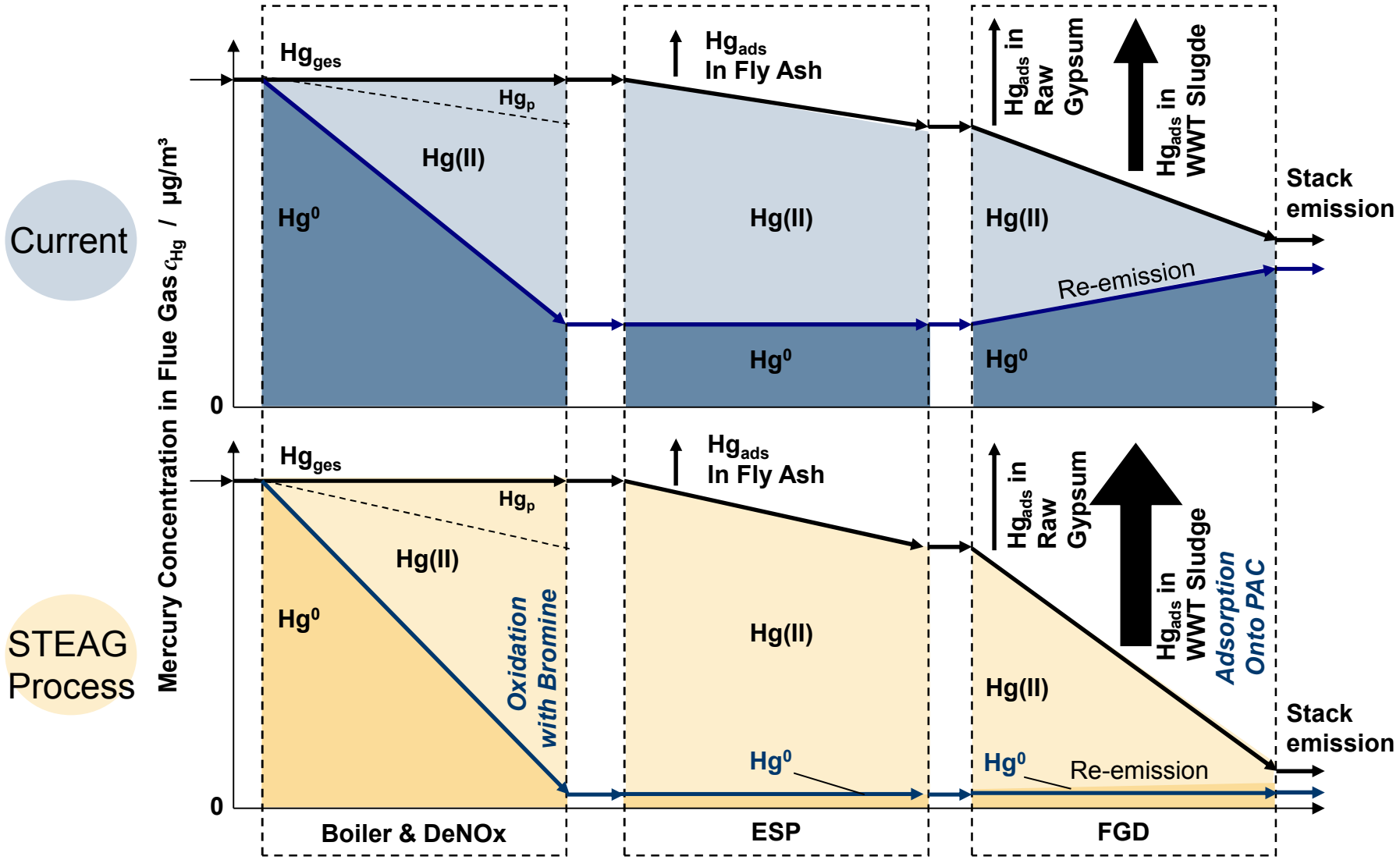
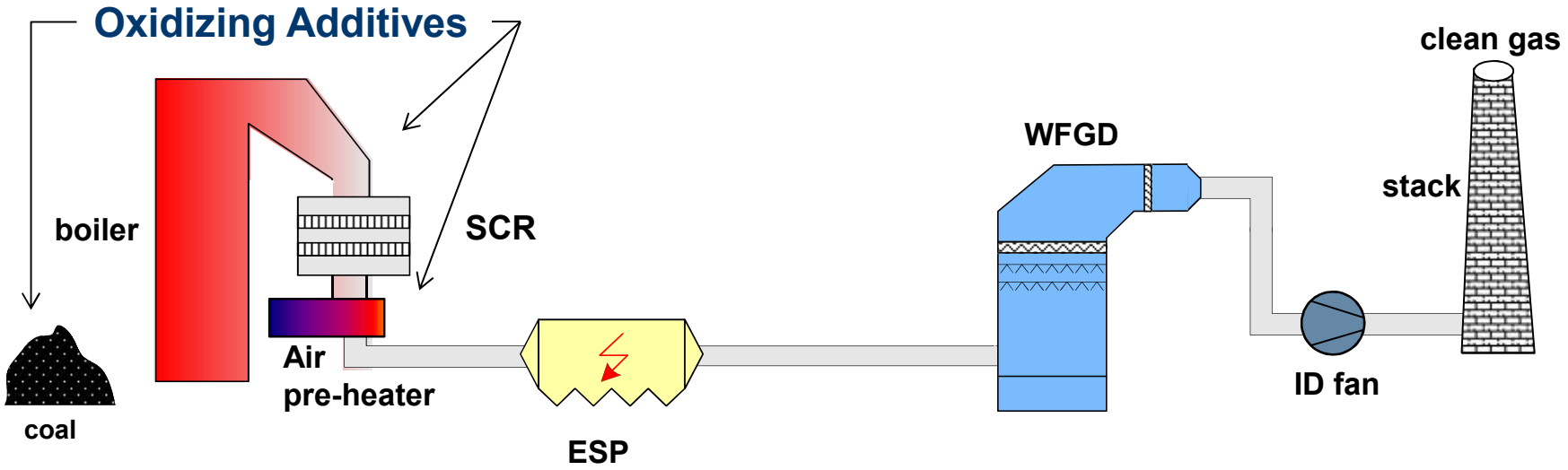
What is the fate of the Mercury?



STEAG Process Goal



STEAG's Mercury Technology



- **The STEAG Technology's Key Points**
  - Is a wFGD technology.
  - Is a technology to capture the Mercury in the slurry and prevent re-emission of the Mercury.
  - Has the capability to remove the Mercury from the gypsum product.
- **Requirements of the technology**
  - Mercury needs to be oxidized form (Hg^{2+})

For STEAG it started at the Herne Power Plant

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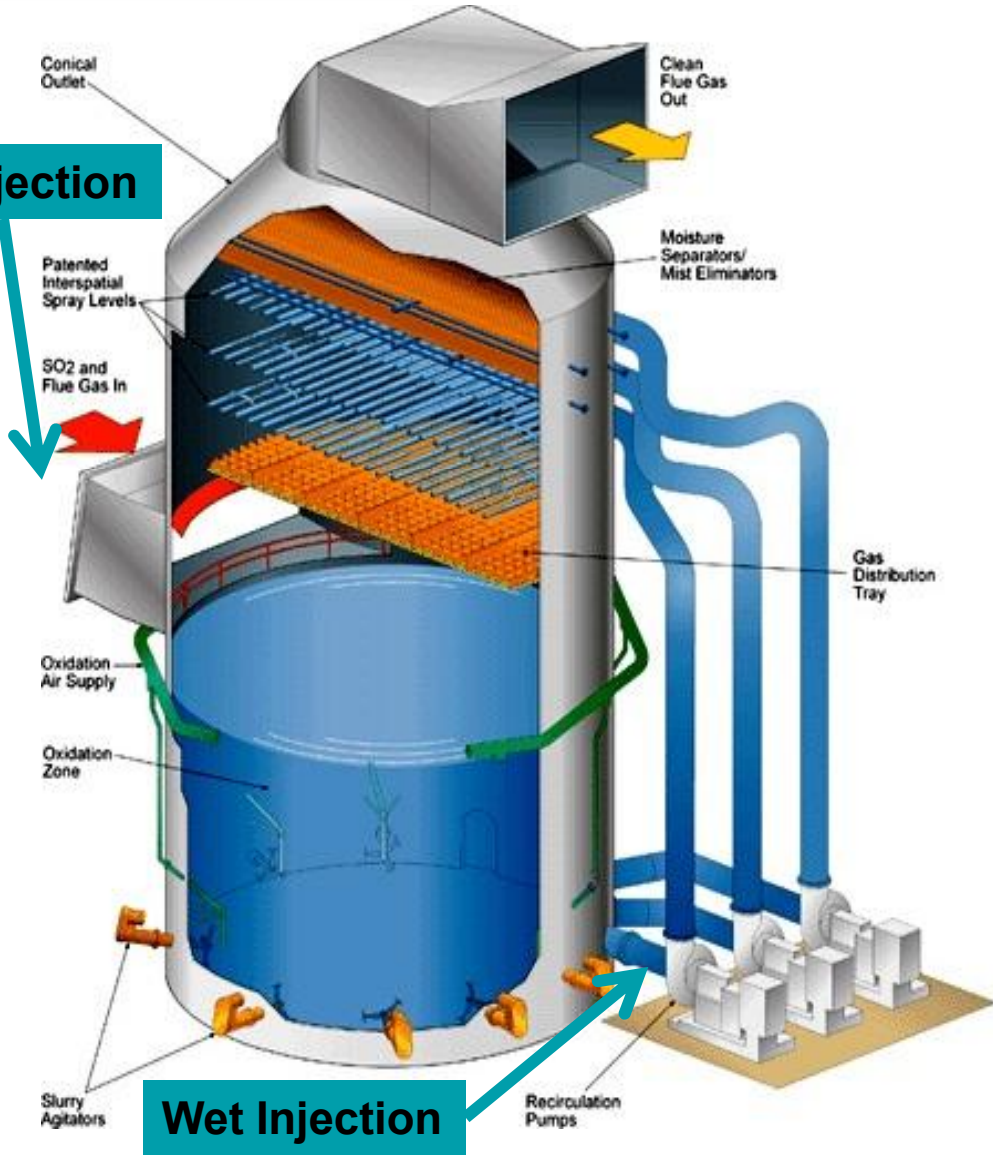
Herne Unit #4

- The Station is a 960 MW Station
- Unit #4 is a 500 MW unit (1989)
- Fuel Source - PC Coal, Wall Fired, bituminous coal (world sourced)
- Flow Gas Rate – 1.8 mm ACFM
- Environmental Equipment
  - High Dust SCR
  - ESP
  - Forced Oxidized wFGD

- **Initial focus of technology was waste reduction**

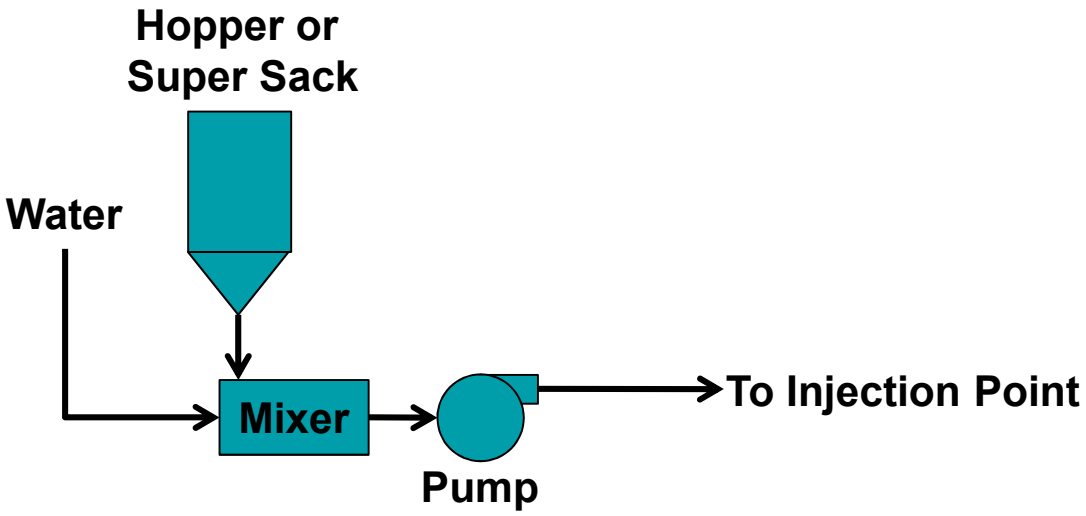
PAC Introduction

- **Capture Medium**
  - **Powder Activated Carbon (PAC)**
- **PAC Introduction**
  - **Wet PAC Slurry - Absorber Recirculation System or Sump System**
  - **Dry PAC Injection – Upstream of the FGD Absorber**
- **Capture Medium**
  - **Powder Activated Carbon (PAC)**



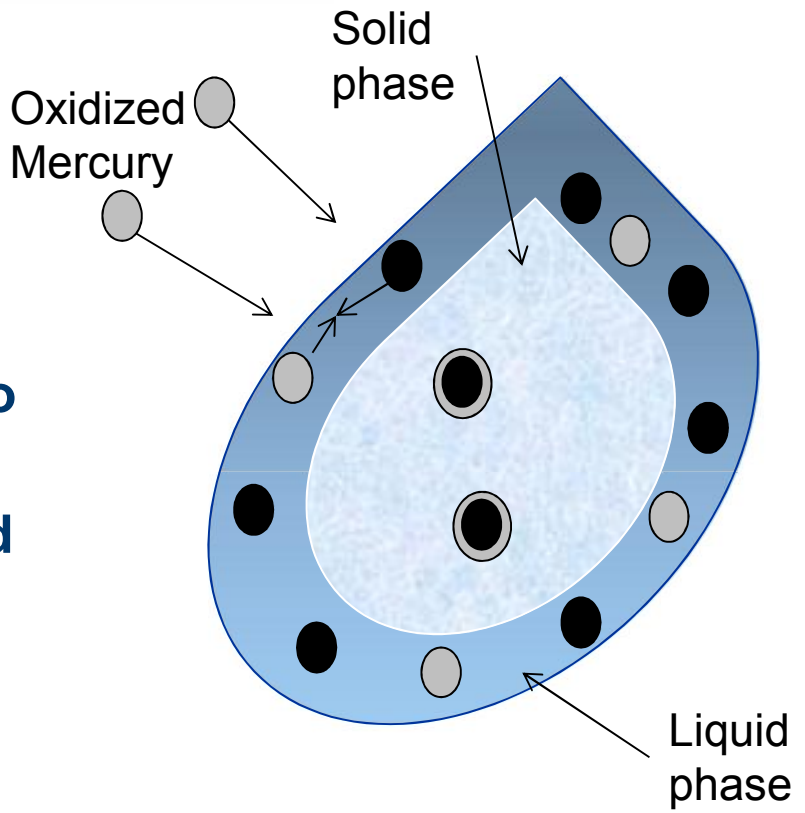
PAC Feed System

- **Feed System is a Dosing not Continuous Feed System**
- **Preferred System is a Wet Feed system**
  - **Simple System**
  - **Lower CapEx Cost**
  - **Multiple Unit Configuration**



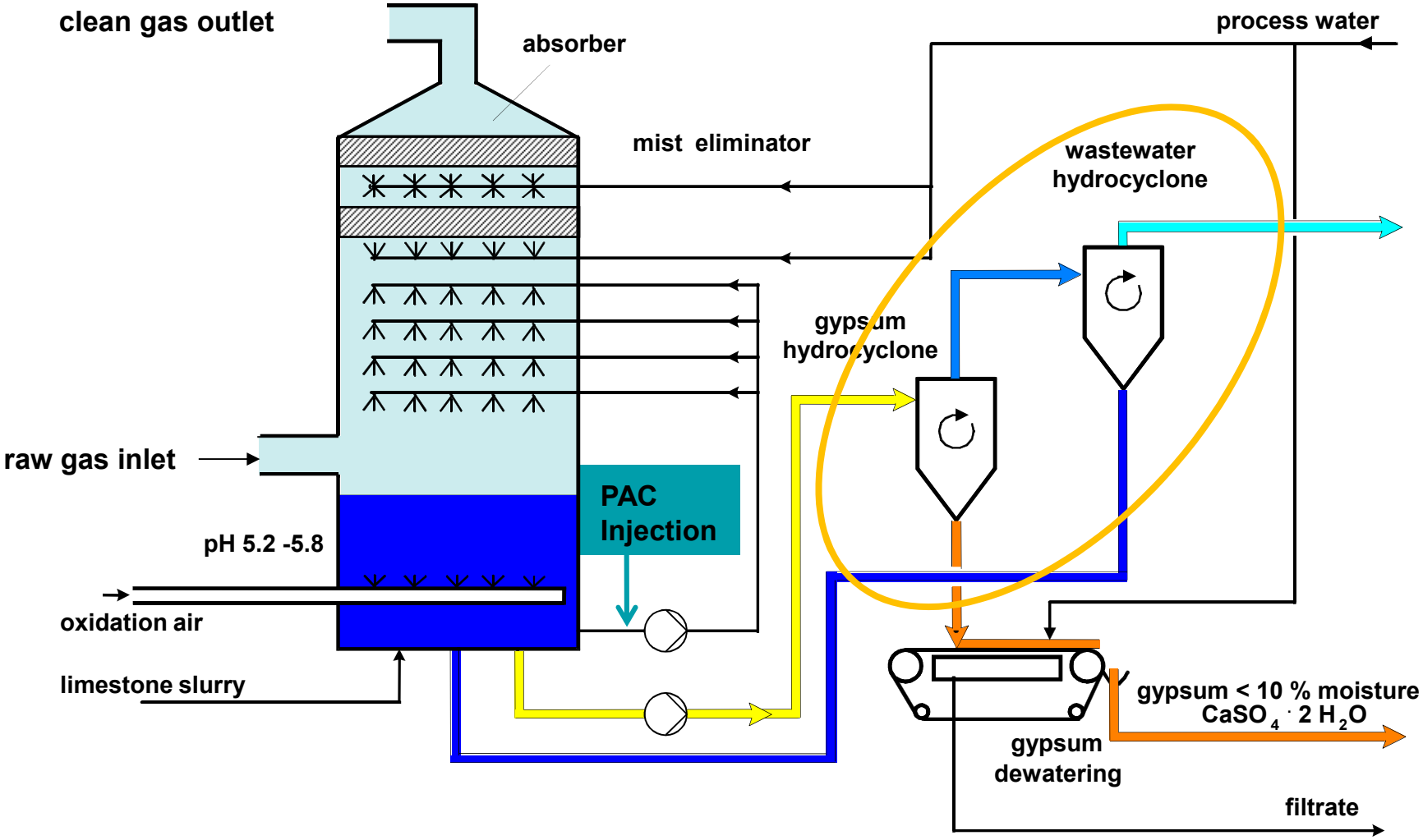
What Happens in the FGD Absorber

- The FGD does the mercury capture process.
- STEAG adds carbon to the liquid phase of the droplet.
- Oxidized Mercury is absorbed into the gypsum slurry droplet
- The Oxidized Mercury is adsorbed onto Mercury. The Mercury is captured at this point and will not re-emit.
- The Mercury is now in the solid phase of the gypsum slurry droplet.



Gypsum Slurry Droplet

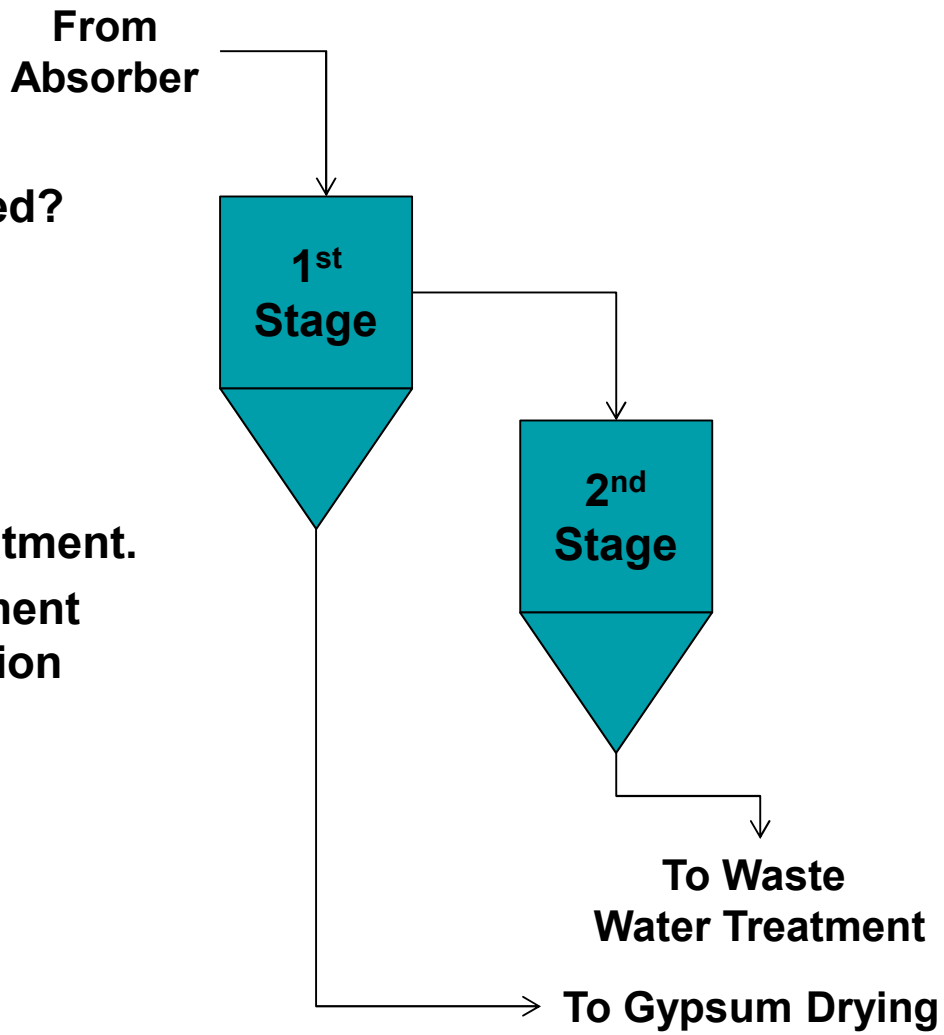
The STEAG Process



Removal of the Mercury

- **Decision Cycle**
  - Is the Gypsum being sold?
  - Does Mercury need to be removed?
  - Landfill / Product Liability.

- **Hydrocyclones is the Mercury Separation System**
  - Mercury to the Waste Water Treatment.
  - Hydrocyclone separation equipment may needs to be 2 stage separation system.
  - Adjustments in the separation equipment may be needed.



STEAG System Testing

- **Significant Increase in Testing in the last Quarter.**
  - **Mercury removal decision by 2015.**
  - **Proof of concept.**
- **STEAG Testing Plan**
  - **Installation of a dosing System.**
  - **Inventory building of the PAC material.**
  - **Testing Analysis**
    - **Mercury Absorber Inlet (oxidized / elemental Mercury)**
    - **Mercury Absorber Outlet (oxidized / elemental mercury)**
    - **Absorber Slurry Purge (Mercury split – liquid to solid)**

STEAG Demonstration Project

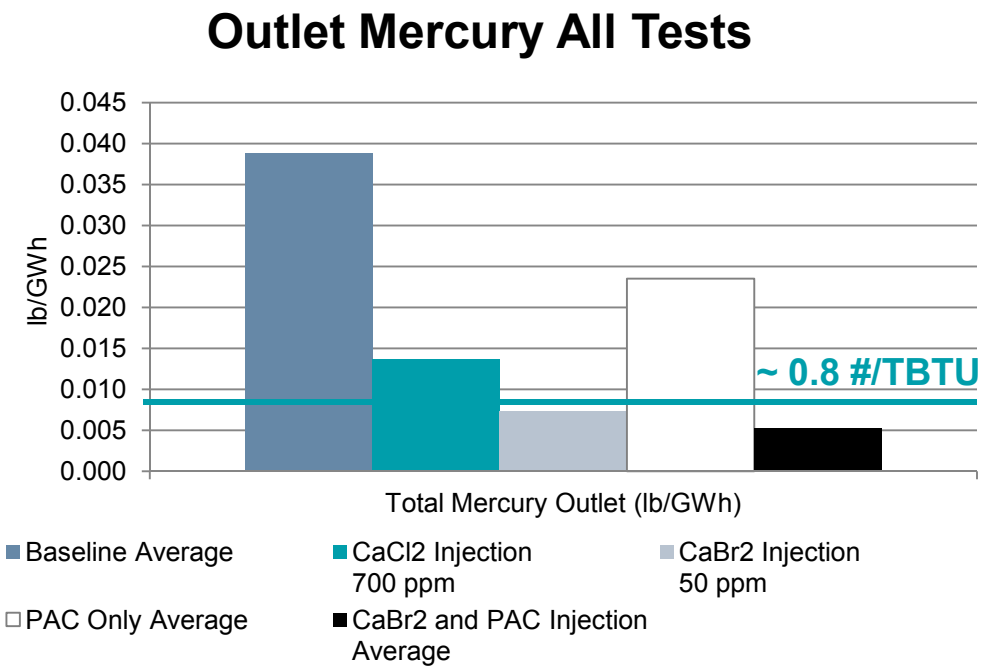
- **Types of Fuels**
  - PRB Units
  - High Sulfur Eastern Bituminous
  - PRB / Eastern Bituminous Blend
  - World Source Bituminous
- **wFGD Reagents**
  - Limestone
  - Sodium
- **Unit Arrangements**
  - High Dust SCR w/ wFGD (Limestone)
  - Tailing End SCR w/ wFGD (Limestone)
  - High Dust SCR w/ wFGD (Sodium)

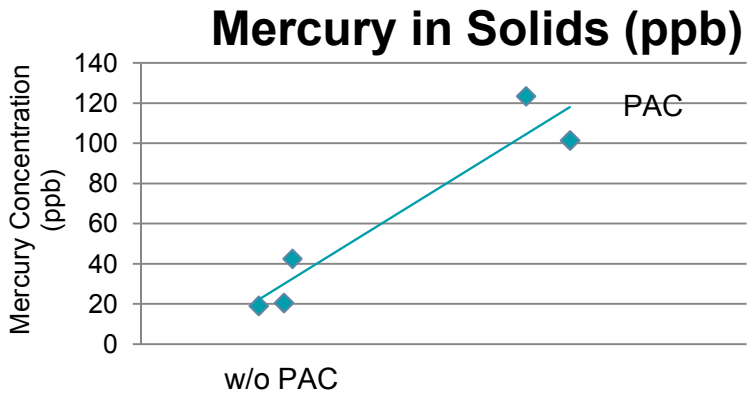
STEAG's Walsum Station

Evonik Marl Station

Testing Results

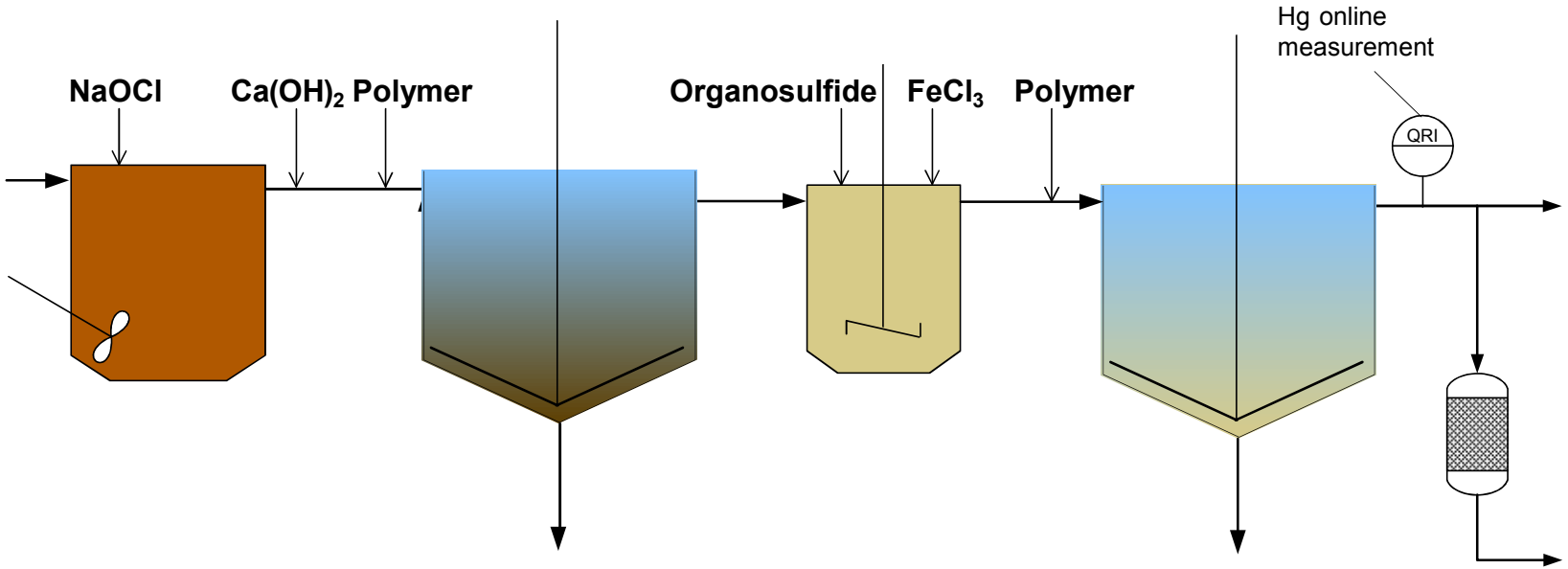
- Unit with SCR & FGD.
- PAC only in an wFGD absorber shows reduction improvements (reduction in the re-emission).
- Combination of PAC & $CaBr_2$ can meet emission requirements. This is a 95% Mercury capture.
- Mercury bonds to the PAC Material.
- PAC injection rate ~ 0.3#/mmACFM
- Results show re-emission with additive is achieved.
- Similar results are seen on the various fuels.





FGD Waste Water Treatment

Wastewater treatment plant



Conclusions

- **STEAG's Process is a wFGD re-emission prevention process.**
- **Oxidized Mercury is required. This is probably the Hardest part of obtaining a high removal.**
- **Process will work on all fuels and configurations.**
- **The process can sequester the Mercury providing a Mercury free gypsum Product w/ STEAG's 2 stage WWT process.**
- **Very low rates of PAC material to prevent re-emission.**
- **Multiple units can be feed from one dosing skid.**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