

REINHOLD ENVIRONMENTAL Ltd.



2011 APC Round Table & Expo Presentation

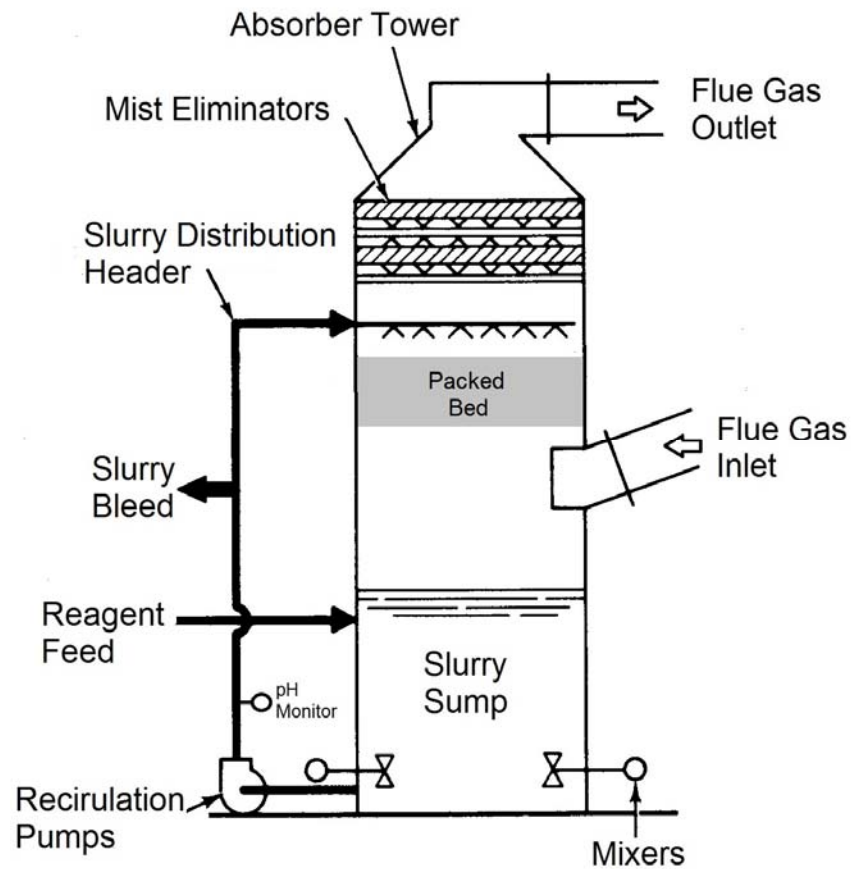
July 11-12, 2011, in Cleveland, OH / Hosted by FirstEnergy

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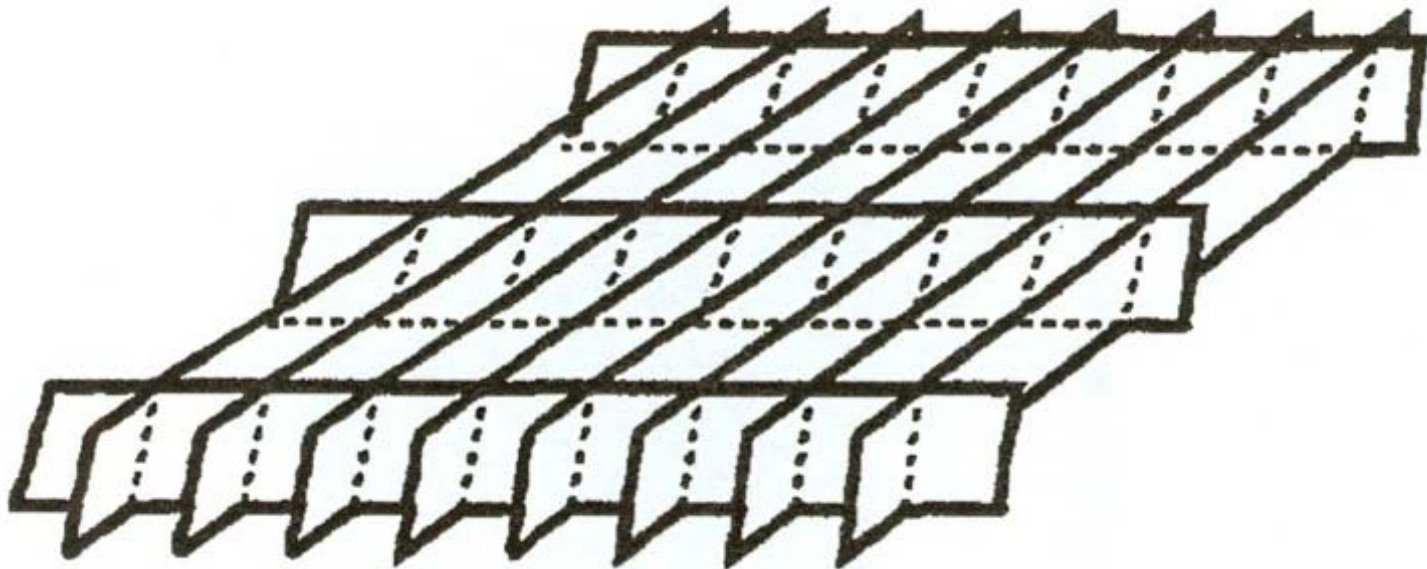
The Evolution of FGD Equipment Design and Operating Practices Has Changed The Conditions That FGD Materials of Construction Must Survive

Ron Richard
Senior Consultant
RE Consulting

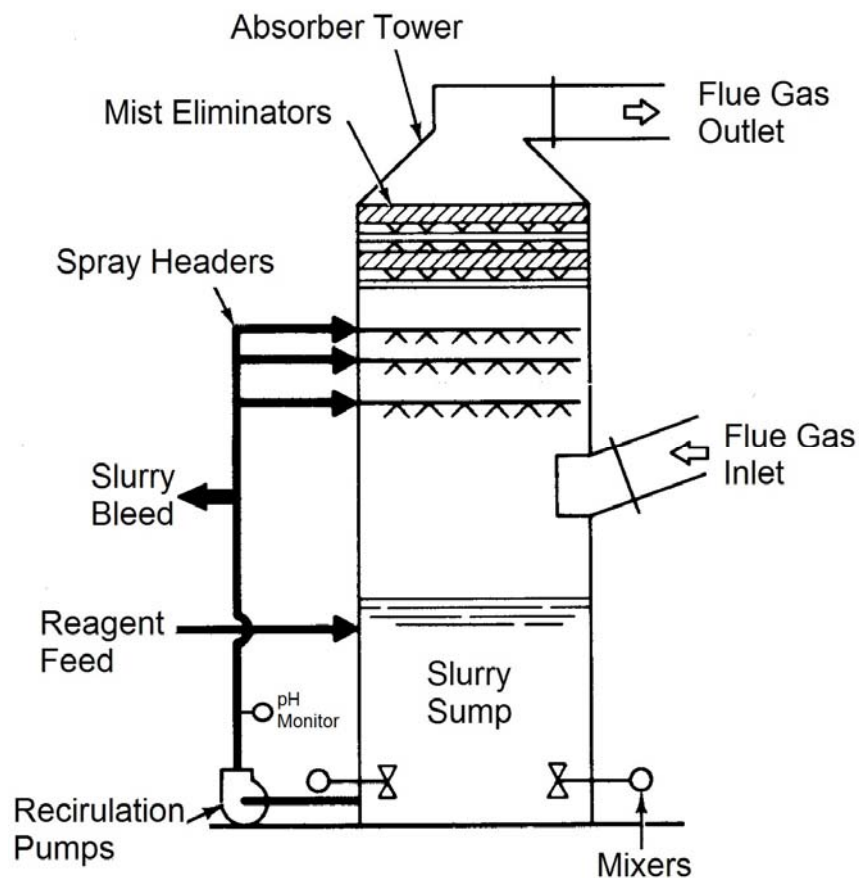
Packed Bed Tower



Most Common Tower Packing



Spray Tower Absorber



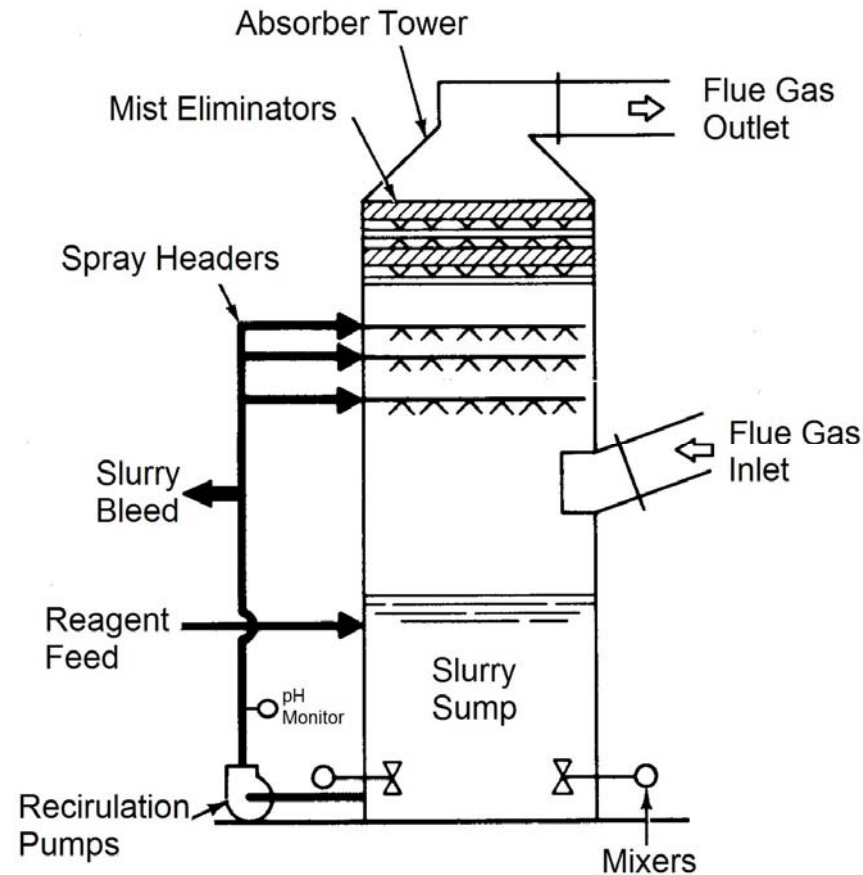
Spray Zone



Spray Headers and Nozzles



Spray Tower Absorber



Tightening Water Balance

- Mechanical seals
- Higher slurry solids
- Better slurry dewatering
- Gypsum sales had negative effect due to chloride limits
- Wastewater treatment regulatory requirement

Pre-scrubbers

- If one added a mini spray tower ahead of the Absorber and sprayed a small amount of slurry through the flue gas, one could remove only the chlorides and fluorides.
- This allowed the use of lower grade materials in the Absorber which provided a cost savings.

Pre-scrubbers (cont.)

- This proved very effective at protecting the MOC in the Absorber.
- This proved very costly in repair and replacement of Pre-scrubber components due to the extremely low pH values experienced in the Pre-scrubber loop.

Bypass Reheat

- Some flue gas was bypassed around the Absorber and mixed with the scrubbed gas to provide reheat for plume rise concerns.
- The alkalinity in the scrubbed gas was removed by the Mist Eliminator and the gas was saturated with water.

Bypass Reheat

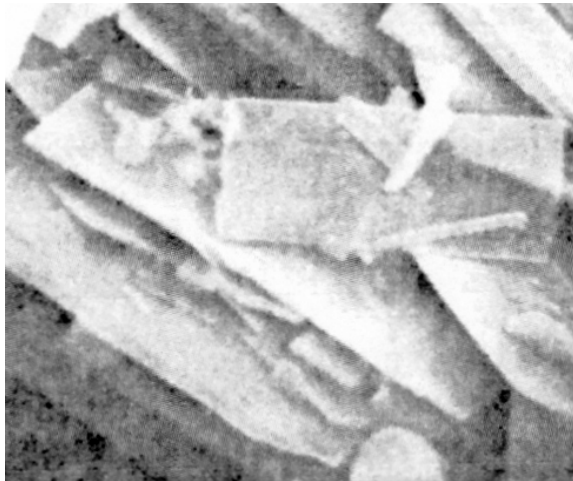
- The SO_2 in the unscrubbed flue gas reacted with the moist scrubbed gas and formed large amounts of sulfuric acid which ran down the outlet duct walls and formed puddles on the floor.
- One can't bypass flue gas and achieve a 95-98% SO_2 removal at the chimney outlet. A choke at the chimney exit can provide plume rise.

Oxidation

- Natural Oxidation
- Inhibited Oxidation
- Forced Oxidation

Crystal Structures

Calcium Sulfit

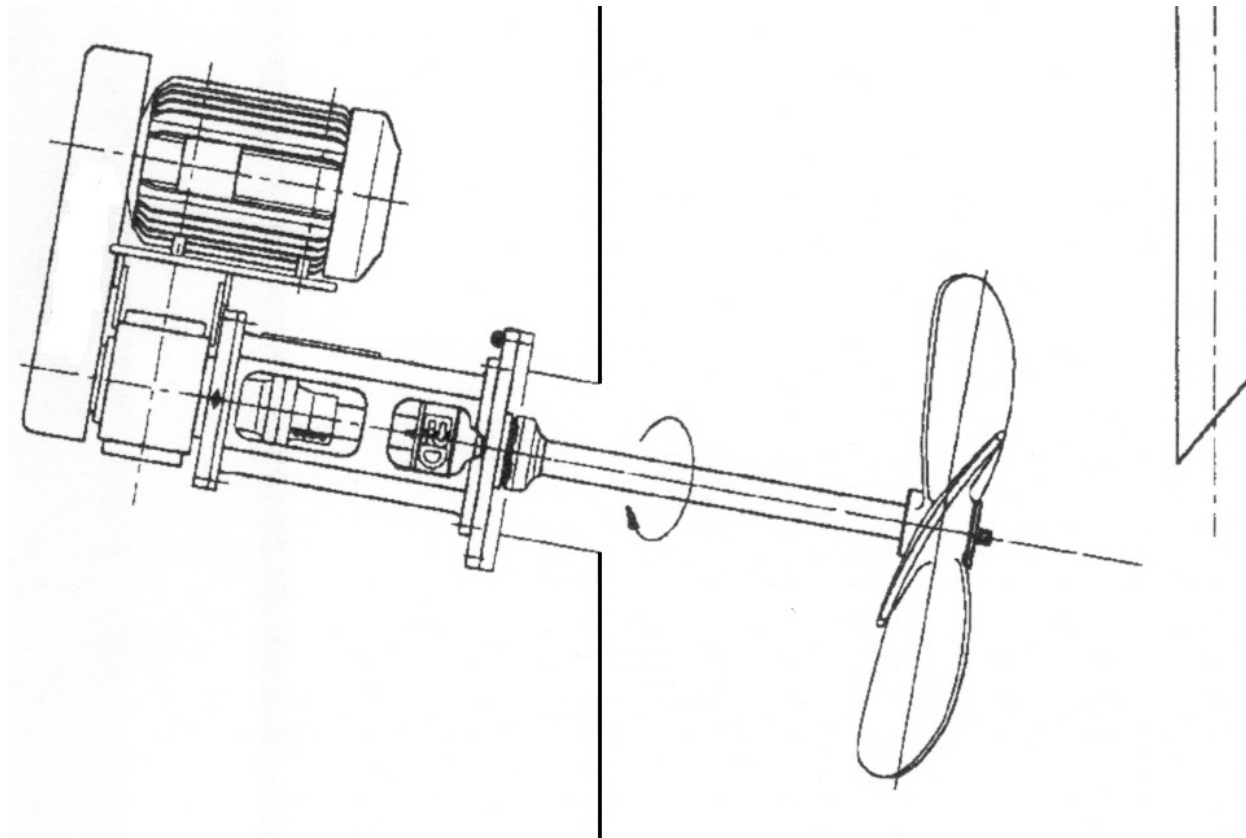


Mixed Crystal

Calcium Sulfate



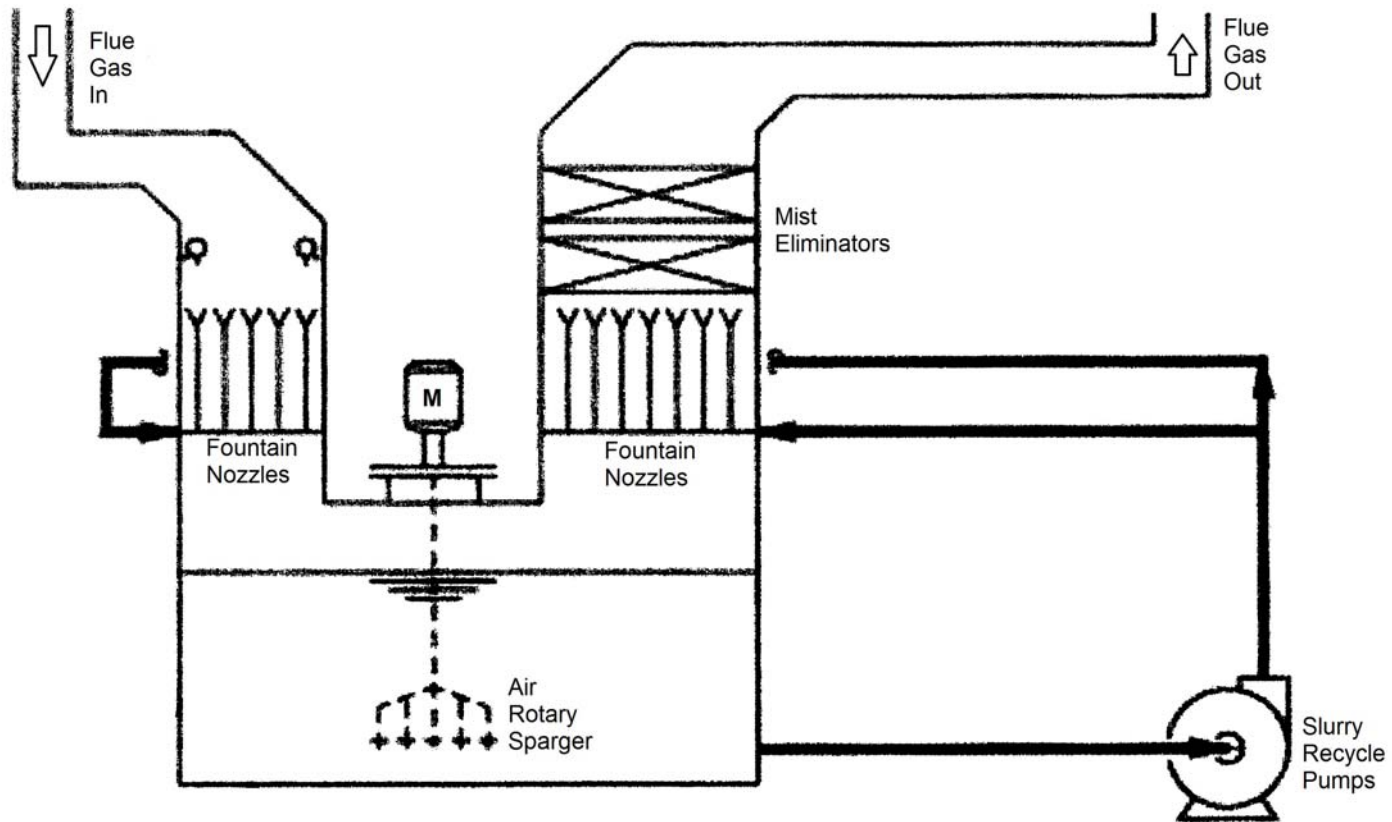
Most Common Oxidation Sparger



Forced Oxidation Systems Today

- Designed for a wide range of coals, some with higher sulfur than is typically used
- Highest quality gypsum is the goal
- Current economy has some units running at lower loads for longer periods of time
- All of the above cause high amounts of excess oxygen in the absorber slurry

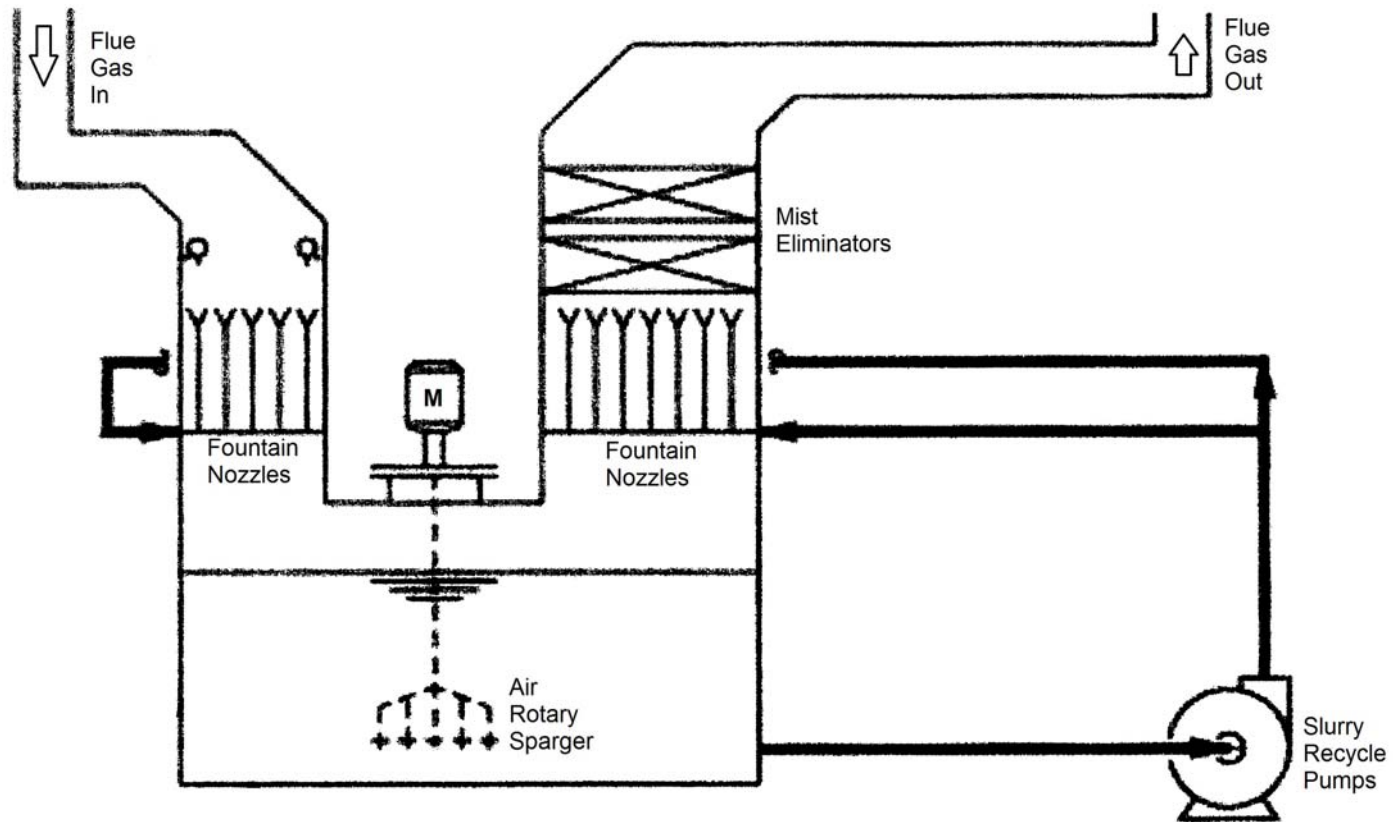
Fountain Nozzle Absorber



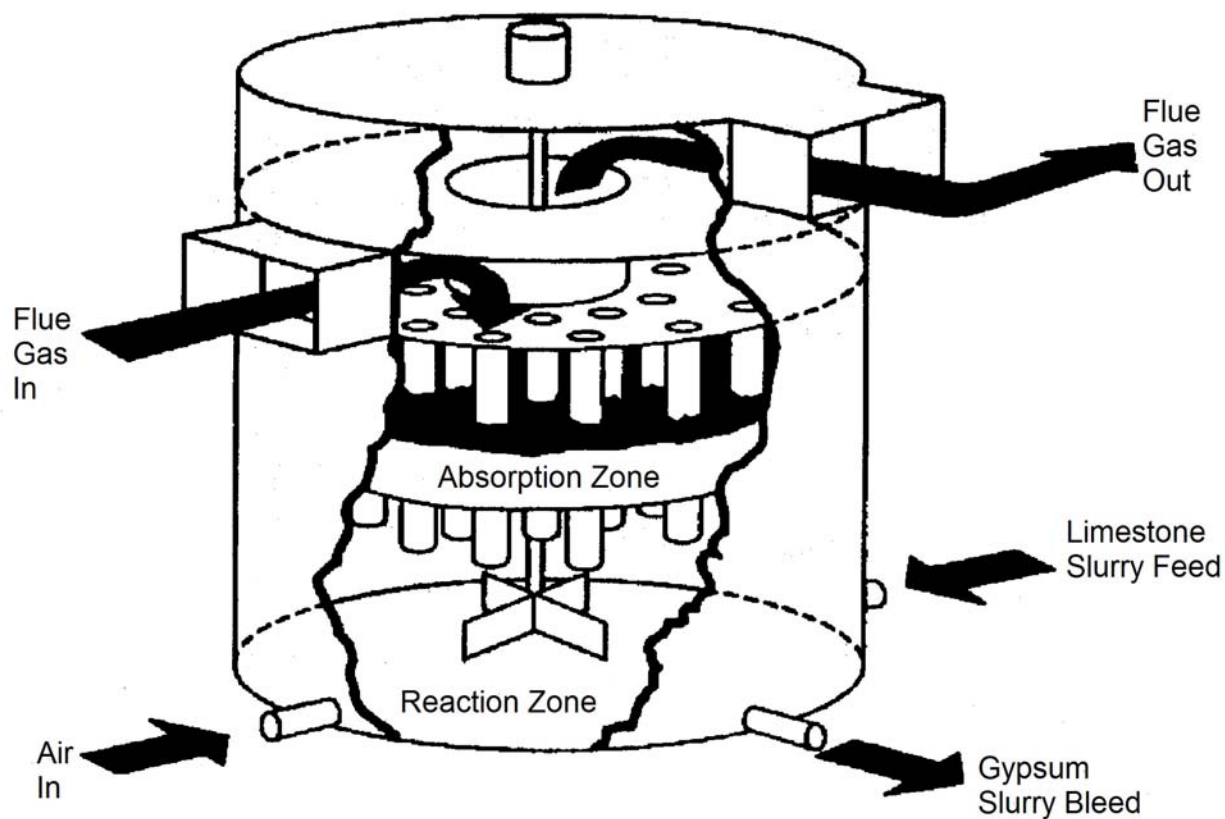
Fountain Nozzles



Fountain Nozzle Absorber



Jet Bubbling Reactor



Questions??