

# **REINHOLD ENVIRONMENTAL<sup>®</sup>**



## **2026 Reinhold/PCUG Round Table Presentation**

Hosted by TVA, Southern Company and Vistra  
in the Sonesta Nashville Airport Hotel, Nashville, TN  
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# REINHOLD/PCUG CONFERENCE

## DRY SCRUBBING LESSONS LEARNED

JUNE 23, 2026 NASHVILLE, TENNESSEE

MARK FIEDLER, PROCESS ENGINEER





# DRY SCRUBBER Technology Overview

SDA=SPRAY DRYER ABSORBER

SDA=SPRAY DRYER EVAPORATOR

CDS AND NID DRY INJECTION SYSTEMS



# SDA DRY FGD

## LESSONS LEARNED BACKGROUND



# Why SDA/Fabric Filters?

1. EMISSION PERFORMANCE,  
COMBINED HIGH PERCENTAGE  
CAPTURE OF SO<sub>2</sub>, SO<sub>3</sub>, HCL  
HAZARDOUS METALS AND  
ORGANICS W PAC.
2. ENVIRONMENTALLY ACCEPTABLE  
WASTE.
3. CARBON STEEL GAS ENVELOPE.



# SDA Basic Designs

## CONCEPTS, DIFFERENCES

# SDA FGD EXPERIENCE

FIRST US SPRAY DRYING PATENT:  
SAMUEL PERCY, 1872

Origins: Chemical & Food Processing

Late 1970's – Early 80's Development

- About 20,000 MW operating on US coal-fired utility boilers
- Technology options:
  - Rotary atomizers
  - Dual-fluid nozzles
- Rotary atomizers predominant in US power industry,
- PRB Coal First Applications, ongoing developments  
For Up to ~3% Eastern Bituminous blends.
- Dual-Fluid Nozzles in many smaller installations:
- Municipal WTE, Iron & Steel Emissions Control.

SDA Systems can also reduce Plant Waste Water Discharge.



Rotary Atomizer SDA



Dual-Fluid Nozzle SDA



## Mechanical / Chemical and Process Design Steps to Success

### Key Process Steps

1. Slurry solids control, Note SLOWER drying with Thin slurry!
2. Atomize slurry droplets / energy input.
3. Maintain SDA Mixing Energy!  
SDA DP Generates Turbulence!  
Droplet Drying and Gas Cooling/Humidification.
4. Maintain Consistent Approach to Gas Saturation.

Absorption of acid gases during cooling and drying

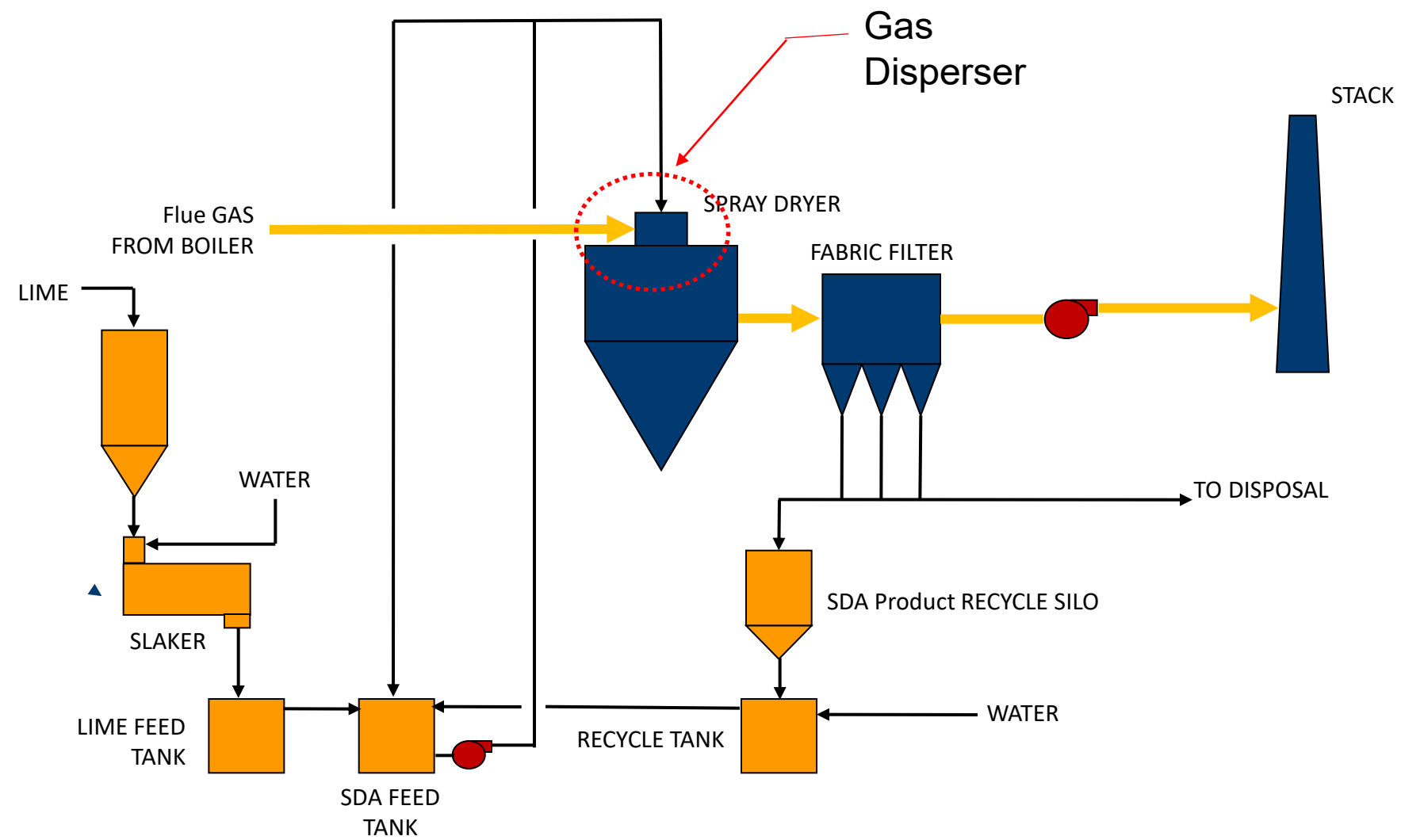
- Slaking Reaction



- Absorption / Drying Reactions



# TYPICAL SDA PROCESS FLOW DIAGRAM WITH SLAKER AND PRODUCT RECYCLE





# SDA Fundamentals Continued

Dry particles at SDA Outlet require Active Control.

$T_{\text{Inlet Gas}} - T_{\text{Outlet Gas}} = \text{Spray Down Window.}$

Slurry Feed Rate Stability at steady loads

Rapid Feed Rate Changes Track variable loads.

Recycle byproduct for best efficiency

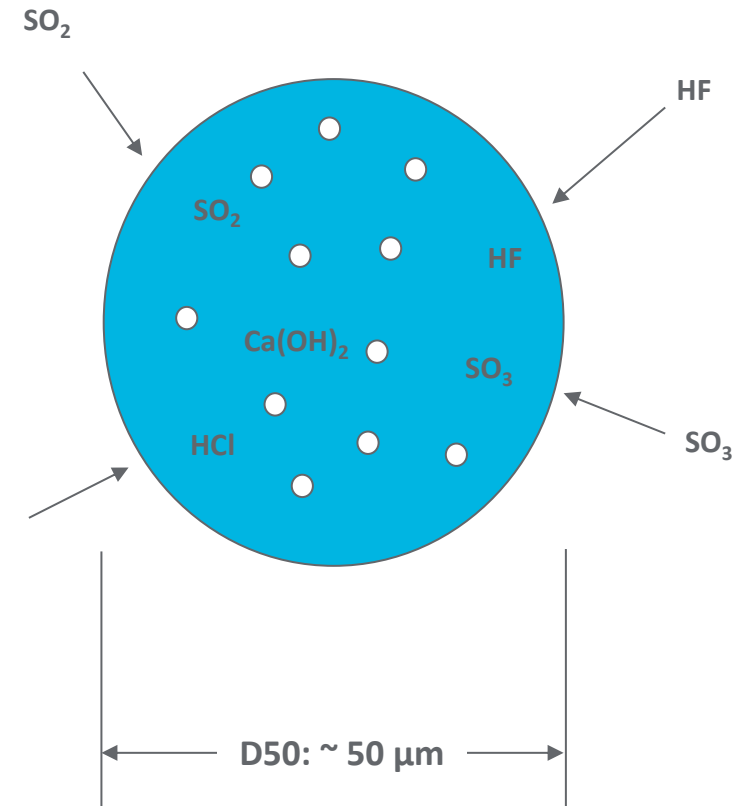
# ATOMIZATION – ENERGY INPUT REQUIRED!



**Rotary Atomizer**



**Dual-Fluid Nozzle**



**Alkali Slurry Droplet**

# ROTARY ATOMIZER



# ROLE OF FABRIC FILTER



## Part of the process

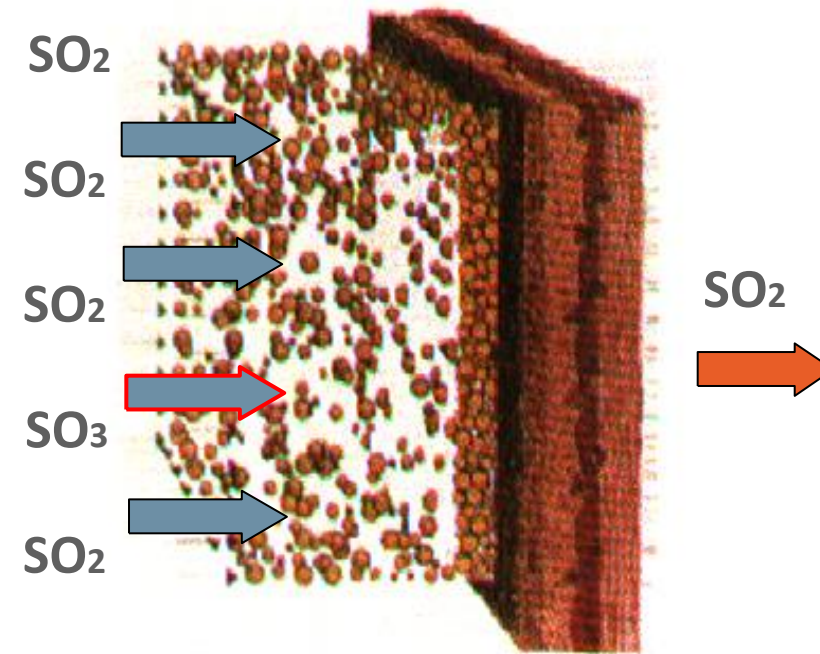
### Second Stage Reaction

- $\text{SO}_2$
- $\text{SO}_3$
- $\text{HCl}$  /  $\text{HF}$
- $\text{Hg}$
- Other trace elements

### Collection

- Fly ash and SDA Product
- Carbon for Hg Control

**FF Pressure Drop is important!**



# MULTIPLE ROTARY ATOMIZER SDA DESIGN



## **Designed for boiler load following**

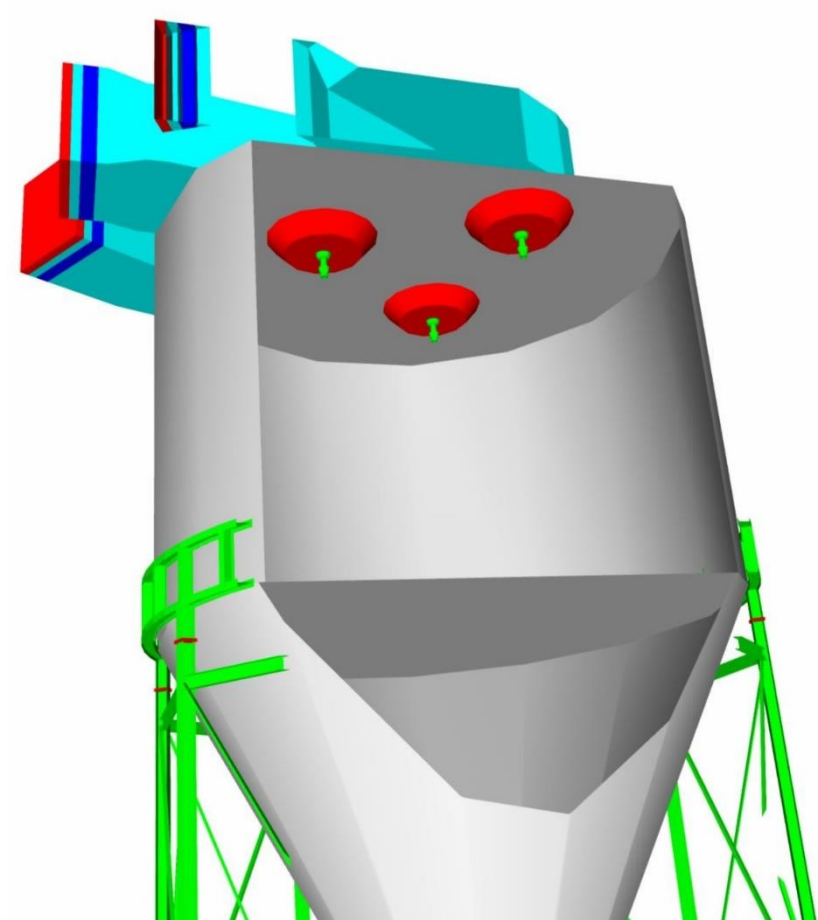
Multiple atomizers (up to 400 hp)

Each atomizer acts independently

Typically designed to allow compliance  
at full-load with one atomizer out of service

Top inlet with gas disperser to promote good gas/liquid contact

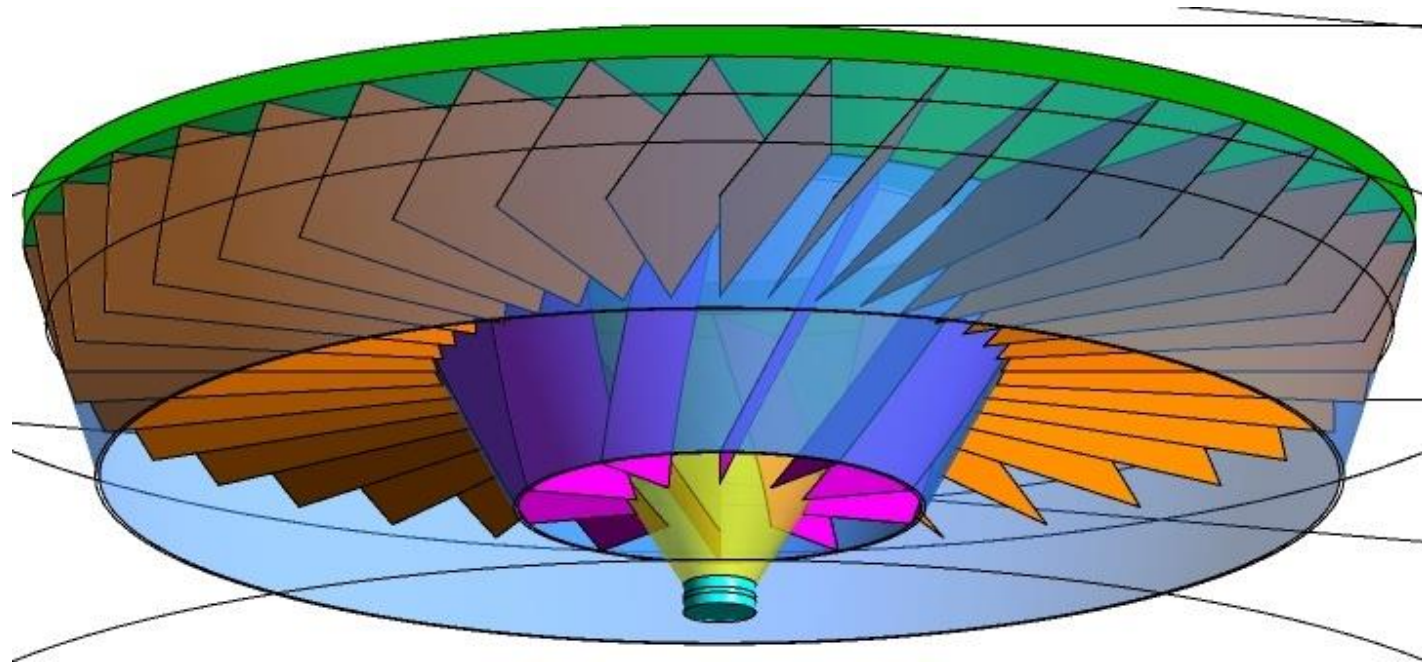
**No internals inside of Spray Dryer Absorber Vessel**



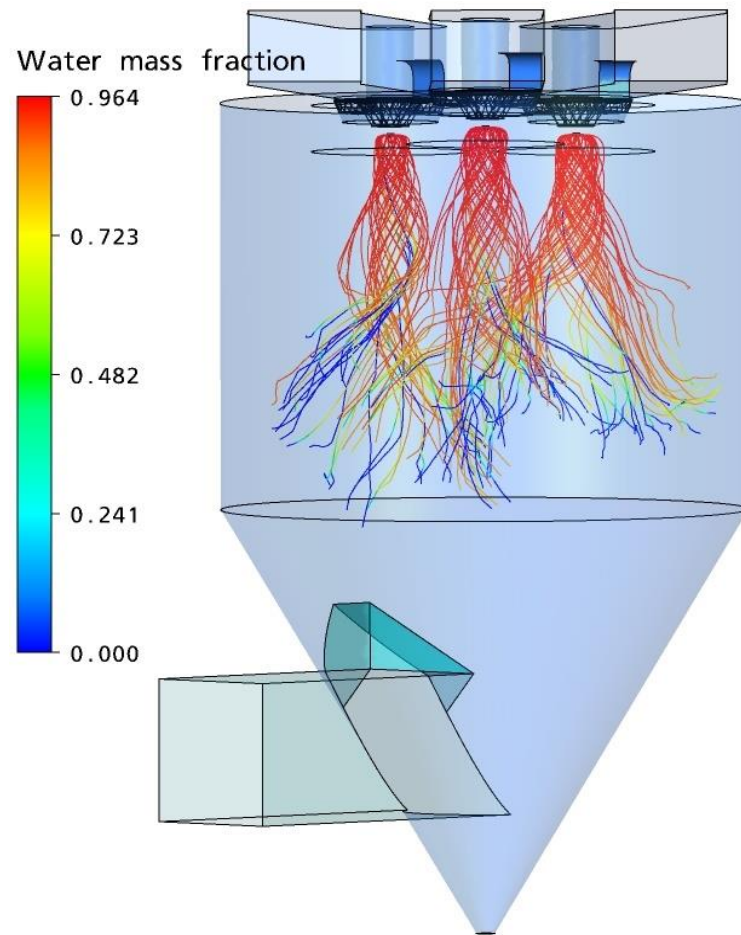
# GAS DISPENSER



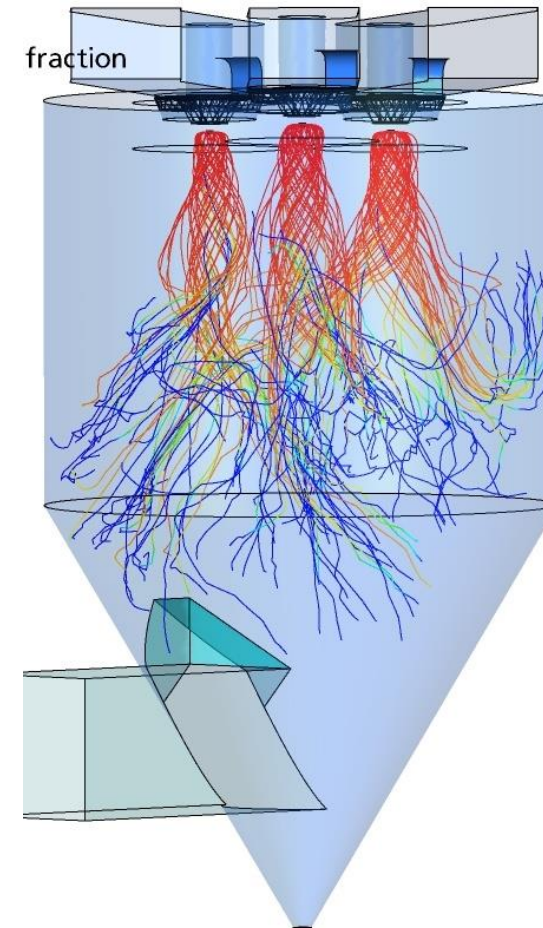
## Rotary Atomizer Gas Dispenser



# ROTARY ATOMIZER CFD MODEL

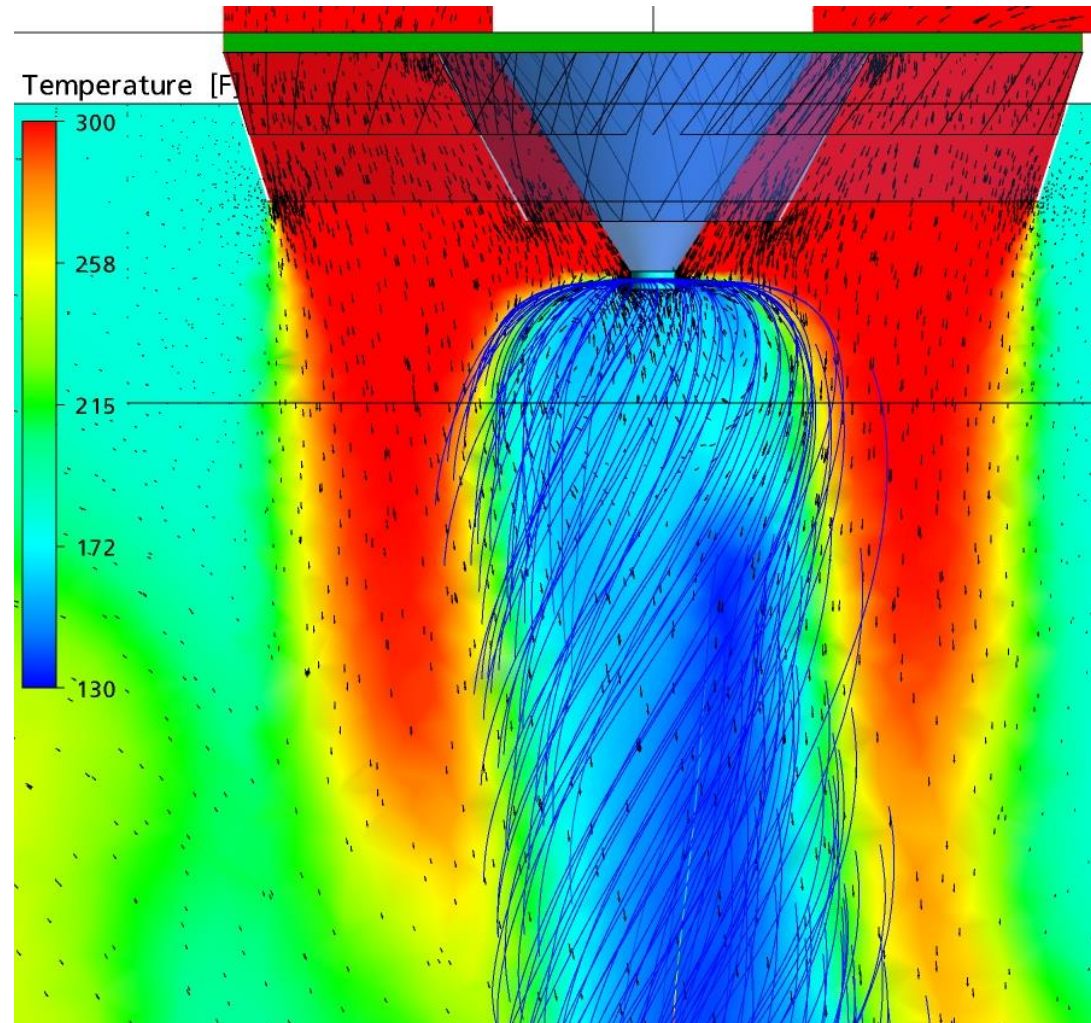


Droplets, 1<sup>st</sup> second of travel



Droplets, 2<sup>nd</sup> second of travel

# ROTARY ATOMIZER CFD MODEL



**Zoom in on atomizer**



# Lessons Learned: 6 Things to know

1. RESPECT SYSTEM STARTUP PROCEDURES
2. UNDERSTAND SLURRY DENSITY IMPACT
3. INSTRUMENTATION MAINTENANCE
4. MAINTAIN APPROACH TO SATURATION CONTROL
5. EQUIPMENT PREVENTIVE MAINTENANCE
6. CONTINUOUS OPERATOR TRAINING / SHARING



# 1. Respect system Startup procedures

**HOT OR COLD FURNACE STARTUP, AMBIENT TEMP?  
ALL EQUIPMENT READY, TAGS CLEARED, DOORS  
CLOSED, INSTRUMENTS OK?**

**OBSERVE ID FAN INLET GAS TEMPERATURE TO  
LIMIT CONDENSATION “WINDOW” BEFORE ADDING  
H<sub>2</sub>O.**

**IS SLURRY READY TO GO? LINES OPEN, ETC.  
AVOID THIN SLURRY STARTS**



## 2. Understand Slurry Density Impact

**THIN SLURRYS ARE DIFFICULT TO DRY.**

LIME ONLY SYSTEMS REQUIRE HIGHER APPROACH TO SATURATION OPERATION, HIGHER LIME INPUT.

RECYCLE SYSTEMS BENEFIT FROM LOWER LIME REQUIREMENTS:

A: RESIDUAL LIME IN RECYCLE DUST.

B: BETTER DRYING AT LOWER APPROACH.

**SDA FEED SLURRY DENSITY BEST ABOVE 25% SOLIDS.**



# 3. Instrumentation Maintenance

## OPERATOR OR DCS CONTROL DEGRADES WITH MISSING OR INACCURATE DATA!

DO: Maintain Calibrations, Inspect whenever possible for broken or obstructed sensors, frozen / clogged Dp / instrument air lines, verify slurry density readings with lab testing.

Utilize data historian to observe / compare ongoing readings with Historical or suspect data.

Check for control valve wear trends with flow vs valve position.

Inspect Gas Path Interior at every outage and remove any significant deposits. Solid obstructions generally grow.



## 4. Maintain Approach to Saturation Control

INSTALL AND MAINTAIN FLUE GAS  
HUMIDITY MONITORS!

TECHNOLOGY HAS IMPROVED  
BUT NOT PERFECT.  
OFTEN USED FOR OPERATOR GUIDANCE,  
NOT DIRECT SLURRY FLOW CONTROL.



# 5. Equipment Preventive Maintenance

**FOLLOW EQUIPMENT MFG'S RECOMMENDATIONS!**

**ATOMIZER MAINTENANCE IS CRITICAL TO  
EMISSIONS COMPLIANCE.  
REGULAR PM ON NOZZLE OR ROTARY ATMS.  
AVOID OPERATION TOO CLOSE TO SATURATION.**

**UNDERSTAND THAT ATOMIZER PROBLEMS  
OFTEN BEGIN IN THE SLURRY PREP SYSTEM.**

**SDA WALL SHED, DRIED CHUNKS IN RECYCLE**

Oversize Grit + bad screen = Atomizer OFF- Line



## 6. Continuous Learning, Operator Training / Sharing

**THE BEST TEACHERS ARE  
EXPERIENCED OPERATORS!  
TALK TO EACH OTHER, SHARE  
THE GOOD AND BAD!**



**Bottom Line, If you can't Dry  
the Slurry, The rest of the  
Process  
Doesn't Matter**



# Questions?

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