



BabcockPower



One Source



Many Solutions



One Purpose

Circulating Dry Scrubbers for PM_{2.5} Compliance

Presentation for the:

**McIlvaine Company Hot Topic Hour on
Compliance Strategies for PM_{2.5}**

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Outline

Circulating Dry Scrubbers for PM_{2.5} Compliance

- A. EPA Regulations**
- B. Particulate Measurement Methods**
- C. Circulating Dry Scrubbers**

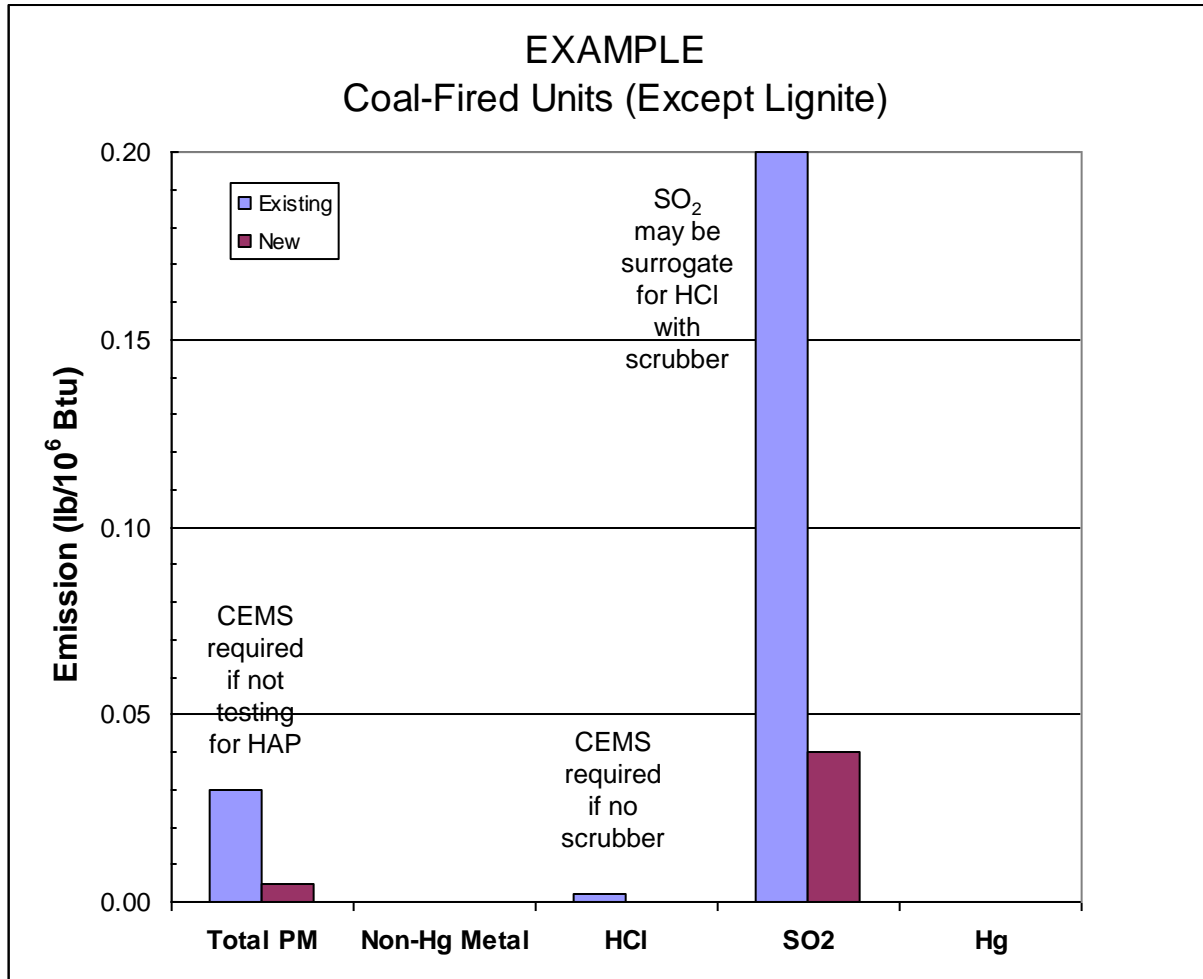


EPA Regulations

- **National Ambient Air Quality Standards (NAAQS)**
- **New Source Performance Standards (NSPS)**
- **Proposed Utility Maximum Achievable Control Technology (MACT)**
- **Proposed Area and Major Source Industrial Boiler MACT**



Proposed Utility MACT Limits

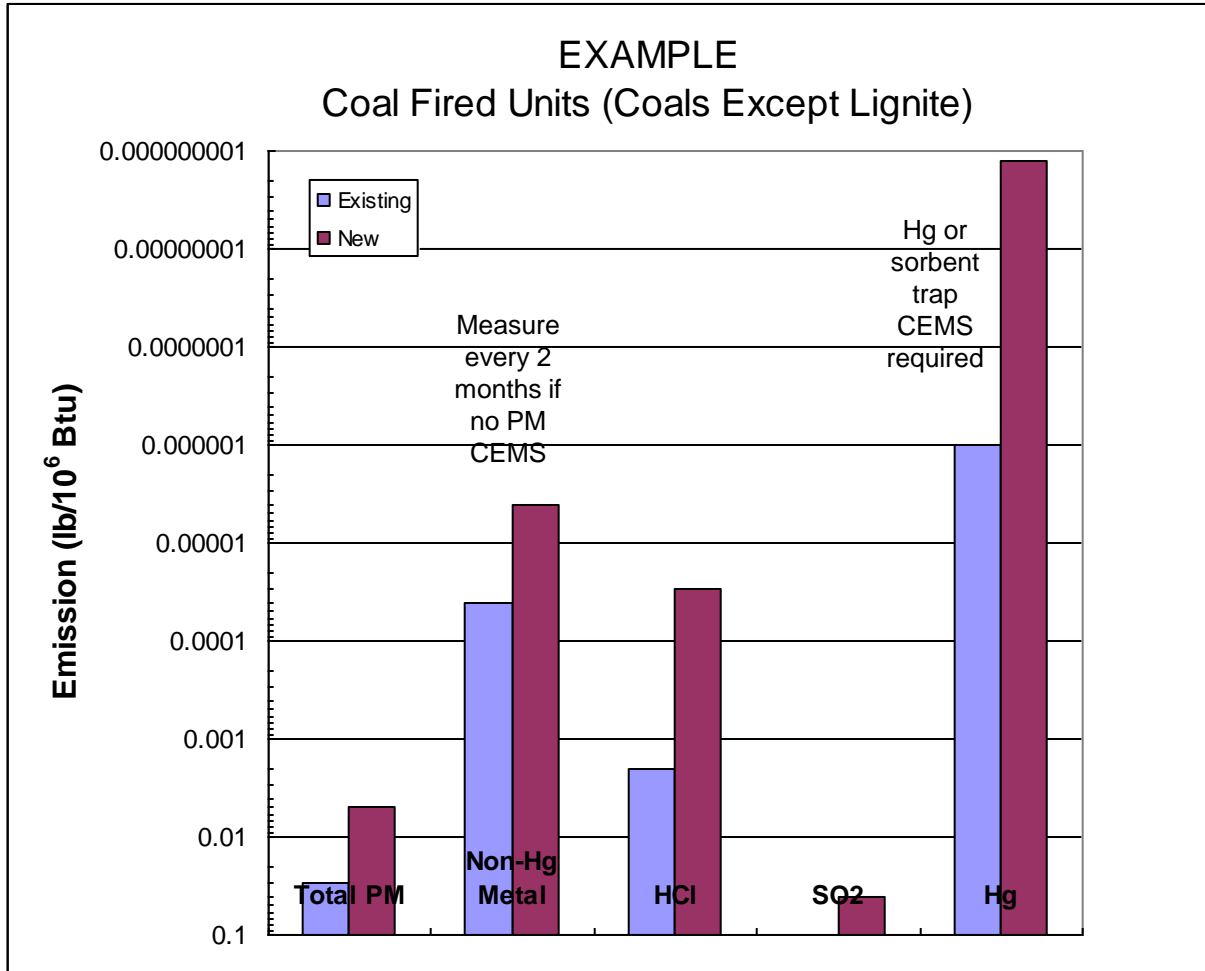


Total PM = Filterable (PM_{2.5}) + Condensibles



Proposed Utility MACT Limits

Reverse Logarithmic Scale
(Bigger Bar Means Much Smaller Limit)





Proposed Utility MACT Limits

- 30-day Rolling Averages of Continuous Monitor Readings Compared to Limits
- Limits are All Pollutants for All-Times
→ No Provisions for Startup Shutdown or Malfunction
- Total PM =
Filterable ($PM_{2.5}$) + Condensibles (SO_3 , NH_4Cl , etc.)
- Measurement programs mandated within 30 days of compliance date
- Operating practices must be defined and established



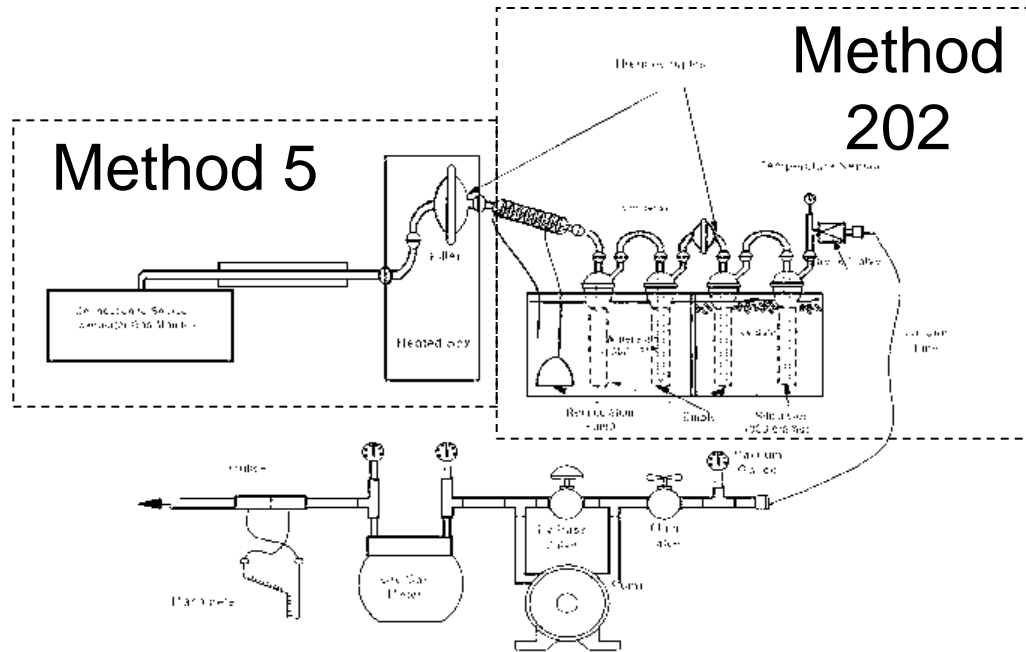
A. EPA Regulations

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B. Particulate Measurement Methods

C. Circulating Dry Scrubbers

Particulate Matter Measurement Methods



- Method 5 for PM_{2.5}
- Method 17 for Total PM
- Method 202 for Condensibles
 - EPA issued New Method 202 in Dec-10



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B. Particulate Matter Measurement Methods

C. Circulating Dry Scrubbers

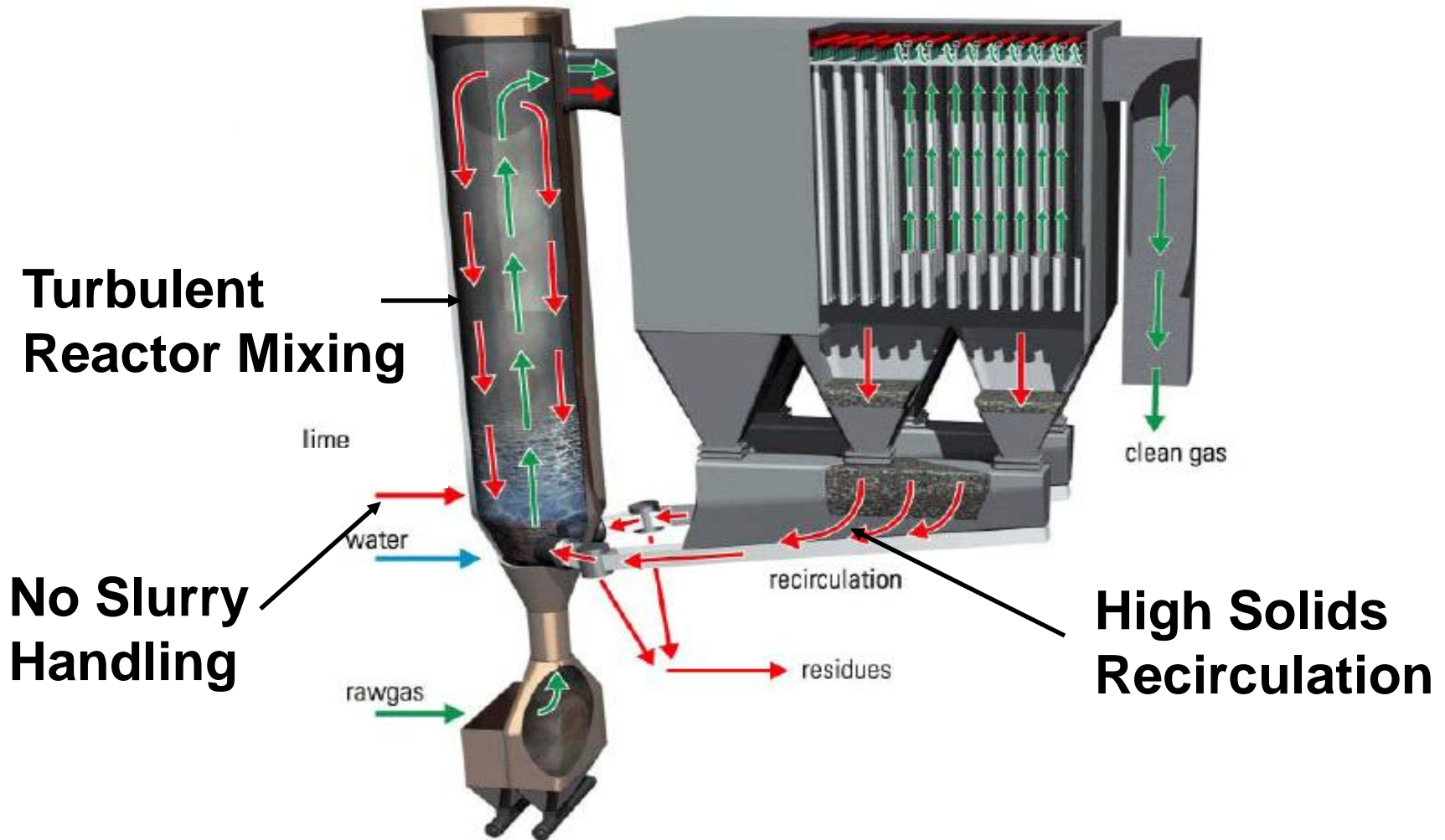
- **Process**
- **Chemistry**
- **Emissions**



Circulating Dry Scrubbers

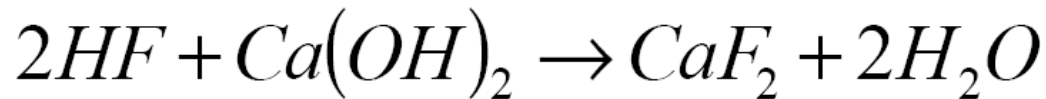
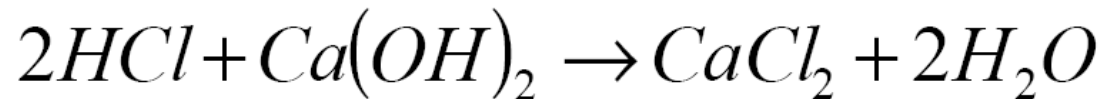
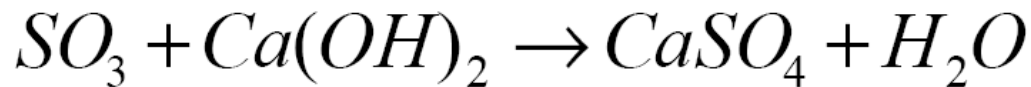
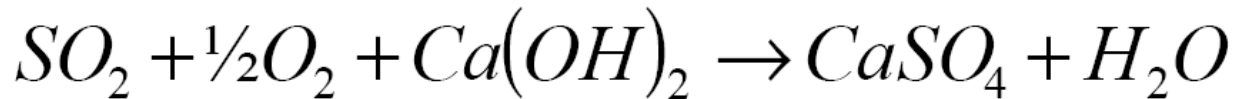
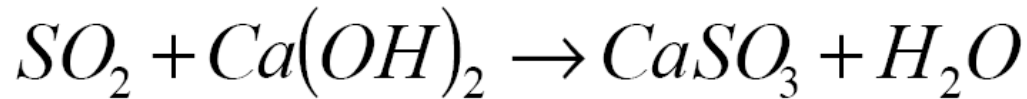
Turbosorp® CDS

Flue Gas and Solids Path Diagram





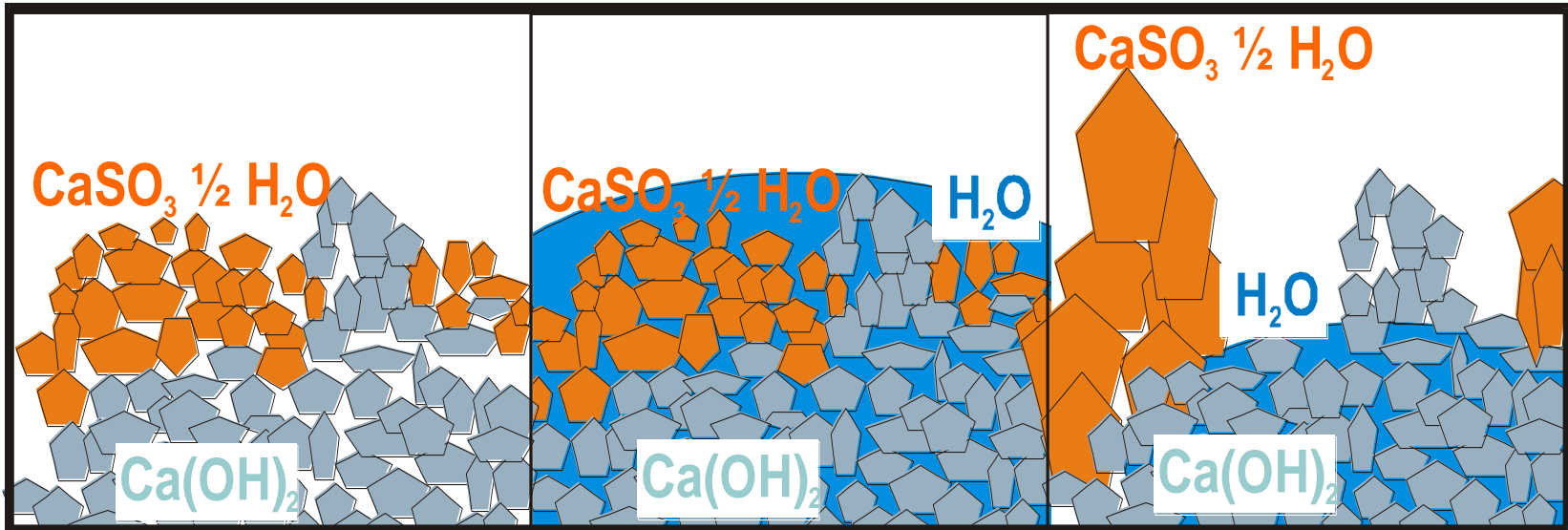
Chemistry





Circulating Dry Scrubbers

Formation of reaction products layer



Reaction after first pass

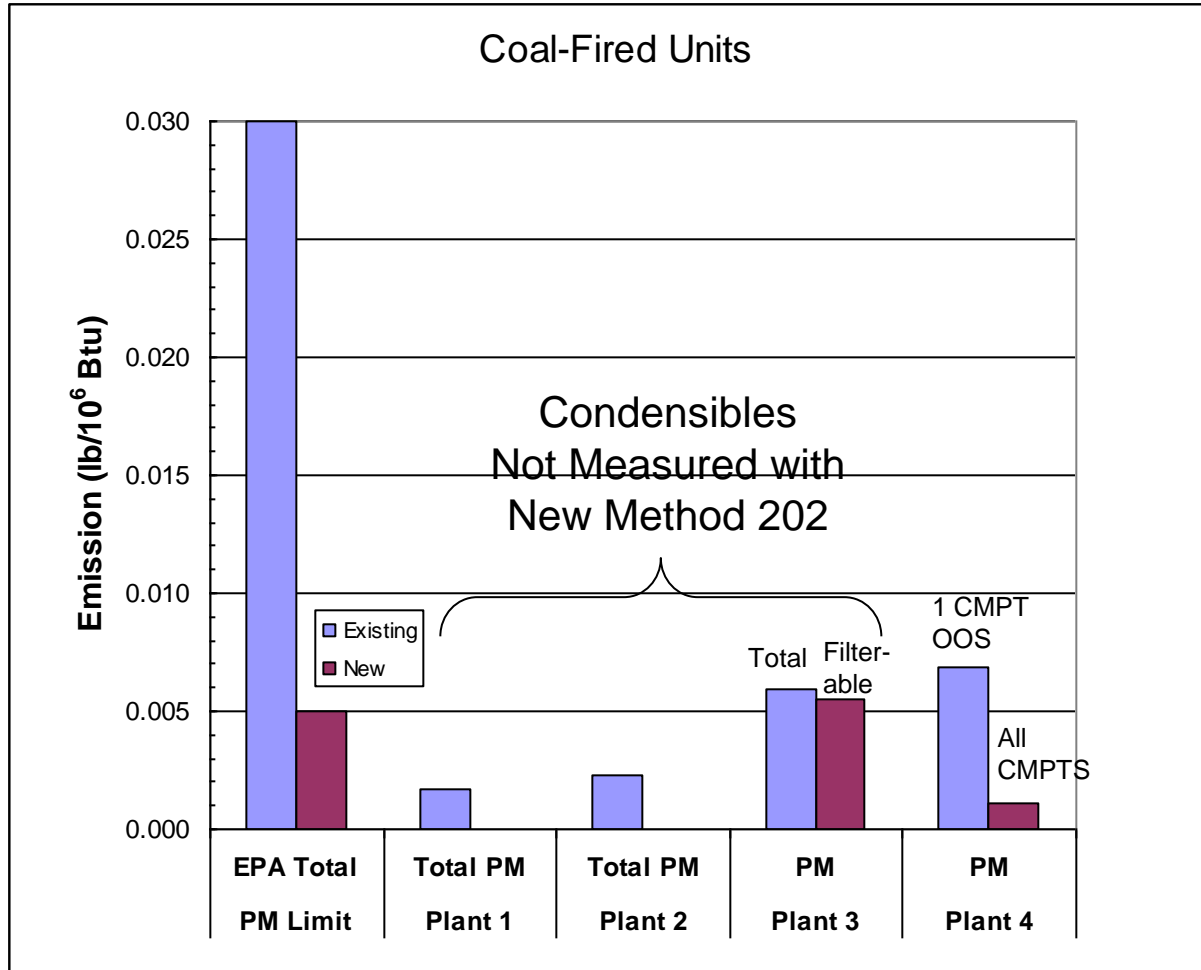
Water added to surface during recirculation

Sulfite crystal forms, exposing fresh surfaces



Circulating Dry Scrubbers

Turbosorp® CDS PM Emission Data Compared to Utility MACT





Circulating Dry Scrubbers

Turbosorp[®] CDS Emissions Summary (Conclusion)

SO ₂	95 – 98 %	} Reduces PM Condensibles
SO ₃	95 – 99 %	
HCl	95 – 99 %	
HF	95 – 99 %	
Mercury	90 – 95 %	

- Coals up to 6 lbs of SO₂/10⁶Btu
- SO₂ down to 0.03 lb/10⁶Btu