Dry Injection of Trona or Sodium Bicarbonate to Mitigate HCl and SO_2 from Industrial Boilers

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Industrial MACT - Impact and Control Options"

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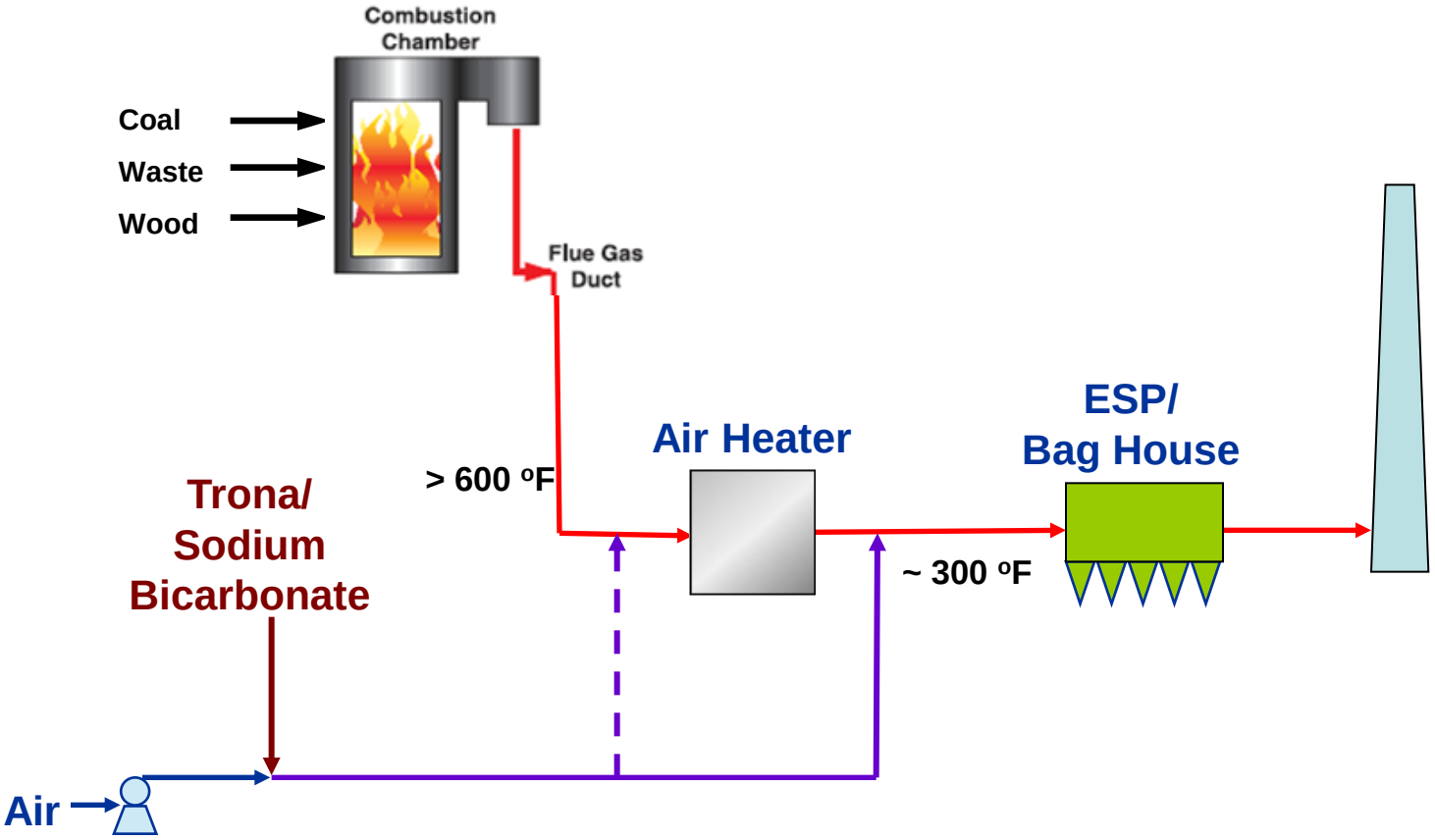
Dry Injection System

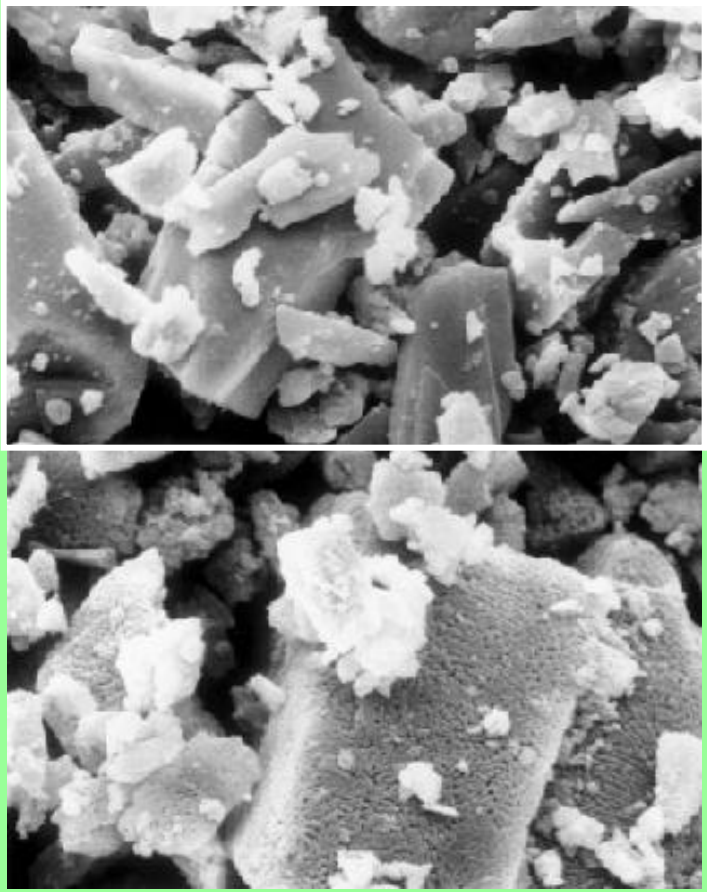


Calcination of Trona or Sodium Bicarbonate at > 275 °F

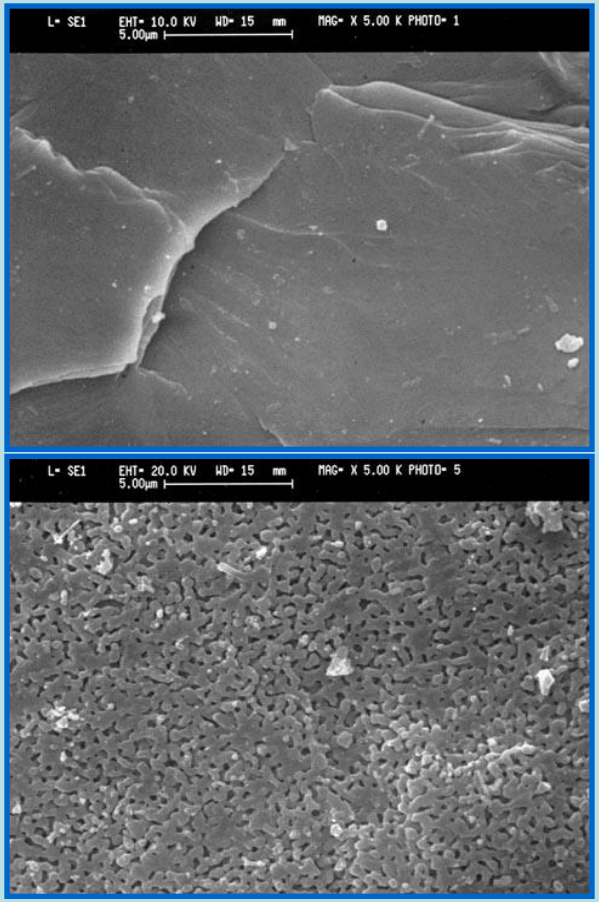
Raw

Calcinated

Trona



Sodium Bicarbonate

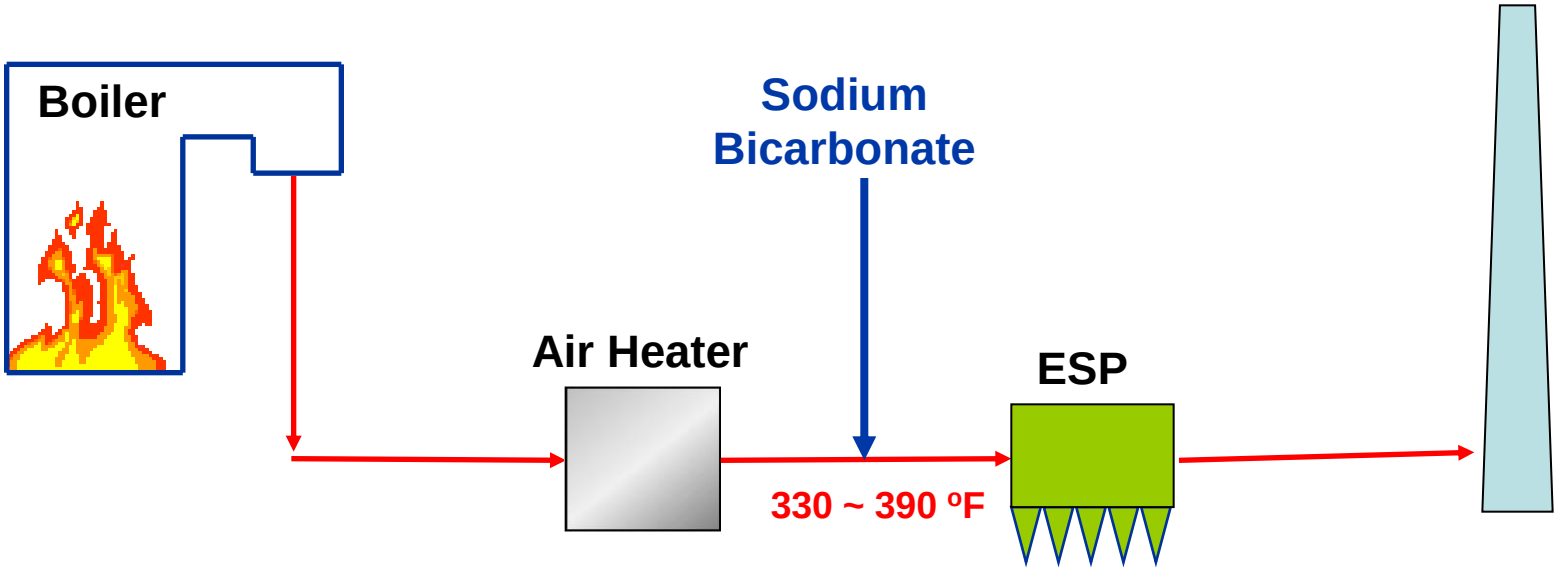


Properties of Trona and Sodium Bicarbonate

	Trona (SOLVAir® Select 200)	Sodium Bicarbonate (SOLVAir® Select 300*)
Formula	$Na_2CO_3.NaHCO_3.2H_2O$	$NaHCO_3$
Particle Size: d_{50} (µm)	~ 30 µm	~ 100 µm
Free-flowing bulk density (lb/ft^3)	49	63
Flue Gas Temperature Range for injection	275 ~ 1500 ^oF	275 ~ 1500 ^oF
SO_2 Removal (%)	Up to 90%	Over 95%
HCl Removal (%)	Up to 98%	Over 99%
Sorbent Cost	Low	Medium

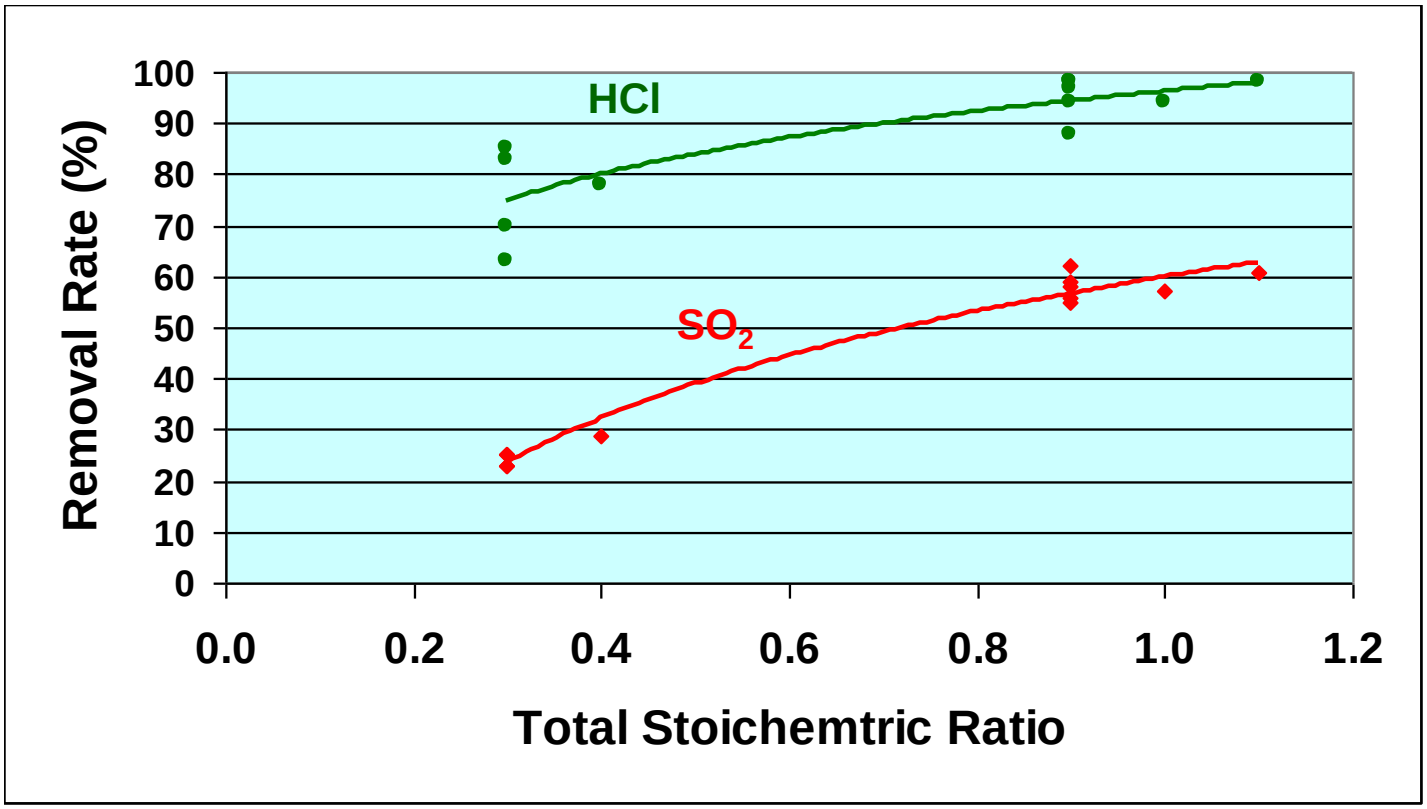
* Needs to be milled before injection

Application: Process Boiler



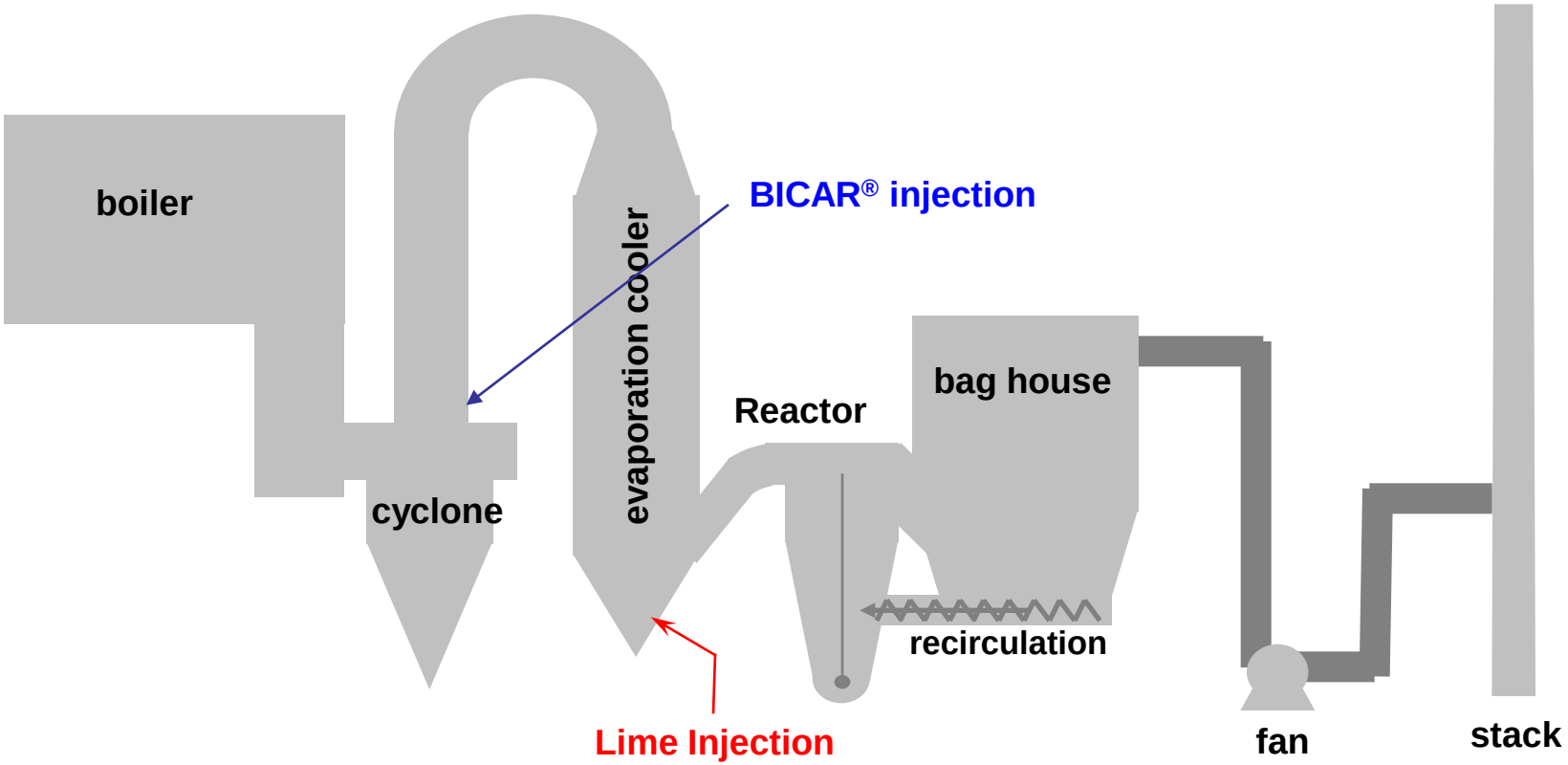
- Steam Output: 195 ton/h
- Flue gas flow rate: 150,000 SCFM (dry)
- SO_2: 190 ~ 350 ppm
- HCl: 30 ~ 40 ppm
- Sodium Bicarbonate particle sizes
  - d_{50}: 10 µm
  - d_{90}: 25 µm

Performance of HCl and SO_2 Mitigation



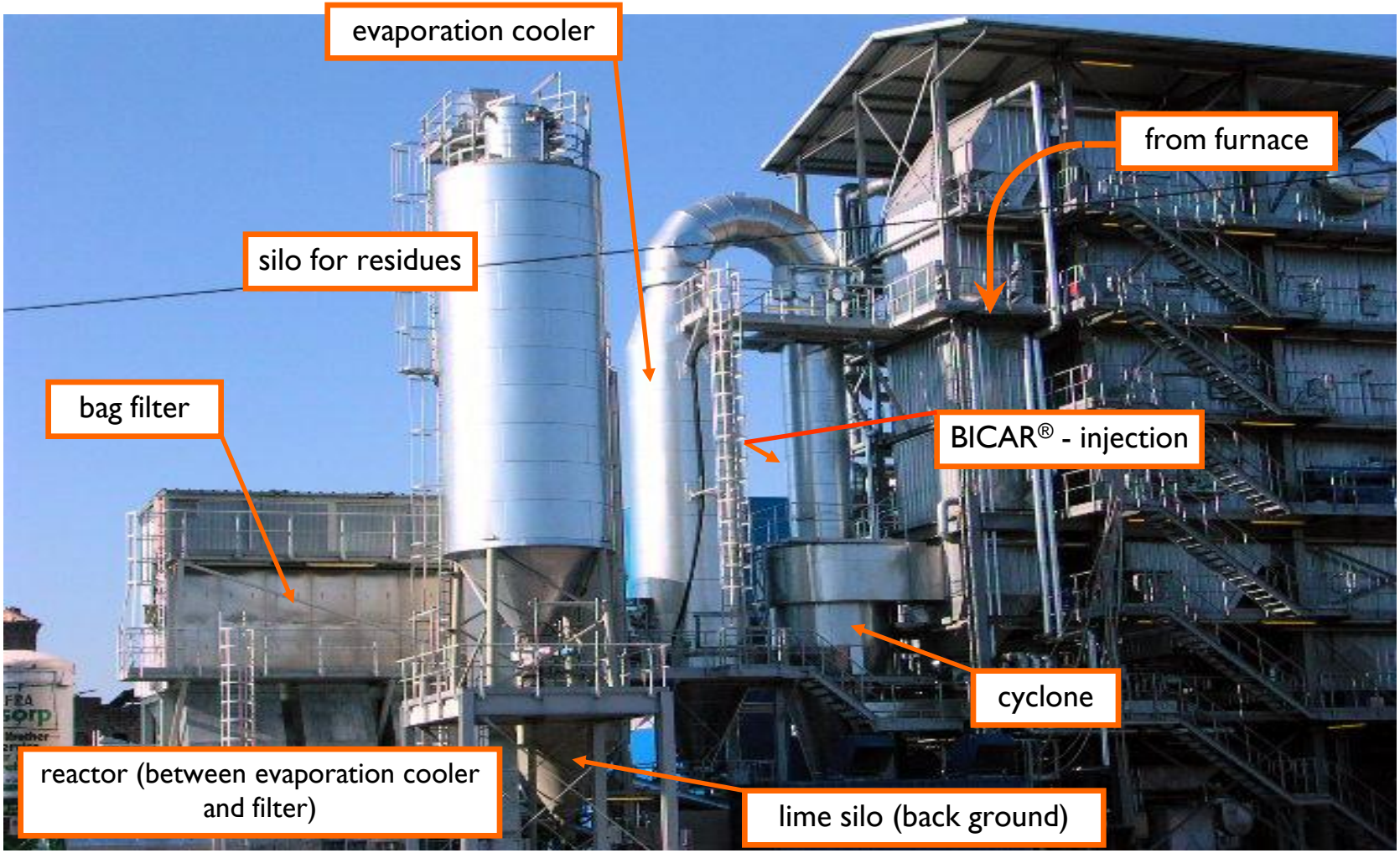
Required SO_2 removal: 20%, 40%, 60%

Application: Biomass Boiler
- Combination of Sodium Bicarbonate and Hydrated Lime



- Flue Gas Flowrate: 18,000 SCFM
- Flue Gas Temperature: 180 °C (at the injection point)
- SO_2: 130 ppm (peaks up to 280 ppm)
- HCl: 60 ppm

Biomass Plant with Flue Gas Cleaning Systems



Performance of Sodium Bicarbonate for HCl and SO_2 Removal from a Waste Incinerator

Test #	Solid Waste Feedrate (tons/h)	Sodium Bicarbonate Feedrate (kg/h)	HCl Removal Rate (%)	SO_2 Removal Rate (%)
1	5.1	130	99.2%	91.3%
2		148	99.3%	91.3%
3		202	99.2%	95.7%
4	5.5	192	99.3%	96.7%
5		99	99.3%	95.7%
6		110	99.3%	93.5%
7	5.5	107	99.3%	92.4%
8		127	99.3%	93.5%
9		103	99.3%	93.5%
10	5.2	139	99.3%	91.3%
11		149	99.3%	94.6%
12		126	99.3%	93.5%

Summary

- Dry Injection of trona or sodium bicarbonate is a cost effective way to mitigate HCl and SO_2.
  - Low capital: very important for industrial boiler owners.
  - Compatible with ESP and Baghouses.
- Able to achieve high removal rates for HCl (>99%) and SO_2 (>90%).
- Effective over a wide temperature range (275 ^{0}F – 1500 ^{0}F)
- Has been implemented at many waste incinerators in Europe and many coal-fired power plants in the United States.

Thanks!

Questions?

For more information, please visit www.solvair.us