

HCl Removal in the Presence of SO₂ Using Dry Sodium Sorbent Injection

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Dry Sodium Sorbent Injection Proven results - Again

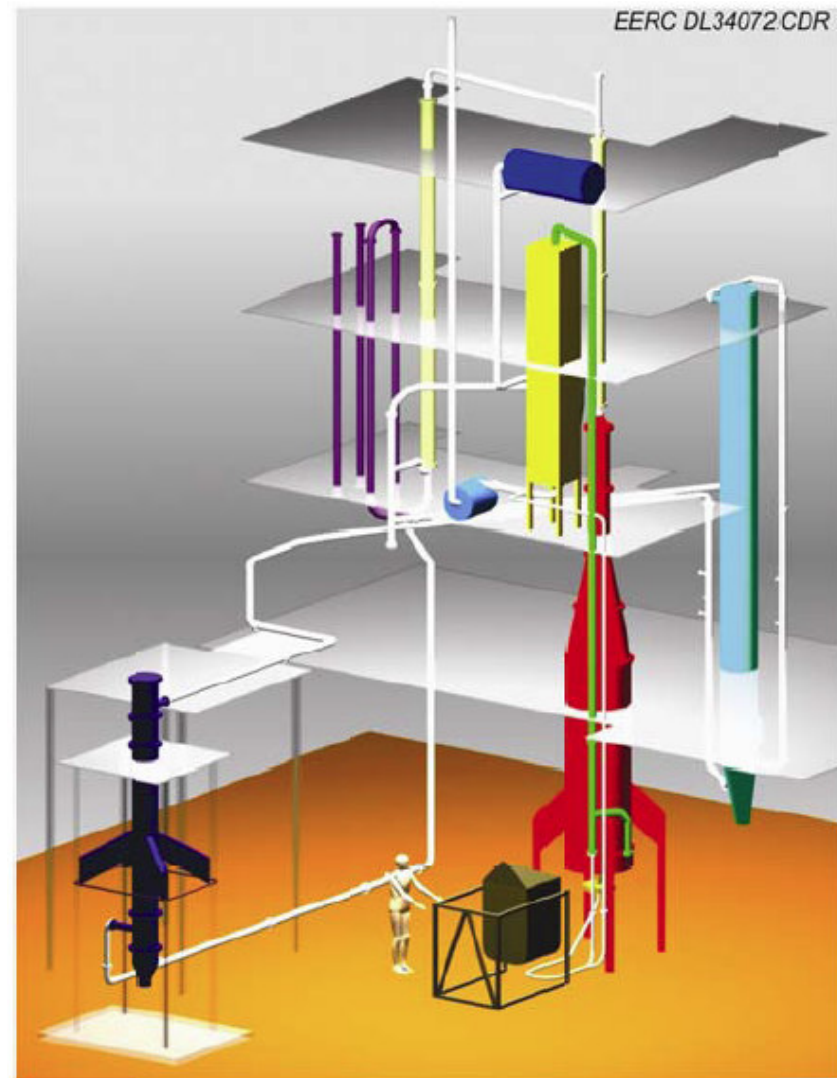
The recent EPA proposals for controlling HAPs, specifically HCl, has raised questions regarding the efficacy of sodium DSI systems to treat high levels of HCl in the presence of SO₂.

Seeing the need for reliable data, Solvay Chemicals' SOLVAir Solutions group contracted a series of pilot tests to model coal fired power plants using moderate sulfur coal with high levels of chlorides.

As expected, sodium sorbents were easily able to achieve compliance even with the tightest emissions limits.

Test at EERC, University of North Dakota

- ◆ A pilot plant
- ◆ Central Appalachian Coal (CAPP)
- ◆ Two PM control devices
 - ESP
 - Bag house
- ◆ Four sodium sorbents and one hydrated lime
- ◆ Flue gas duct diameter: 6" The small duct size allows excellent mixing between sorbent and flue gas, and consequently may result in better efficiencies than may be experienced in field applications.



CAPP Coal Analyses

Proximate Analysis, as received, %	Sample 1	Sample 2
Moisture	2.79	2.64
Volatile Matter	33.76	33.24
Fixed Carbon	52.16	52.26
Ash	11.29	11.85
Ultimate Analysis, as received, %		
Hydrogen	5.04	5.05
Carbon	71.63	72.63
Nitrogen	1.22	1.22
Sulfur (%)	0.78	0.78
Oxygen (Ind)	10.05	8.48
Ash	11.28	11.85
Heat Value, Btu/lb	11,496	
Chlorine, µg/g	954–970	

Sorbents

◆ Trona (S200)

- d_{50} : 30 μm , d_{90} : 125 μm

◆ Milled Trona (S250)

- d_{50} : 15 μm , d_{90} : 60 μm

◆ Milled Sodium Bicarbonate (S350)

- d_{50} : 12 μm , d_{90} : 40 μm

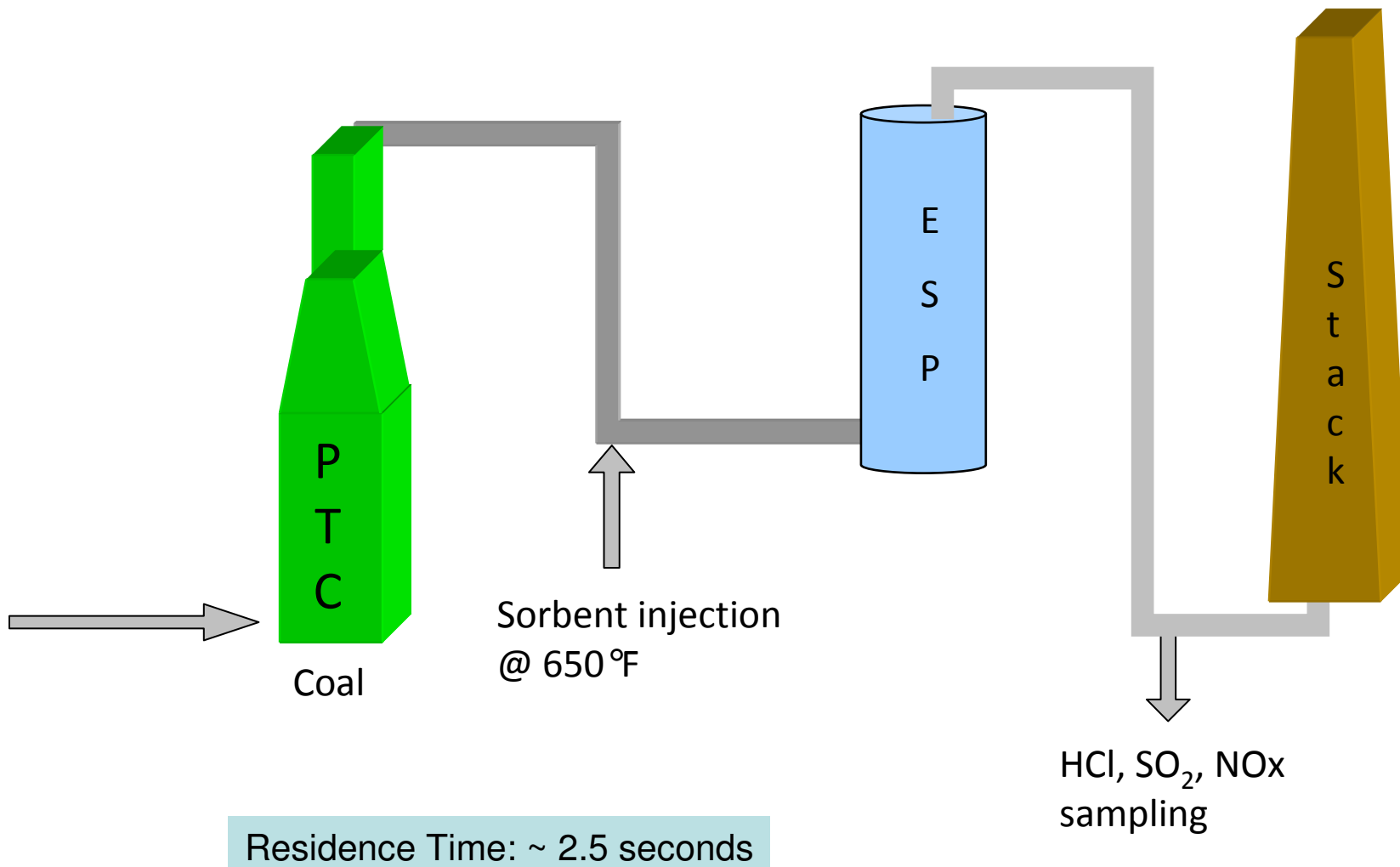
◆ Finely Milled Sodium Bicarbonate (S450)

- d_{50} : 7 μm , d_{90} : 17 μm

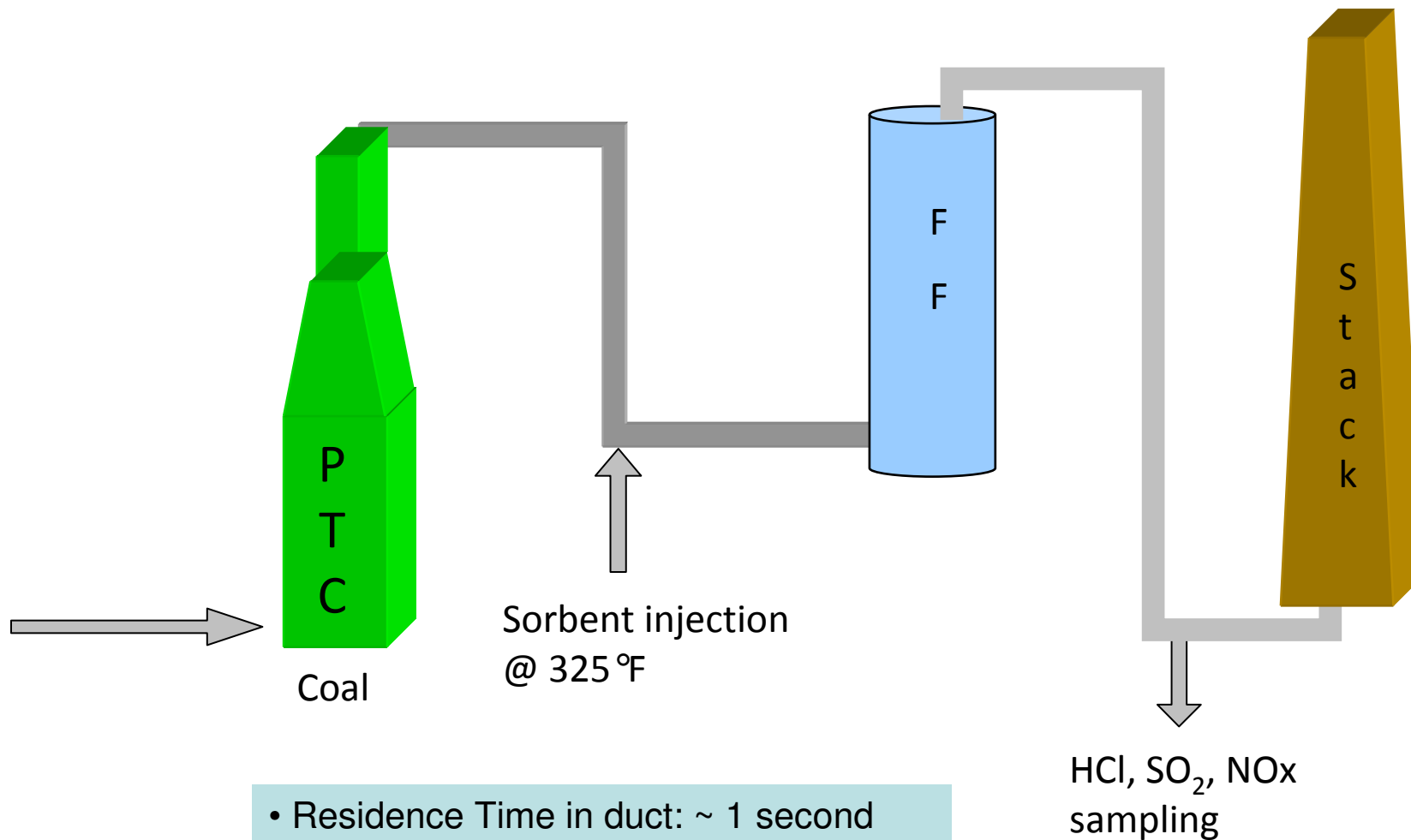
◆ Hydrated Lime

- d_{90} : 45 μm , purity: 96.8%

Injection Upstream of ESP



Injection Upstream of Baghouse

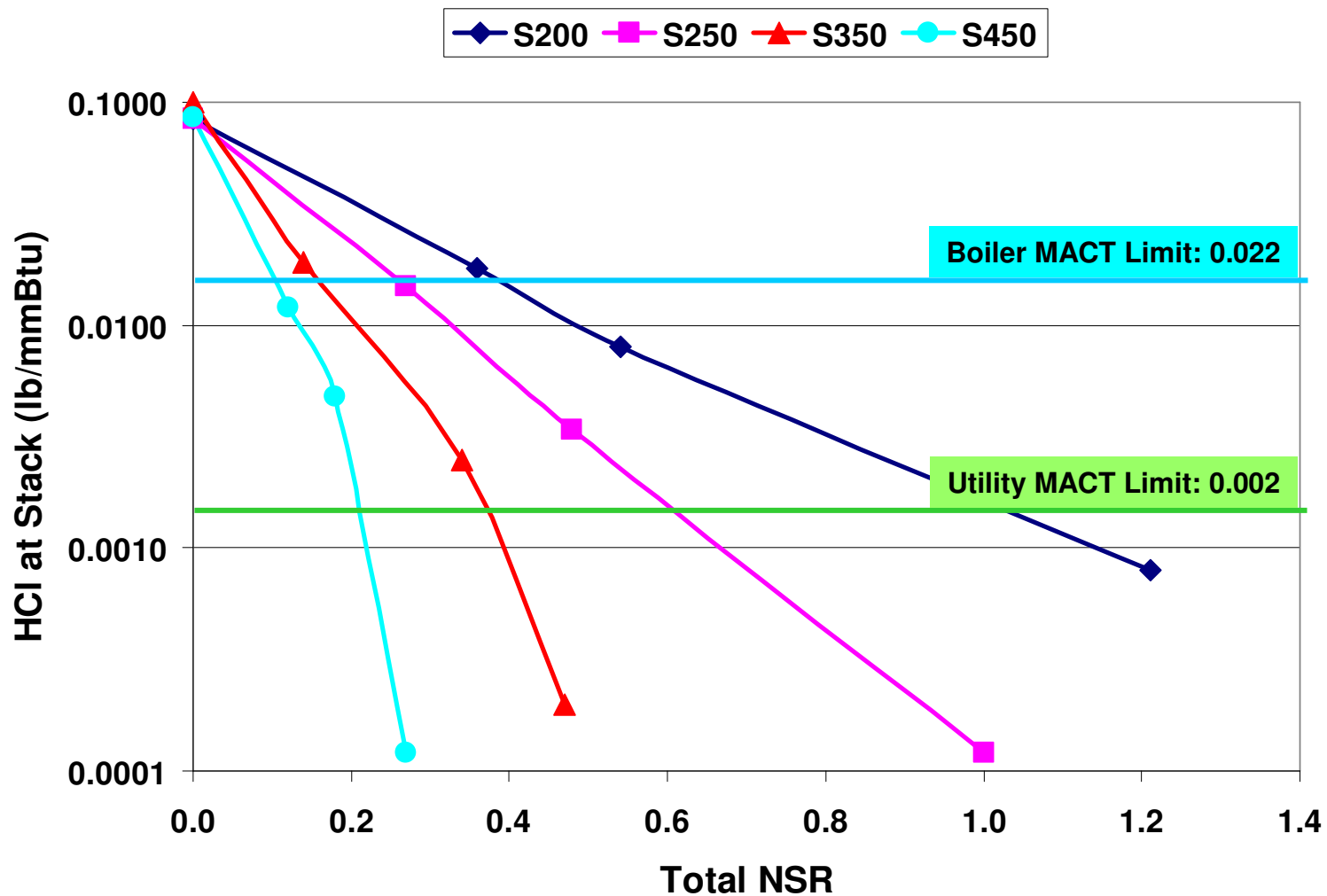


- Residence Time in duct: ~ 1 second
- Baghouse was cleaned before each run

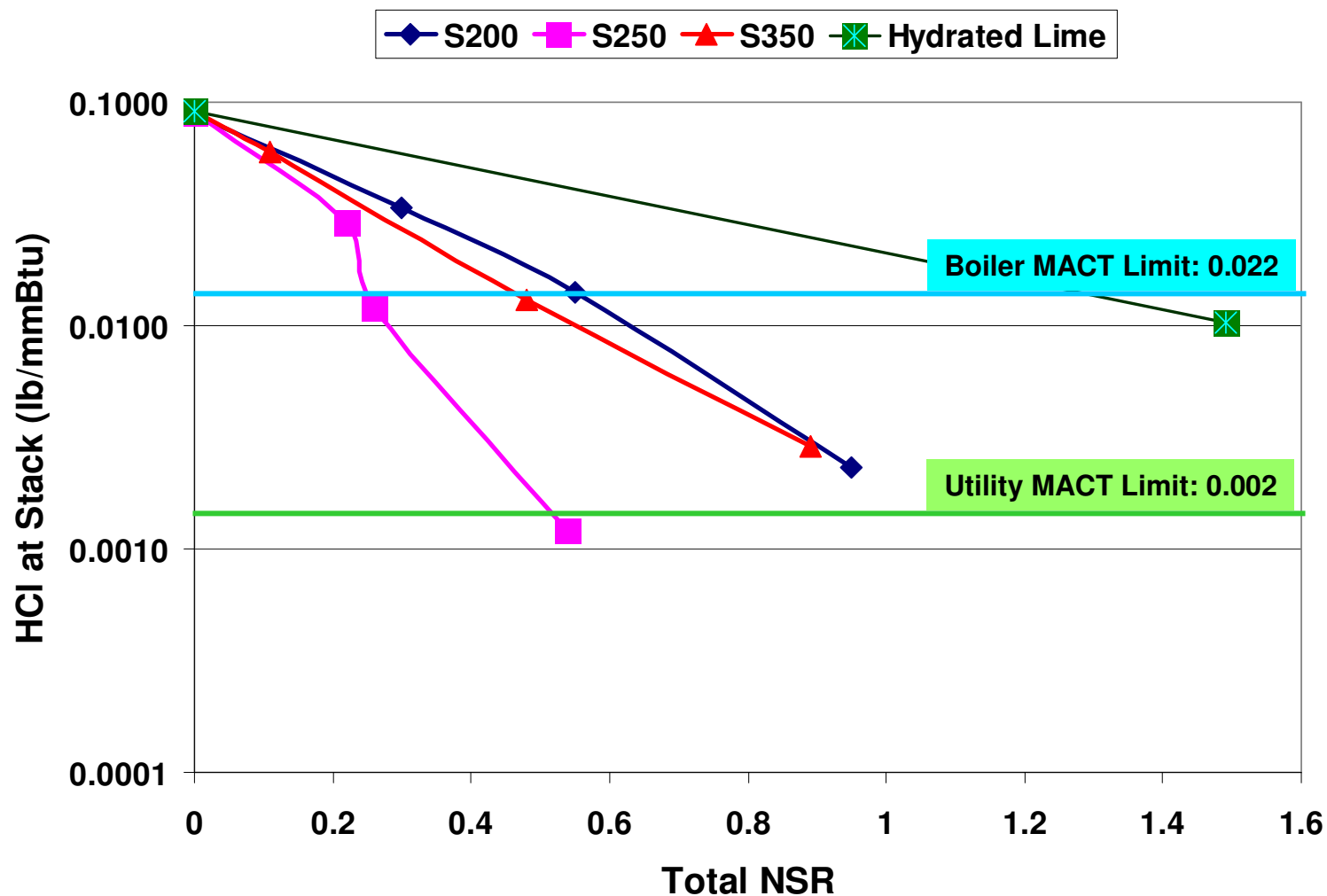
Sorbent Performance

HCl Removal

HCl Removal with Sorbent Injected at ESP Inlet



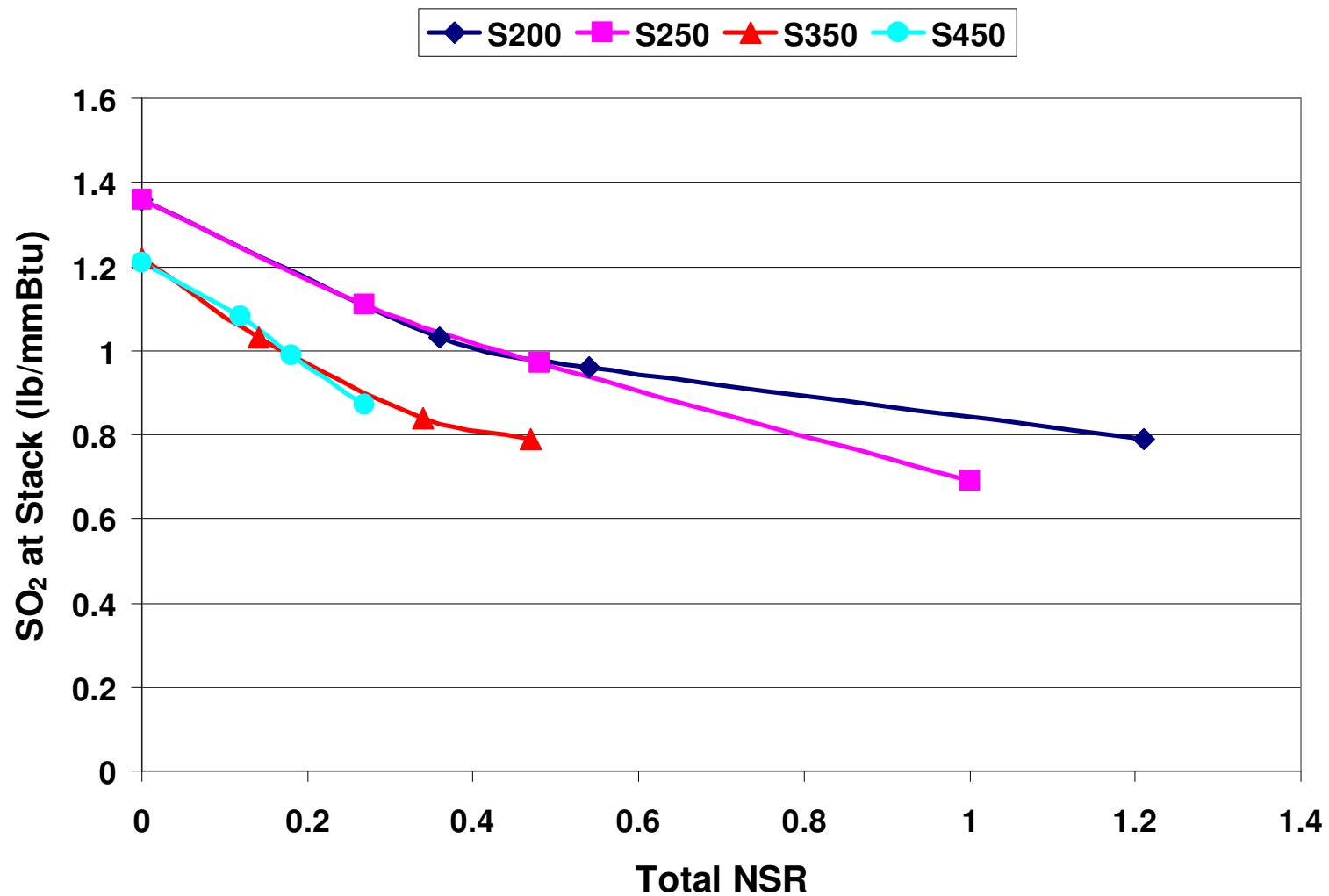
HCl Removal with Sorbent Injected at Baghouse Inlet



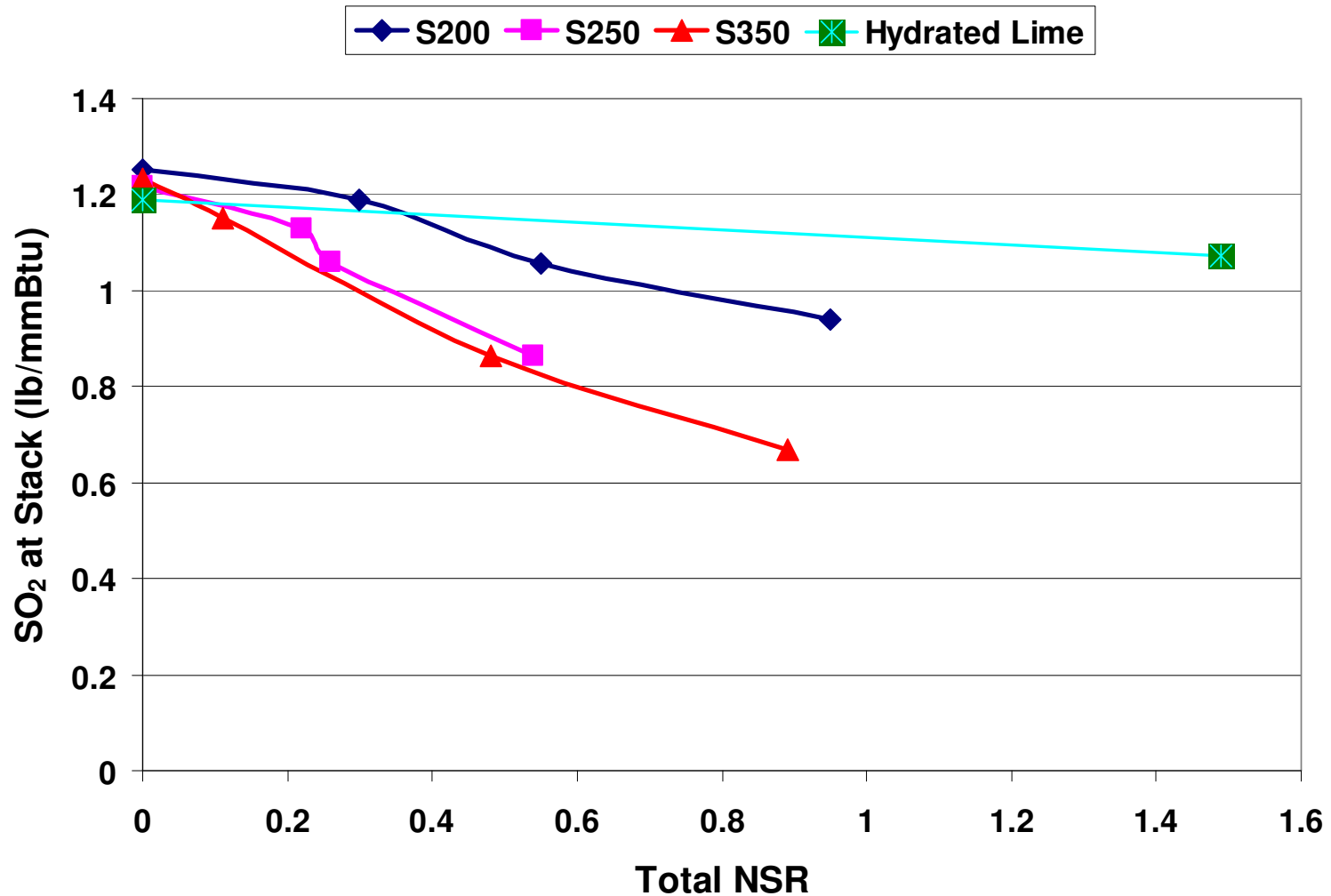
Sorbent Performance

Some SO₂ is unavoidably removed coincident with the removal of HCl. Higher reactivity rates of HCl than SO₂ would suggest lower levels of SO₂ removal

SO₂ Removal with Sorbent Injected at ESP Inlet



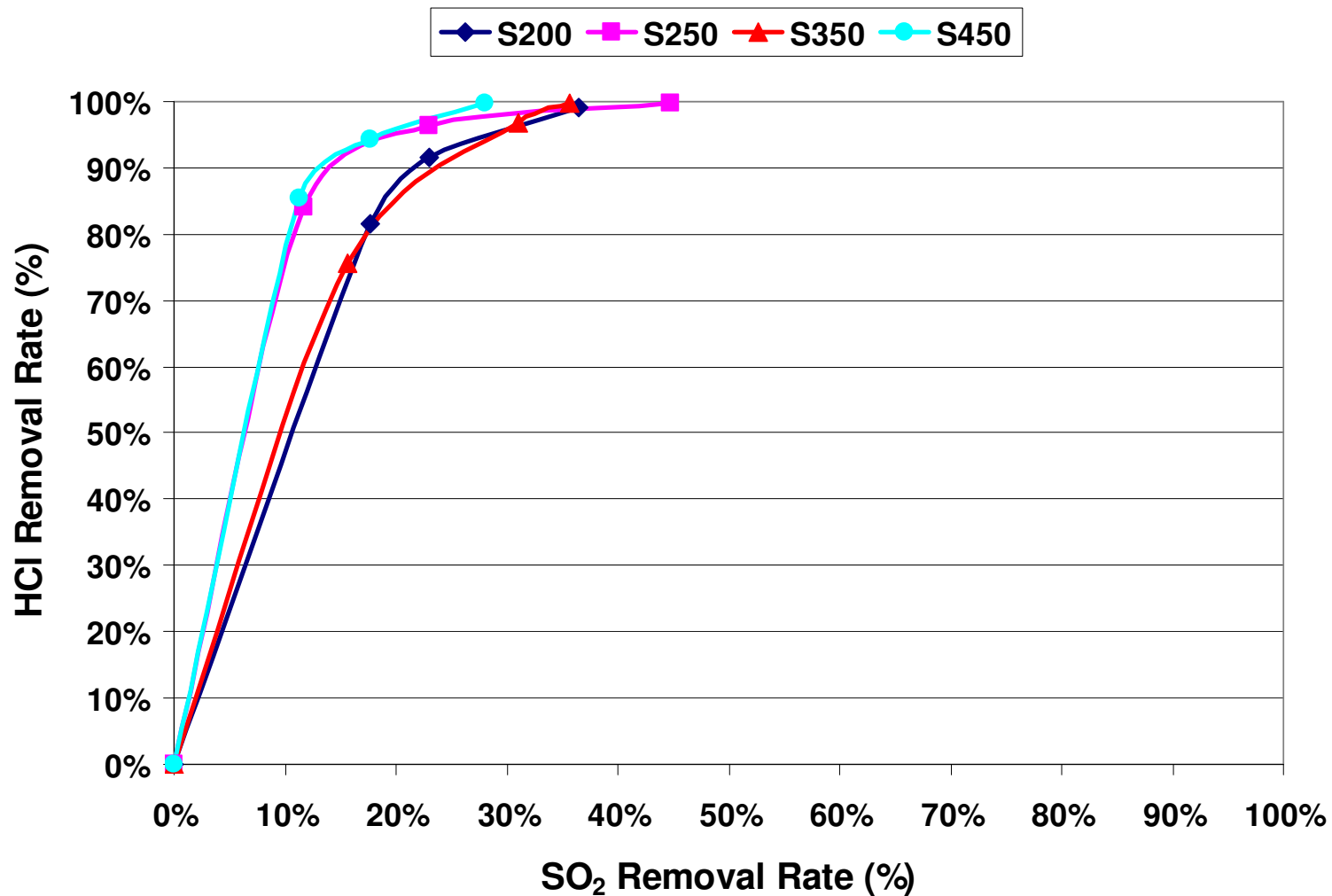
SO₂ Removal with Sorbent Injected at Baghouse Inlet



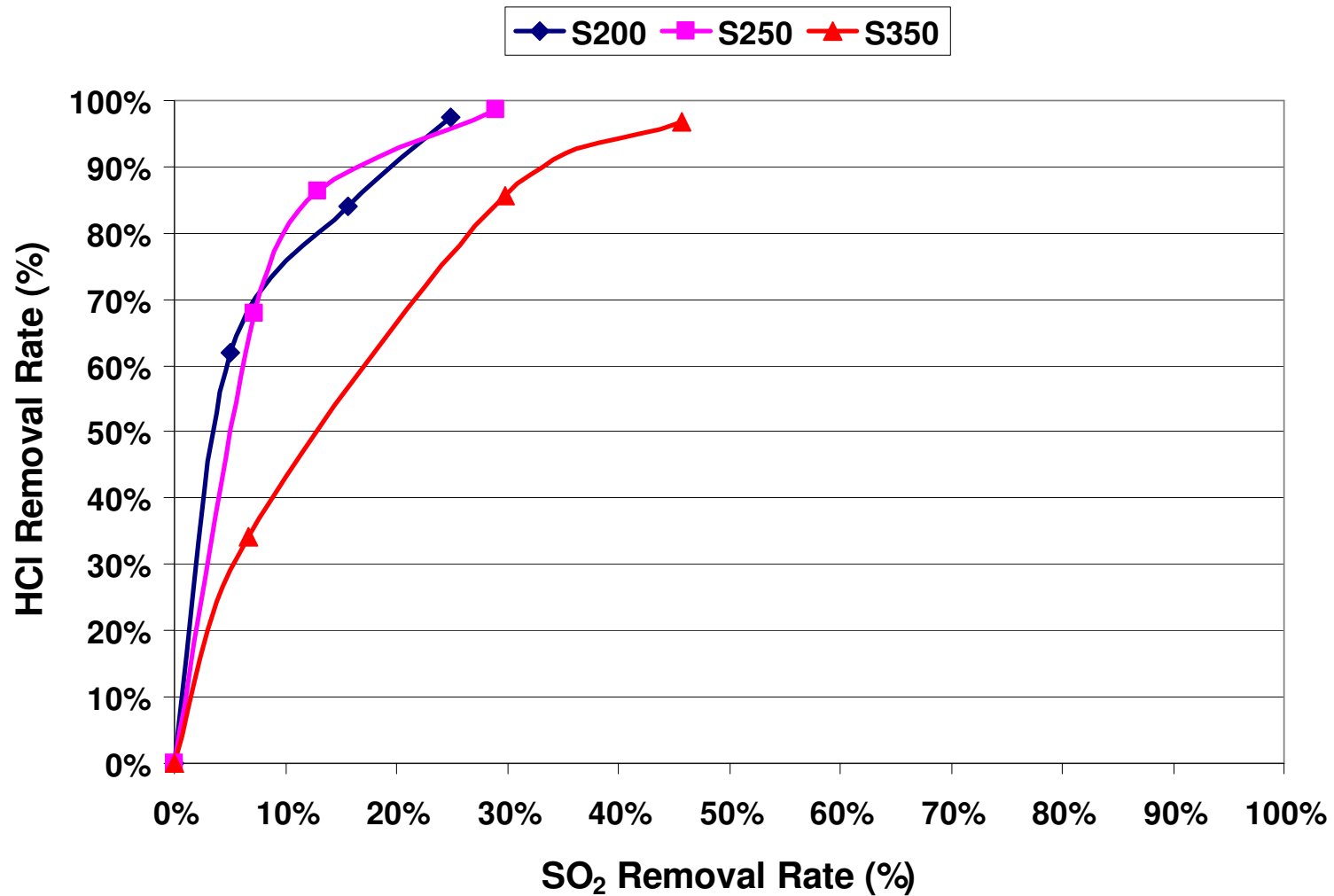
Sorbent Performance

Combined HCl and SO₂ results

HCl Removal vs. SO₂ Removal - ESP



HCl Removal vs. SO₂ Removal - Baghouse



Summary

- ◆ **Dry Sodium Sorbent Injection using trona or sodium bicarbonate is a cost effective way to mitigate HCl, SO₂ and SO₃.**
 - Low capital cost.
 - Small footprint
 - Short installation time
 - Compatible with ESP and Baghouses.
- ◆ **Able to achieve high removal rates for HCl (>99%) and SO₂ (>90%)**
 - Able to meet the HCl limit in both the proposed Utility MACT (0.002 lb/MMBtu) and the Industrial Boiler MACT (0.022 lb/MMBtu)
- ◆ **Effective over a wide temperature range (275 °F – 1500 °F)**
- ◆ **Has been implemented at hundreds of sites in the United States and Europe including industrial sites, waste incinerators, and coal-fired power plants.**