Dry Injection of Trona and Sodium Bicarbonate for Multi-Emissions Control

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McIlvaine Company Hot Topic Hour on
"Multi-Emissions Control"
October 27, 2011

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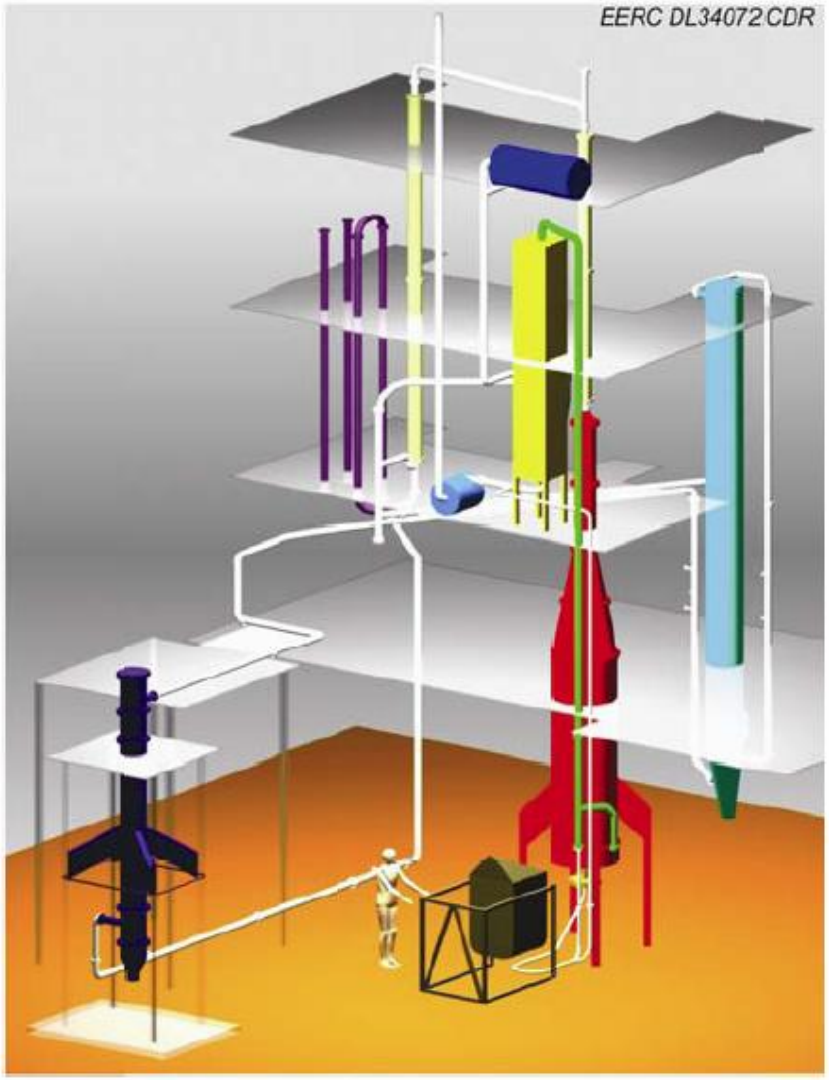
Test at EERC, University of North Dakota

- 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 results in almost perfect mixing between sorbent and flue gas, and consequently much better HCl and SO_2 mitigation performance than with utility boilers.



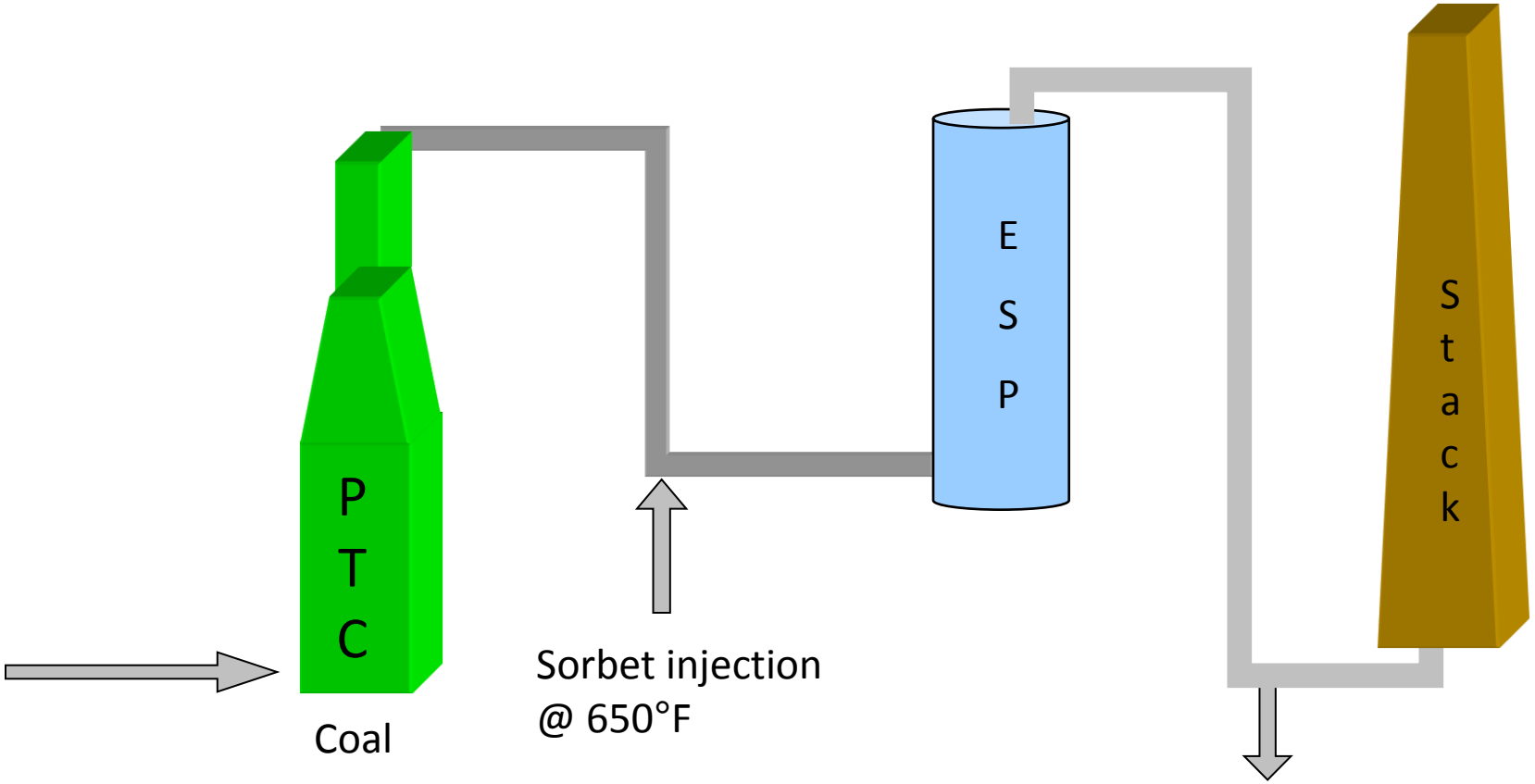
CAPP Coal Analyses

Proximate Analysis, as Received,%	Sample I	Sample II
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)	11496	
Chlorine, µg/g	954-970	

Sorbents

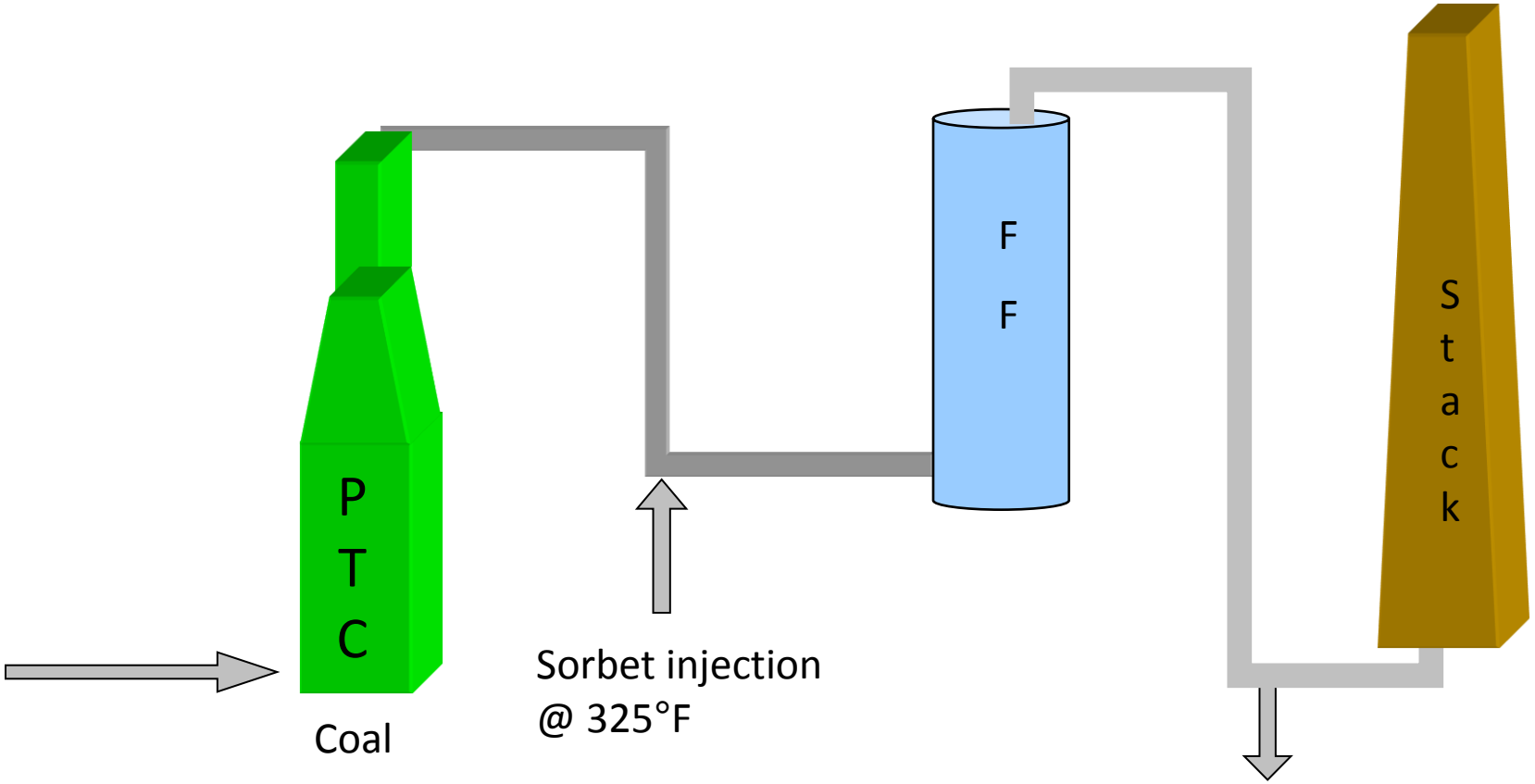
- **Trona (S200)**
  - d_{50}: 30 µm
- **Milled Trona (S250)**
  - d_{50}: 15 µm
- **Milled Sodium Bicarbonate (S350)**
  - d_{90}: 40 µm
- **Finely Milled Sodium Bicarbonate (S450)**
  - d_{90}: 17 µm
- **Hydrated Lime**

Injection Upstream of ESP



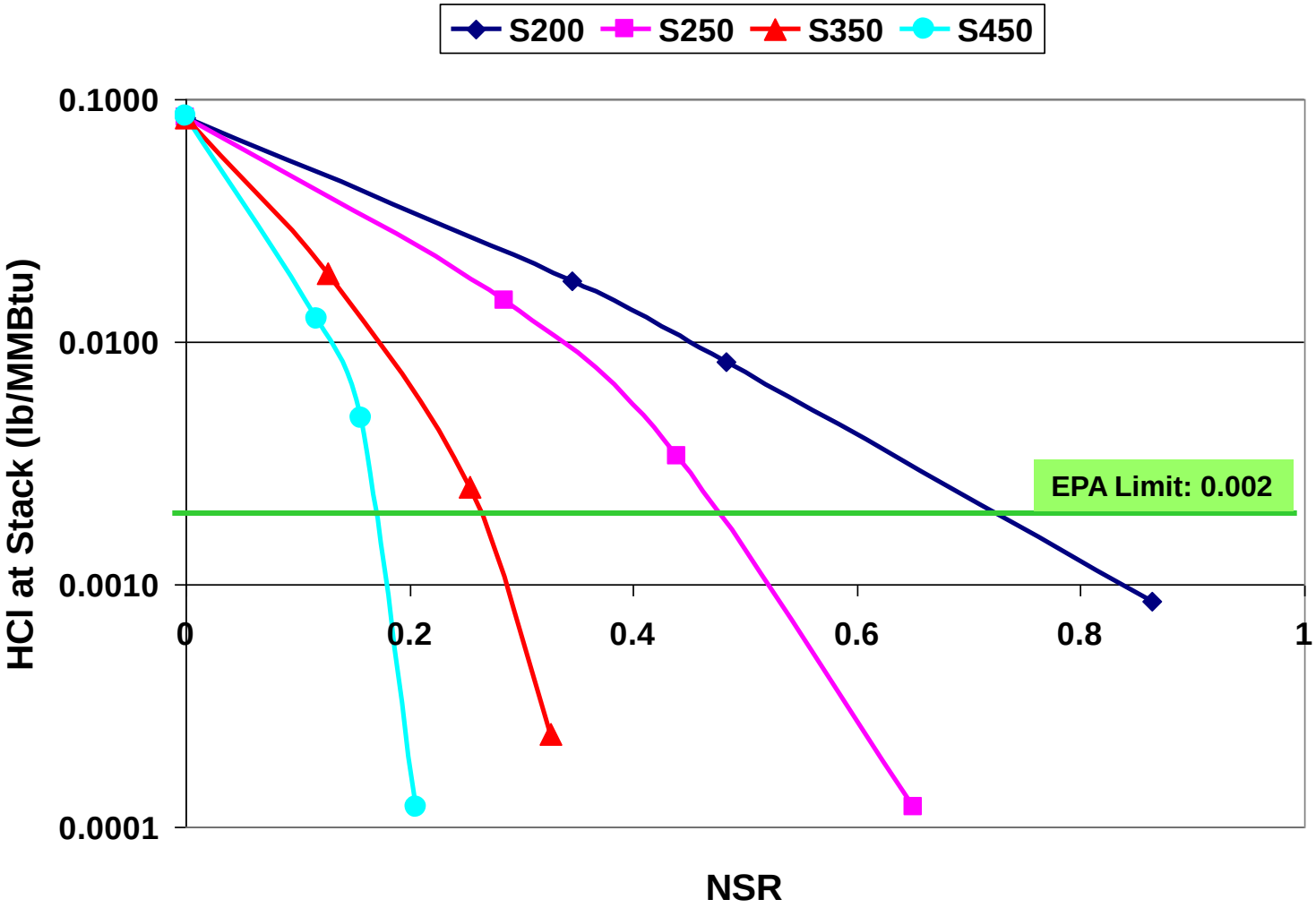
Residence Time: ~ 2.5 seconds

Injection Upstream of Baghouse

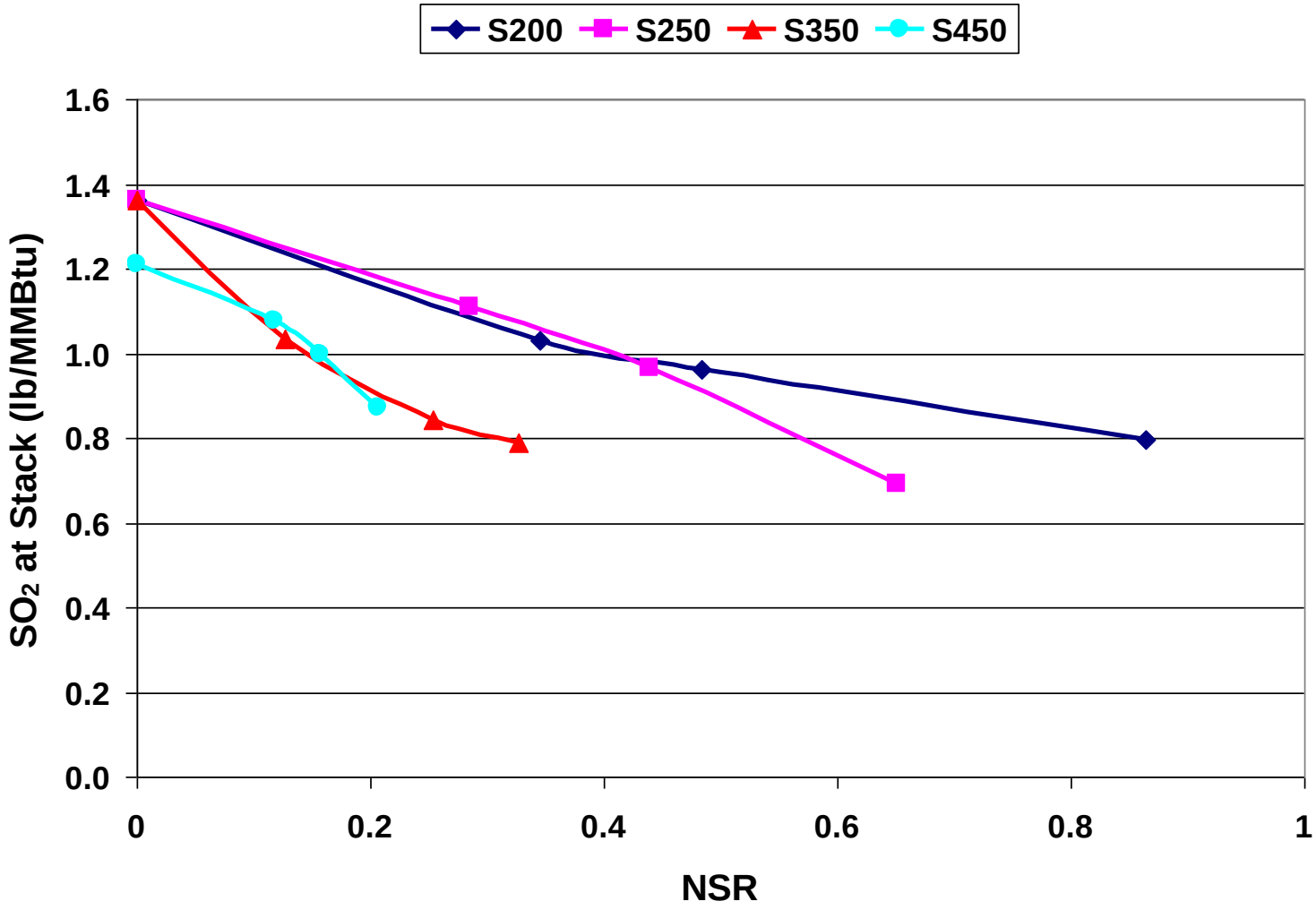


- Residence Time in duct: ~ 1 second
- Baghouse was cleaned before each run

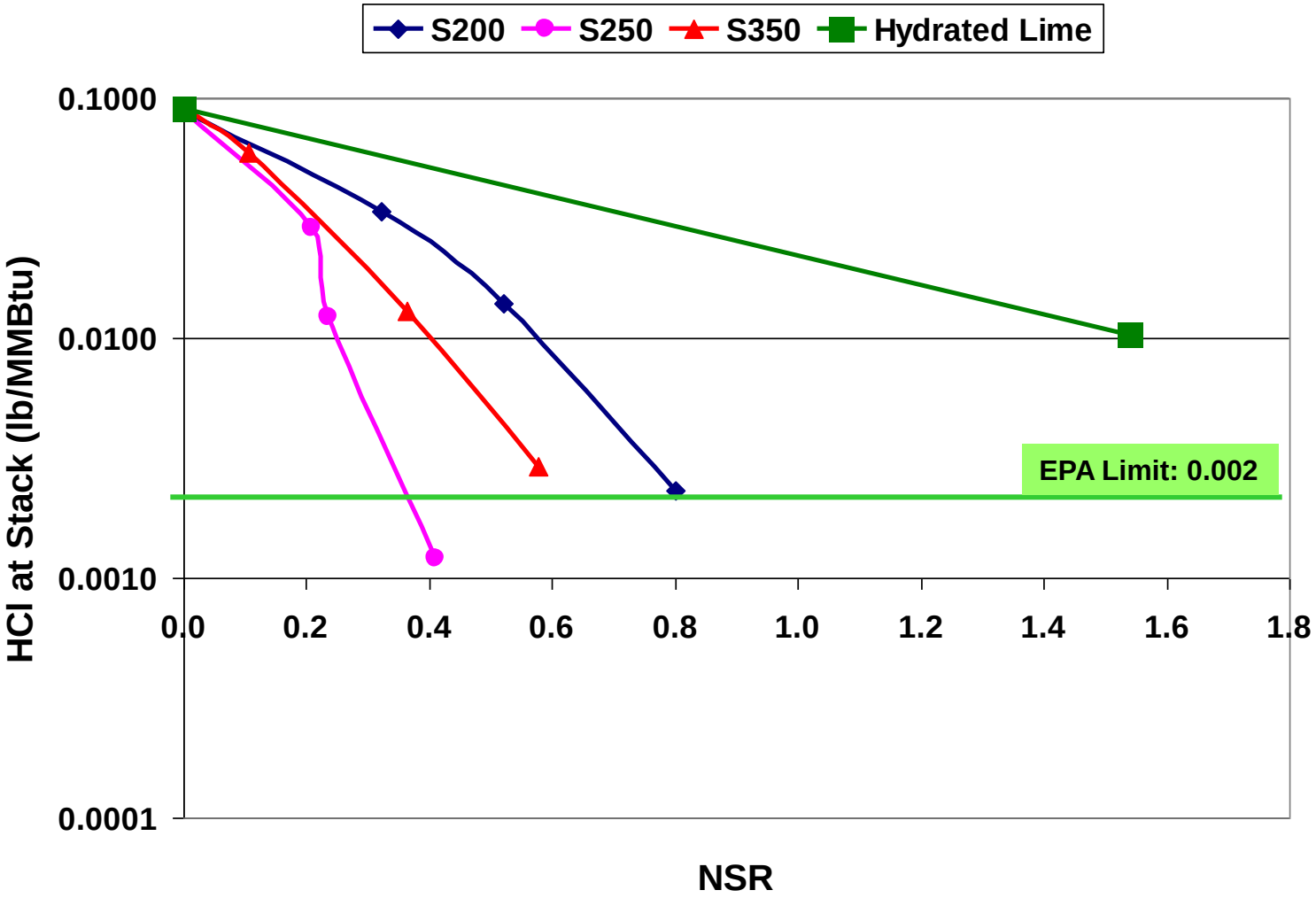
HCl Removal with Sorbent Injected at ESP Inlet



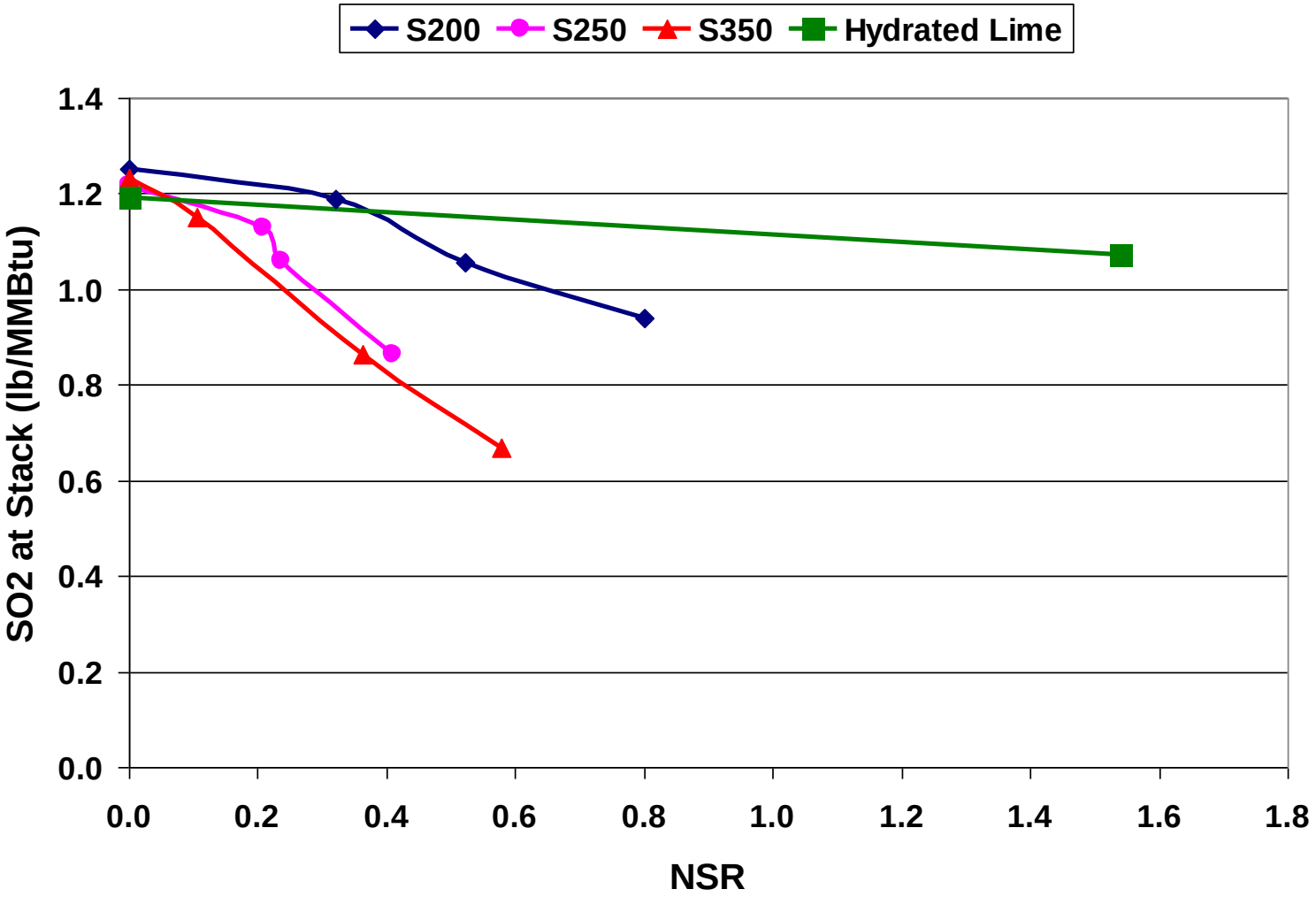
SO_2 Removal with Sorbent Injected at ESP Inlet



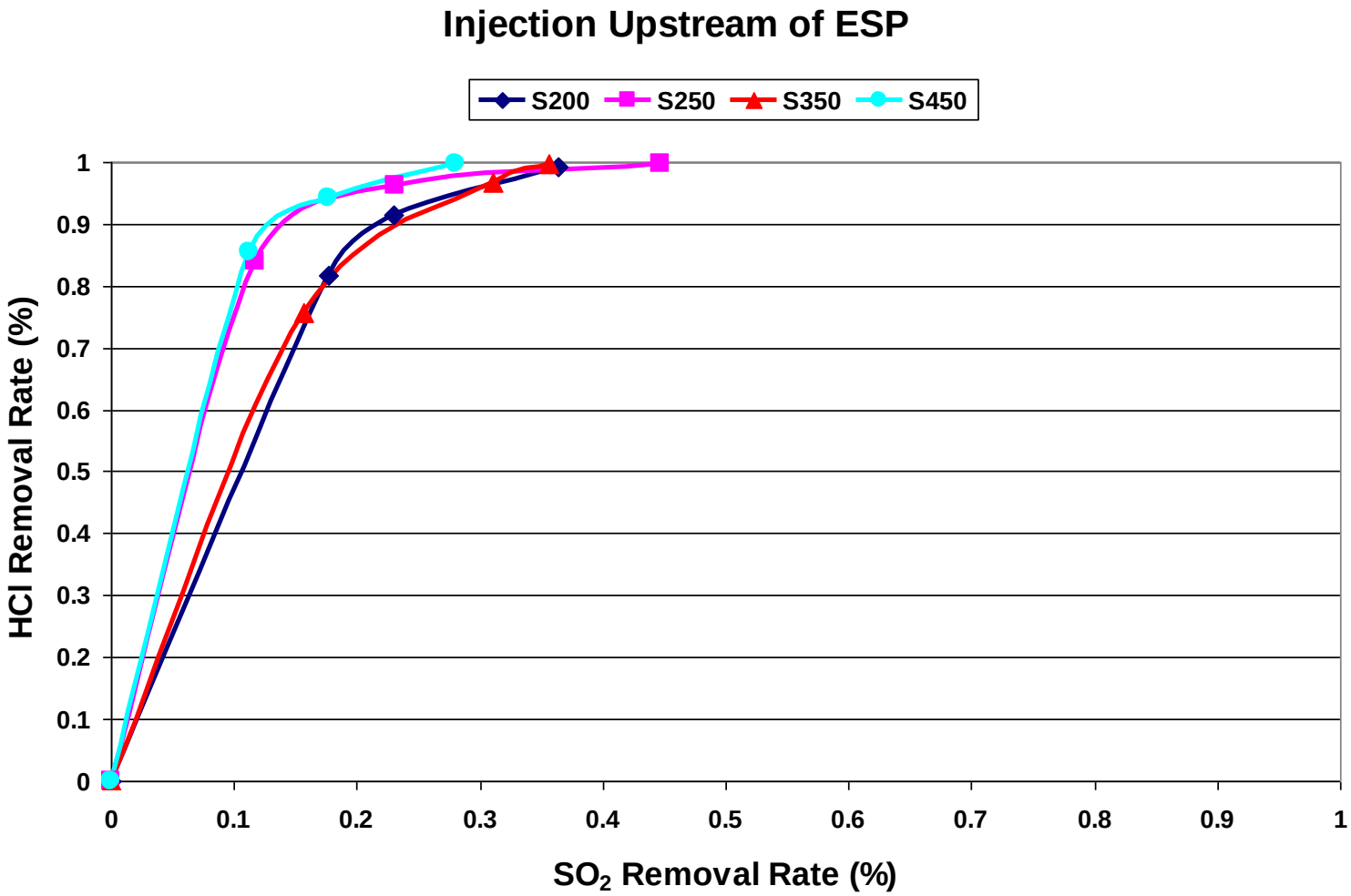
HCl Removal with Sorbent Injected at Baghouse Inlet



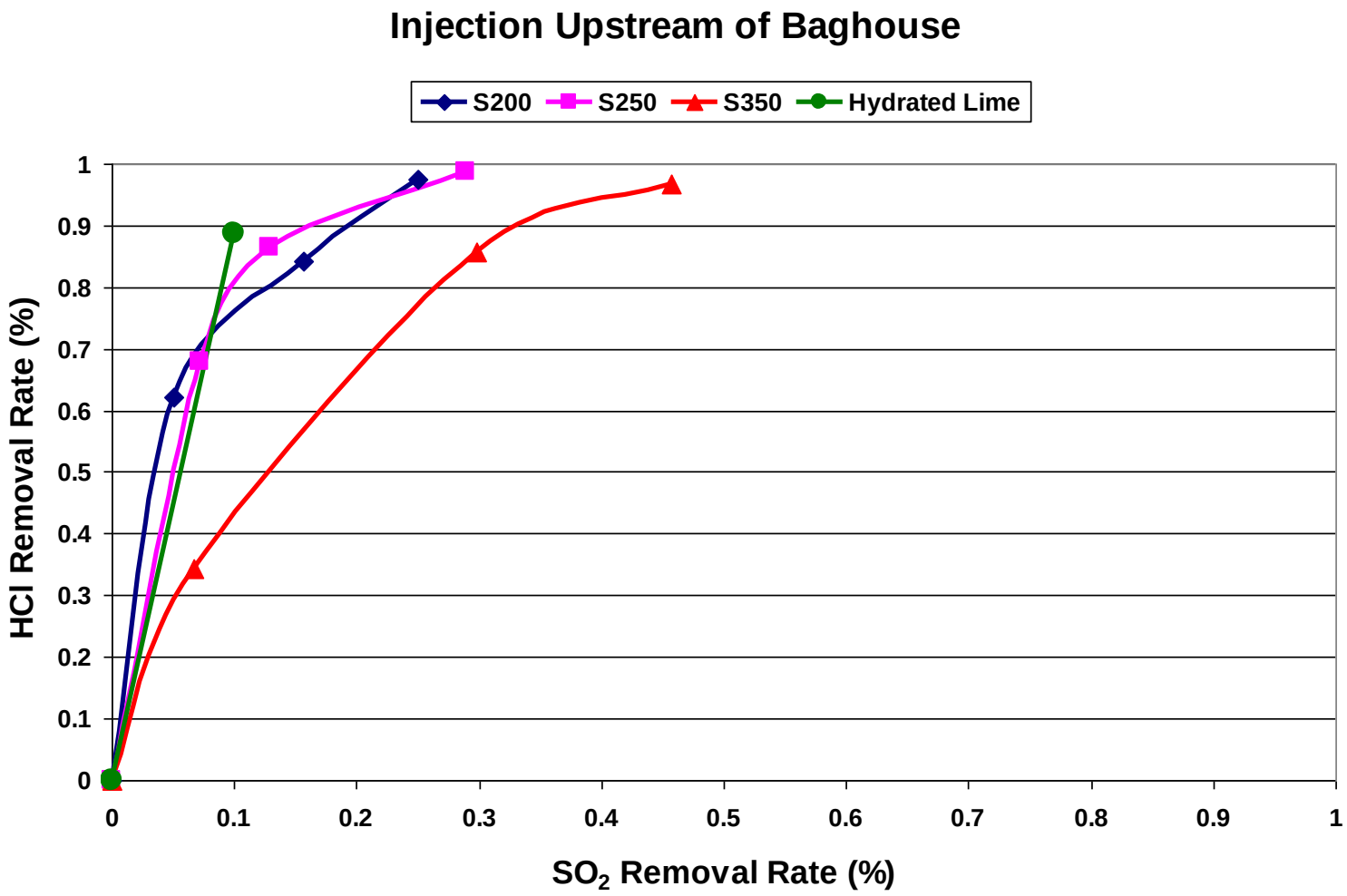
SO_2 Removal with Sorbent Injected at Baghouse Inlet



HCl Removal vs. SO_2 Removal - ESP



HCl Removal vs. SO_2 Removal - Baghouse



Summary

- **Dry Injection of trona or sodium bicarbonate is a cost effective way to mitigate HCl, SO_2 and SO_3.**
  - **Low capital cost.**
  - **Compatible with ESP and Baghouses.**
- **Able to achieve high removal rates for HCl (>99%) and SO_2 (>90%)**
  - Able to meet the HCl limit in the proposed Utility MACT (0.002 lb/MMBtu)
- **Effective over a wide temperature range (275 ^{0}F – 1500 ^{0}F)**
- **Has been implemented at many coal-fired power plants in the United States and waste incinerators in Europe .**

Questions?

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