THE McILVAINE COMPANY

MACT Compliance Options

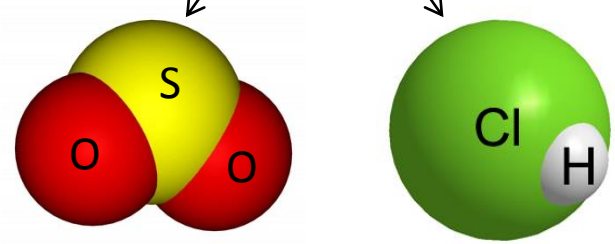
MISSISSIPPI® LIME

Discovering what's possible with calcium

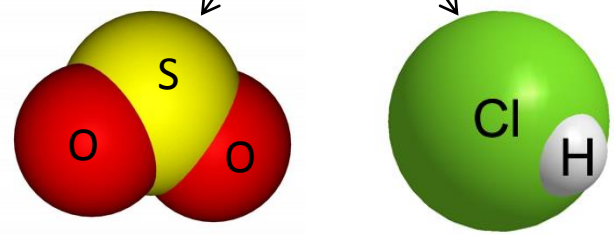
May 7, 2015

Dry Sorbent Injection Options for MACT

Boilers



Cement

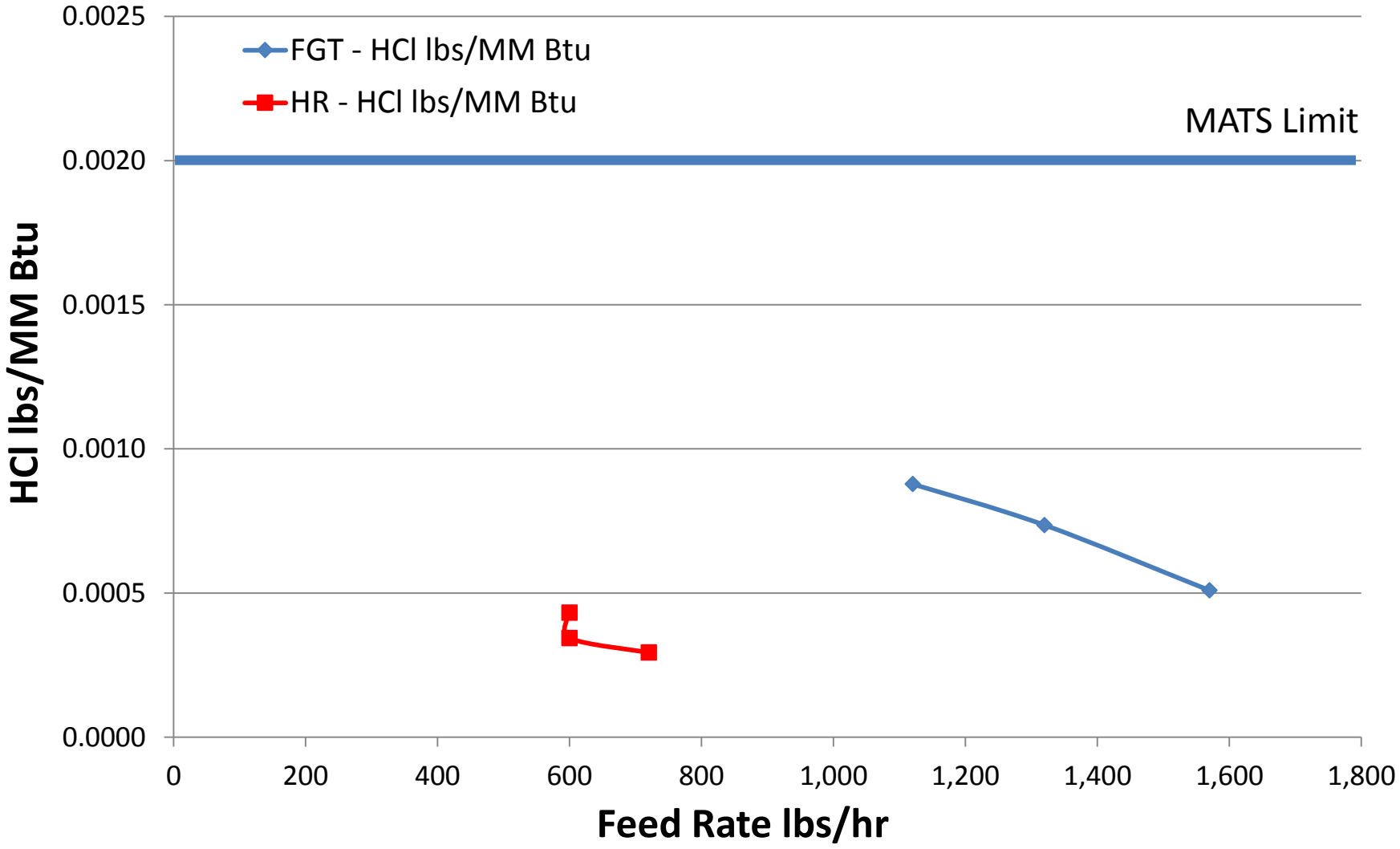


- DSI with FGT grade hydrated lime has proven effective at capturing SO_2 & HCl in both conventional boiler systems & cement plants.
- In challenging applications a High Reactivity or fast reacting hydrated lime may be required or desired.

Hydrated Lime Types and Expectations

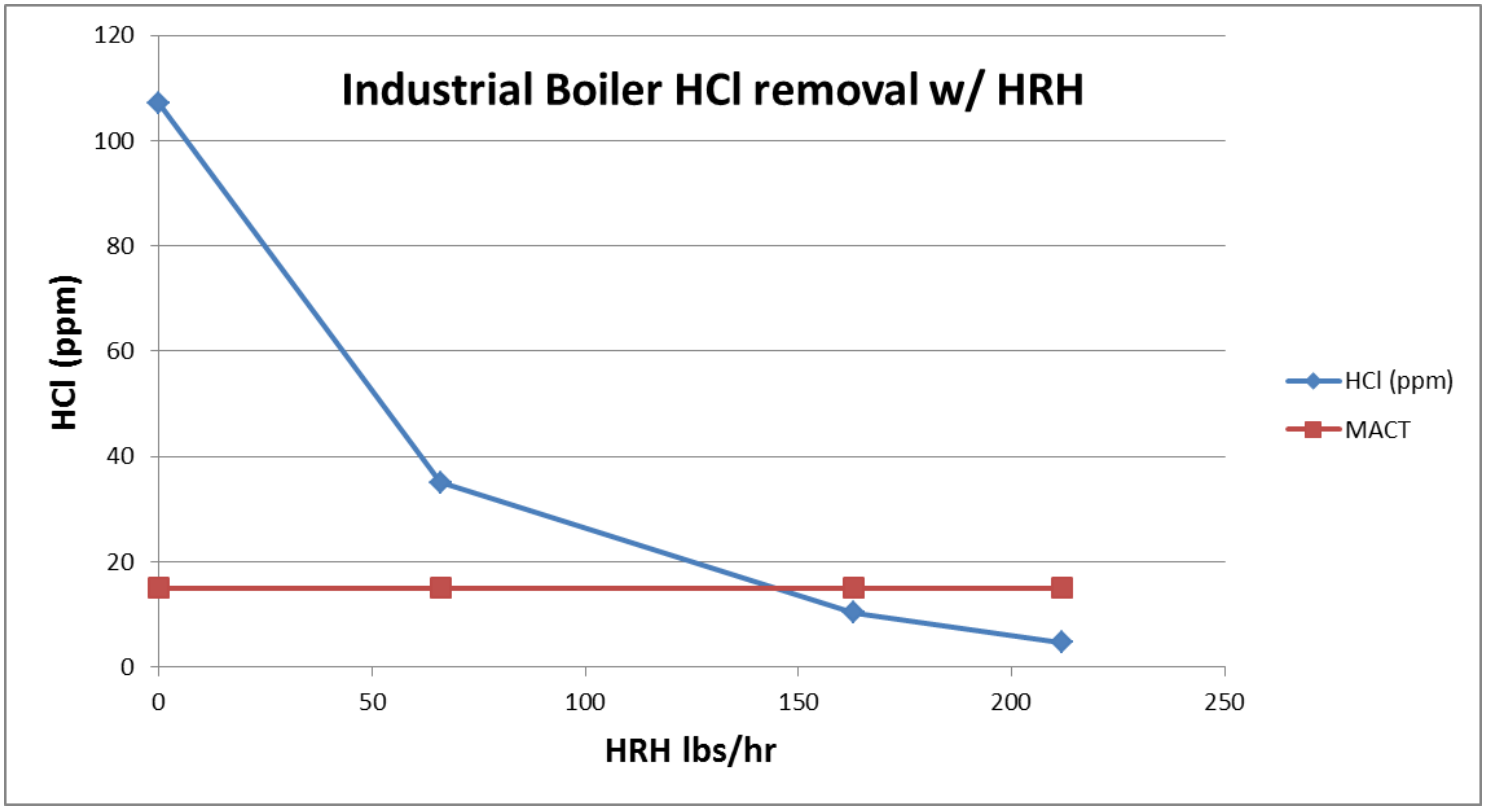
Hydrate	Target Mkt	Description	Annual tonnage
Regular	• WWT • Construction	• Low surface area • Low purity	1.2 X
Standard	• Water treatment • Chemical	• Moderate surface area • High purity	1.1 X
Flue Gas	• Dry sorbent injection • Dry scrubbers	• High purity • High (>20) surface area	X
High React	• Next generation for DSI and CDS	• High purity and surface area • Fast reactivity	0.7 X

HCl Reduction – CFB w/ Bag House



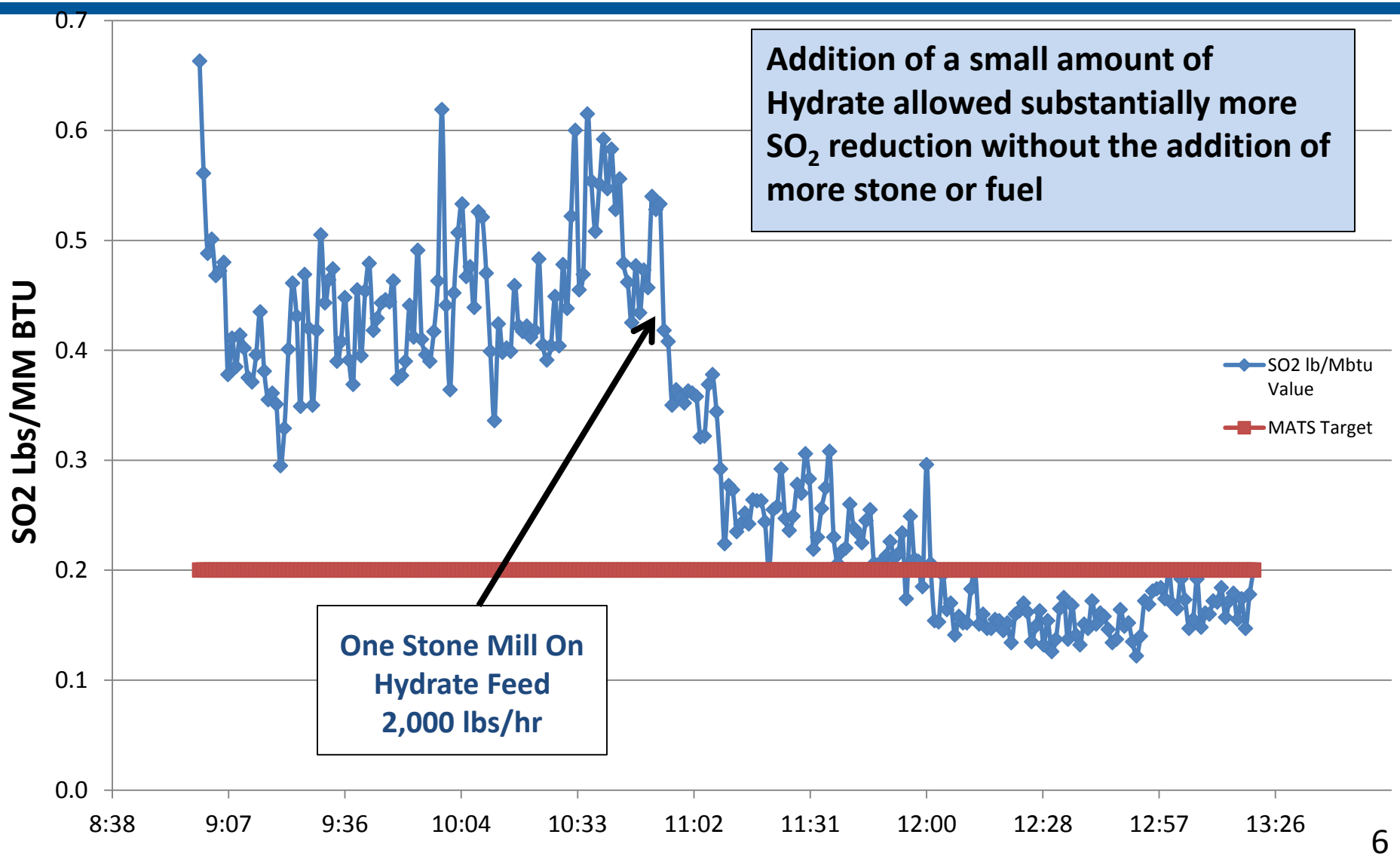
HCl Mitigation – Industrial Boiler

- 135,000 lbs/hr stoker boiler; KY washed coal
- Fed ~ 40 ft before the bag house



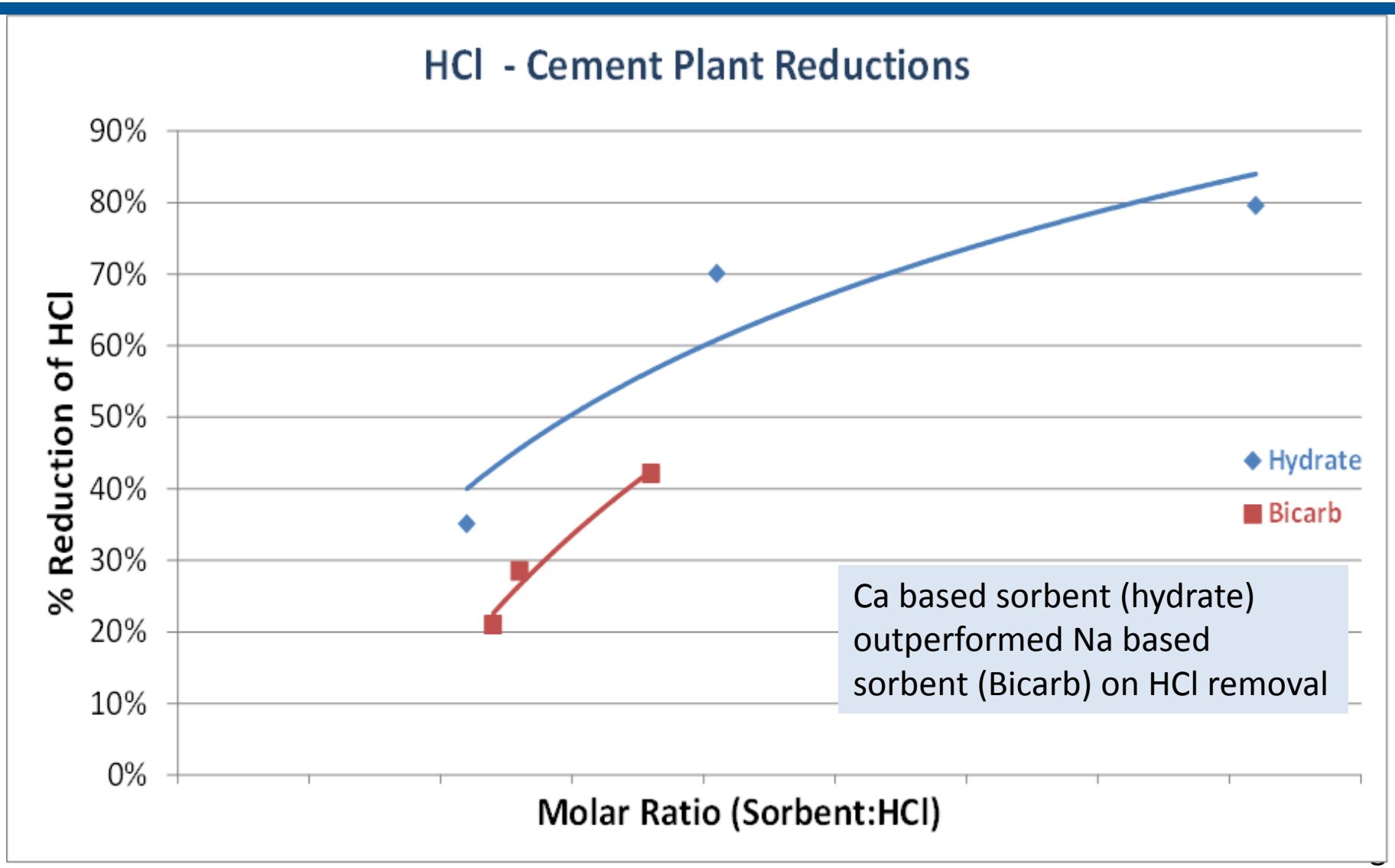
- HCl control to below MACT levels with High Reactivity Hydrate

2013 FSI Testing FGT Hydrate (only one stone mill):



DSI In Cement Manufacturing

Cement Plant for HCl



Typical Scrubber System in Cement

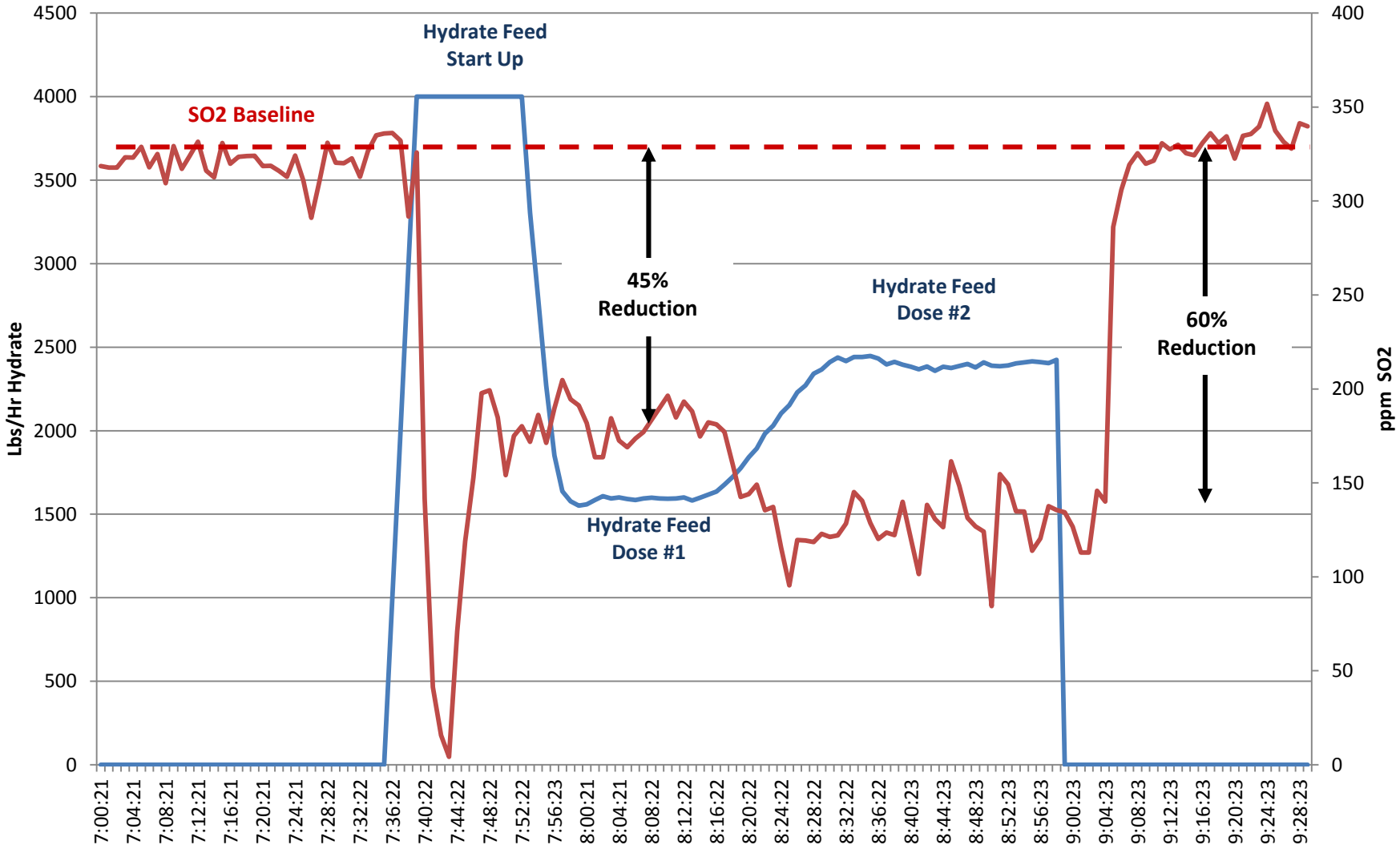
- Hydrated lime is mixed on site into a slurry
- Slurry fed through nozzles into the SO_2 scrubber
- In many systems the nozzles eroded &/or plugged - causing high maintenance costs.
- In the Midwest liquid systems froze, making compliance difficult & inconsistent (especially during the “Polar Vortex” in early 2014)

Could we get the same removal rates using **Dry** Sorbent Injection – and eliminate the challenges with handling a liquid slurry??

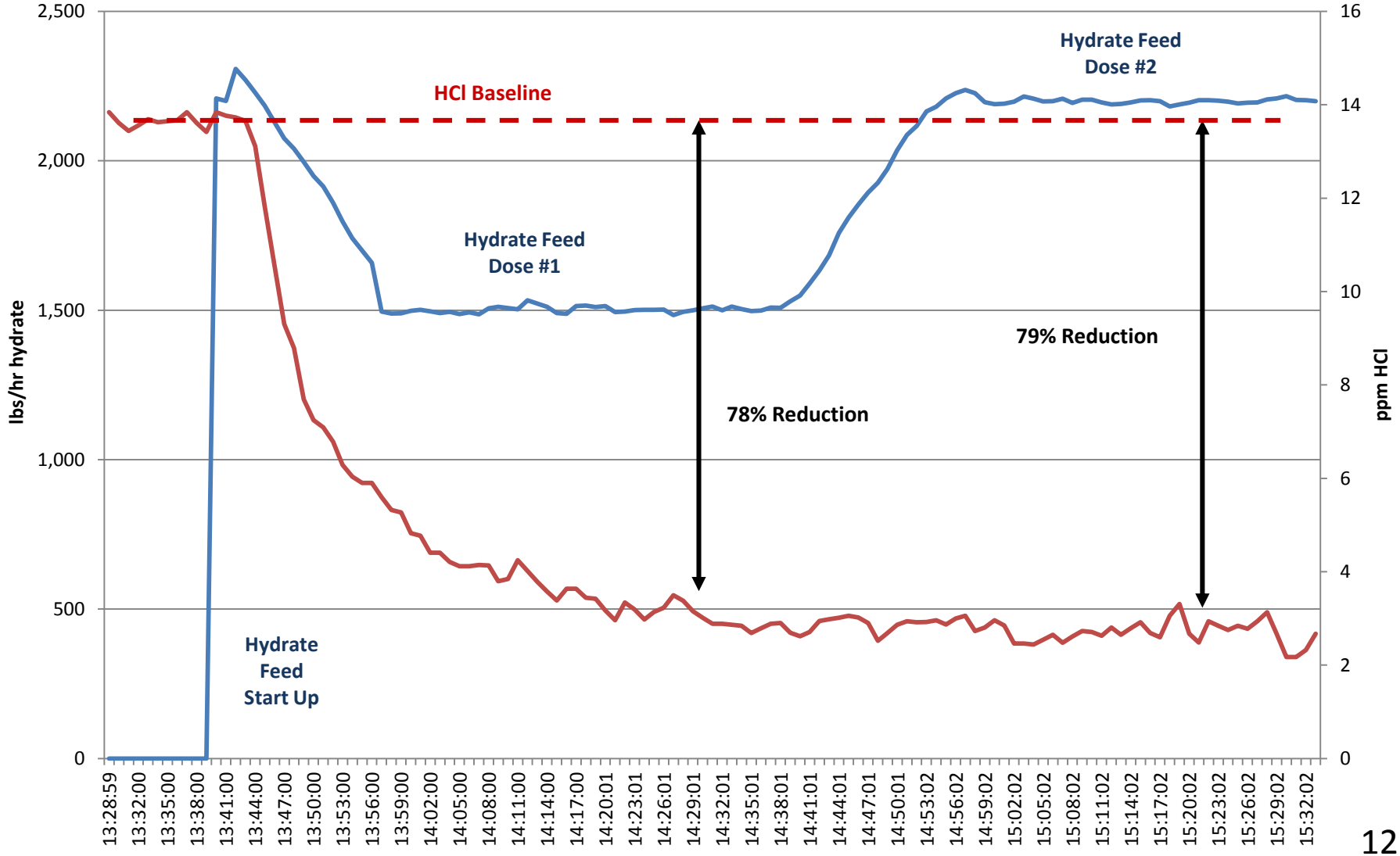
Evaluation of Dry Sorbent Injection

- MLC supplied a temporary DSI feed system to a large US cement manufacture
- 2 feed locations were tested: the bucket elevator (before scrubber tower) & the ID fan (after the scrubber tower)
- Bucket Elevator location was more effective on SO_2 removal, ID Fan location was more effective on HCl

Results: SO_2 Removal at Bucket Elevator

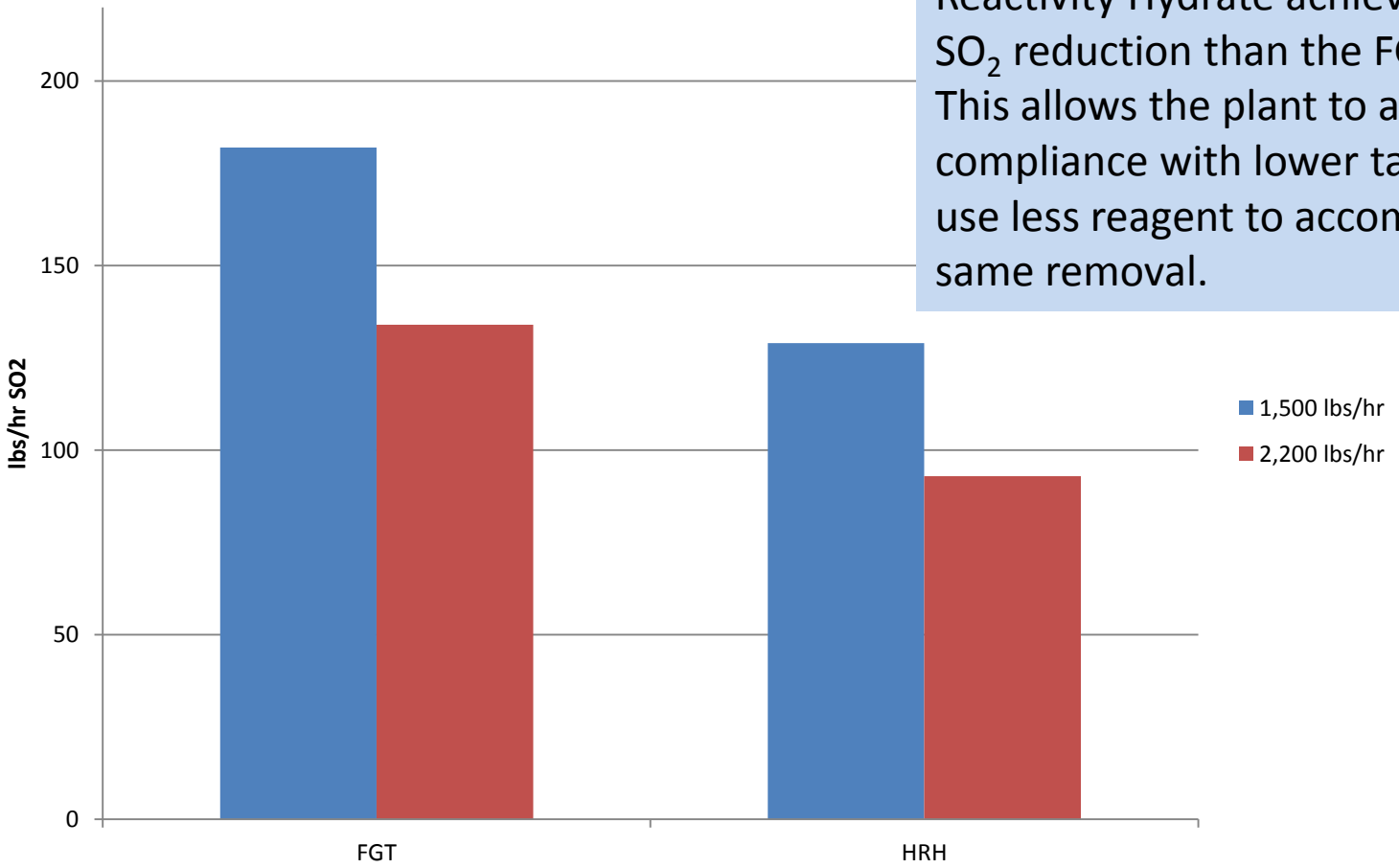


Results: HCl Removal at ID Fan



Results: FGT vs High Reactivity

At a given feedrate, the High Reactivity Hydrate achieved more SO_2 reduction than the FGT grade. This allows the plant to achieve compliance with lower targets, or use less reagent to accomplish the same removal.



Conclusions:

- DSI with hydrated lime can allow SO2 & HCl reduction for both industrial boilers and cement manufacturers.
- Depending on the application and the facilities goals, a High Reactivity Hydrate may allow better removal or lower costs.
- In cement scrubber towers, DSI gave comparable removal rates to feeding a liquid slurry of hydrated lime directly to the scrubber tower.

Questions

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