

HCl Reduction with Trona for MATS Compliance

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Outline

- Natron_x overview
- Trona Chemistry
- MATS Compliance – 3 trials
 - Plant 1
 - APH inlet vs. outlet
 - Plant 2
 - Load variation
 - Plant 3
 - Milled vs. Unmilled trona
- Conclusion /Questions





Earth's Technology Providing Cleaner Air



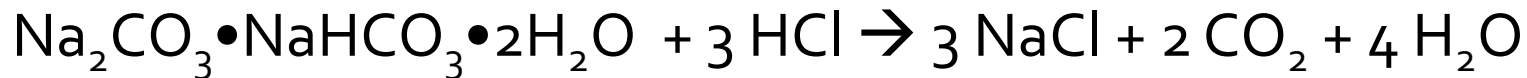
Natron_x Overview

- Natron_x Technologies, LLC is a partnership created by three of the world's most forward-thinking and cutting-edge chemical, manufacturing and mining companies.
- The Scope of the Natron_x Technologies :
 - To develop, manufacture, market, sell and distribute sodium products for use in dry injection acid gas scrubbing processes
- First Trona Plant designed and built from the ground up for the acid gas control market



Trona Sorbent Reactions

Trona- (EnProve TR)



Stoichiometry

- 2.40 lbs of Trona neutralizes 1lb of SO₂ (g)
- 2.11 lbs of Trona neutralizes 1lb of HCl (g)



Normalized Stoichiometric Ratio NSR

$$NSR = \frac{\frac{lbs}{hr} Trona}{\left(\frac{mmBtu}{hr} \text{ heat-input} \times \frac{lbs}{mmBtu} \text{ acid gas} \right) \times \left(\frac{226 \frac{g}{mol} \text{ trona}}{\frac{g}{mol} \text{ acidgas}} \times \frac{\text{mol Trona theoretically reacted}}{\text{mol acidgas theoretically reacted}} \right)}$$

- NSR
 - An adjusted ratio of showing the actual over theoretical (efficiency) of the reaction compared to ideal conditions
- NSR >1
 - More sorbent than the theoretical is injected
- NSR <1
 - Less sorbent than the theoretical is injected



Factors in Acid Gas Mitigation

- Sorbent Particle Size
- Residence time to Baghouse/ESP
- Temperature of injection point
- Particulate collection equipment
- Material Handling
 - Moisture
 - Pre calcination
- Material Distribution



Utility MATS Limitations

Pollutant	Regulatory Limitation (lb/mmBtu)
SO ₂	0.2
HCl	0.002



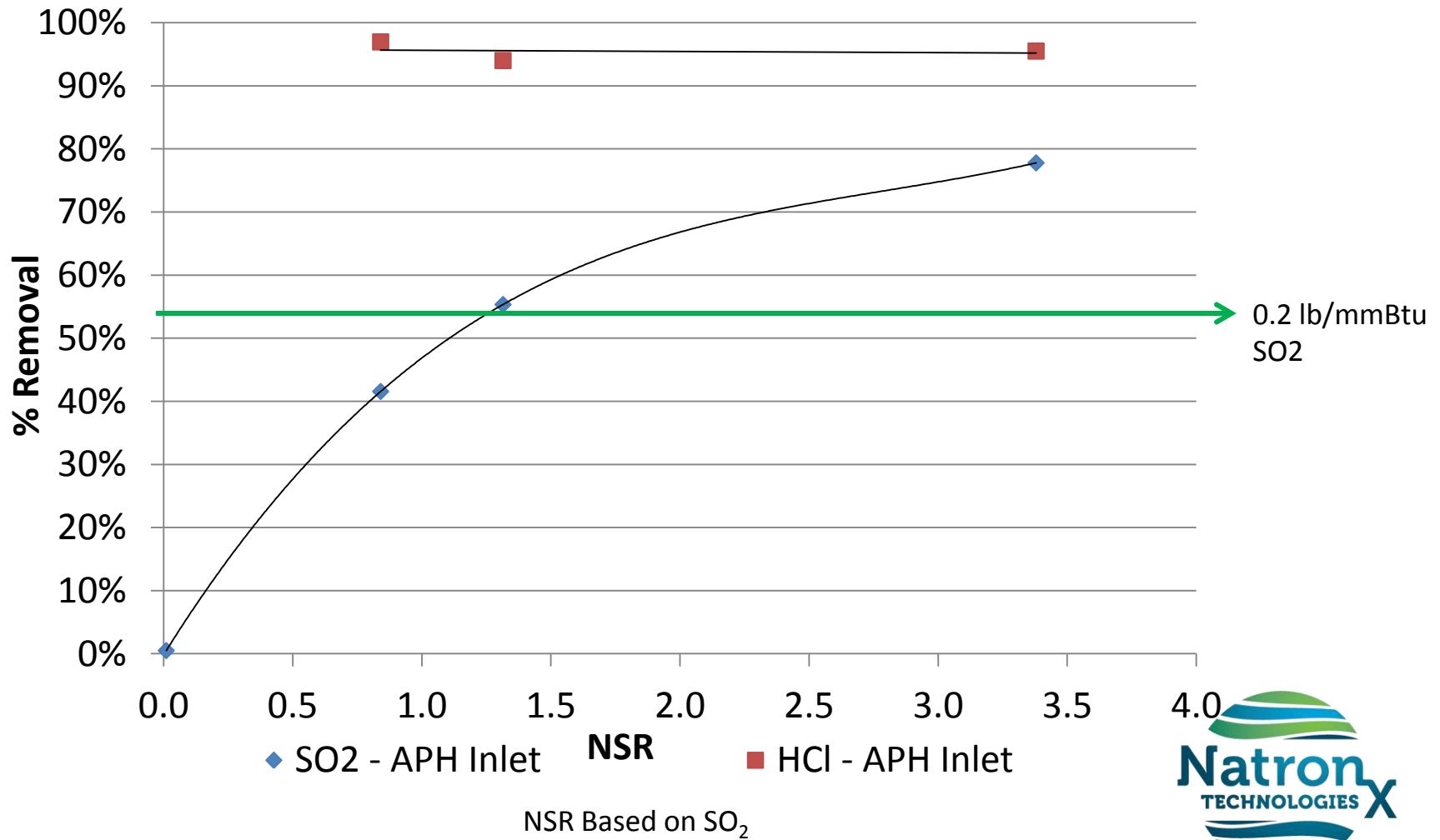
MATS Compliance Trial - Plant 1

- Size: 240 MW
- Fuel : PRB
- Baseline HCl: 0.001 lb/mmBtu
- Baseline SO₂: 0.46 lb/mmBtu
- Particle Collector: ESP
- Injection points
 - APH inlet : 750° F
 - APH outlet: 300°F



HCl & SO₂ Removal Results – Plant 1

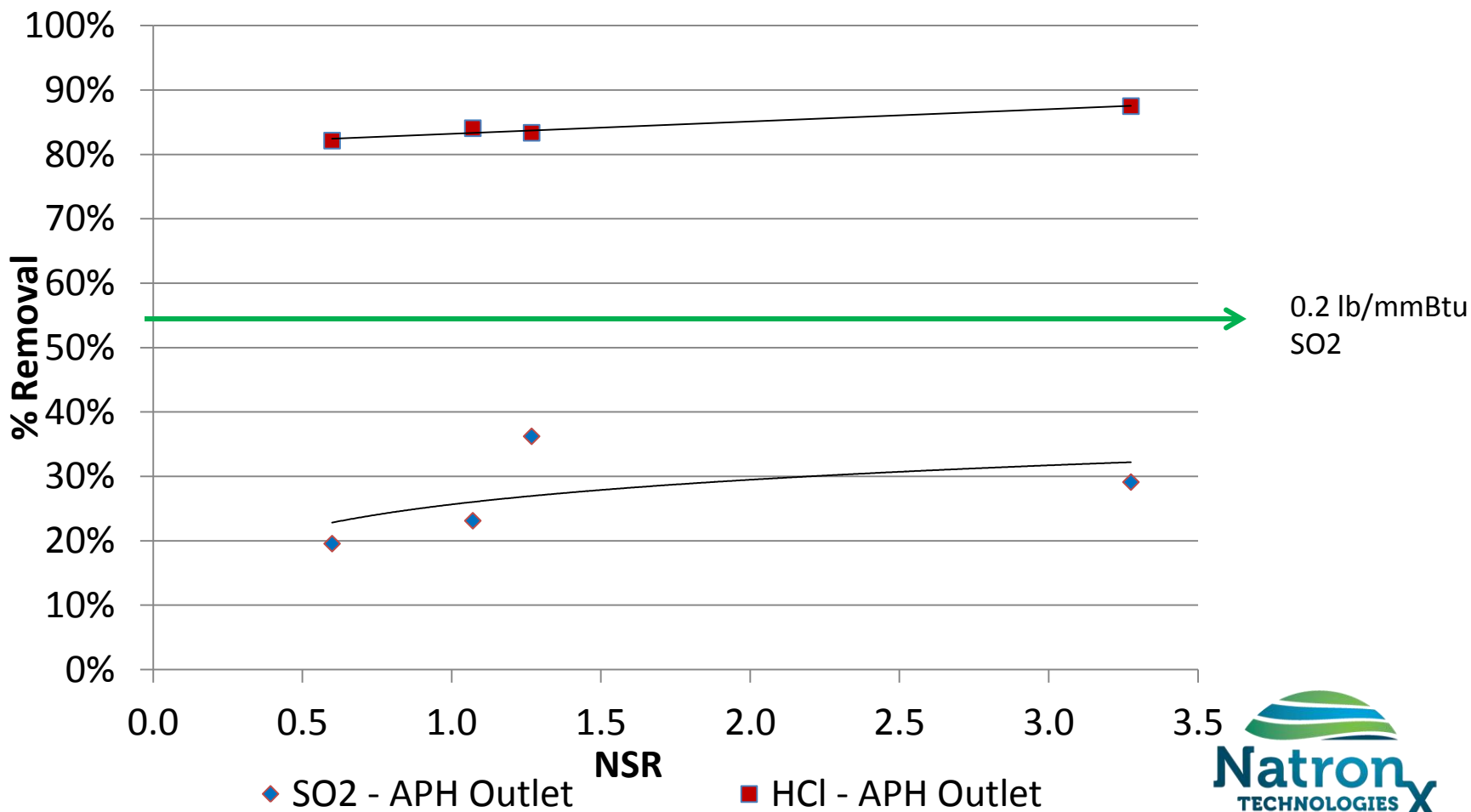
Trona Injected at APH Inlet



Note: Milled Trona
ESP Collector

HCl & SO₂ Removal Results – Plant 1

Trona Injected at APH Outlet



Note: Milled Trona
ESP Collector

NSR Based on SO₂

MATS Compliance Trial - Plant 2

- Size: 115 MW
- Coal Type: PRB
- Baseline SO₂: 2.29 lb/mmBtu
- Baseline HCl: 0.130 lb/mmBtu
- Injection point: APH inlet
- Injection temperature: 612° F
- Particulate Collection Device: ESP



MATS Compliance Trial - Plant 2

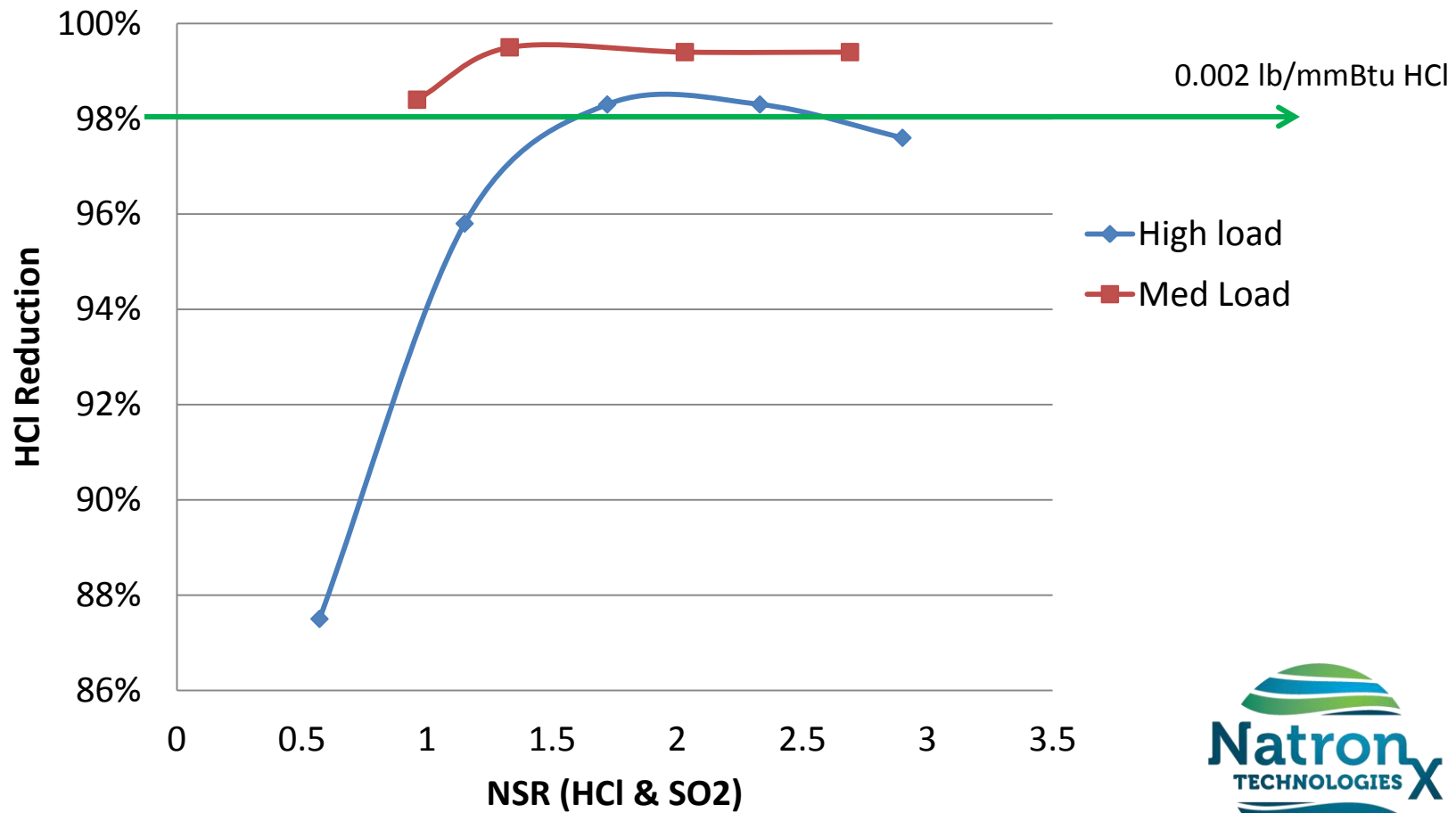
Material Handling Description

- Particle Size unmilled trona: D50 ~30 microns
- Particle Size milled trona: D50 ~22 microns
- Post Mill Temperature: 105°F



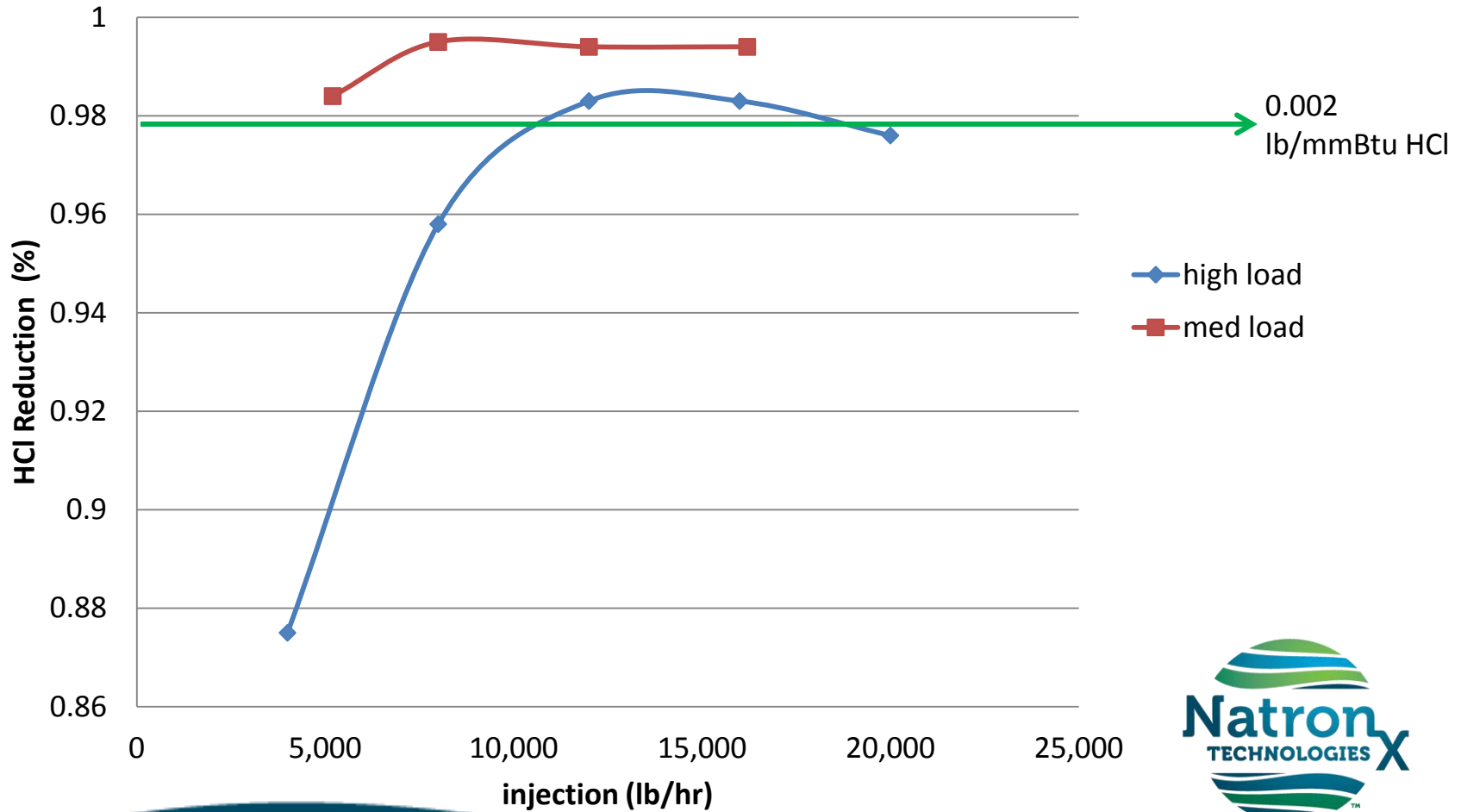
MATS Compliance Trial-Plant 2

HCl Reduction vs. NSR at Varied Load



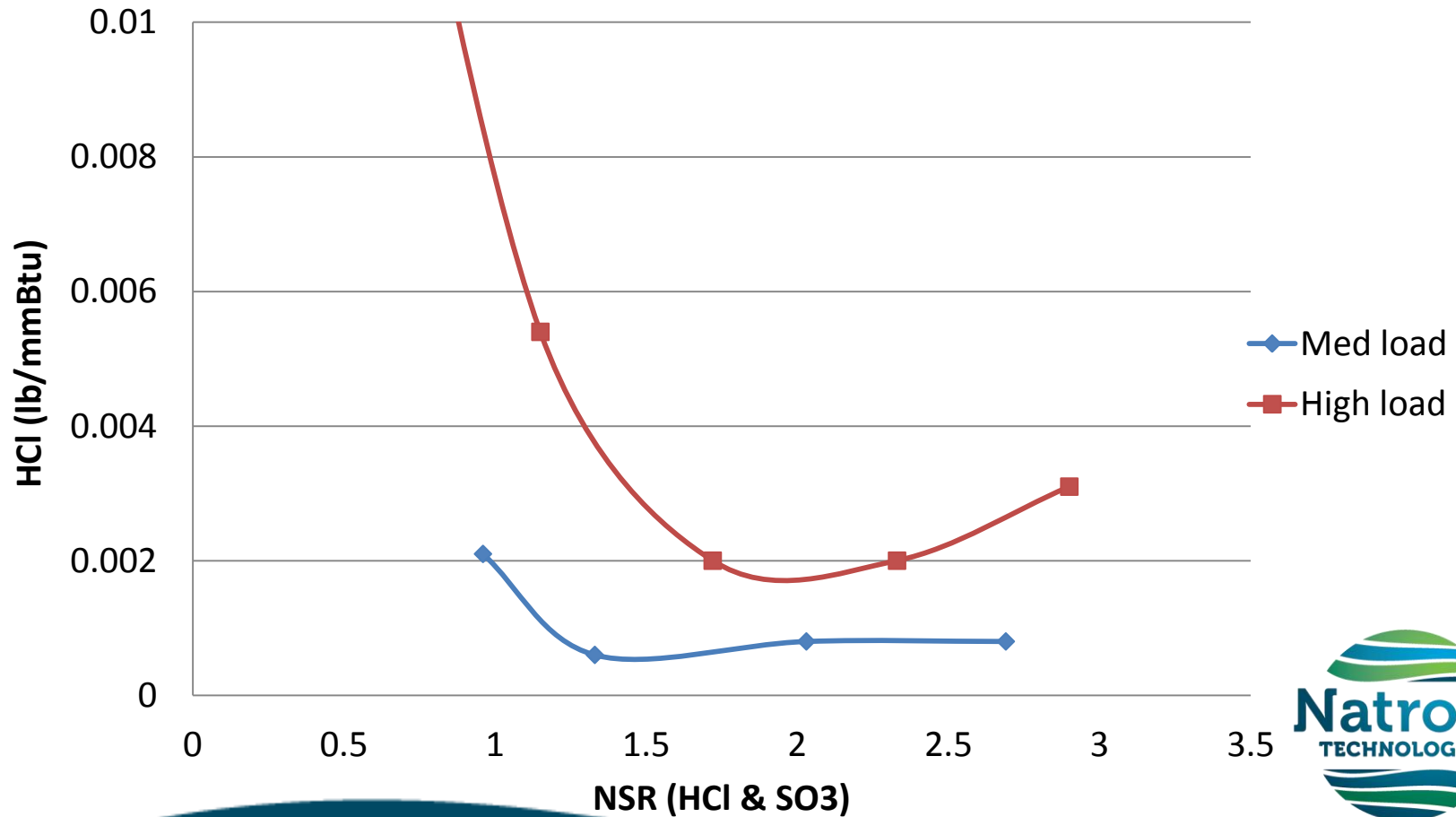
MATS Compliance Trial-Plant 2

HCl Reduction vs. Injection rate



MATS Compliance Trial-Plant 2

HCl Removal Level at Varied Loads



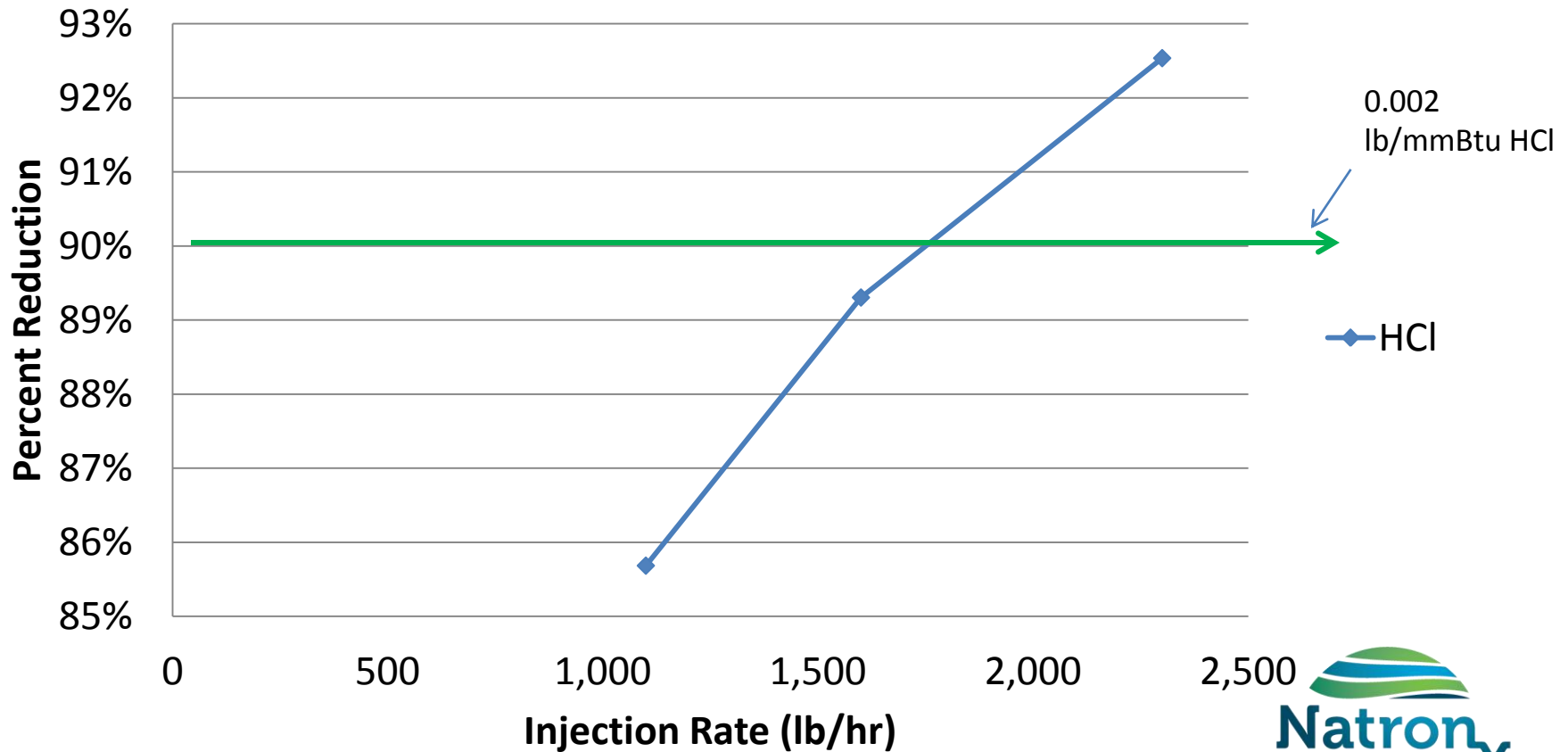
MATS Compliance Trial - Plant 3

- Size: 90 MW
- Coal Type: PRB
- Baseline SO₂: 0.53 lb/mmBtu
- Baseline HCl: 0.00489 lb/mmBtu
- Injection point: APH inlet
- Injection temperature: 735° F
- Particle Collection Device: ESP



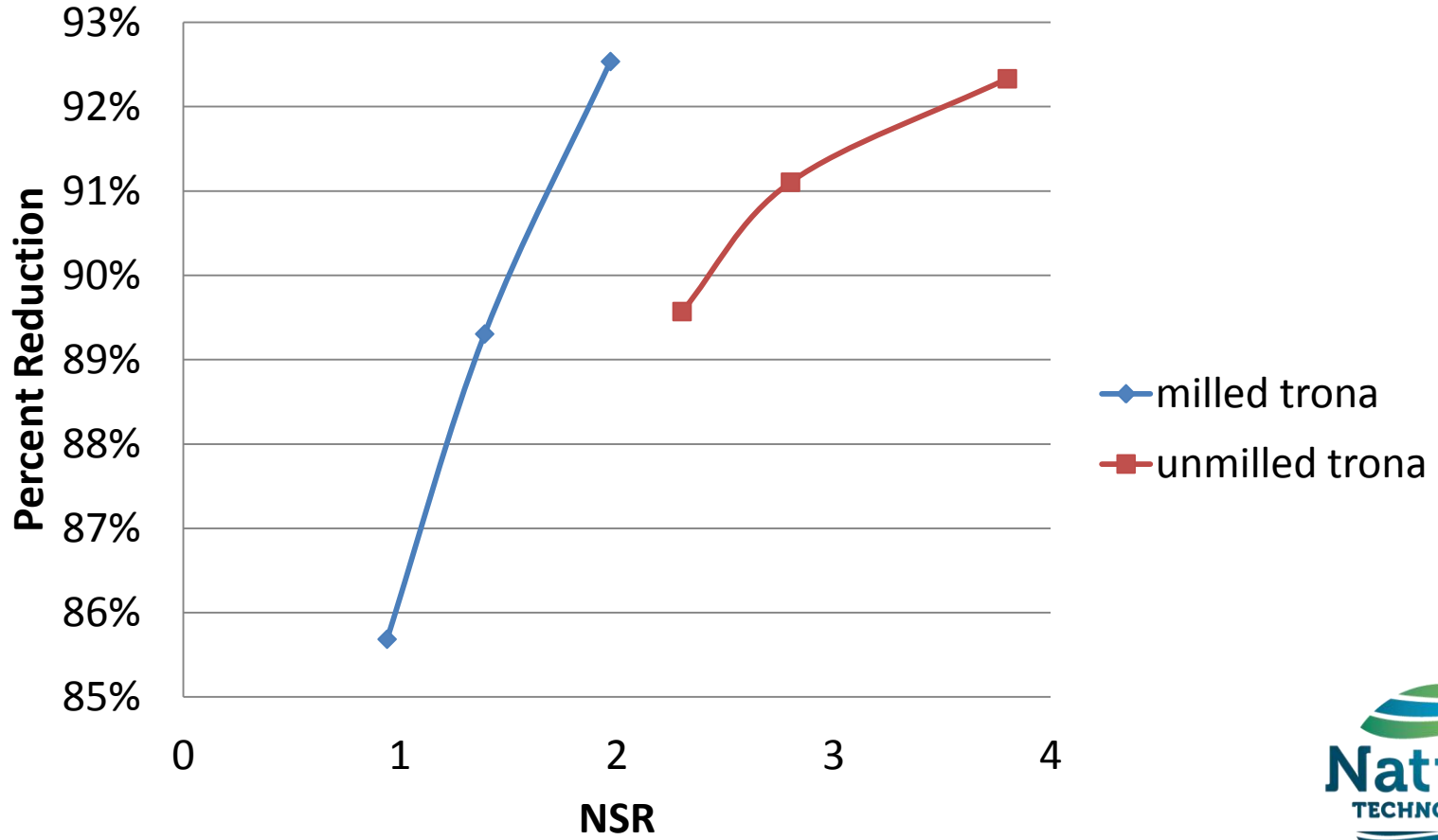
MATS Compliance Trial-Plant 3

Milled Trona HCl Reduction



MATS Compliance Trial-Plant 3

Milled vs. Unmilled Trona for HCl reduction



Conclusions

- Trona has the ability to reduce HCl by up to 98%
- Temperature does effect the sorbent utilization efficiency
- Milling Trona will reduce the amount of sorbent required to achieve removal targets
- Dry Sorbent Injection with Trona is an effective solution for compliance



QUESTIONS

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