

Dry Sorbent Injection of Sodium Sorbents for Acid Gas Mitigation

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Overview

- Sodium Sorbents
 - Trona
 - Sodium Bicarbonate
- Dry Sorbent Injection (DSI) Overview
- Impacts of Sodium Sorbents
- Case 1: UVE Agglomération Metz (Metz, France)
- Case 2: Oshima (Japan)

SOLVAir[®] Select 200

(Trona)

- Naturally formed mineral, Sodium Sesquicarbonate
- Chemical Structure: $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$
- Mined underground in Green River WY
 - Numerous beds containing billions of tons
 - Mostly extracted and converted to sodium carbonate
- Product specifically manufactured for air pollution control market
- Injectable as-is

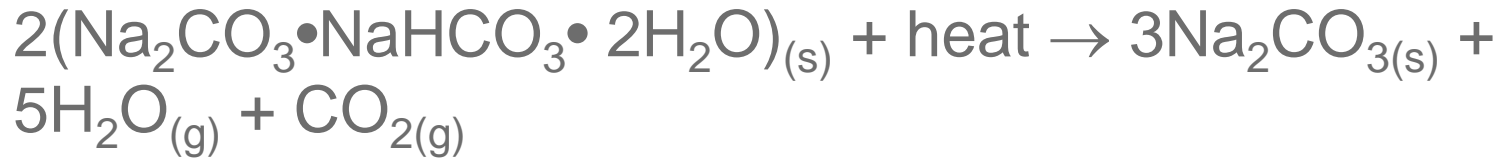
SOLVAir[®] Select 300

(Sodium Bicarbonate)

- Baking soda
- Chemical Structure: NaHCO_3
- Made from sodium carbonate, which is made from trona
- Production dedicated to SOLVAir Products in Green River, WY
- Sorbent of choice in Europe and other parts of the world

Sodium Sorbent Calcination

- Trona



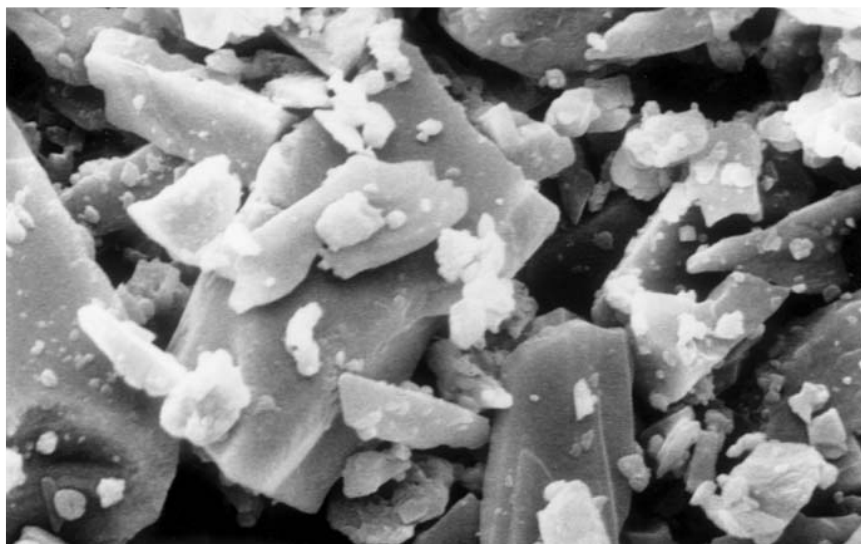
- Sodium Bicarbonate



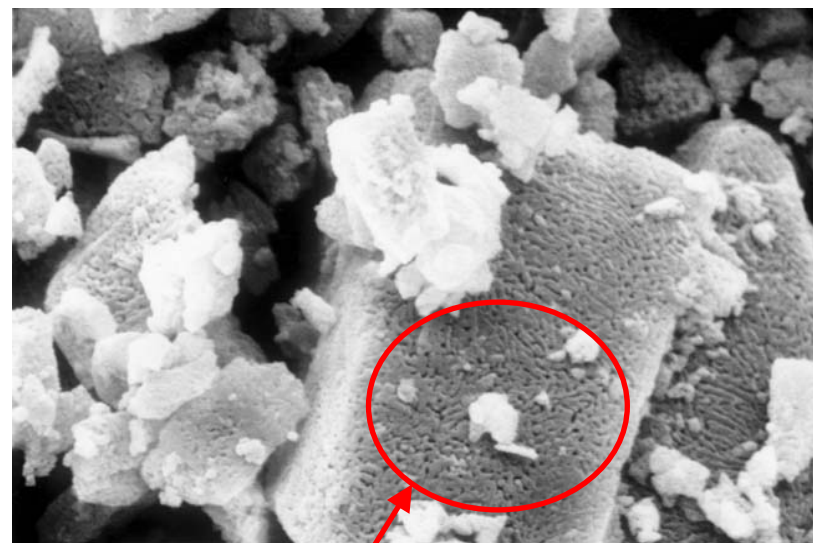
- Flue gas temperature should be above 275°F at the injection point

SOLVAir® Select 200: View at 2500X

SOLVAir Select 200
Raw



SOLVAir Select 200
Heated >275°F



Micropores – Increased
Surface Area

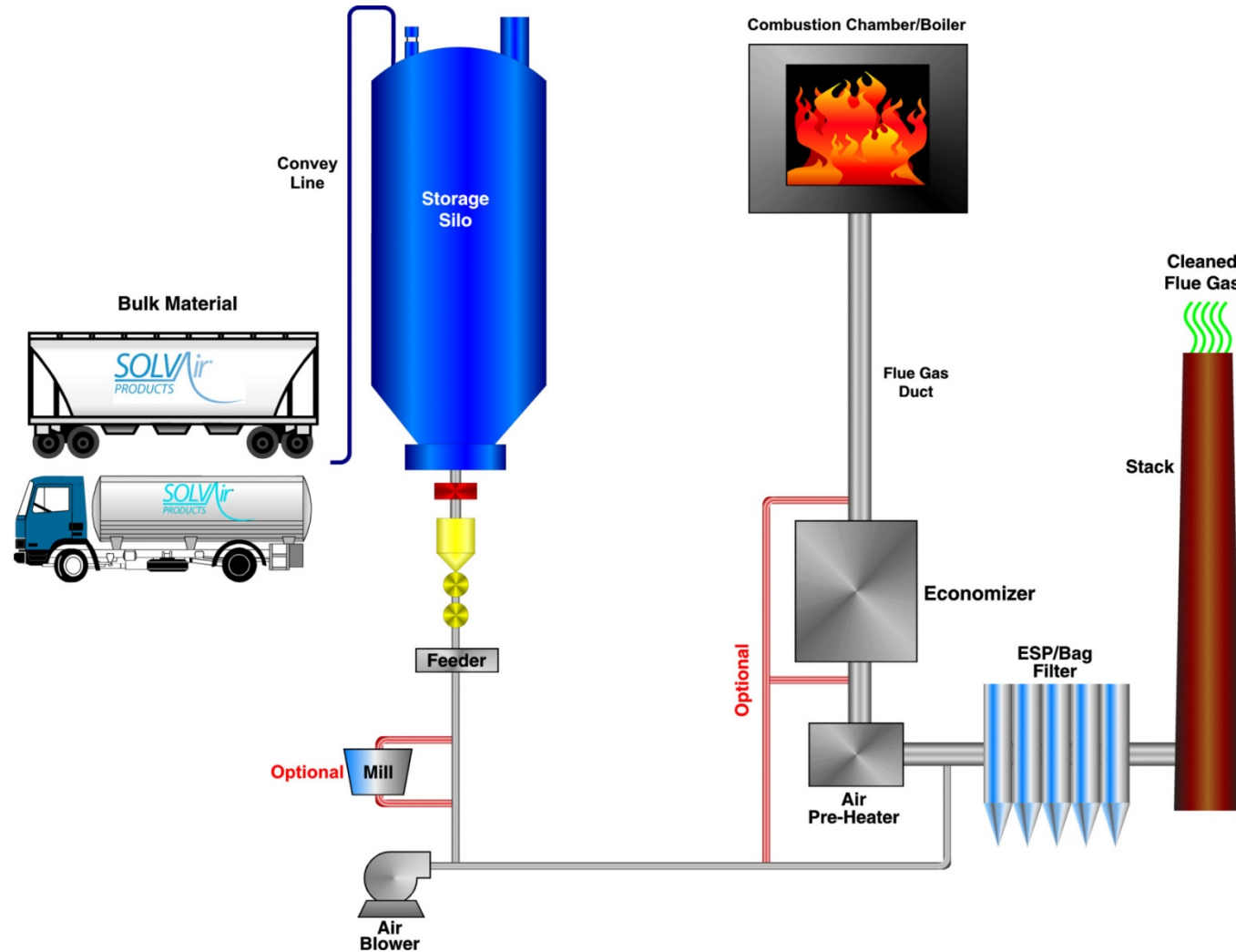
Acid Gas Reactions



Dry Sorbent Injection (DSI) of Sodium Sorbents USA Timeline

- 1965: Started injecting sodium bicarbonate and trona for SO₂ mitigation at California Edison
- 1970: Public Service of Colorado sponsored by EPRI to treat SO₂
- 1970's & 1980's: Bicarb trials completed showed good SO₂ removal; limited by product availability and cost
- 2002: Use of trona for SO₃ investigated by AEP

Dry Sorbent Injection Schematic



DSI Parameters Affecting Performance

- Sorbent injection rate/Normalized Stoichiometric Ratio (NSR)
- Sorbent particle size
- Residence time in flue gas stream
- Dispersion and mixing with flue gas
- Particulate control device for capture (ESP vs. Baghouse)
 - Particle size more critical with ESP
 - Longer contact time through the filter cake in baghouse
- Flue gas temperature
 - Minimum of 275°F
 - Hotter is better for trona
- Other competing acids in the flue gas

Dry Sorbent Injection

Advantages

- Lower-capital costs than many alternatives
- Simple systems to design and operate
- Safe reagent and by-products
- May improve ESP removal efficiency
- Non-corrosive to equipment
- No liquid effluent

Case 1: UVE Agglomération Metz (Metz, France)



- Household Waste Incineration
- Commissioned 2001
- Capacity: 99,000 tpy waste
- Flue Gas Temperature: 350°F
- Sorbent: Sodium Bicarbonate
- Specific consumption:
24.4 lbs SBC/ t waste

	Units	Raw Flue Gas Characteristics	Regulatory Limits	Measured Values	Removal Efficiency
HCl	ppmv	366	6	0.8	>99%
SO ₂	ppmv	52	17	0.2	>99%

Case 2: Oshima (Japan)



- Household Waste Incineration
- Commissioned 2002
- Capacity: 44,000 tpy (2 lines)
- Flue Gas Temperature: 350°F
- Sorbent: Sodium Bicarbonate

	Units	Raw Flue Gas Characteristics	Emission Limits (daily average)	Cleaned Flue Gas (observed values)
HCl	ppmv	400	< 100	< 1
SO ₂	ppmv	50	< 20	< 2

Summary

- Sodium sorbents are efficient at treating acid gases with other positive benefits
- Low capital investment
- Network of terminals and dedicated railcars for distribution
- Experience of over 20 years in the air pollution control market
- Additional information at www.solvair.us



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