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Overview of SO_3 Emission Control with Hydrated Lime

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Technology Status

- Dry Sorbent Injection with hydrated lime offers a simple, low capital cost SO_3 control approach
- Key equipment components are a silo, compressors/blowers, piping and lances
- The technology is currently being used for SO_3 control on over 30 utility boilers
- Initial system startup system plugging issues are basically solved by a combination of work practice and operational modifications – issues were addressed cooperatively by the utilities, EPRI, system vendors, and lime suppliers
- The technology is fully commercial for SO_3 control
- Recent developments have been focused on control of other acid gases (HCl and SO_2)

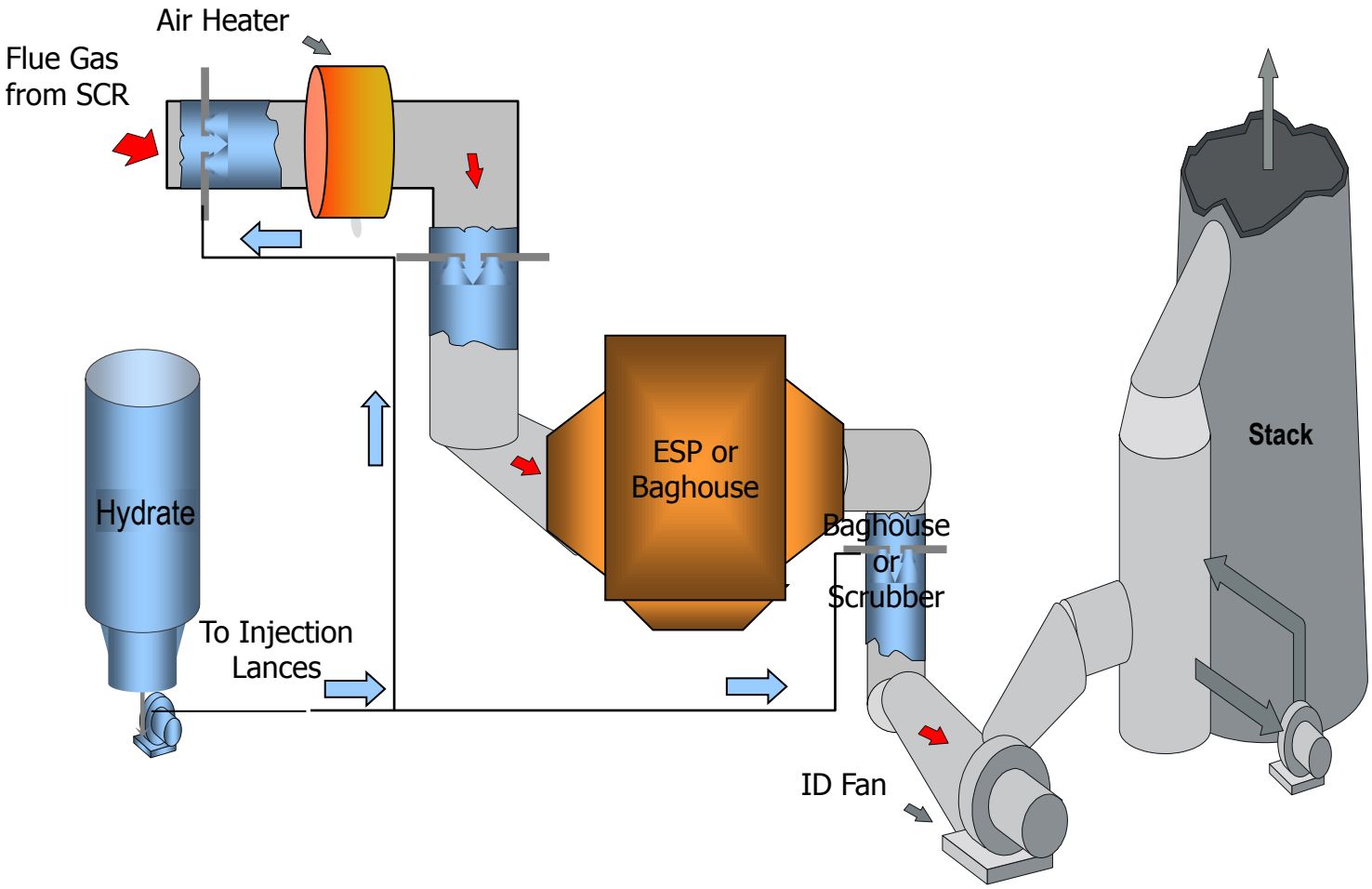
Brief Review of "Recent" Development History

Year	Location	Test Summary	What Was Learned
2004	Widow's Creek	1. Testing done downstream of AH.	Hydrate worked effectively - but
	Zimmer	2.VEE reduction was objective - some	not all work the same.
	Cumberland	mesaurements made that showed stack	
		emissions to be >5 ppm @ 3:1 feed rate	
2005	Paradise	1.Basically repeat of 2004 results.	1.Major effort to understand hydrate
	Wilson	2.Gavin not effective due to short run	differences
	Gavin	and ESP issues.	2. Injection downstream of ESP
	East Bend	3.Boiler injection had no impact on	was effective
	Gadsden	AH performance.	
	Potomac River		
2006 - 07	Seminole	1. Highly reactive sorbent demonstrated	1. Highly reactive sorbent was ~40%
	Hammond	2. Testing upstream & downstream	more effective
	Bowen	of ESP	2. Injection at 2 locations was more
	Yates		effective than just one
	Ghent		3. Hydrate injection actually decreased
	Trimble County		particulates from scrubber
	Cheswick		
2008	Roxboro	1. Injection downstream of ESP	Particulate emissions did not
	MRC		increase but rather decreased.

Key Design Considerations

- Flue Gas Properties
  - ✓ Gas composition
    - SO_3, SO_2, HCl
  - ✓ Residence time
- Reagent Properties
  - ✓ Surface area
  - ✓ Porosity
- Plant Operations
  - ✓ Injection location
  - ✓ Type of particulate collection

Hydrate Injection - SO_3 Control



Summary

- Hydrated lime injection is an effective approach for reducing SO_3 emissions
  - ✓ Low cost reagent
  - ✓ Mass feed rates similar to trona
  - ✓ Emissions <5 ppm
- Not all hydrates perform the same
- Hydrated lime can be injected downstream of ESP (upstream of a scrubber) and not increase particulate emissions
- Injecting hydrated lime at 2 locations is more effective than 1 location
- Injection upstream of air heater can reduce ABS formation with no downstream impacts

SE Utility Demonstration