REINHOLD ENVIRONMENTAL Ltd.

2014 APC Round Table & Expo Presentation

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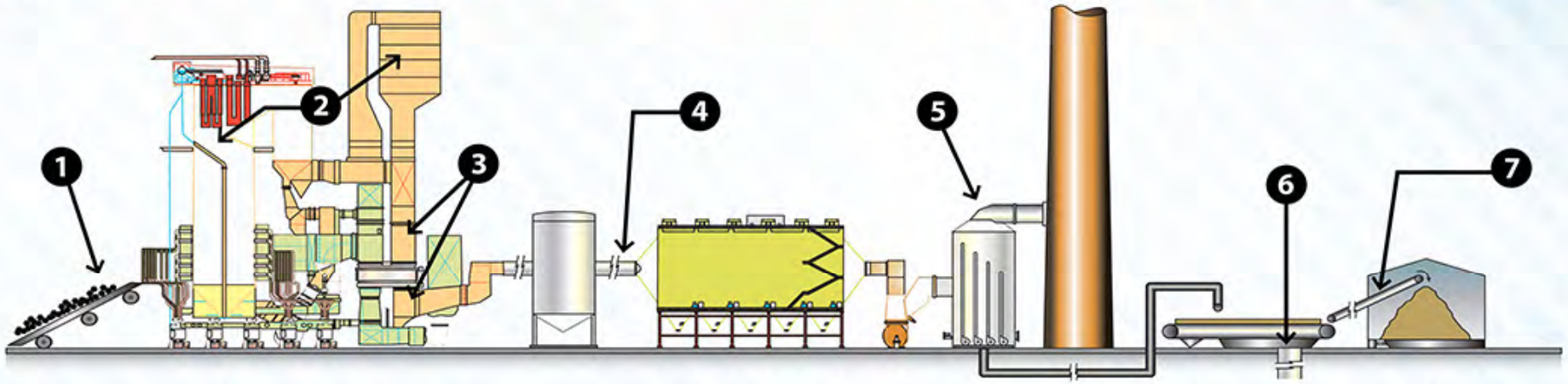
Calcium in the Flue Gas Path
BOILER to STACK and BEYOND

FGP

MATS 2015

REGULATIONS ARE COMING. WE CAN HELP YOU MAKE MONEY.

ELG 2018



1 Limestone
- Removes arsenic
- Protects SCR catalyst

Save on catalyst cost $$

2 Pulverized Limestone or Hydrated Lime
- Reduces SO_2 and SO_3

Reduces downstream treatment costs $

3 Hydrated Lime
- Reduces SO_2, SO_3, HCl and HF
- Optimizes Air Heater Operation
- Mercury Sorbent Conditioning

Significantly reduces fuel costs $$$$

4 Lime or Hydrated Lime
- Reduces SO_2, SO_3, HCl and HF

Improves fuel flexibility $$$$

5 Magnesium Enhanced Lime (MEL) or Limestone
- Reduces SO_2, SO_3, HCl and HF

Improves fuel flexibility $$$$

6 Hydrated Lime
- Waste Water Treatment
- Reduces Heavy Metals

Reduces waste water treatment costs $

7 Lime
- Ash Stabilization & Solidification
- Zero Liquid Discharge (ZLD)

Reduces wet impoundment costs and liability $$

Pozzolanic Reactions – A Path to Zero Liquid Discharge

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Clean Water Act

- The Clean Water Act was enacted in 1982.
- do not include:
  - arsenic (As),
  - mercury (Hg),
  - selenium (Se)
  - and nutrients know by today's standards to be toxic.
- Effluent Limitation Guidelines (ELG) implemented starting 2017-2022
- establishes control levels for liquid discharges

ELG Limits for FGD Wastewater

- Effluent Limitation Guidelines (ELG)
  - implemented starting 2017-2022
- establishes control levels for liquid discharges

	Daily Maximum	Monthly Average
Arsenic, total	8 µg/l	6 µg/l
Mercury, total	242 ng/l	119 ng/l
Selenium, total	16 µg/l	10 µg/l
Nitrite/Nitrate, as N	0.17 mg/l	0.13 mg/l

How can these limitations be met?

- Approximately 1,100 power plants will be regulated by these rules
- discussion on how power plants will meet these new ELGs
  - waste water treatment systems (WWT)
  - zero liquid discharge (ZLD) options.
  - Other options???
- There is a more affordable technology which takes effluent to landfill as a transportable solid.

What is a Pozzolanic Reaction?

"A siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties"

Translation: Ca + Al + Si + OH + H_2O = cement

Pozzolanic Reactions

- used by the coal fired power industry for over 30 years.
- dispose of untreated waste water and FGD calcium sulfite
- Similar to the cement industry Pozzotec at a power plant takes advantage of the pozzolans found in fly ash.
- Typical Fly ash has a high content of silicon (Si) and aluminum (Al),
- fly-ash exhibits cementitious properties in the presence of water and quicklime (CaO).
- FGD effluent can be used in place of fresh water
- stabilize any heavy metals
- Additionally FGD sludge can be included in the mixture to fixate additional pollutants.
- The final product from the pozzolanic reaction is then landfilled for final disposal.
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Fixation

- For a pozzolanic reaction to effectively mix and fixate dissolved solids in the effluent stream there must be a proper mixture of materials.
- A common technique is to blend fly ash, FGD calcium sulfite sludge and FGD effluent.
- In addition to this mixture an additional 2-4% of quicklime is added for additional calcium and drying. The initial handling properties of this stabilized FGD waste stream are sufficient enough to move and transported the material immediately after mixing. Within 3 days the landfilled stabilized material has enough internal strength to withstand 1 ton per square foot of pressure.

Example: treat a total 100 gpm of FGD Effluent Water

Pozzotec Mixture Ingredient	Pounds Per Hour
FGD effluent 100 gpm @ S.G.=1 (purged in combination with FGD sludge as 50% solids)	50,000 lb/hr
FGD calcium sulfite sludge dry weight	50,000 lb/hr
Fly Ash	50,000 lb/hr
Quicklime 2% combined weight (water+sludge+ash)	3,000 lb/hr
Total	153,000 lb/hr to landfill

Conclusion

- Pozzotec systems have been and continue to be a simple and economic route for disposal of power plant effluent waters and other coal combustion by-products.
- The Industry has over 30 years of experience in designing blends and helping customers maintain pozzolanic disposal systems.
- pozzolanic reactions can treat your solid and liquid wastes and help achieve zero liquid discharge and to ensure your system is ready for the new EPA regulations effecting FGD waste water.

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Thank You

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