

# Flue Gas Conditioning

Improve Performance of Electrostatic Precipitators and Capture of Flyash and Particulate

Flyash precipitators will not operate effectively if sufficient sulfur trioxide ( $\text{SO}_3$ ) is not present in the flue gas. By injecting  $\text{SO}_3$  and, in some cases, ammonia into the flue gas it improves the performance of Electrostatic Precipitators (ESPs). All of the  $\text{SO}_3$  attaches to the flyash and does not increase  $\text{SO}_x$  emissions.

To produce the desired conditioning gas in the flue gas conditioning (FGC) process, elemental sulfur is burned in a chamber which produces  $\text{SO}_2$ ; which is converted to  $\text{SO}_3$  with a catalyst and injected into the flue gas at levels normally less than 20 ppm.

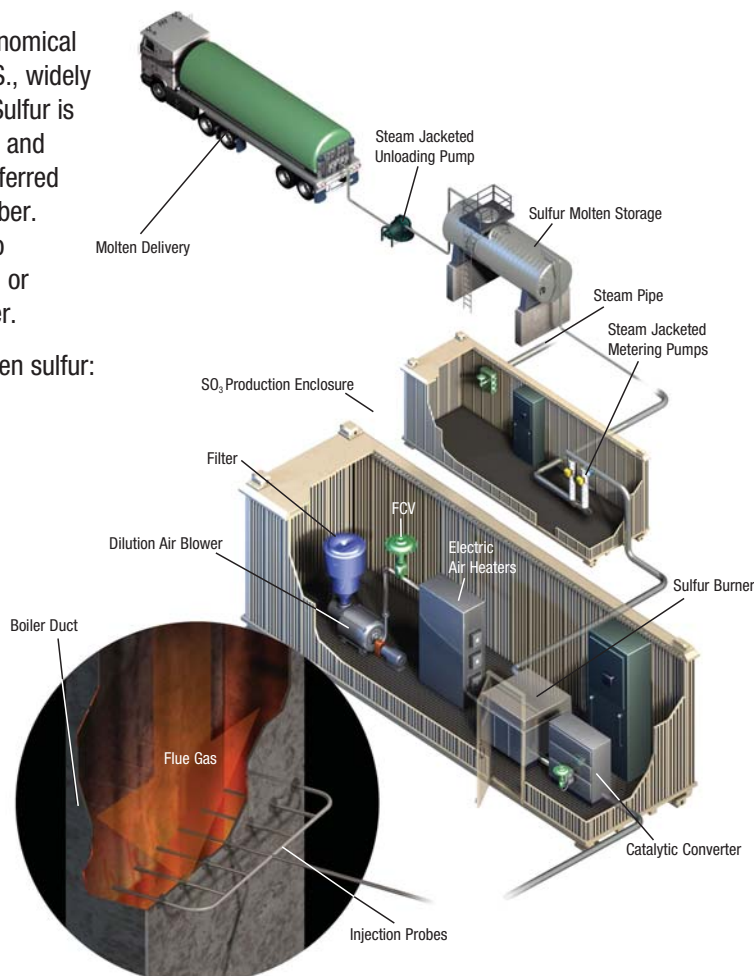
There are two sulfur feedstock options available: molten sulfur and pelletized dry sulfur or DSI™ Dry Sulfur Interface. Ammonia systems can be operated independently or added to  $\text{SO}_3$  injection for “dual conditioning.” The system best for you is unique to your operation’s capacity and flyash conditioning needs, as well as, the type of coal burned.

## Molten Sulfur

Molten sulfur is the most economical and common feedstock in U.S., widely available in bulk shipments. Sulfur is non-hazardous and is reliably and accurately metered and transferred to the burner converter chamber. The molten sulfur is heated to temperature with plant steam or via small, electric steam boiler.

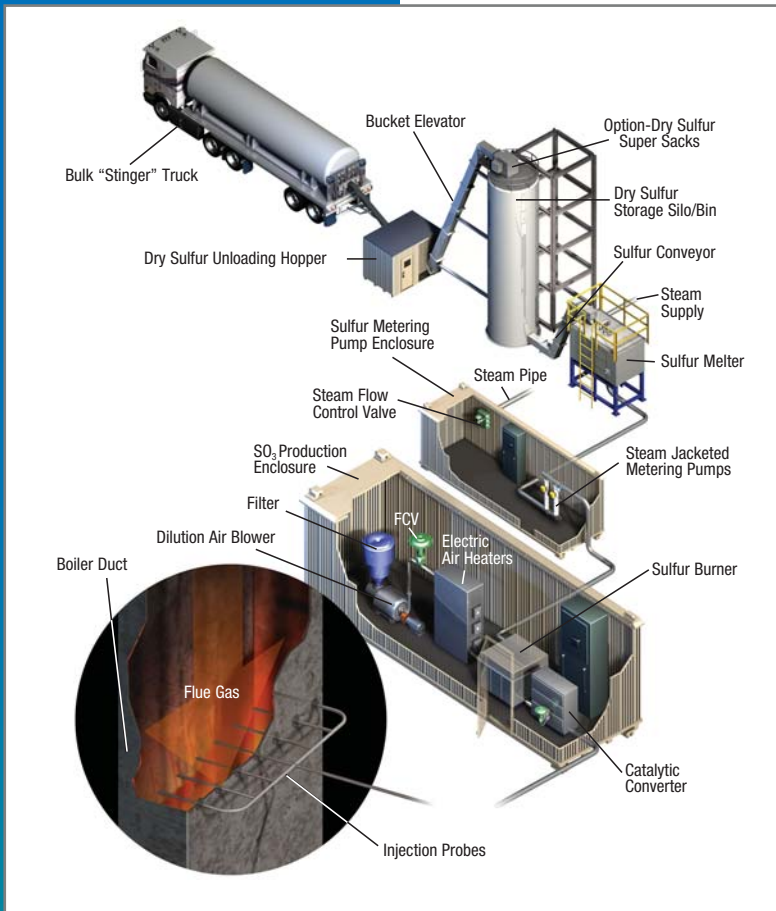
Equipment sequence for molten sulfur:

- Molten Tank
- Metering Pumps
- $\text{SO}_3$  Production
  - Air Blower
  - Air Heater
  - Sulfur Burner
  - $\text{SO}_2/\text{SO}_3$  Converter
- Injection Probes



## Benefits

- Enhanced collection of flyash when burning low quality coals
- Reduction in stack and visible opacity and plume
- Injection of  $\text{SO}_3$  and ammonia into flue gas to improve operation of Electrostatic Precipitators (ESPs)
- Reduction of precipitator sizing and capital requirements for new boilers
- Produces continuous supply of molten sulfur for high accuracy metering while requiring minimal molten sulfur storage
- Reduces flyash resistivity
- Improves ESP capture of fine particulate for reduced opacity and emissions
- Technology proven on over 500 ESPs worldwide

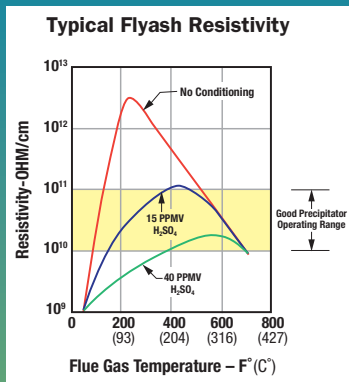


## DSI™ Dry Sulfur Interface

Pelletized Sulfur or Dry Sulfur Interface Technology (DSI™ Technology) provides substantial benefits, especially for smaller capacity units. It eliminates unloading of hot molten sulfur from a tanker truck and reduces steam usage and amount of jacketed interconnecting process piping. Dry sulfur is shipped on pallets or in silo and can be stored indefinitely without need for steam heating. It has more flexibility in sulfur storage location and equipment layout and is widely available in one-ton super-sacks or bulk deliveries. As with molten sulfur, dry sulfur is also non-hazardous.

Equipment sequence for DSI™ Technology:

- Dry Unloading
- Dry Silo w/ Conveyor
- Sulfur Melter
- Metering Pumps
- SO<sub>3</sub> Production
  - Air Blower
  - Air Heater
  - Sulfur Burner
  - SO<sub>2</sub>/SO<sub>3</sub> Converter
- Injection Probes



## Fly Ash Resistivity vs. Flue Gas Temperature

Cold side ESP's are located downstream of the air heater. FGC modifies ash resistivity for optimum ESP performance.

## Ammonia Systems

Ammonia systems are available using anhydrous or aqueous ammonia. NH<sub>3</sub> is effective alone in certain precipitator enhancement applications, or also in conjunction with SO<sub>3</sub> creating a "dual" conditioning process.

- Wide range of system size availability
- Urea based systems provide safer reagent
- Dual FGC required for high ash coals and flyash where SO<sub>3</sub> alone is not sufficient
- Dual FGC is effective on high ash coals, including many from China and India



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