Stationary Source Control Equipment

Carlos Garcia
Technical Projects Coordinator
Central Region
Stationary Source Control Equipment

- Particulate
- SOx
- VOC
- CO
- NOx
PM Control

- Cyclones
- Baghouses
- ESPs
- Scrubbers
- Particulate Filters
Cyclones
Multi-Cyclone
Baghouse
Clean Air
Clean Air Plenum
Pulse Pipe
Bag
Cage
Venturi
Solenoids
Dust-Laden Air
Inlet Baffle
Pulse Jet
Baghouse
Pulse Jet
Baghouse
Pulse Jet Baghouse
Inside a Pulse Jet Baghouse
Pulse Jet Bag
Measuring Pressure Drop

Clean-air Plenum

Dirty-air Plenum

Tubing

High

Low
Baghouse Design Considerations

- Pressure Drop
- Air-To-Cloth Ratio
- Collection Efficiency
- Fabric Type
- Cleaning
- Temperature Control
- Bag Spacing
- Compartment Design
- Space and Cost
Electrostatic Precipitator
ESPs: Design Factors Affecting Performance

- Specific Collection Area
- Aspect Ratio
- Collection Plate Spacing
- Sectionalization
- Power Requirements/Spark Rate
Diesel Particulate Filters
Diesel Particulate Filter (DPF)
PM Scrubbers
Packed-Bed Wet Scrubber

- Clean Gas
- Mist Eliminator
- Liquid Spray
- Packing
- Dirty Exhaust
- Dirty Scrubber Liquid
Wet FGD

SOx Control

Clean Flue Gas Out

Moisture Separator

Water Wash Nozzles

Multiple Interspatial Spray Levels

SOx and Flue Gas In

Absorption Zone

Patented Tray Promotes Gas/Slurry Contact

Quench Zone Saturates Gas with Slurry

Recirculation Pumps

Agitator Continuously Mixes Slurry To Prevent Settling

Oxidation Zone

Oxidation Air Supply

Patented Alloy Perforated Tray

Silicon Carbide Slurry Spray Nozzle
Five FGD Scrubber Modules on Utility Boiler
VOC Control

- Transfer Efficiency
- Containment
- Condensation
- Absorption
- Adsorption
- Oxidation
High Volume Low Pressure (HVLP) Spray Gun
Controlled Spraying

- Reduces VOC emissions
- Increases transfer efficiency
- Low fluid tip pressure
- Employee gun handling training
Gel Coat Application in a Spray Booth
Carbon Adsorption Systems
Carbon Adsorbers at a Soil Remediation Site
Combustion Sources
Flare at Landfill

Combustion of VOCs
Thermal Oxidizer/Afterburner

- Waste Gas
- Auxiliary Fuel Burner
- Waste Gas
- Mixing Section
- Combustion Section
- Optional Heat Recovery
- Fan
Thermal Incinerator
Venting to Oxidizer
NOx Control

- Thermodynamic realities
- Low-NOx combustion techniques
- Ammonia injection (SCR & SNCR)
- Catalytic controls
Thermal NOx
Fuel-bound NOx
Prompt NOx

NOx Creation
Low-NOx Burner with Staged Fuel
Flue Gas
Recirculation
Gas Turbine Power Plant Controls
Gas Turbine Power Plant
Steam/Water Injection
Selective Catalytic Reduction (SCR)

- NOx control thru ammonia (NH₃) injection
  - $4\text{NO} + 4\text{NH}_3 + \text{O}_2 \rightarrow 4\text{N}_2 + 6\text{H}_2\text{O}$
  - $2\text{NO}_2 + 4\text{NH}_3 + \text{O}_2 \rightarrow 3\text{N}_2 + 6\text{H}_2\text{O}$
- 65-90% control
- Problems
  - Expensive
  - High maintenance
  - Ammonia “slip”
  - Catalyst replacement & disposal
NH₃ Manifold
Small Boiler with SCR
Gas Fired I.C. Engine Controls
Gas Fired I.C. Engines
Three-Way Catalyst
The End