Advanced Air Quality Control
Retrofit Solutions for PC Fired Boilers

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BoldEco Low-Cost Solutions

• Address SO$_x$, HCl, NO$_x$, Hg, PM$_{10}$ and PM$_{2.5}$ individually OR comprehensively

• Fully retrofit and add-on technologies

• Small footprint - require little space for installation

• High performance - require shorter residence times

• Cut into existing ductwork; Short tie-in time

• Leverage inherent process chemistries to achieve minimal operating cost

• Low capital and operating costs
BoldEco Low-Cost Solutions

• Scrubbing (Multi-phase Reaction) Optimization Solutions
  - Acid Gas Scrubbing and Neutralization
    • sorbent efficiency and utilization
  - Elemental Hg Conversion and Adsorption
    • Oxidation and particulate formation

• Particulate Control Solutions
  - PM Capture Optimization for ESPs
    • Resistivity and Humidity control
  - Condensables and Ionic Hg Capture
    • Nucleation by Gas Cooling
BoldEco Family of Technical Solutions

Eco|SprayTech Systems
  - Gas cooling and reaction chambers, patented injection systems for gas cooling, humidification, emergency dilution and chemical reactions

Eco|SorbTech Systems
  - Low-cost BACT and MACT level acid gas and combined PM removal

Eco|PulseTech Systems
  - Low-cost MACT level high efficiency Fabric Filters for PM removal, controls and add-on systems for FF optimization

Eco|SelecTech Systems
  - Low-cost MACT level, low temperature SCR and SNCR NO\textsubscript{x} removal, hybrid SNCR/SCR systems
 BoldEco Low-Cost Solutions

• Acid Gas Scrubbing Optimization
  - Dry Sorbent Injection - Reactor or In-duct Injection Approaches
    • Calcium-based DSI
      • Spongiacal Lime Injection
      • Microfine Lime Injection
      • Hybrid Dry-Wet Injection Retrofits
      • Fully Dry or Humidification-Assist
    • Sodium-based DSI
      • Trona Grinding/Dosing and Injection
      • Sodium Bicarbonate Grinding/Dosing and Injection
BoldEco Low-Cost Solutions

• Hg and Particulate Control Enhancement
  - ESP Enhancement
    • Spray Cooling
  - Condensables Enhancement
    • Spray Cooling
  - ACI Enhancement
    • Spray Cooling
BoldEco Low-Cost Solutions

Gas Cooling Solutions
Low-Cost ESP Enhancements

- ID-side - Evaporative Gas Cooling Tower
- FD-side - Fan Inlet Cooling
Solution Element - EGC Spray Cooling Tower
Solution Element - EGC Spray Cooling Tower

- Downflow EGC Tower in installed after APH where finely atomized water is evaporated to cool gases to lower resistivity
- EGC tower eliminates danger of build-up in ductwork and provides engineered evaporation times
Flyash Resistivity

Optimum Resistivity Range for Good ESP Operation
Air Preheater Outlet Temperature Profile
Zone Cooling Approach

CIRCULAR AIR HEATER PROFILE
- PRIMARY/SECONDARY AIR DUCTING
- AIR PREHEATER SEAL
- AIR INLEAKAGE
- HIGH VOLUME GAS FLOW
- 260°F
- 310°F AVG
- 360°F
- HOT GAS TO PRECIPITATOR
- LOW FLOW RATE
- LOW VELOCITY

DUCTING OUTLINE

ZONE COOLING TARGET

VIEW FROM ESP

Spray Cooling Target
Zone Cooling Implementation with EGC

Duct Temperature Profile
Upstream of EGC

Duct Temperature Profile
Downstream of EGC

ESP Inlet Temperature Profile
280-300°F Average
Additional Benefits of Cooling Technology

• Enhancement of DSI
• Enhancement of ACI
• Enhanced Collection of Condensable Fraction
• More Stable ESP Electrical Operation
BoldEco Low-Cost Solutions

Acid Gas Control Solutions
Low-Cost Acid Gas Solutions

• DSI Enhancement
  - Evaporative Gas Cooling Tower (EGC) Temperature Control
    • Enhances Acid Gas Removal by Approach to Saturation
    • Enhances HCl, H$_2$SO$_4$ and SO$_2$ Capture
  - EGC Combined with Turbulent Fluid Bed Reactor
    • Increases Utilization of Sorbent
    • EGC establishes Optimum Temperature to Optimize Reaction
    • Provides Increased Turbulence
    • Increases Gas Contact Time
    • Eliminates Sorbent Build-up
Solution Element -
TFB Reaction Chamber
Solution Element - TFB Reaction Chamber

- Upflow reactor close-coupled to an EGC Tower
- Sorbent is injected downstream of pre-cooled gases to maximize reaction
- Upflow reactor greatly increases turbulence, mixing and residence time
BoldEco Low-Cost Solutions

Dry Injection Solutions
BoldEco/STM Micron Technology Benefits

• Increased efficiency for removal and injection rates

• Guaranteed particle size distribution
  - Optimized for SO2 or HCl removal, depending on requirements

• 8000 Hr guaranteed operating time without maintenance

• Maintenance friendly design

• Soundproof enclosures available for inside installations

BoldEco|Environment
JCF Mill Schematic
Bicarmill Installation
Integral Controls

Automatic Greasing

Anti-Scaler

Operating Guarantee
8’400 h

Air Flowmeter

Vibration Sensor

Temperature Measurement

BoldEco Environment
Bicarmill Installation Example
Distributor Application