Air Monitor Power Air & Coal Flow Measurement Systems

Wall-Fired
T-Fired
Cyclones
CFBs
Stokers
Trash Burners

OFA
IBAM
Pf-FLO
CEM
PA
SA

Proven solutions for a tough industry
Coal Flow Measurement

[Diagram showing signal processing and coal flow measurement]

Amplitude

Frequency shift

X/2

Mid amplitude

Y/2

Frequency

Sensor distance 40 - 60 cm

Transmitter

Receiver

Signal 1: \( x(t) \)

Signal 2: \( y(t) = x(t-T) \)

Cross correlation method

Pf velocity = \( \frac{\text{Distance}}{\Delta t} \)
MBF Mill Improvement

- Decreasing PA improves coal balance
- Optimum coal velocity for better combustion
Coal Pipe Layout

Proven solutions for a tough industry
Coal Mass and Coal Speed

Proven solutions for a tough industry
Absolute Coal Flow

Proven solutions for a tough industry
Adjustable Diffusing Coal Valves
Coal Pipe Balancing
Coal Pipe Balancing
Coal Pipe Balancing
Prevent Burner/Pipe Fires
Prevent Burner/Pipe Fires
Pulverizer Overview

- Automatic PA “kicker” for lowest pipe velocity limit
Burner Airflow – IBAM

Proven solutions for a tough industry
Burner Airflow Measurement

Wind Tunnel Testing at Air Monitor HQ

**Equation 2:** Inner Vane Position - 15° Open, Outer Vane Position - 55° Open

\[
\text{Coefficient} = 0.0000335938^*X^4 - 0.0013321146^*X^3 + 0.0179408814^*X^2 \\
- 0.0886535541^*X + 0.8467944546
\]

**Equation 3:** Inner Vane Position - 15° Open, Outer Vane Position - 60° Open

\[
\text{Coefficient} = 0.0000718750^*X^4 - 0.0025442917^*X^3 + 0.0314481881^*X^2 \\
- 0.1504645772^*X + 0.9413919352
\]
F/A Screens in Control Room
Crystal River Unit 4 CCM success

- B&W Opposed Fire Pulverized Coal 770 MW
  - 6 MPS-89 Pulverizers
    - 9 Coal Outlets per Mill
  - 54 B&W DRB-4Z Low NOx Burners

- 6 Compartmentalized Windboxes
  - 3 x Front, 3 X Rear

- SCR, Cold Side ESP & Wet FGD
Continuous Combustion Management (CCM)

- **Equipment Additions:**
  - Coal Flow Measurement & control valves
  - Burner Secondary Air Flow Measurement & auto purge
  - Burner Secondary Air Flow Adjustment
  - Primary Air Measurement and Auto Purge
  - CO measurement

- **Equipment Modifications**
  - Relocation of O2 Probes
  - New O2 equipment (probes and cabinets)
CRN O2 Distribution Comparisons

CR4 O2 Profiles

CR5 O2 Profiles

Note: Unit scales are different
CO Measurement gives confidence in O2 reduction
CO and O2 in close proximity
New O2 Curve

- LOI benefit
Project Results

- Boiler Efficiency Increase = 0.5%
  - Annual fuel savings
- Combustion NOx Reduction
  - 7% at full load, 15-25% at part load
  - Annual Ammonia Reagent Usage Reduction
  - SCR Catalyst Life Extension
- Fan Auxiliary Power Savings
- Reduced LOI
- Reduced potential for slagging and fouling events
- Improved Pressure part life due to improved temperature profile