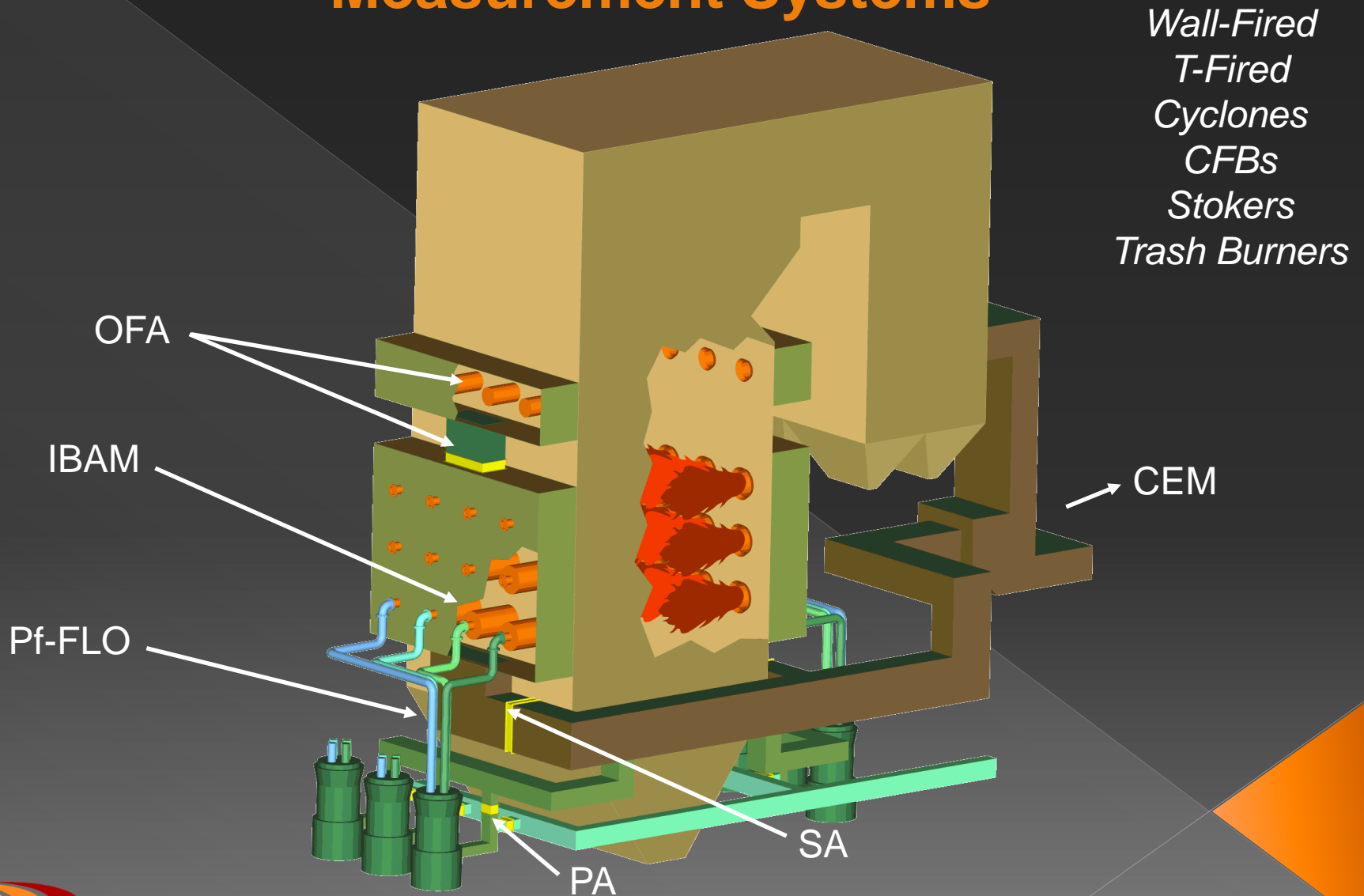
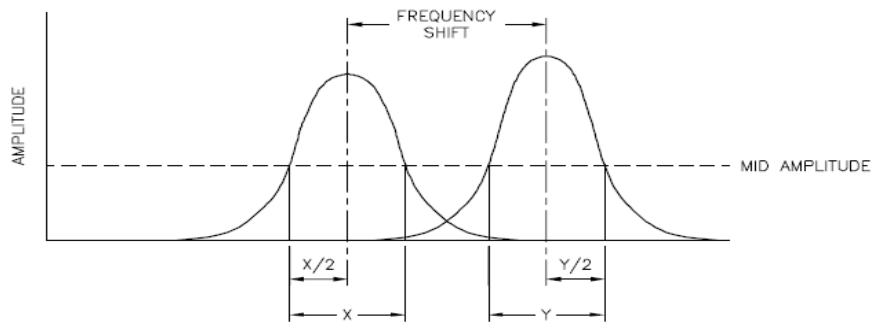


Air Monitor Power Air & Coal Flow Measurement Systems

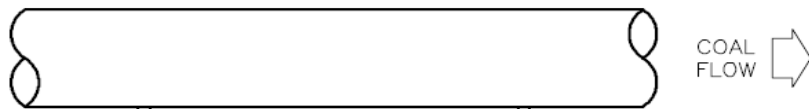


Proven solutions for a tough industry

Coal Flow Measurement

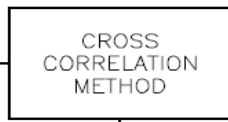


SENSOR DISTANCE
40 - 60 cm



SIGNAL 1
 $x(t)$

SIGNAL 2
 $y(t)=x(t-T)$

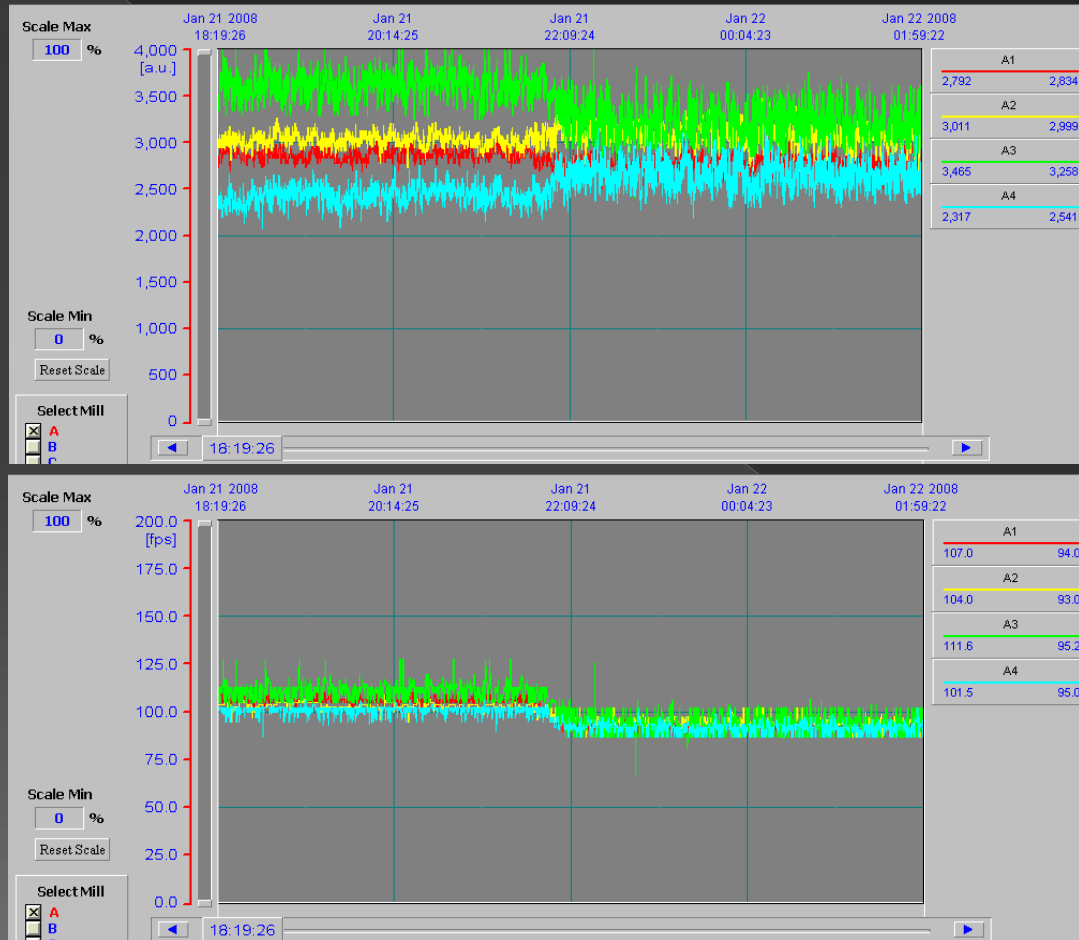


$$\text{PF VELOCITY} = \frac{\text{DISTANCE}}{\Delta t}$$

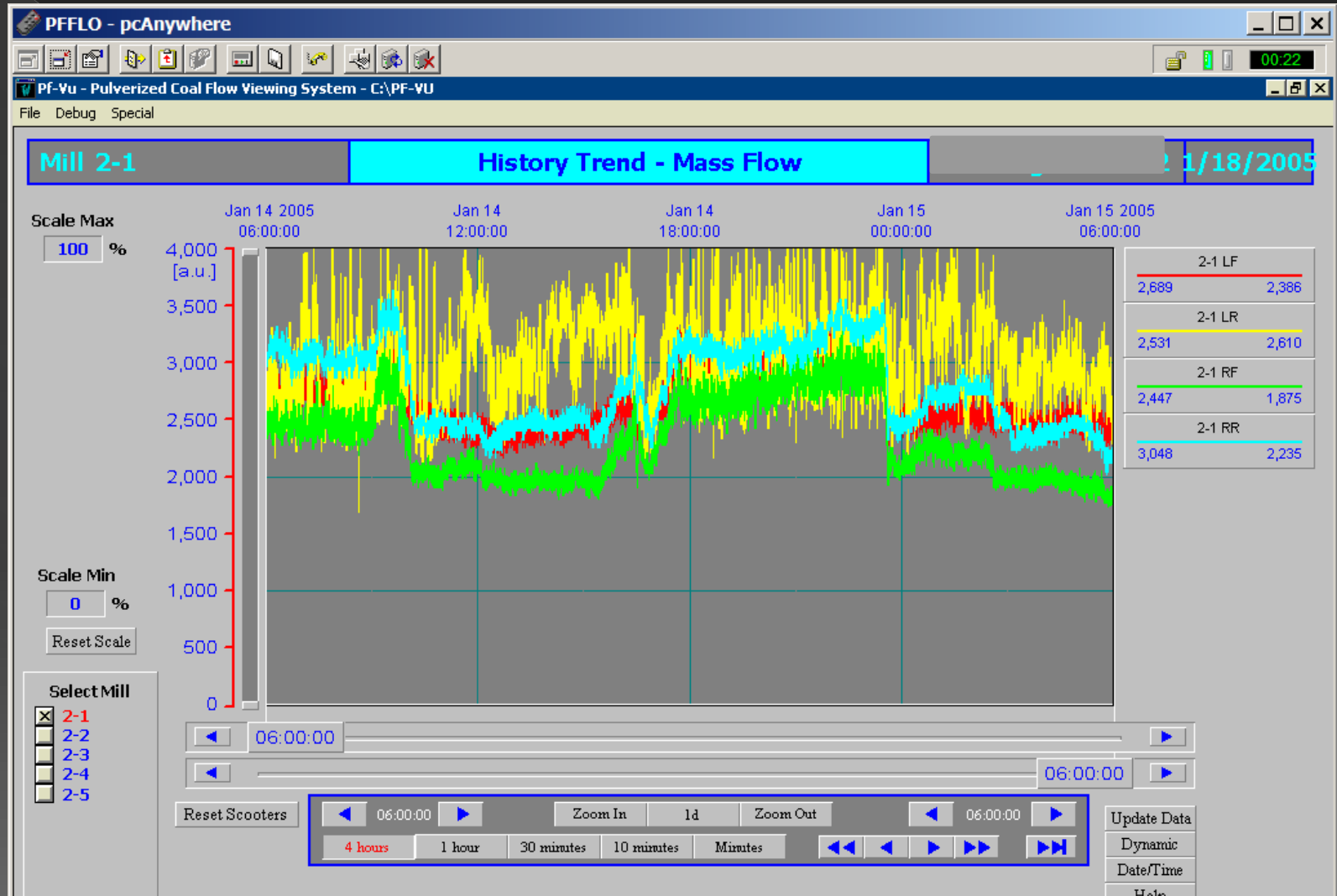


MBF Mill Improvement

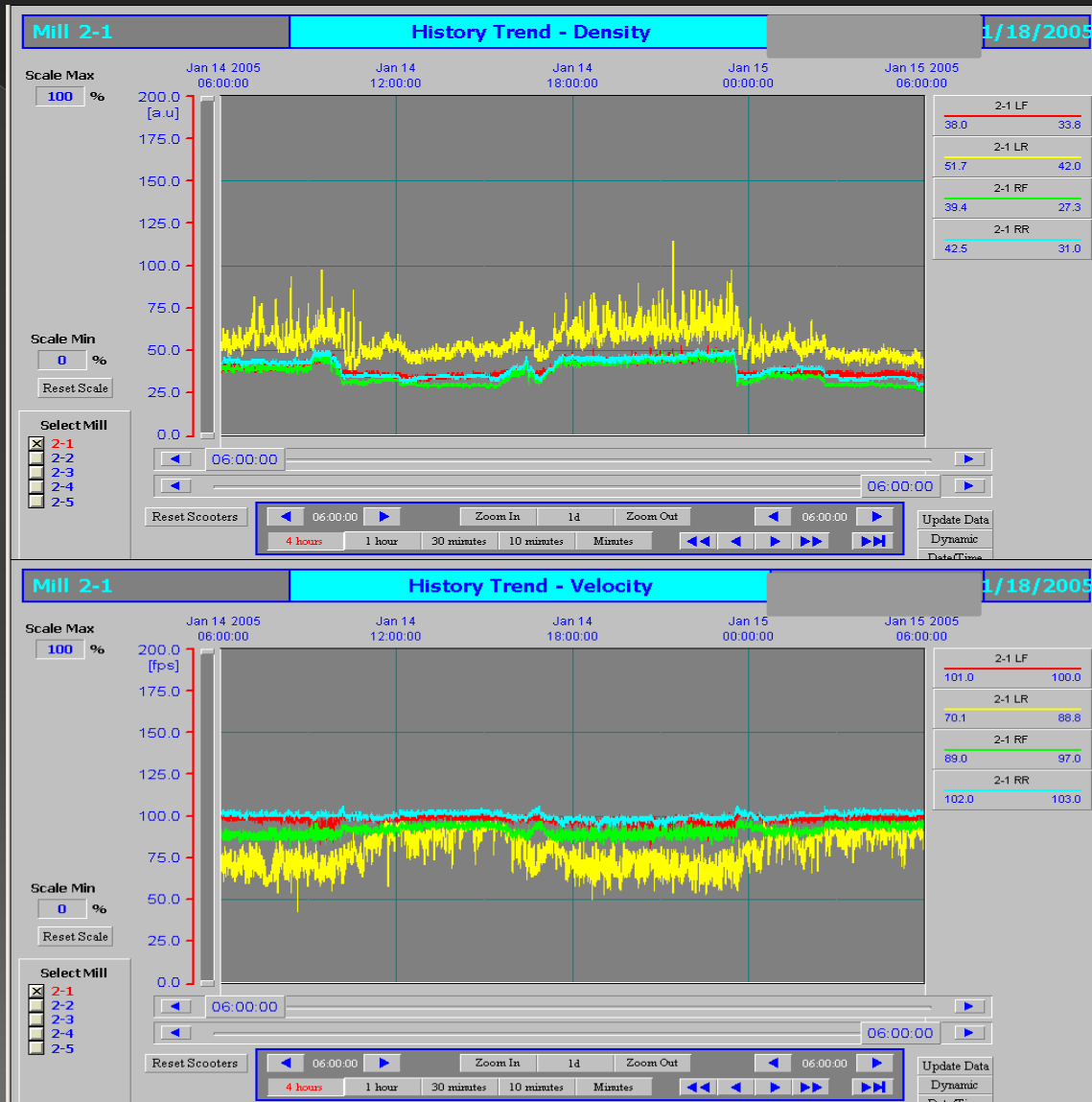
- Decreasing PA improves coal balance
- Optimum coal velocity for better combustion



Coal Pipe Layout

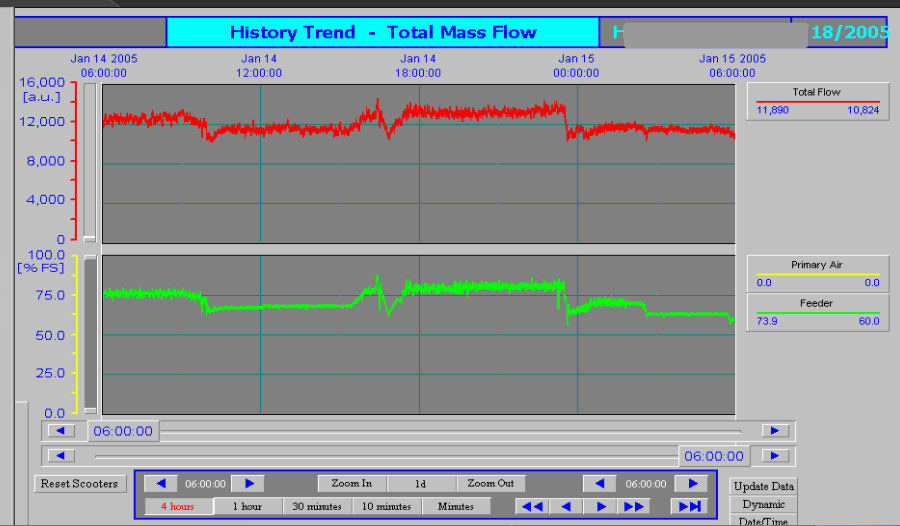
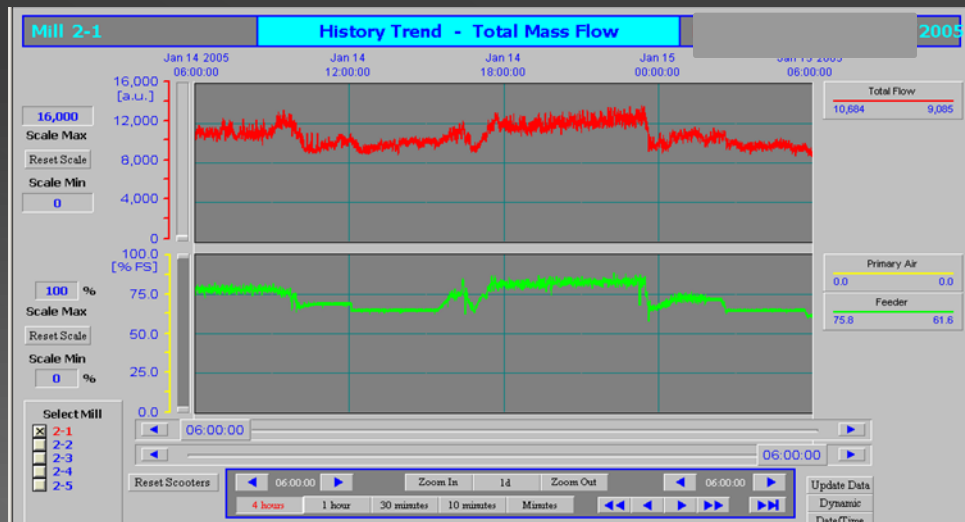
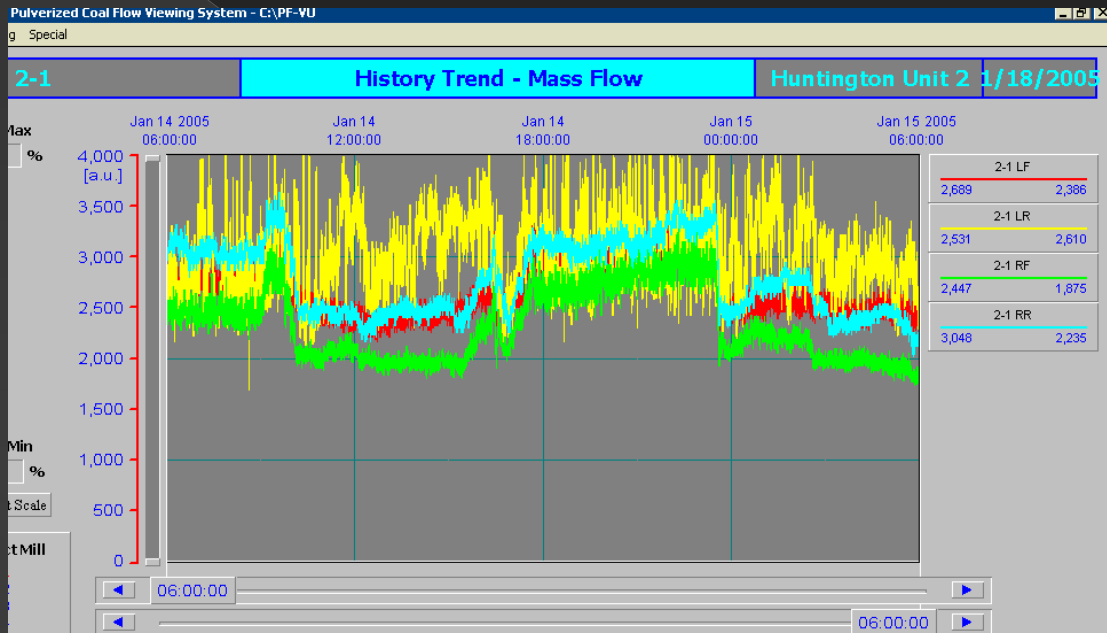


Coal Mass and Coal Speed

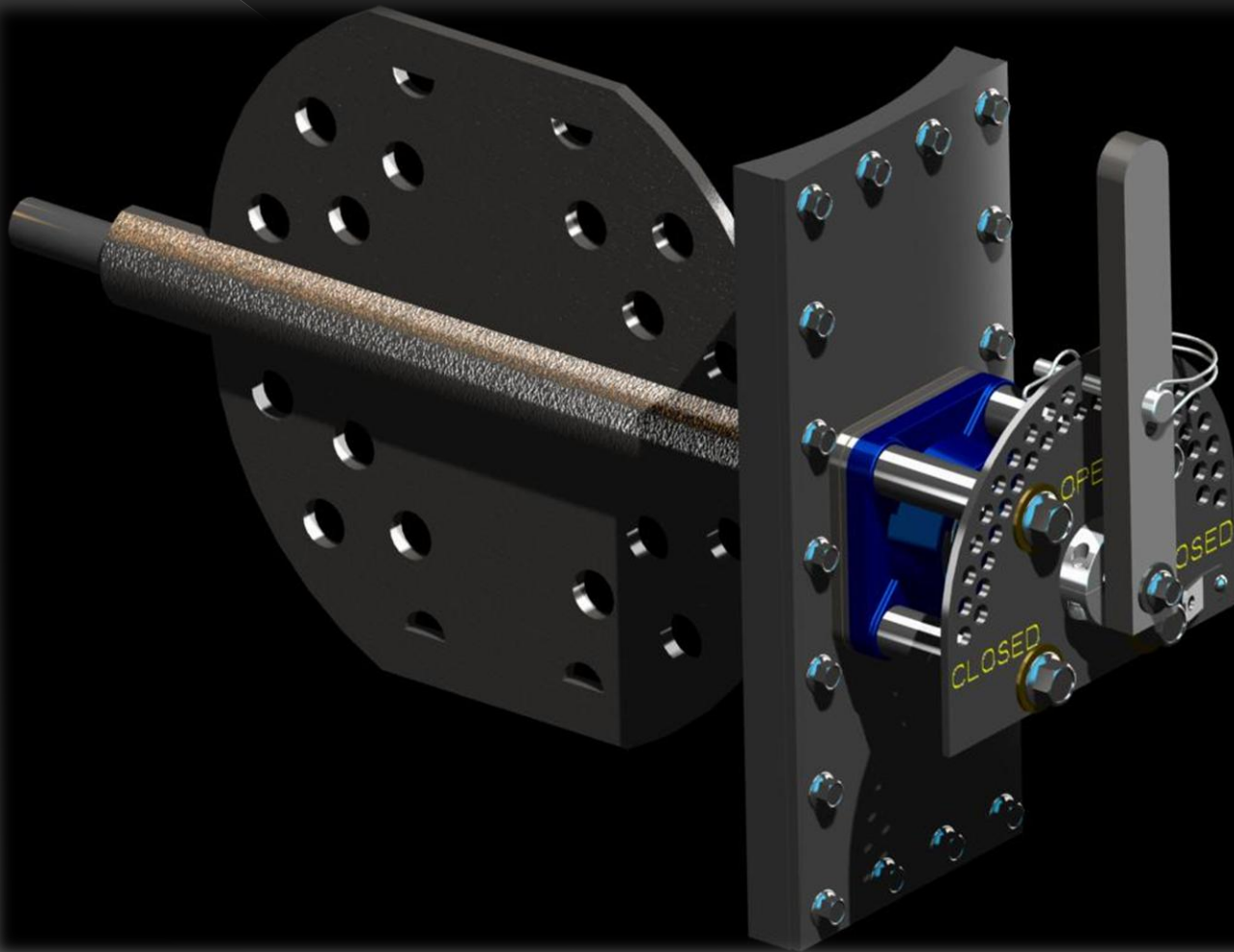


Proven solutions for a tough industry

Absolute Coal Flow



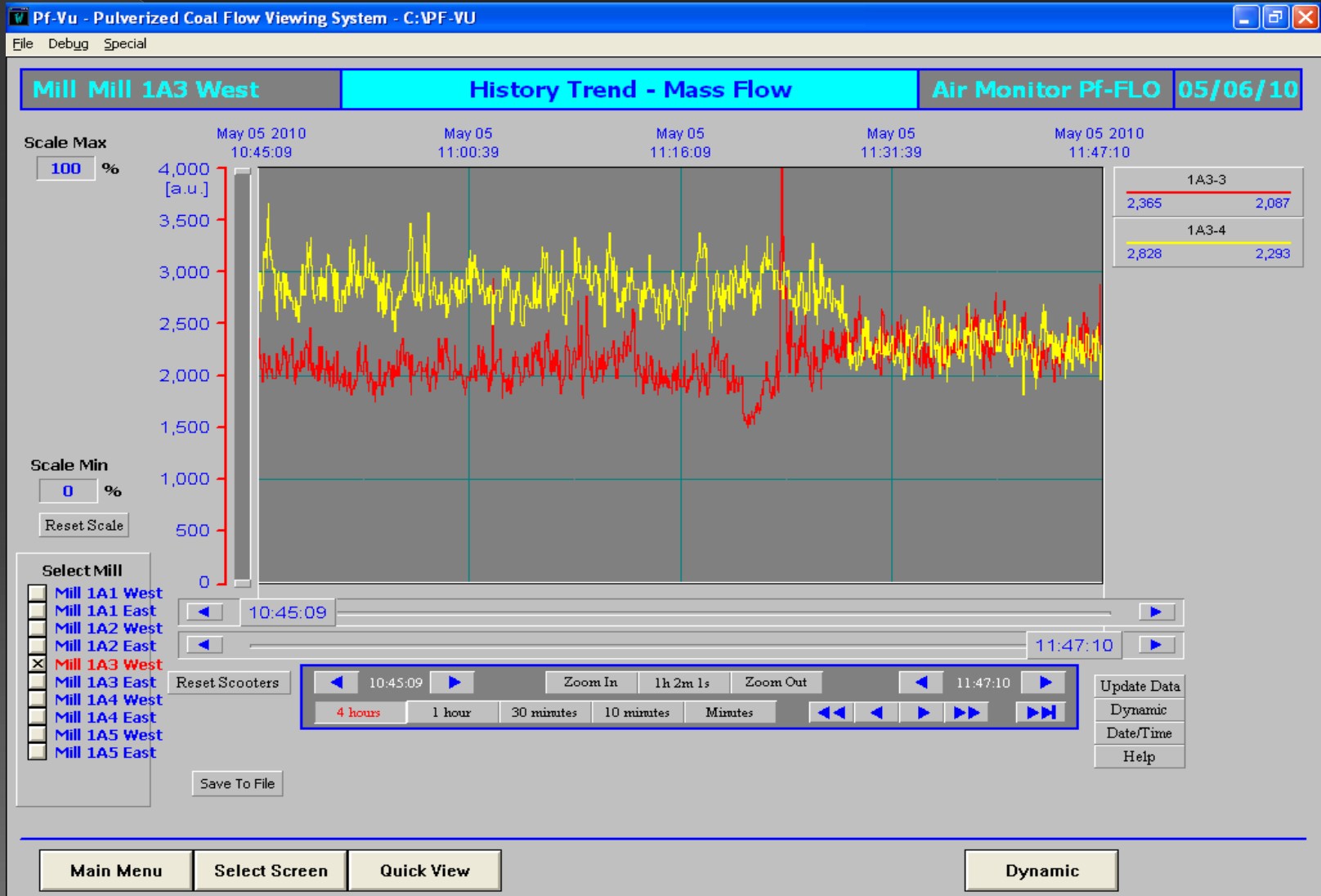
Adjustable Diffusing Coal Valves



Coal Pipe Balancing

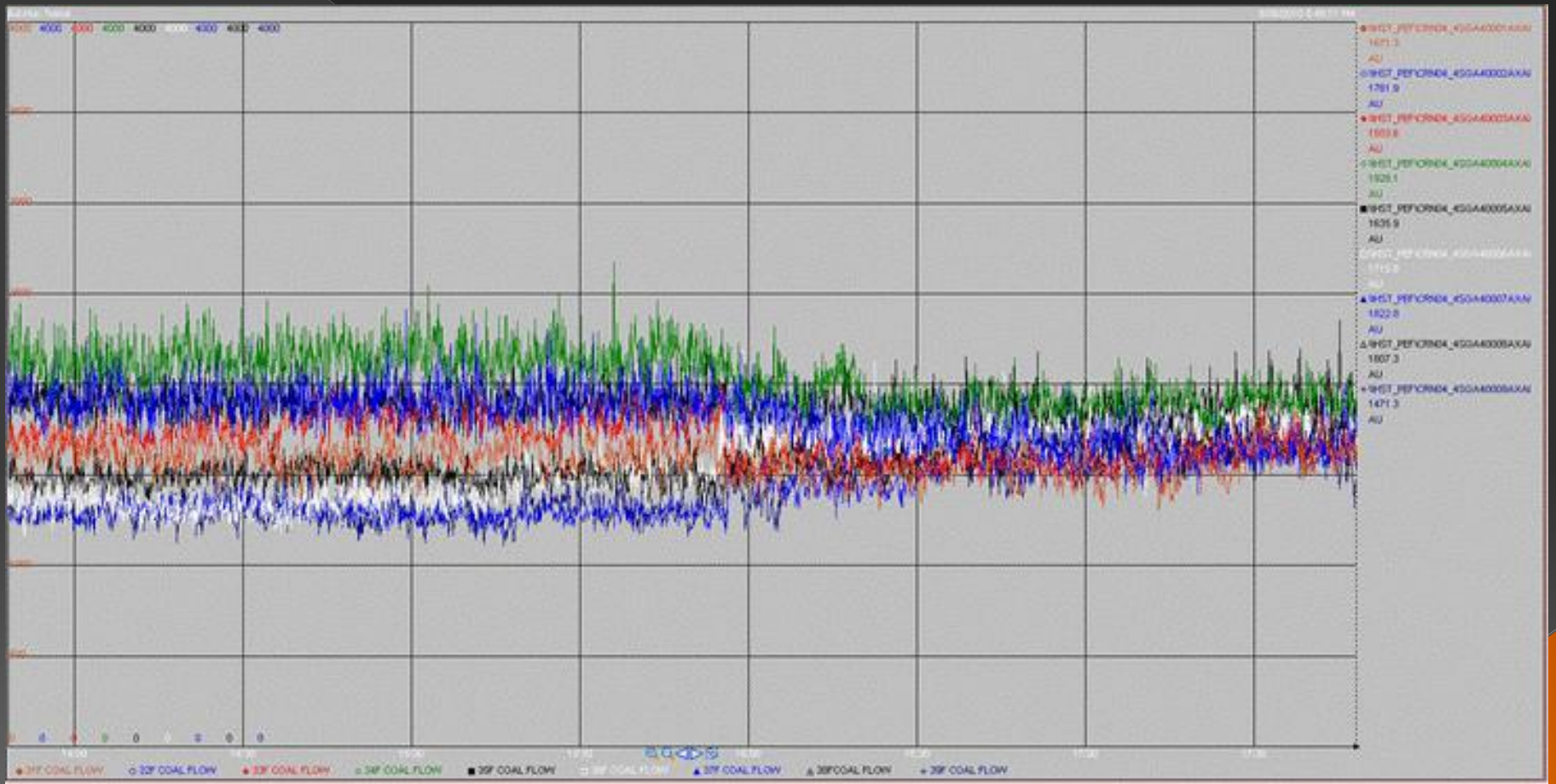


Coal Pipe Balancing

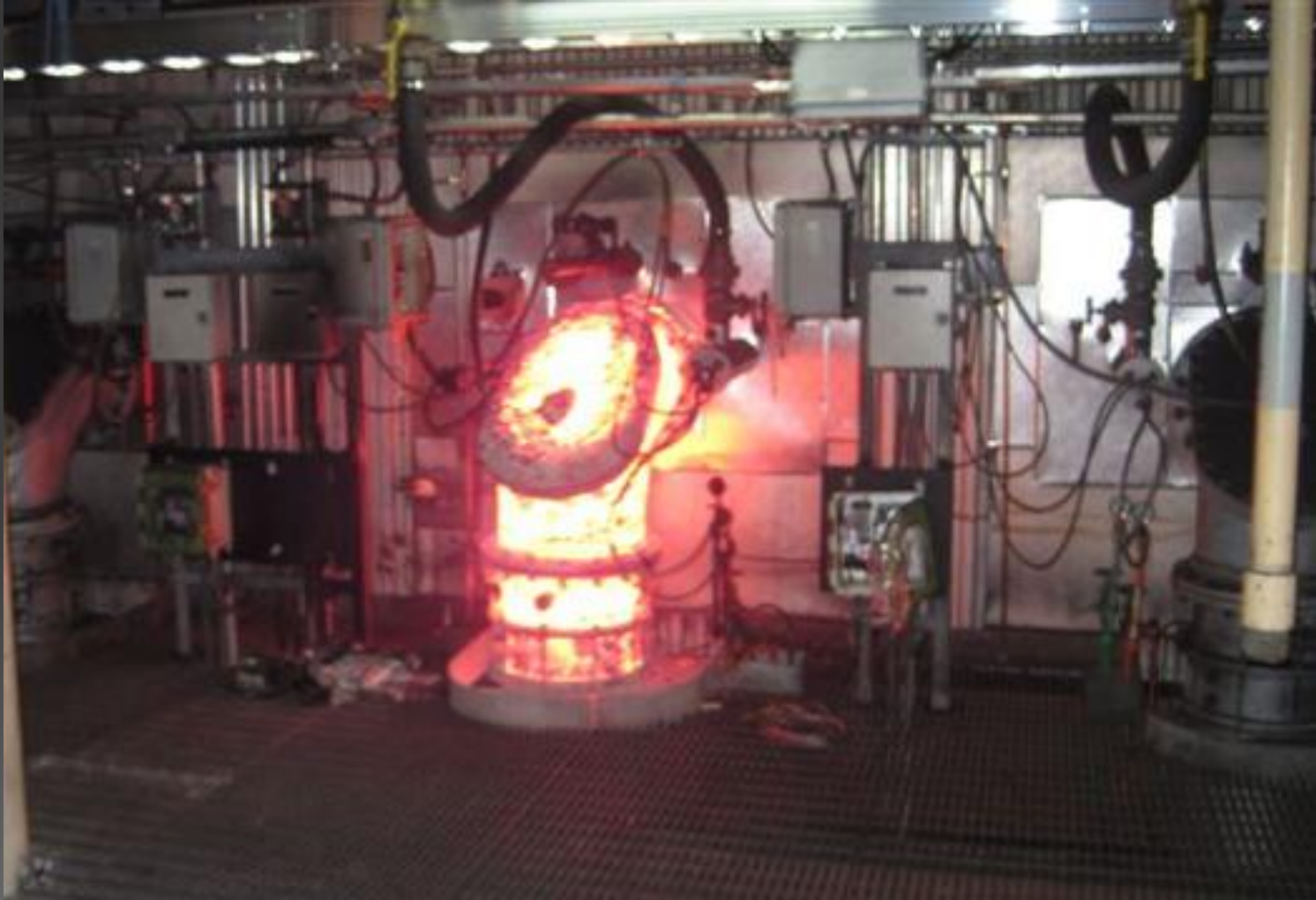


Coal Pipe Balancing



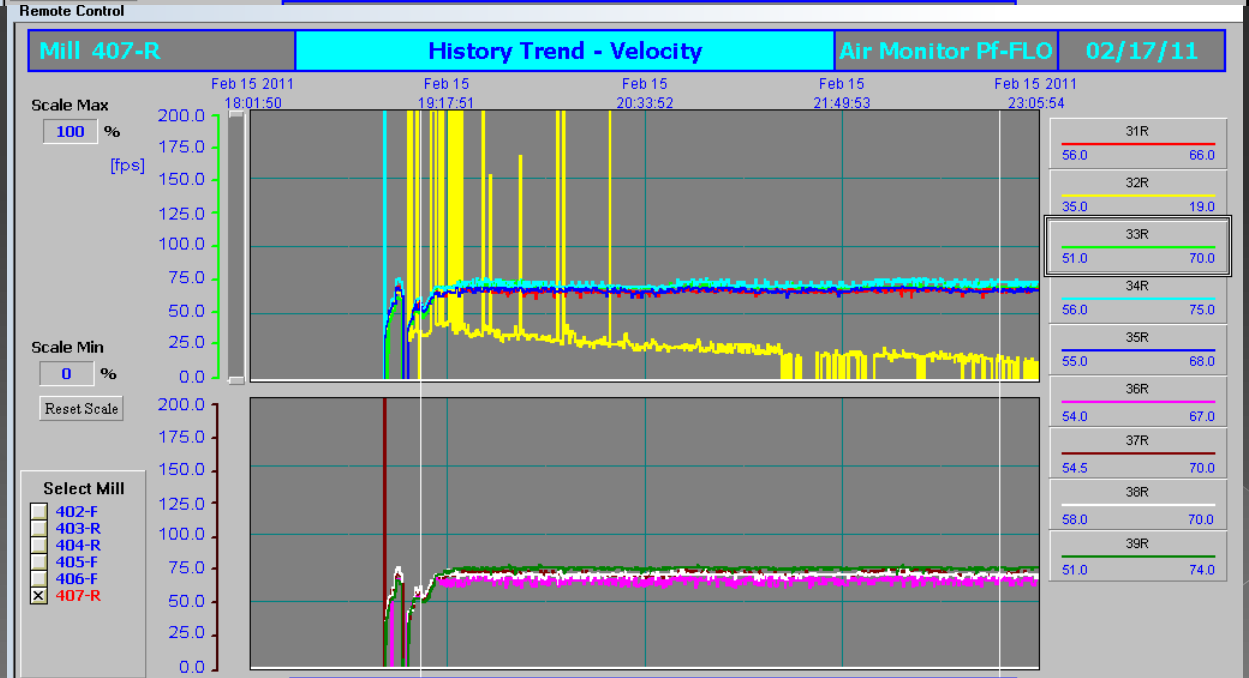
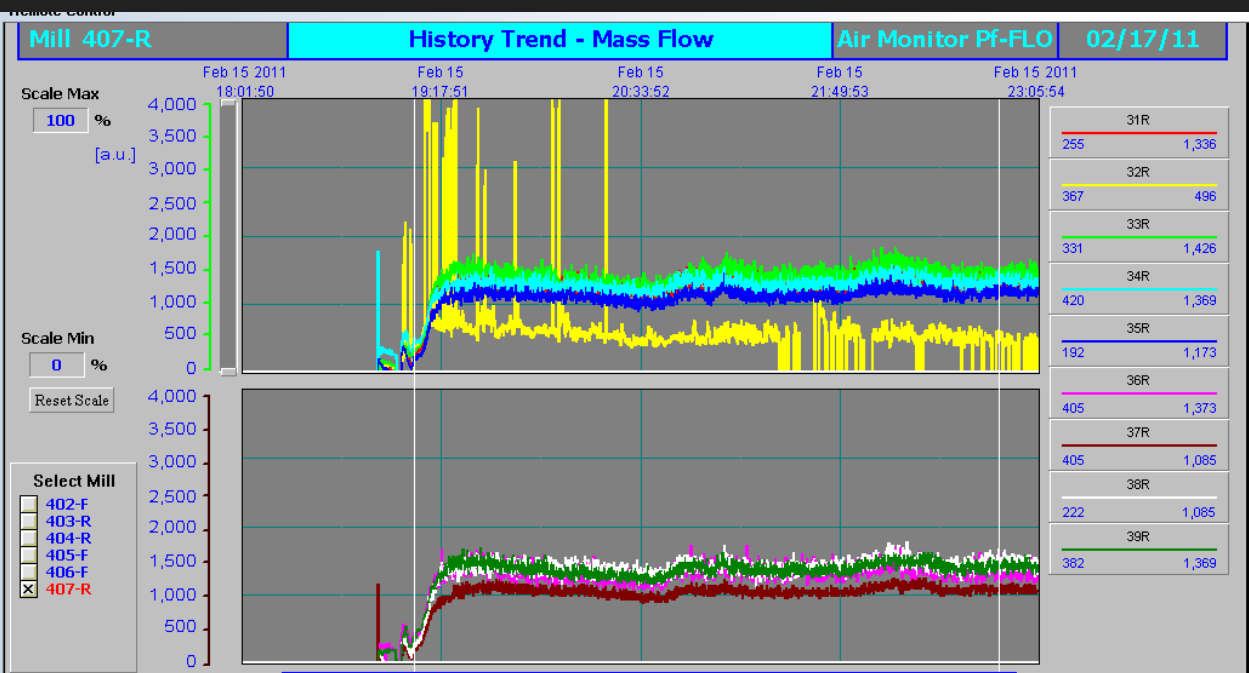


Prevent Burner/Pipe Fires



Prevent Burner/Pipe Fires





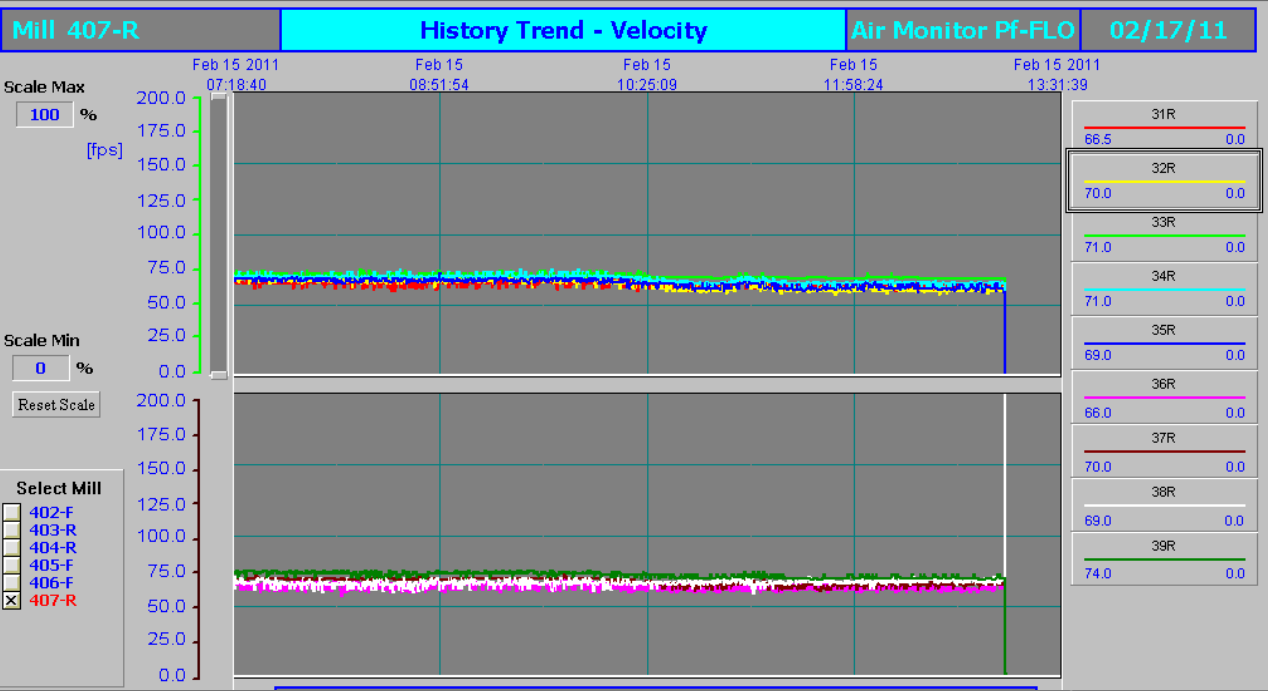
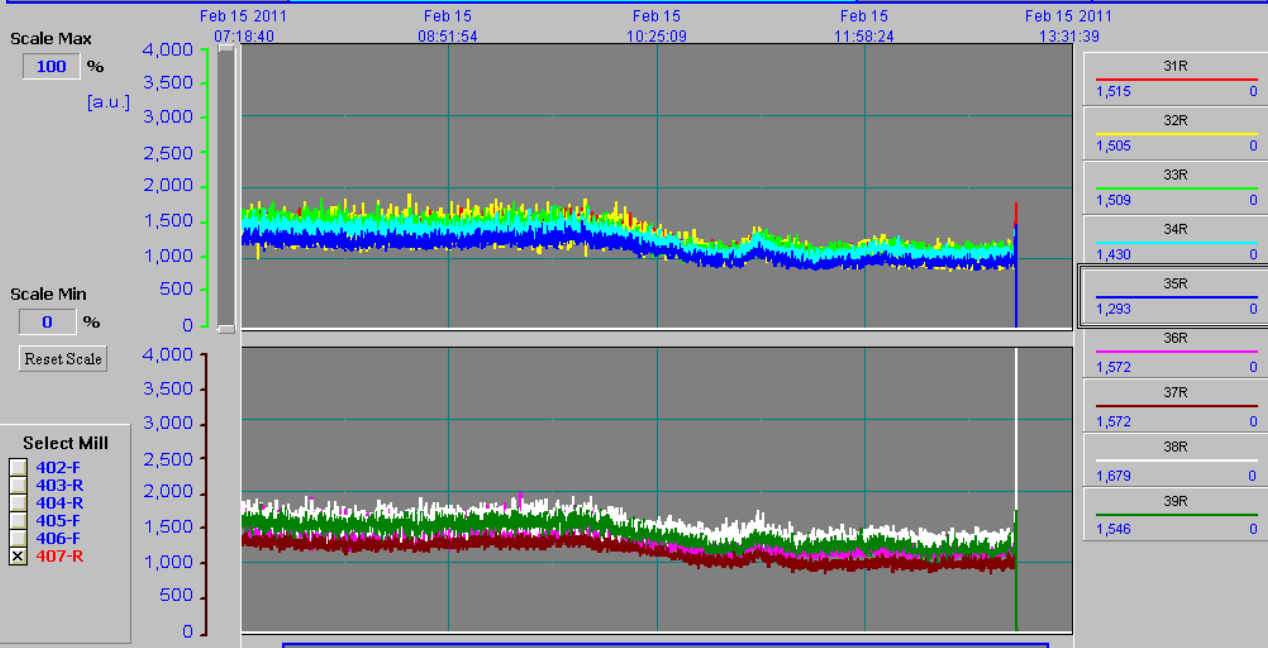
Proven solutions for a tough industry

Mill 407-R

History Trend - Mass Flow

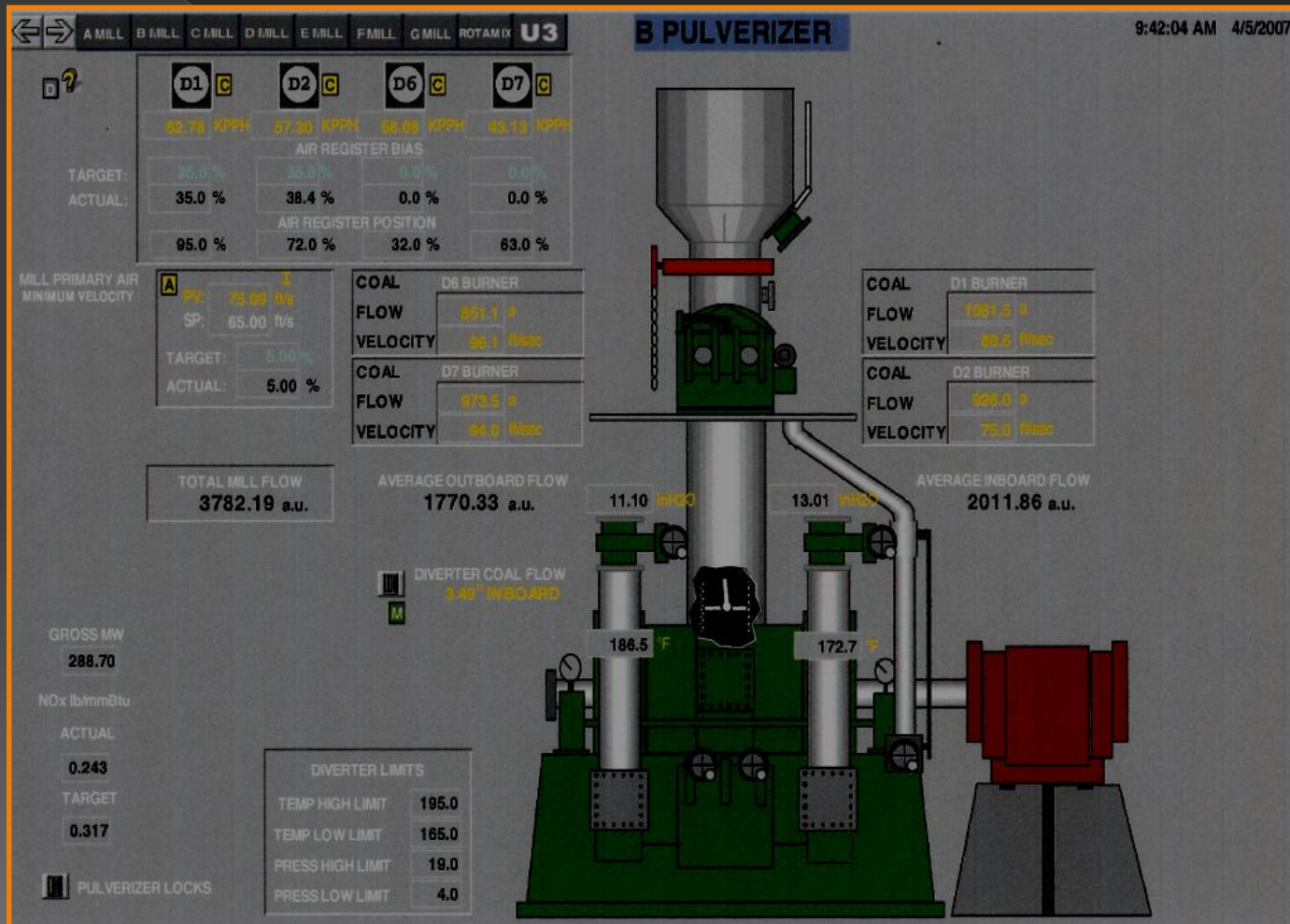
Air Monitor Pf-FLO

02/17/11



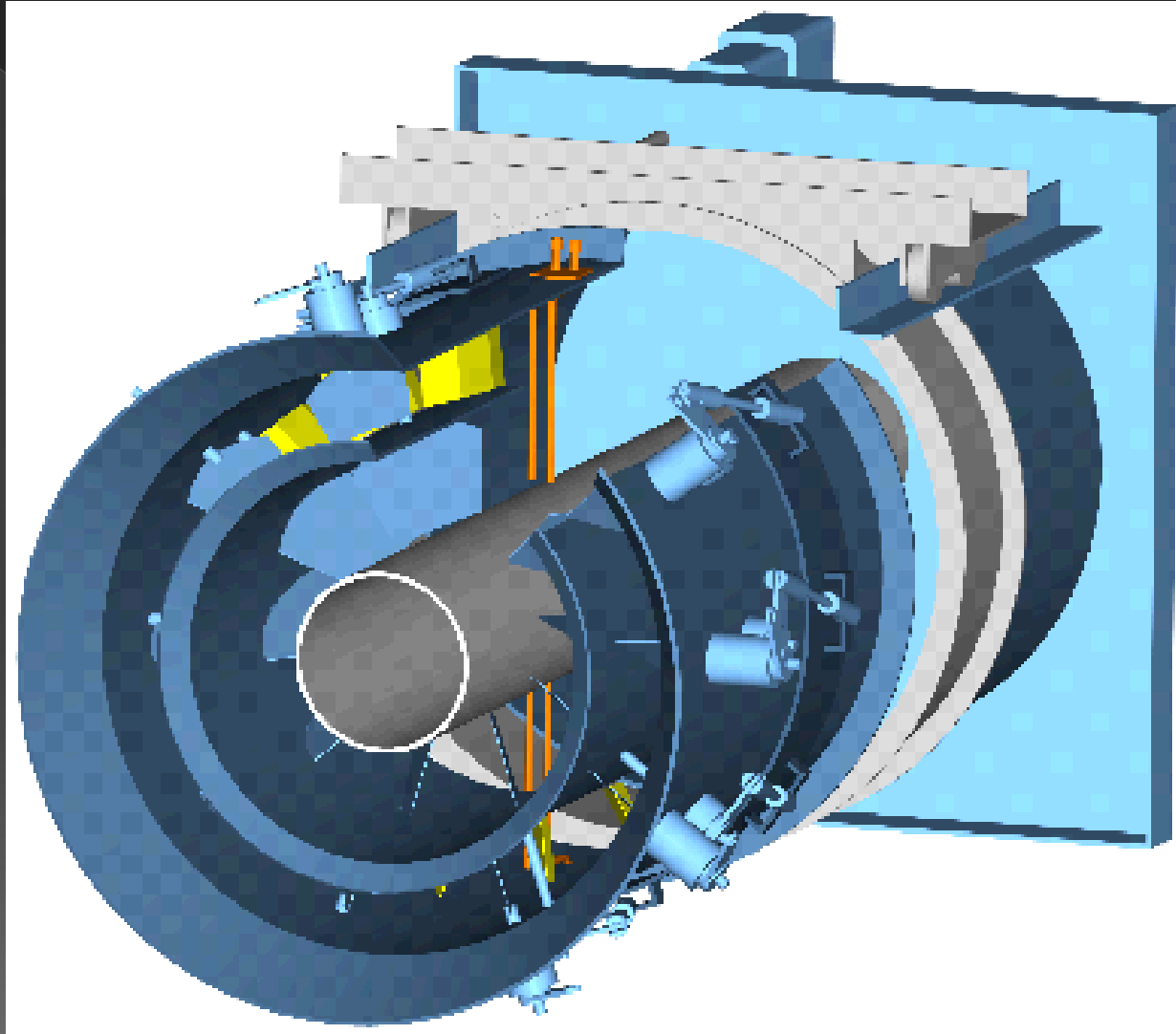
Pulverizer Overview

- Automatic PA “kicker” for lowest pipe velocity limit



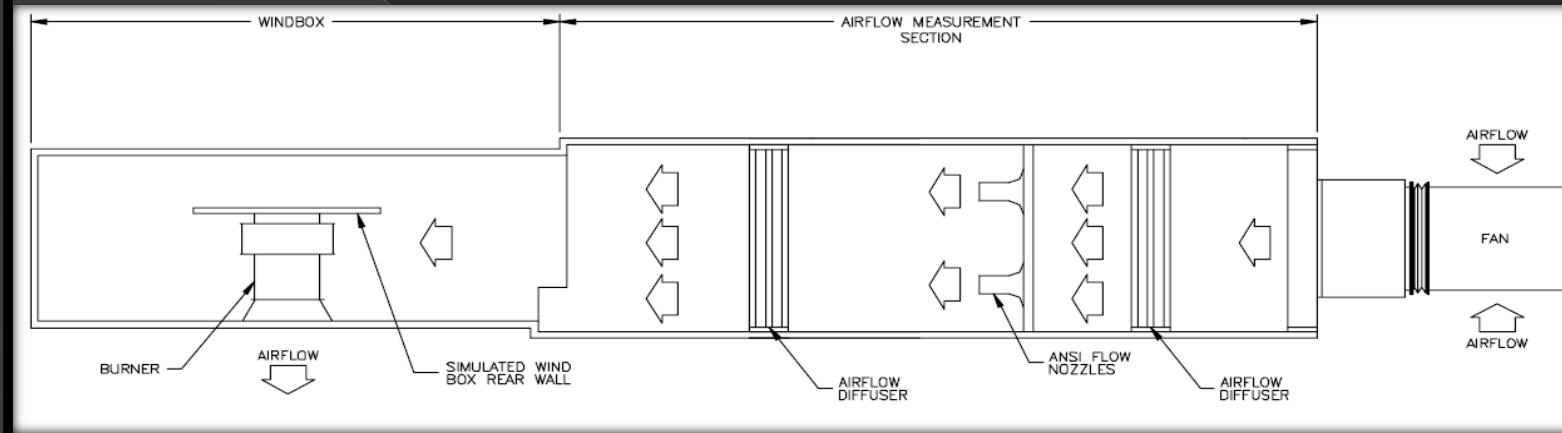
Proven solutions for a tough industry

Burner Airflow – IBAM



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



Proven solutions for a tough industry

Crystal River Unit 4CCM success

- B&W Opposed Fire Pulverized Coal 770 MW
 - 6 MPS-89 Puvlerizers
 - 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

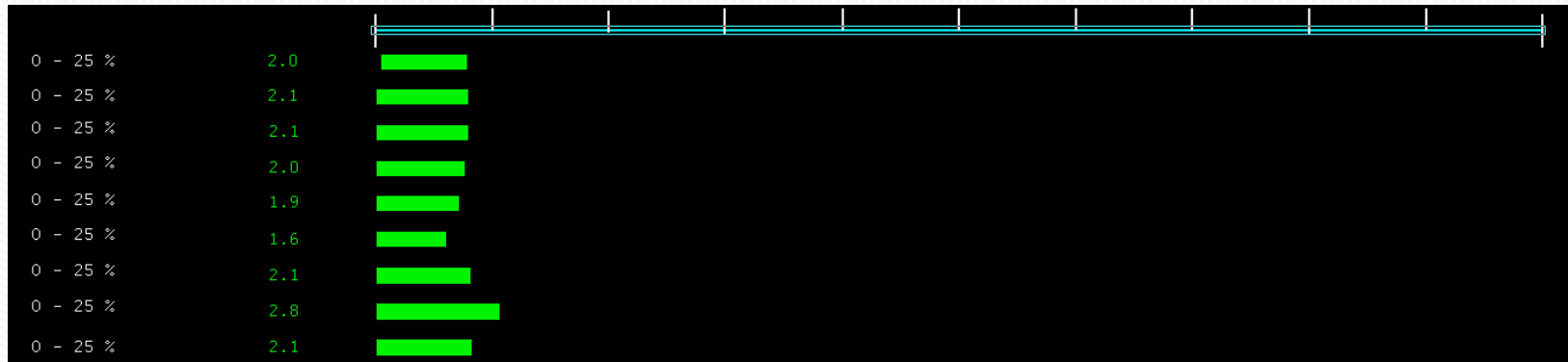


Continuous Combustion Management (CCM)

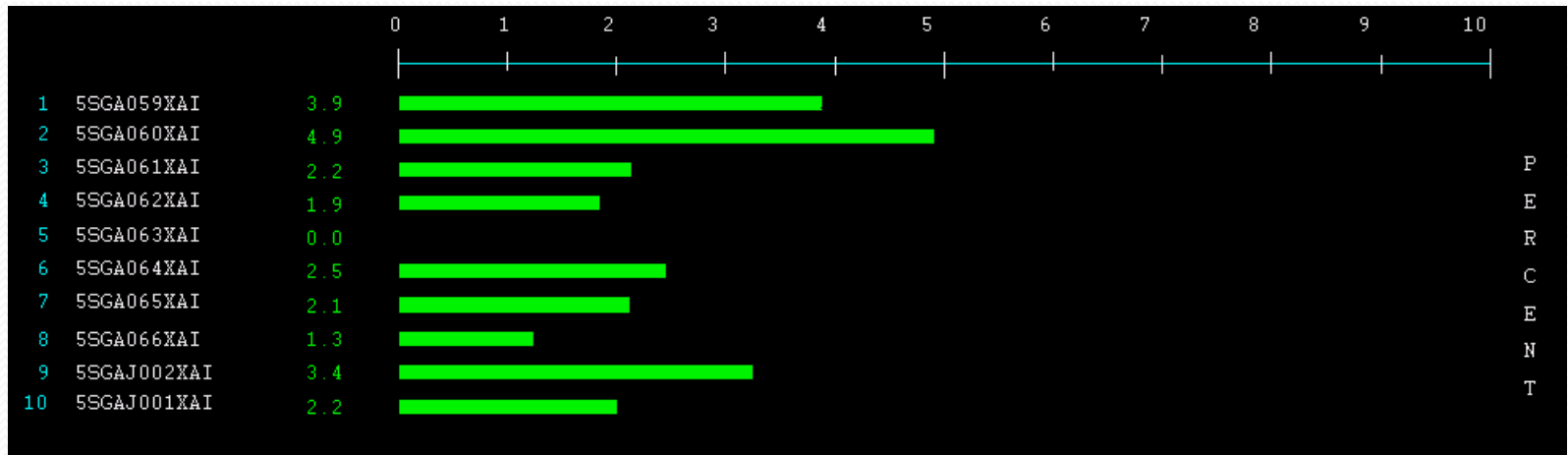
- Equipment Additions:
 - Coal Flow Measurement & control valves
 - Burner Secondary Air Flow Measurement & auto purge
 - Burner Secondary Air Flow Adjustment
 - Primary Air Measurement and Auto Purge
 - CO measurement
- Equipment Modifications
 - Relocation of O2 Probes
 - New O2 equipment (probes and cabinets)

CRN O2 Distribution Comparisons

CR4 O2 Profiles

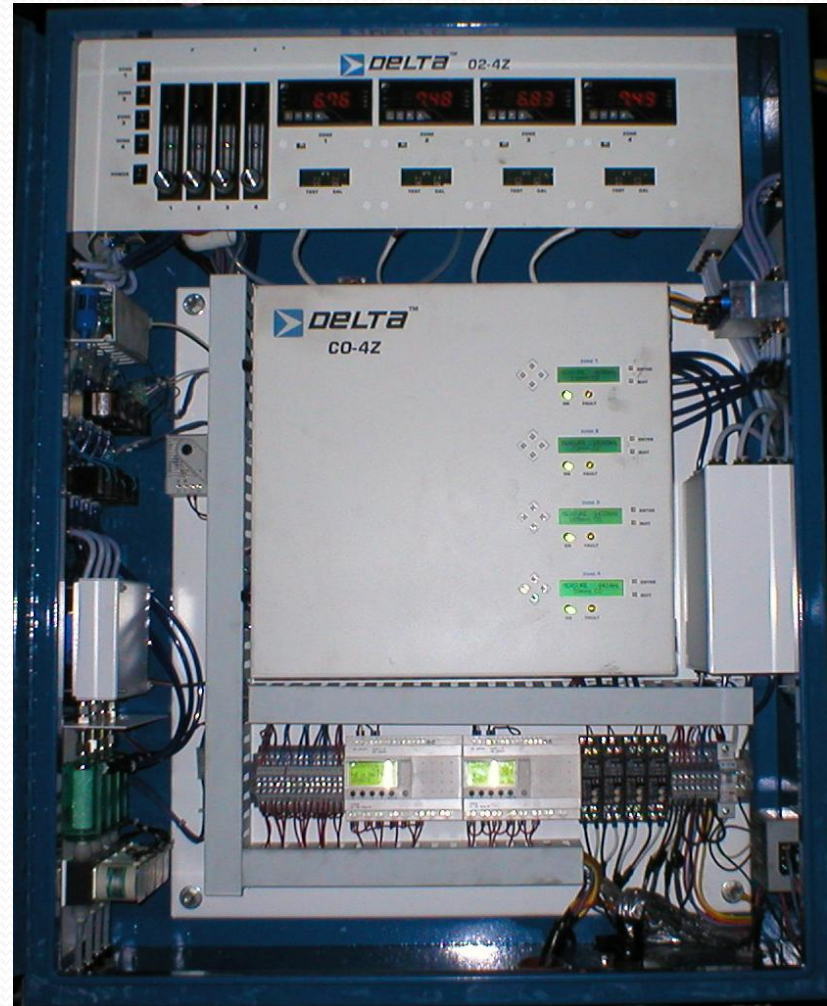


CR5 O2 Profiles

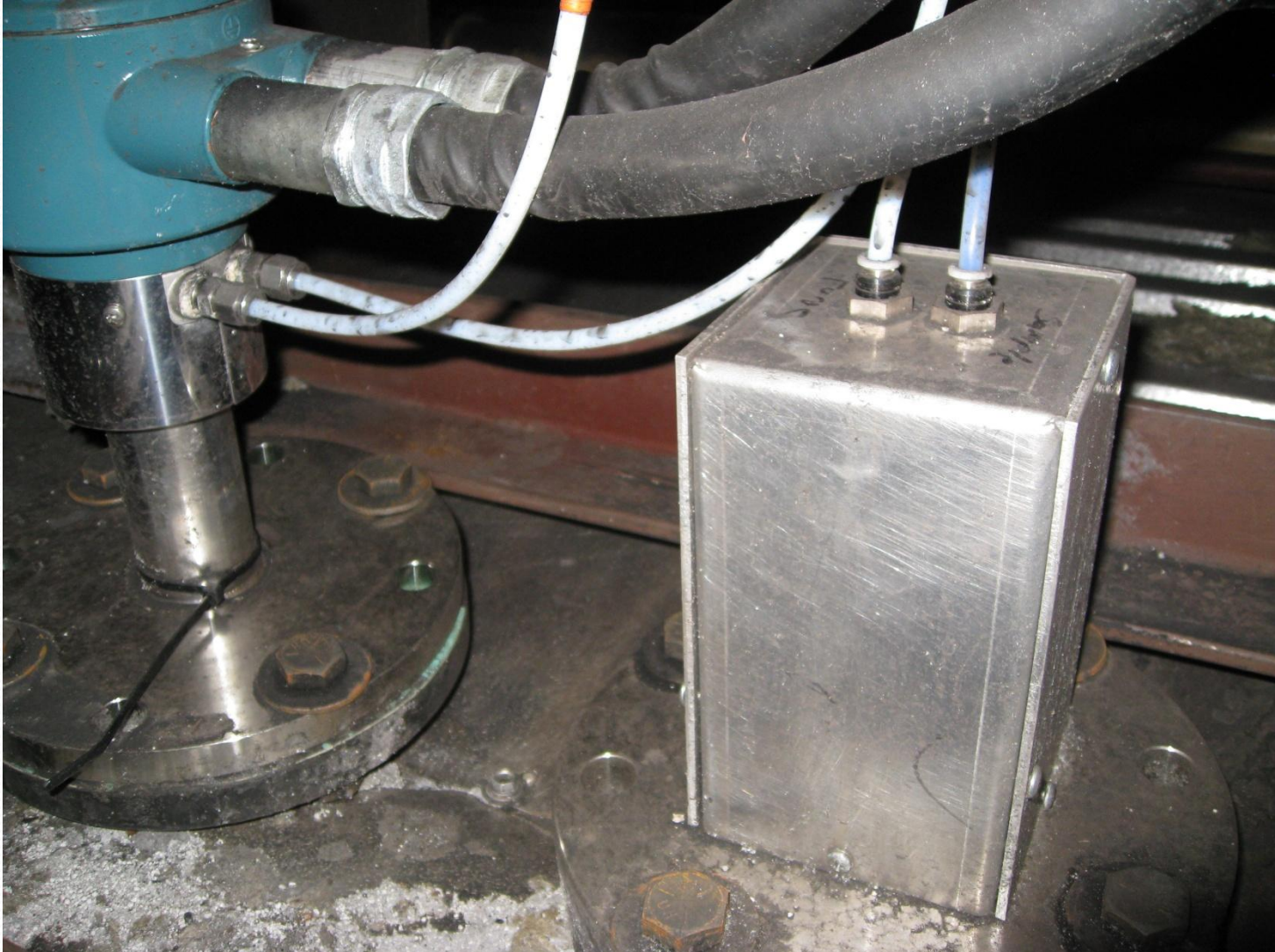


Note: Unit scales are different

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