Technical Publication

Pf-FLO III Vs. Conventional Coal Balance Testing

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PF –FLO III VS. CONVENTIONAL COAL BALANCE TESTING

The conventional methods of testing pulverizer systems to measure and control coal distribution uses coal recovery/dirty air methods. The coal testing is typically done per ASME/ASTM, ISO or a combination of the two. The use of orifices to affect the balance of both coal and primary air adds pressure drop to the system, additional maintenance and has very little effect on coal distribution.

These coal measurement methods and equipment, no longer represent the best technology available. The conventional test methods are only, a relative indication of conditions in a coal pipe and merely show just a point in time. Relative pipe-to-pipe differences derived from the conventional methods may be indicative of coal distribution or just be the difference in mill operation over the period of the testing. The conventional approach requires 2 to 3 people to collect, weigh, bag and label each and every sample. The testing must be repeated after each orifice adjustment. These old, conventional methods are time consuming, costly, and don't provide real time data.

The use of orifices for adjusting both coal distribution in the coal piping has been the conventional approach to balancing the coal and primary air distribution. Orifices have been used as a means for balancing coal pipe pressure drop on a clean air basis. In an effort to balance pipe-to-pipe coal distribution, additional, and/or double duty adjustable orifices have been added to the coal piping system. This system of adjustment slightly changes coal distribution, but mainly changes primary air distribution, adds pressure drop to the system and increases maintenance. Often times while attempting to balance coal in a pipe the conventional method starves the pipe of primary airflow and potentially, causes coal layout and subsequent fires. The old, conventional methods are fine to spot check mill performance, but to deal with the growing problems with LOI, CO & slagging created by the ever-lowering emissions limits, a more precise and continuous data stream is needed.

Today we have technology that reduces the testing time and cost with real time, more accurate and repeatable results. The system can be portable or a permanent installation. The testing technology is the Pf-FLO III system by Air Monitor. Riley uses a portable Pf-FLO III system for measuring the actual coal particle velocity, density and mass flow in each coal pipe. The real time data trends are used to balance coal distribution while the mill is in service. No time is lost with iteration after iteration of coal distribution testing after each adjustment. Using Riley's patent pending, on line coal balancing technology, no mill shut down or isolation of coal valves is necessary to balance coal distribution. As coal distribution adjustments are made, the changes are immediately seen in the Pf-FLO III trend data. Therefore, with this technology, coal balance may be achieved in less than a day of testing/mill.

Using Riley's portable Pf-FLO system with Riley's patent pending P F Distributor™, the time and costs for actual balancing is drastically reduced from the traditional methods used by others. For mills with centrifugal classifiers, such as a vertical spindle mill and the Riley Ball Tube Mill, the coal distribution control is done internal to the classifier with Riley's patent pending, P F Distributor™. For mills that use riffle distributors, such at the Riley Atrita and the Raymond exhauster mills Riley uses the patented Variable Control Riffle (VCR). Both are very effective for balancing coal distribution, and have little to no affect on primary air distribution and pressure drop.

RILEY'S COAL BALANCING PROGRAM

Riley uses the portable Pf-FLO III system along with the P F Distributor™ or VCR depending on the mill system to be balanced. The portable system is a cost effective alternative to a permanent system that provides the same real time data for evaluation and balancing.

Figure 1 — Riley Portable Pf-FLO III
Reads up to 8 coal pipes simultaneously

Coal Pipe Sensors

The program would provide Pf-FLO III coal pipe sensors, reflectors and mounting hardware for one or two mills to reduce cost. These sensors and reflectors would be moved from mill to mill to accomplish the balancing. Once the balancing of all mills is complete, the sensors would be removed by the plant and stored for future use. A sufficient supply of hardware is supplied to support the transfer of sensors to all mills.

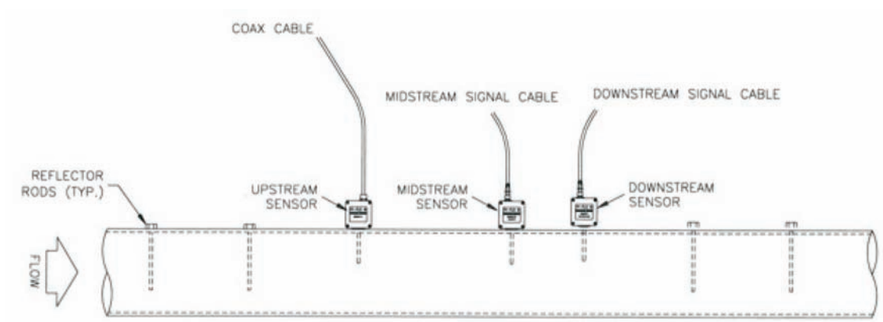

Figure 2 — Typical 3 Sensor Array

Sensor Location Survey

A typical program includes a site survey and review of coal piping drawings to identify the best locations for the sensors. Drawings provided by the customer will be reviewed to identify likely locations for the sensors. A site walk -down follows the drawing review to select sensor locations that will provide good data as well as accessibility. A template is provided for installation and additional on site service is available.

Benefits of Coal Balancing

Balancing the coal distribution improves burner zone stoichiometry, resulting in significant improvements in combustion, reduced LOI, lower NO_X and CO emissions, reduced slagging, more balanced O_2 and tube metal temperature profiles and increased boiler efficiency.

Additional Benefits: Service Time & Cost Savings

The program can be completed in less time and with fewer people and at lower cost than the conventional methods of balancing. The initial expense of the sensors on the first testing would be a little more costly but should still be less than the cost on the conventional testing due to time and manpower savings. For all subsequent balance testing there would be no cost for sensors, therefore costs savings would begin to be seen and accumulate for all subsequent testing. Graph 1 shows the cost savings of the Pf-FLO III testing after the first year. Graph 2 shows the accumulated savings for the same testing cycle.

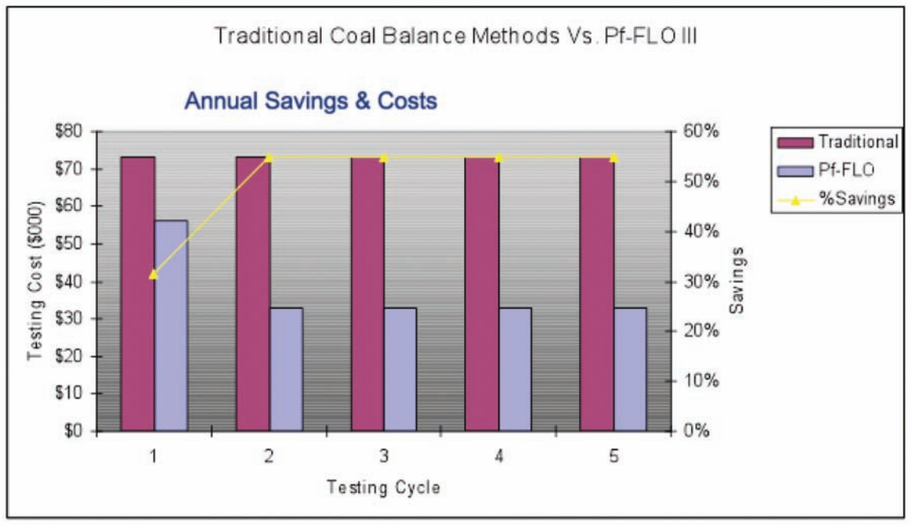

Figure 3 — Graph 1

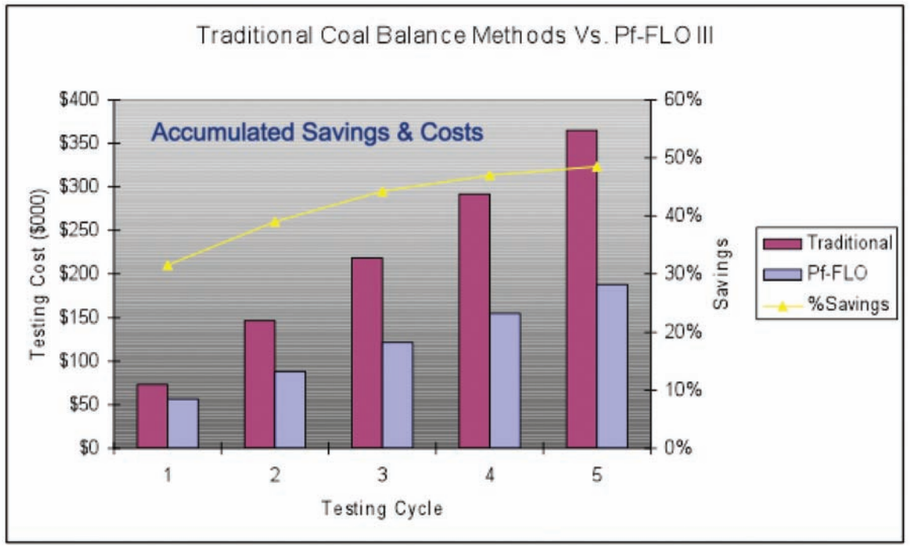

Figure 4 — Graph 2

Data analysis

The accurate trend data shows velocity, density and mass flow in each pipe, which allows data analysis for pipe-to-pipe balance (Graph 3), conditions for coal layout, (Graphs 4 & 5) mill instability (Graph 6) and clean air conditions when the feeder is shut down and the mill is stripped of coal (Graph 7).

Figure 5 — Graph 3: Pipe to Pipe Balance

Figure 6 — Graph 4: Erratic & High Density in pipe 2-1 LR

Figure 7 — Graph 5: Erratic & low velocity in pipe 2-1LR

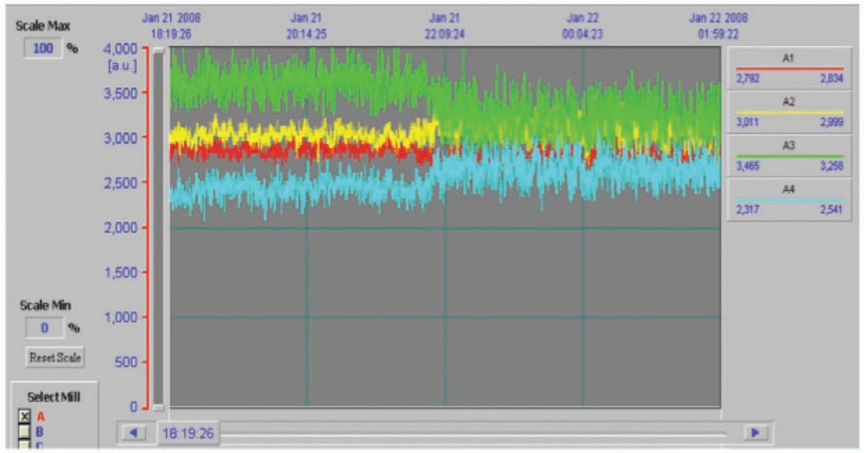

Figure 8 — Graph 6: Instability

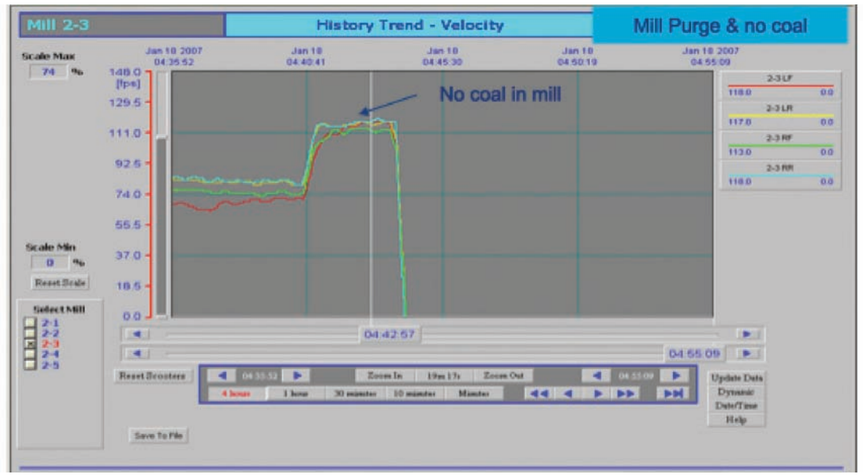

Figure 9 — Graph 7: Clean Air Velocity

The quantity and quality of real time data for mill system diagnostics provided by the Pf-FLO III is simply not available from the conventional test methods.

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