GREENBANK
Enhancing Performance

CASE STUDY

Optimizing Multi-Outlet Mills using PfMaster CFMS

Optimizing coal distribution for multi-outlet mills

For a boiler with an aggressive over fire air strategy or Boosted Over Fire Air, a couple of burners out of each boiler row with the richer percentage of coal would be the main contributor to carbon levels when staging air to the upper furnace area.

Distribution is the major influence on combustion efficiency and un-burnt carbon. Fineness does improve carbon, but is a second order effect to the actual coal to air ratio at each individual burner.

820 MW B&W opposed wall fired boiler in USA

This large USA B&W opposed wall boiler has 8 mills, with 4 mills arranged at the front and back of the boiler having Alstom high performance rotary classifiers.

Greenbank participated in a joint project with OEM boiler manufacturers to improve the coal distribution from the multi-outlets to the burners of one mill.

Following successful distribution results from the extensive testing Greenbank have the contract to supply equipment to the complete boiler.

It has been found that simple use of venturi's or adjustable valves on multiple outlets simply allows for air balancing given different pipe run distances of multiple pipes from a given mill to individual burners.

However, significant reductions in the cross sectional area of a pipe are required to effectively reduce the coal flow problematic high coal flow pipe runs to burner, but this has a large negative impact on the air flow and transport velocity of the coal.

To put more simply, reductions in cross sectional area of a pipe , will reduce the coal transport velocity but make little impact on the coal flow until a total reduction in cross section limit is reached which sees a sharp reduction in coal flow.

Classifier Outlet Pipes

Deflector Blade
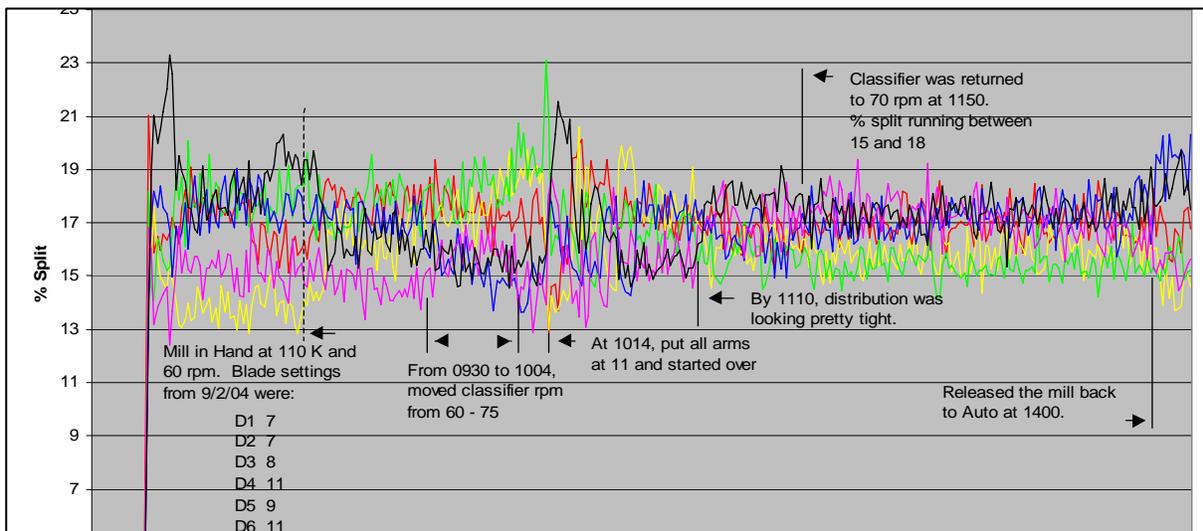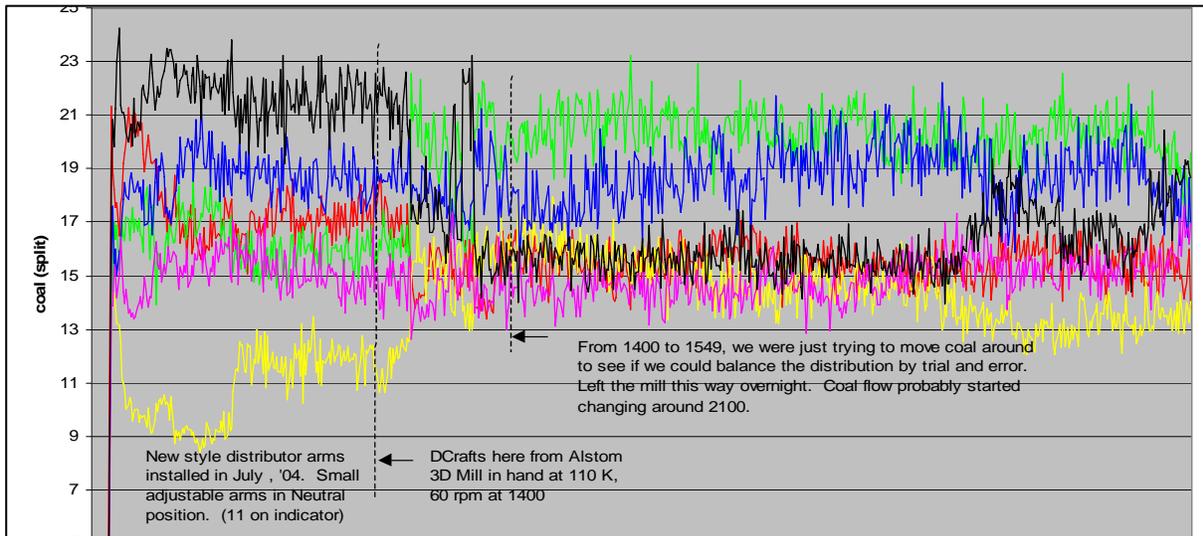
Balancing Multi-Outlet Mills

Multiple solutions were tested using various paddle type arrangements inside the classifier at a location below the pipe itself. This would allow adjustment to the amount of coal diverted away from any particular pipe without impacting the pressure drop down any particular pipe.

PfMaster sensors from Greenbank / ABB were used together with adjustable blades to optimise the coal distribution to the multiple outlets.

Data from the graphs below show the complex tuning process where reducing coal flow to one pipe would see increases in adjacent pipes and required all pipes to be measured in real time to allow adjustment for coal flow balance. The optimum for the 6 pipes was a split of 16.7 %.

PfMaster In-Situ

From 1400 to 1549, we were just trying to move coal around to see if we could balance the distribution by trial and error. Left the mill this way overnight. Coal flow probably started changing around 2100.

New style distributor arms installed in July , '04. Small adjustable arms in Neutral position. (11 on indicator)

DCrafts here from Alstom 3D Mill in hand at 110 K, 60 rpm at 1400

Classifier was returned to 70 rpm at 1150. % split running between 15 and 18

By 1110, distribution was looking pretty tight.

At 1014, put all arms at 11 and started over

Released the mill back to Auto at 1400.

Mill in Hand at 110 K and 60 rpm. Blade settings from 9/2/04 were:
D1 7
D2 7
D3 8
D4 11
D5 9
D6 11

From 0930 to 1004, moved classifier rpm from 60 - 75