Diagnosing Pulverizer Performance

We have been promoting the application of "fundamentals first" in combustion optimization for a long time. We thought it is a good time to review pulverizer performance and how to measure it. If you have heard of our company before, you most likely have seen the 13 Essentials of Optimum Combustion. Well, nine of the 13 are pulverizer and fuel line related. Therefore, the phrase "The Pulverizer is the Heart of a Coal Fueled Boiler" it is truly accurate in our experience. Here is what we believe should be done on a regular basis to keep the coal pulverizers operating at the best performance and by so doing will be an important step forward to keeping combustion optimized within the boiler furnace. Why are pulverizers important? Because the efficacy of furnace combustion depends on optimum mill performance. In the June issue of POWER we authored an article on minimizing boiler slagging.

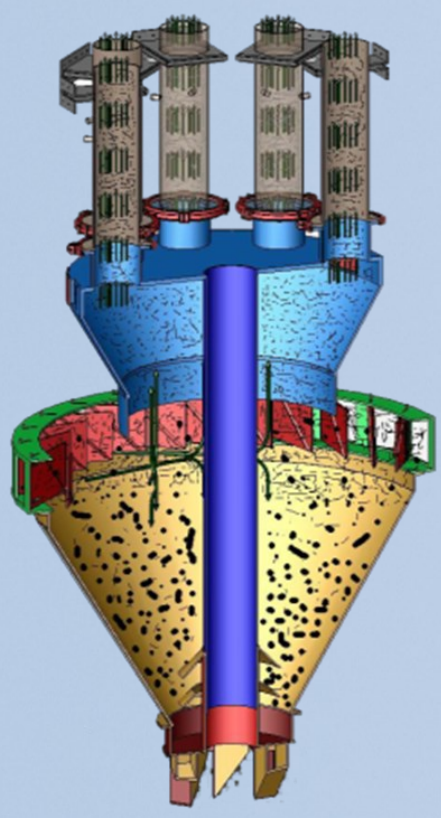


Figure 1. Good fineness creates a homogenous & balanced mixture & will produce a more homogenous mixture if mechanical synchronization is optimum

Whether the issues are slagging, CO, flyash LOI, furnace tube wastage, superheater/reheater tube metals overheating or cinder carryover into the SCR, usually the "root cause" if the pulverizers are the culprits, is one of three factors:

1. Non-optimum coal fineness
2. Poor fuel distribution
3. High primary airflow's

The best way to trouble shoot whether these apply, in our experience, is to conduct a full isokinetic coal sampling test of all of the pulverizer fuel lines using the Storm isokinetic coal sampling method. We have used this for many years and it has a proven record of identifying the root cause of combustion issues. Usually, related to one or more of the three issues listed above.

This also was described in 1993 and 2010 articles in POWER Magazine and has been used ever since with good success. Please see Link:

http://www.powermag.com/pulverized-coal-pipe-testing-and-balancing/

Here is a short outline of the Storm approach to optimizing pulverizer performance:

Four steps:

1. Perform clean air tests of the fuel lines and balance the system resistance of all of the coal pipes from each pulverizer within +/- 2%
2. Balance fuel lines to +/- 5% on dirty-air and +/- 10% for fuel balance
3. Obtain fuel fineness of greater than 75% passing a 200 mesh sieve and a maximum of 0.1% on a 50 mesh sieve. Use four sieves and plot results on a Rosin-Rammler Chart
4. Calibrate and program primary airflow ramp to provide the best primary air/fuel ratio over the load range. Usually, 1.8 pounds of air/pound of fuel

Fuel lines balanced to each burner by “Clean Air” test ±2% or better.

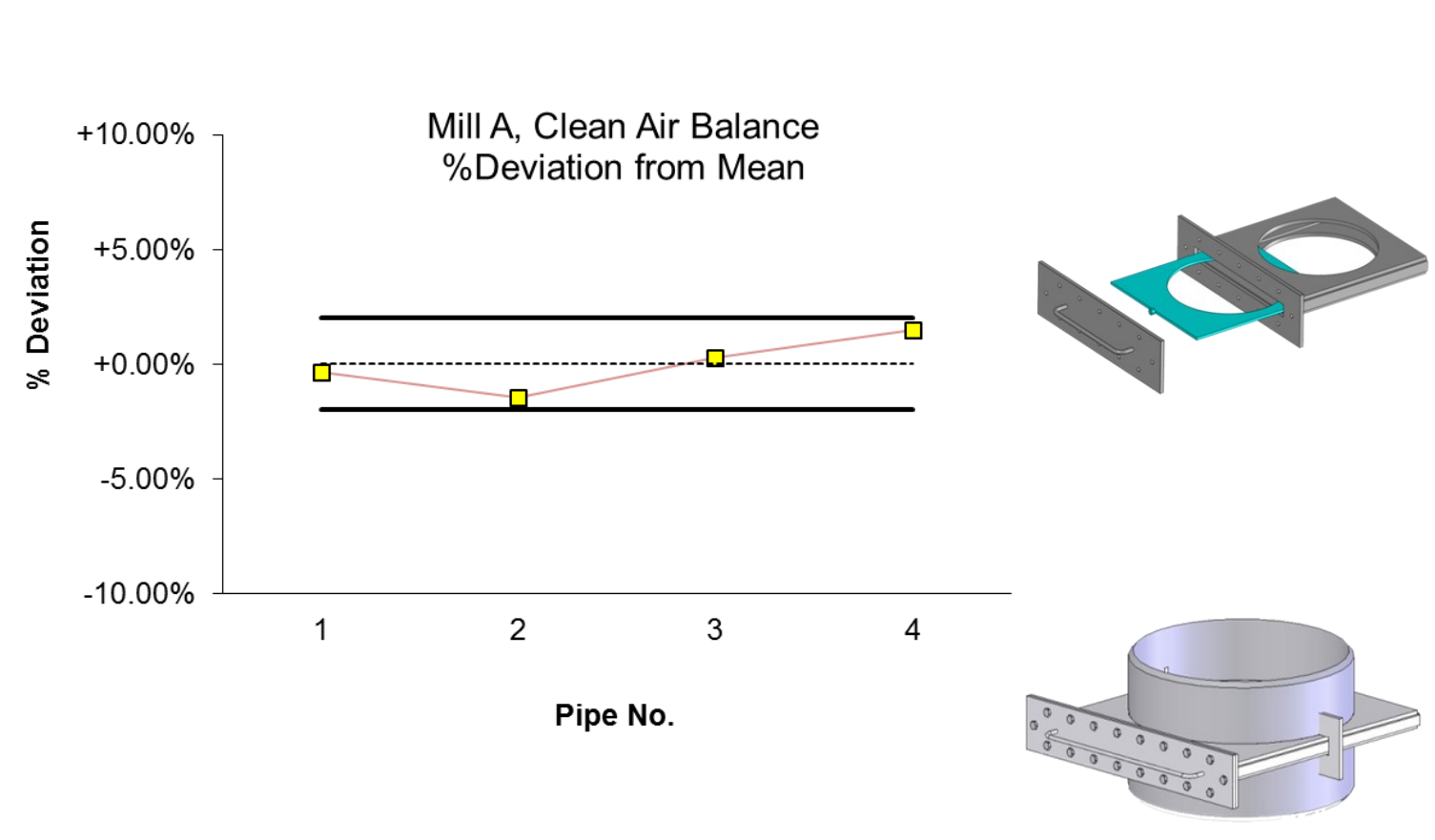


Figure 2

Fuel lines balanced in fuel flow to ±10% or better.

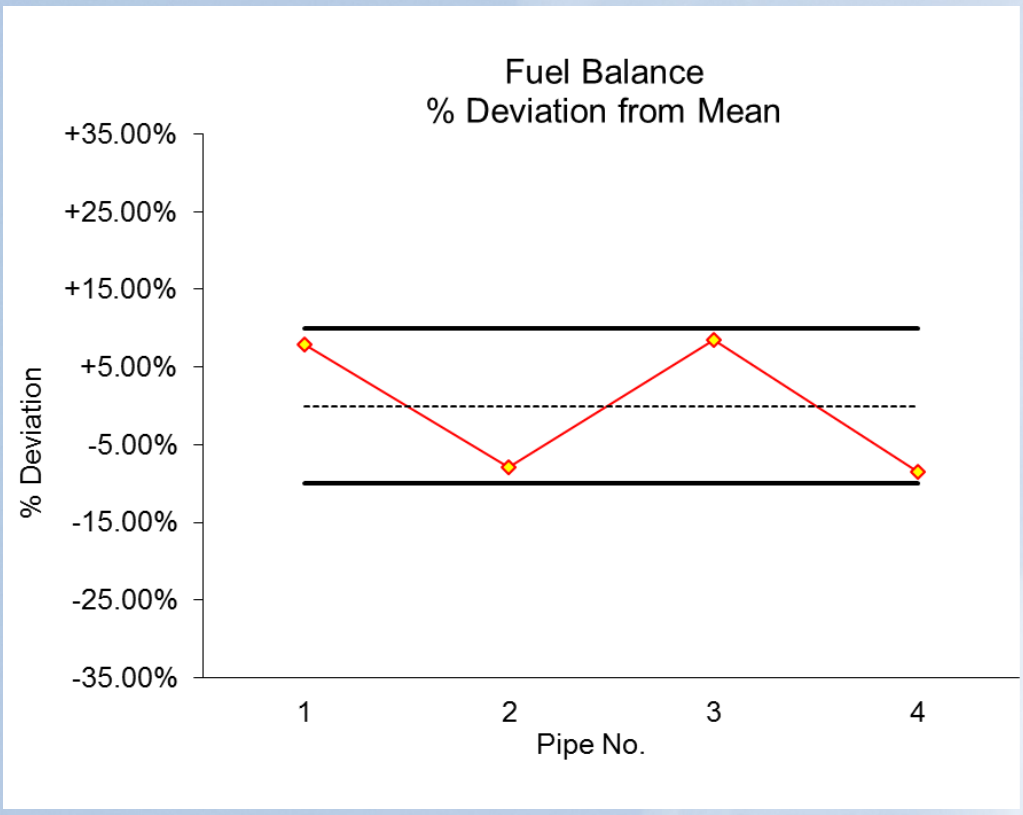
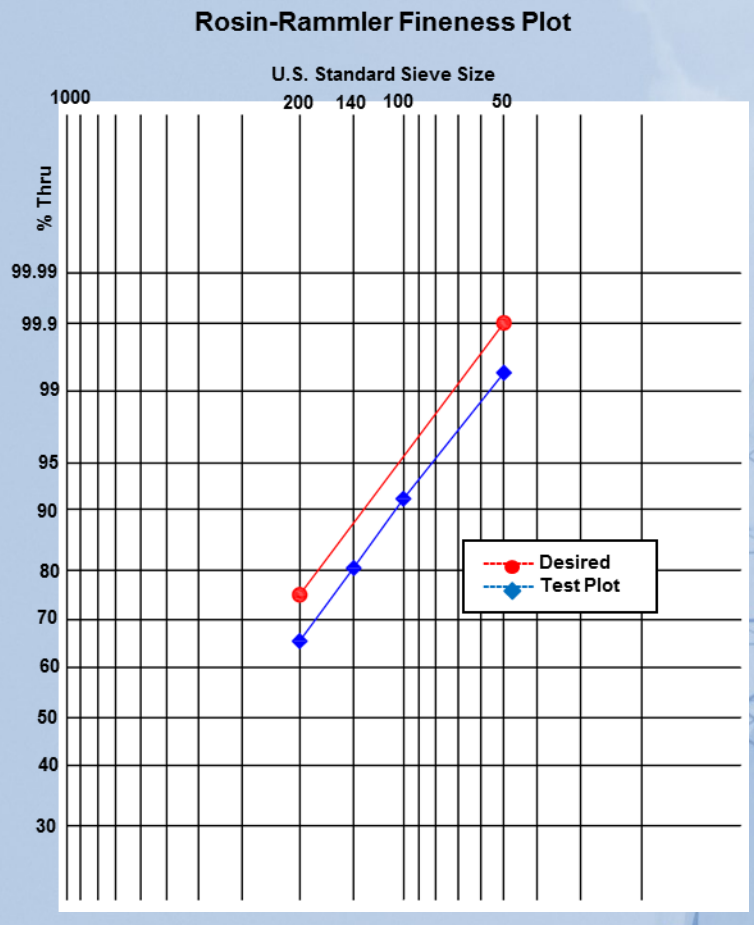


Figure 3

Fuel line fineness shall be 75% or more passing a 200 mesh screen. 50 mesh particles shall be less than 0.1%.



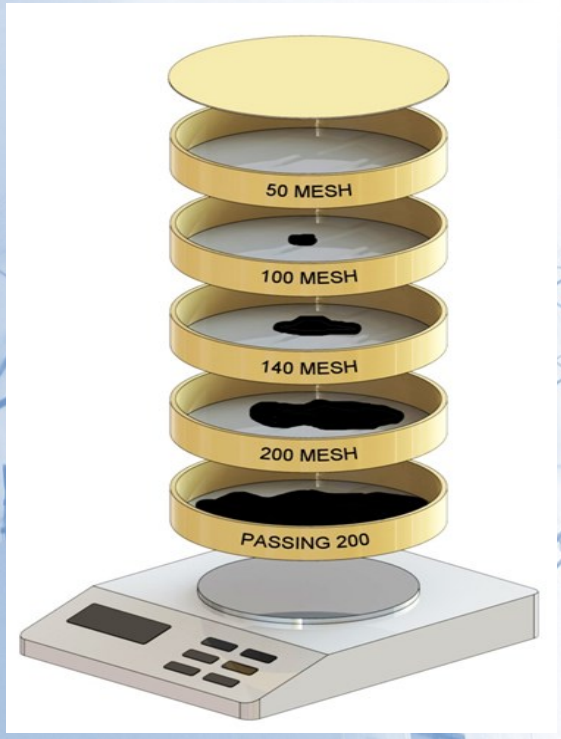


Figure 4

Primary air/fuel ratio shall be accurately controlled when above minimum.

"Best" Burner Belt Combustion is the result of tuning the Pulverizers and setting up the optimum coal/air mixture, fuel fineness and fuel distribution. Also, burner mechanical tolerances and secondary airflow are important to achieve optimum combustion.

Figure 5

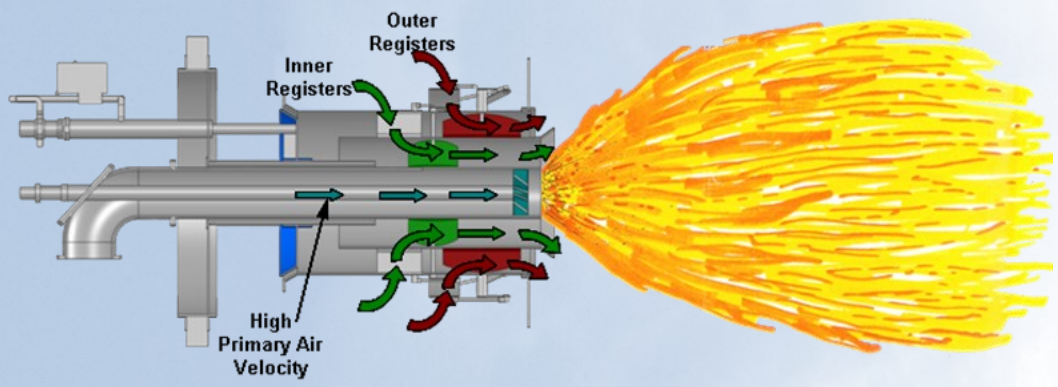
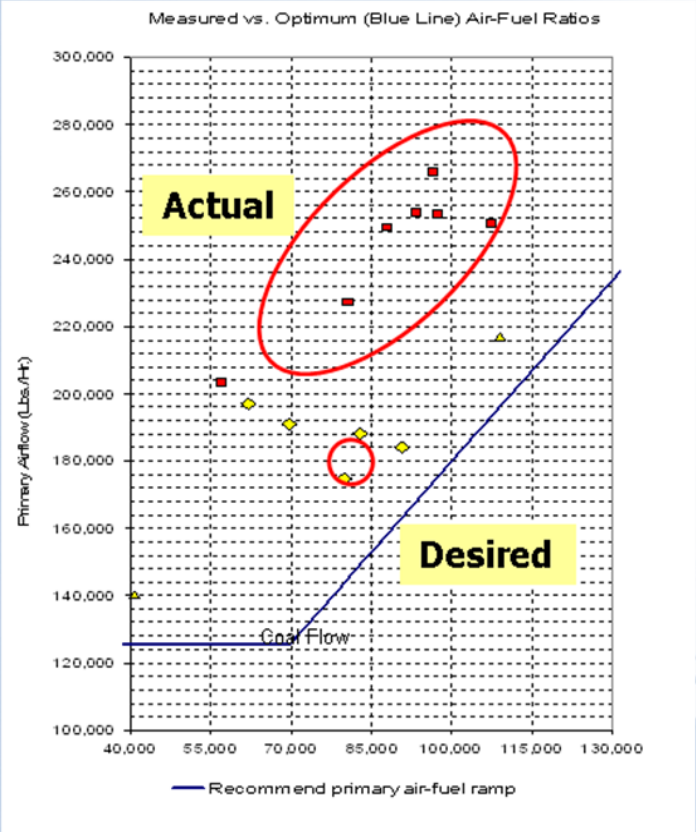


Figure 6

Typical "As Found" Performance:



Additional information is included on the Storm Technologies and POWER Magazine websites. A few links are:

http://www.powermag.com/pulverizers-101-part-i/http://www.stormeng.com

When should fuel lines be tested? In our experience it is a good practice to do it at least quarterly and especially before and after pulverizer overhauls. It is also recommended that Fuel Line testing and primary airflow calibrations be conducted after an incident such as a pulverizer fire or puff.

First apply the Fundamentals of "Blueprinting" the Mills to meet the required fineness. Then, if desired fineness and distribution cannot be achieved, move on to mechanical tuning solutions developed by Storm Technologies, Inc.

In essence, the approach is to first measure current performance and then if desired fineness and distribution cannot be achieved, apply solutions such as:

- Coarse particle guide classifier blades
- Quick change orifice boxes
- Primary elements for airflow measurement and control
- Pulverizer grinding zone performance packages
- Adjustable throats for coal pulverizers for wider load range operation and minimal coal spillage at low loads
- Improved coal riffles and coal/air mixing solutions

There is a lot of information on our website that further outlines the Storm approach to combustion optimization.

Send us an email or call if you would like further information.

Yours truly,

Richard F. (Dick) Storm, Senior Consultant

and the staff of Storm Technologies, Inc.

Some of the Storm Technologies, Inc. Designed Fuel Fineness and Distribution Correcting Products and Techniques