Pulverizers 101: Part 1

The Storm Approach to Coal Pulverizer Optimization

America still depends on coal to keep our lights on. People like you and me think of coal as a national energy treasure and it is! That is the reason that we prepare and widely distribute our newsletters with what we think is useful information. In this issue, it is our aim to help shed some light on a few basics. This is the first edition in a series on the topic of achieving excellence in combustion.

IN THIS ISSUE:

- What is pulverizer capacity?
- How do you handle starting up a coal pulverizer after a fire or other incident?

To be continued...

- How to measure pulverizer performance
- Why pulverizers' primary air flow measurement, accuracy and fuel balance are important to boiler optimization
- How to achieve the best performance with Storm pulverizer components
- How to preserve furnace performance by applying Storm performance driven maintenance

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Let's use an MPS-89 pulverizer as an example. Most MPS-89 pulverizers are rated for about 125,000 pounds of coal per hour and this is often referred to as the mill capacity. We prefer to discuss coal throughput as one of the three major components of capacity (Hardgrove grindability and fineness are the other two). Take one version of a typical correction curve for a pulverizer rated at 125,000 lb/hr as shown in Figure 2 for an HGI of roughly 50 and 70% passing a 200 mesh sieve (green line).

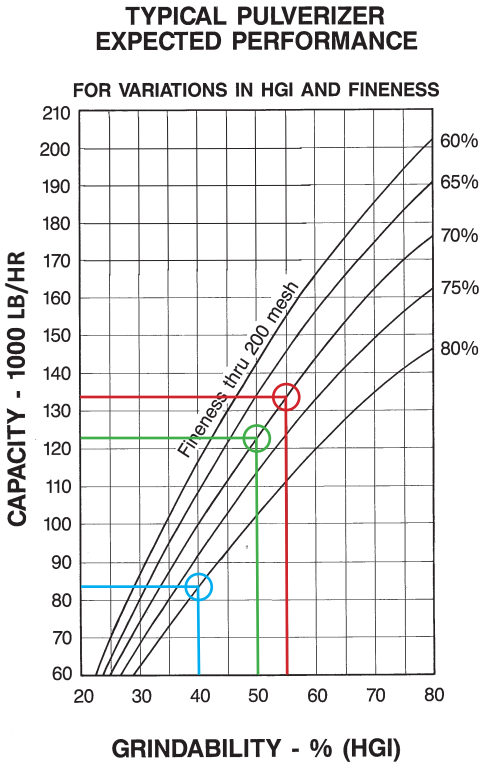

Figure 2

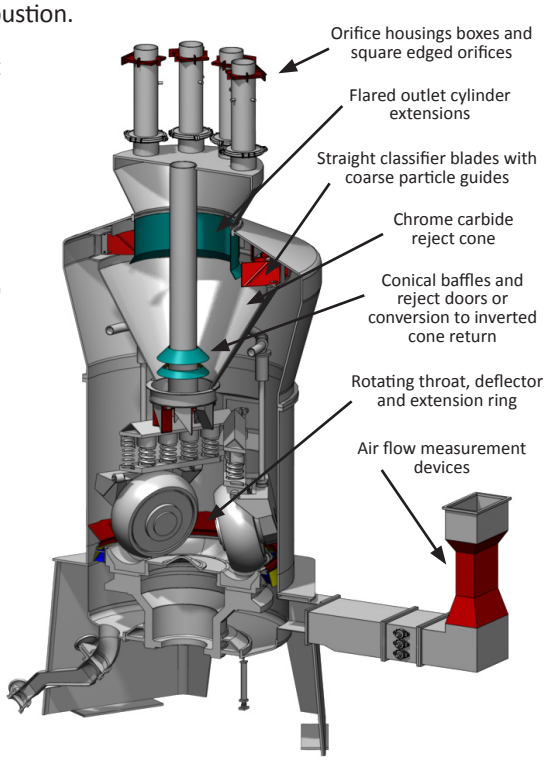

Figure 1: Typical MPS-89 with Storm Components

Note: Concepts discussed apply to other pulverizer types as well. MPS-89 used as an example only.

The three main components of pulverizer capacity are:

- HGI
- Fineness
- Throughput

Other factors impacting pulverizer capacity include moisture and raw feed size.

The design "capacity" of the same pulverizer will grind 135,000 pounds per hour with fuel that is 55 HGI (Hardgrove Grindability Index) coal, ¾" raw coal top size, 7% moisture and produces pulverized coal that is 70% passing 200 mesh fineness (red line). This is pretty standard.

Now, take that same pulverizer and provide fuel that is 40 HGI, still ¾" top size and still 7% moisture, but increase the fineness requirement to 80% passing a 200 mesh sieve. Check the correction curve now and you will see that the rated "capacity" which we prefer to call throughput now drops to 83,000 pounds per hour (blue line).

The point we are trying to make is this: coal pulverizer capacity is a specified fuel grinding capability or throughput at a certain HGI (coal grindability index) and also based on raw coal size, moisture and desired fineness level. These factors are significant and must all be taken into account when discussions of pulverizer capacity become serious. We have written volumes on the reasons for optimum airflows, the needs for good fuel fineness and the many other items required to achieve optimum combustion for your boiler.

Any of the three main components of pulverizer capacity can be sacrificed to make up for the other two as in the examples of correction curves (Figure 2 – highlighted for different fuels and levels of fineness). This, we trust, answers the first question, "What is pulverizer capacity?"

What to do after mill excursions or burner fires

What do you do after a burner fire, mill fire, mill puff or a mill explosion? We have seen situations where pulverizer fires, burner line stoppages, burner fires and mill puffs have occurred. After the damage is repaired, how can the mill and burner system be safely and confidently returned to service? Well here is our experience of what we have found to be a safe and prudent course of action. To the right are the steps that have been successfully used by Storm in the past.

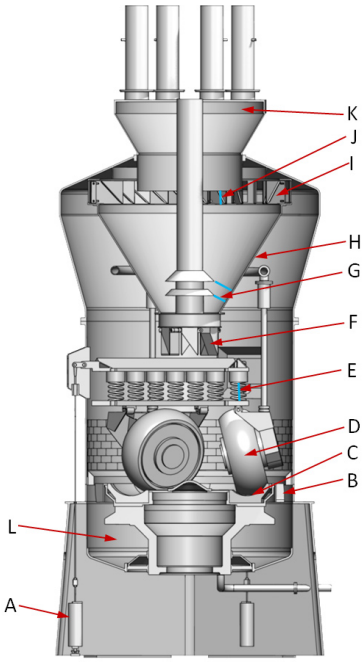

Figure 3

A. Preload on grinding elements
B. Throat dimensions/opening
C. Grinding element condition/clearances
D. Roll/journal condition
E. Spring frame condition and alignment
F. Feed pipe clearances and discharge door operation
G. Inverted cone/conical baffle clearances
H. Classifier cone condition
I. Classifier blade condition/length/stroke synchronized angles
J. Outlet cylinder height in relation to classifier blades
K. Outlet smooth, free of any obstructions or spin arresting protrusions into the spinning two-phase mixture of coal and air. Assure isolation valves stroke and open fully.
L. Pyrite sweep conditions/clearances

Many years ago at a plant that had been plagued with mill fires and explosions, this procedure was used as a corrective measure. This was followed by many years with no further incidents. Storm Technologies, Inc. is now into our 19th year of business. The hallmark of our success has been to solve our customers' problems and to do it with cost effective solutions.

Since our founding in 1992, we have established a strong engineering team of over ten graduate engineers. Our technicians are the best trained in the industry and the quality service and results of our entire team are second to none.

Our shop regularly builds components to solve field challenges and to do it on short notice. If you have a nagging problem related to the clean and efficient use of America's treasure of coal, give us a call. We love solving problems and helping our friends in the industry to keep the lights on and to do it cleanly, efficiently and reliably!

Yours truly,

Dick Storm
CEO/Senior Consultant

After a pulverizer incident, perform these steps:

1. Measure and record internal clearances, tolerances and spring preloads. Review the checklist and graphic in Figure 3 (sometimes called "Blueprinting the Mills").
2. Check and calibrate the coal feeders.
3. Functionally check the full movement and position indication of all dampers.
4. Review primary air flow curve to assure safe operation throughout the operating range assuring adequate minimum airflow as well as proper air to fuel ratios when above minimum airflow.
5. After thoroughly checking mechanical tolerances and clearances, close the mill and start primary airflows. Warm mill to normal operating temperature of 150°F mill outlet temperature (bituminous coal) and airflow at minimum (normal minimum PA flow).
6. Conduct a primary airflow measurement traverse to verify the indicated primary airflow is correct across the operating range.
7. Conduct "clean air" 24 point traverses of all of the fuel lines to measure and compare the balanced airflows through each pipe. All coal pipes (and flows to all of the burners from each respective pulverizer) should be balanced and within +/- 2% of the mean flow.
8. Perform a seal air check.
9. Begin the normal pulverizer start sequence.
10. Once normal coal flow is applied to the mill, a full mill test should be conducted. This should include isokinetic coal sampling and dirty airflow measurements through each fuel line to determine air fuel balance and coal fineness. Primary airflow "Hot-K" calibrations of the primary airflow measuring element should also be conducted.
11. Only after the mill is thoroughly checked out should it be released to operations.