

## Purpose

The purpose of this bulletin is to advise customers and field personnel of additional recommendations concerning pulverizer fuel system fires (this supplements information provided in PSB-10). The new recommendations include fire detection systems, actions to be taken when a fire occurs, inerting systems for various coal classifications, and fire extinguishing procedures for air swept pulverizer systems.

## Problem

Pulverizer and burner line fires may occur, especially with highly volatile Western coals. A fire in any part of an air swept pulverized fuel system is considered a stable, but very dangerous, condition. A more dangerous situation can occur during the pulverizer shutdown procedure when the pulverizer passes through a potentially explosive fuel air mixture. Pulverizer system explosions have occurred during this transition period.

## Safety Alert Warning

WHEN A PULVERIZER SYSTEM FIRE IS SUSPECTED, AREAS ABOVE, AROUND AND BELOW THE HAZARDOUS AREA SHOULD BE EVACUATED OF ALL PERSONNEL IN ACCORDANCE WITH PLANT EMERGENCY PROCEDURES.

THE PULVERIZER AIR/FUEL RATIO (PRIMARY AIR FLOW AND FEEDER SPEED) SHOULD NOT BE CHANGED IN A DIRECTION THAT MAY INCREASE AIR FLOW RELATIVE TO THE FUEL OUTPUT.

It is of utmost importance to warn all personnel that a pulverizer with

combustible contents at ignition temperature is unsafe to open, regardless of the atmosphere in the pulverizer. The pulverizer and its contents must be allowed to cool to room temperature before any known fire can be considered extinguished. **DO NOT OPEN PULVERIZERS WITH BURNING CONTENTS TO FIGHT FIRES.**

## Recommendations

### Fire detection

Fires can occur in various locations of a pulverized fuel system, but usually are confined to the burner lines or the pulverizer itself. Various means can be used to detect fires and include the following:

1. Pulverizer outlet temperature monitors
2. Visual or infrared detection of hot spots
3. Local hot spot temperature monitors
4. Gas analyzers to detect gaseous products of combustion in the fuel/air stream
5. Odor of burning coal

### Action

If a fire is detected by these or other means, THE FOLLOWING SAFETY PROCEDURES SHOULD BE INITIATED IMMEDIATELY:

1. Before making any change to mill operation, actuate audible and/or visible warning signals to clear the following areas associated with the fire source:
  - a. Around primary air duct(s) and fan
  - b. Burner line pipes

- c. Burner elevations
- d. Areas above these, not shielded by a solid concrete floor
- e. Around the pulverizer

2. If the pulverizer system allows the admission of inerts, such as steam or CO<sub>2</sub> in quantities sufficient to dilute the primary air flow (50% or more), actuate this system at the same time as the alarm is initiated.

3. With the hazardous areas cleared of personnel, initiate an immediate mill emergency shutdown using the following special procedure:

- a. Maintain the existing fuel feed rate. Changes to the air/fuel ratio that increase air flow or decrease coal flow make the fire more dangerous and should be avoided. Thus, it is highly recommended to maintain the existing fuel feed rate while the primary air flow is stopped.
- b. Stop the primary air flow by closing the flow control damper or by closing the burner line valves, or both. On hot primary air fan systems, trip the primary air fan. Upon stopping the primary air flow, the existing interlock logic may cause an additional automatic action, such that the following item (c) occurs automatically.
- c. When positive indication of loss of air flow is received, stop the feeder and stop the mill. (Damper position indicators are not positive indications of loss of air flow. Positive indication of

air flow consists of such measurements as differential pressure across the pulverizer or a primary air flow metering device.)

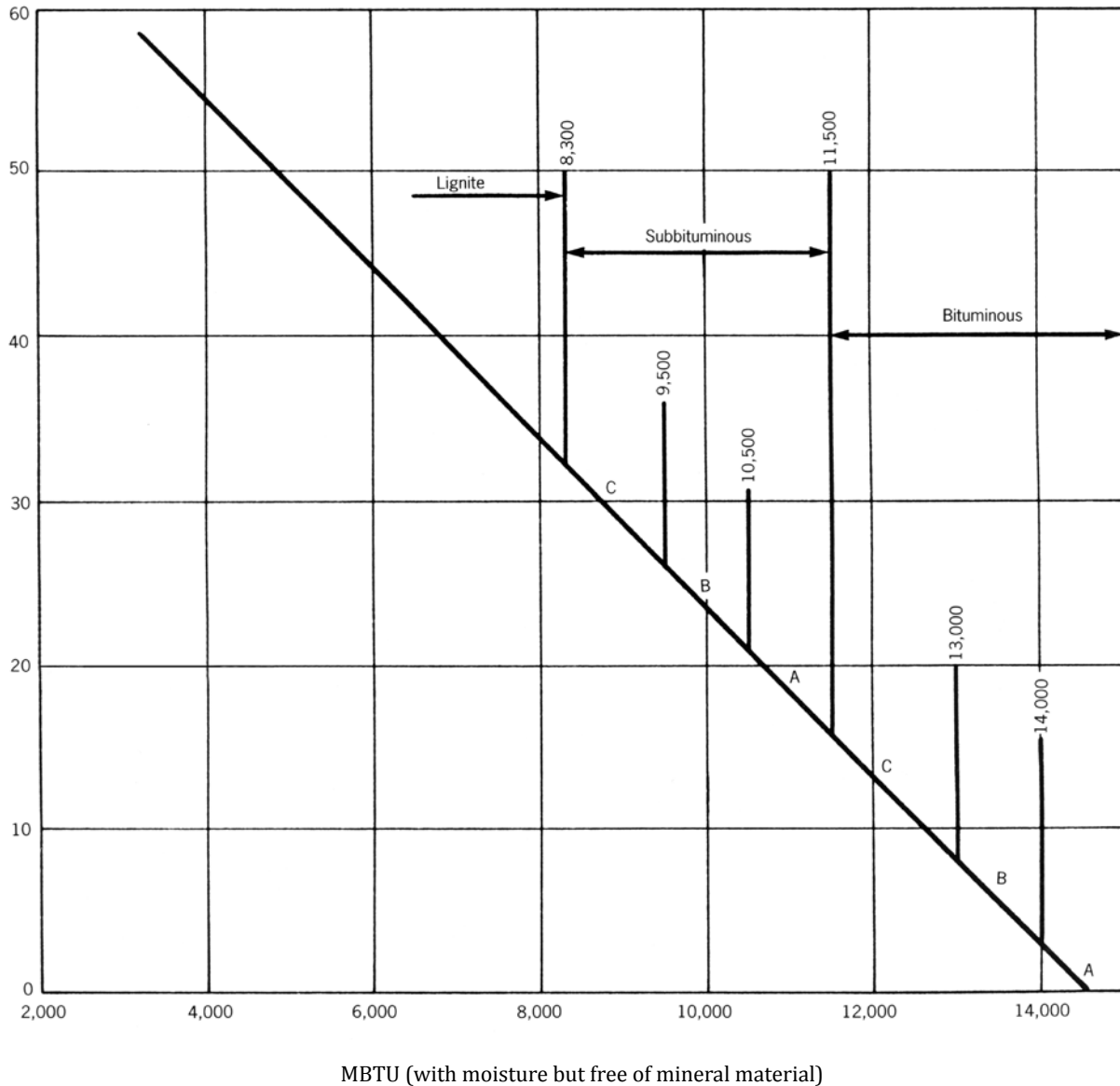
- d. With the mill tripped, initiate fire extinguishing procedures.
- e. Once it is known that the fire has been successfully extinguished, and the housing temperature has

cooled to room temperature, the mill may be opened for inspection.

- f. It is a good safety procedure to test the mill for combustibles and low oxygen levels prior to personnel entry.
- g. Do not return the mill to service until all areas affected by the fire have been inspected and all debris removed.

### Safety systems for various classifications of coal

As part of an overall fire safety system, appropriate equipment for inerting and extinguishing internal fires in a pulverized fuel system should be installed. The design of this equipment should be compatible with the type of coal used and the fire and explosion potential of that coal. Coals can be classified according to Figure 1. Lignites and



$$MBTU = \frac{\text{As-Fired Btu} \times 100}{(100 - (1.1 \text{ Ash} + 0.1S))}$$

Ash & Sulfur - As Received

Figure 1 Coal classification curve.

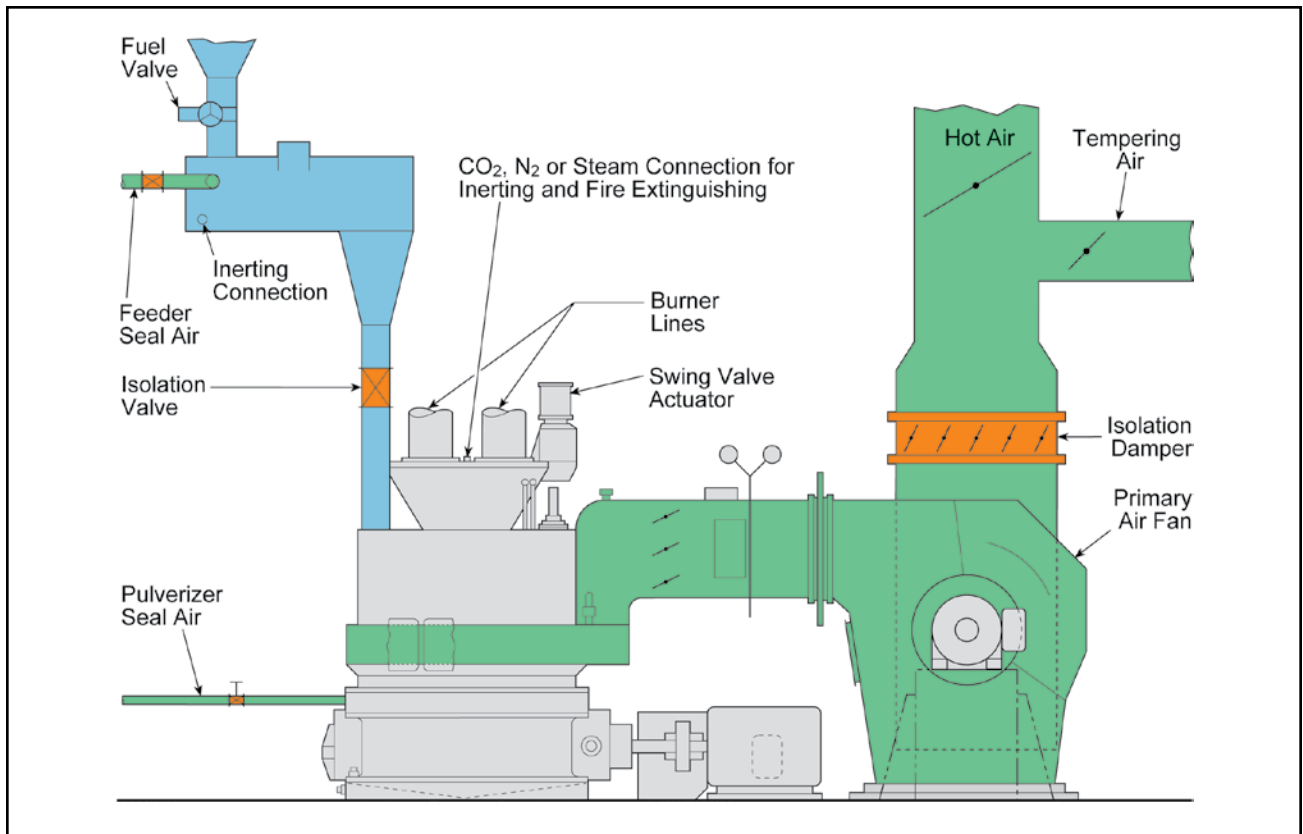


Figure 2 Typical isolation and inerting points for EL pulverizers.

subbituminous B and C coals have the greatest potential for fire and explosion dangers.

1. For subbituminous B, C and lignite coals, or when the pulverizer air inlet temperature exceeds 450F, the safety system should be designed to:

- a. Control fires
- b. Prevent fires following mill trips
- c. Isolate tripped mills (tightly shut off primary air dampers; shut off seal air)
- d. Inert tripped pulverizers after isolation
- e. Be actuated from a remote location

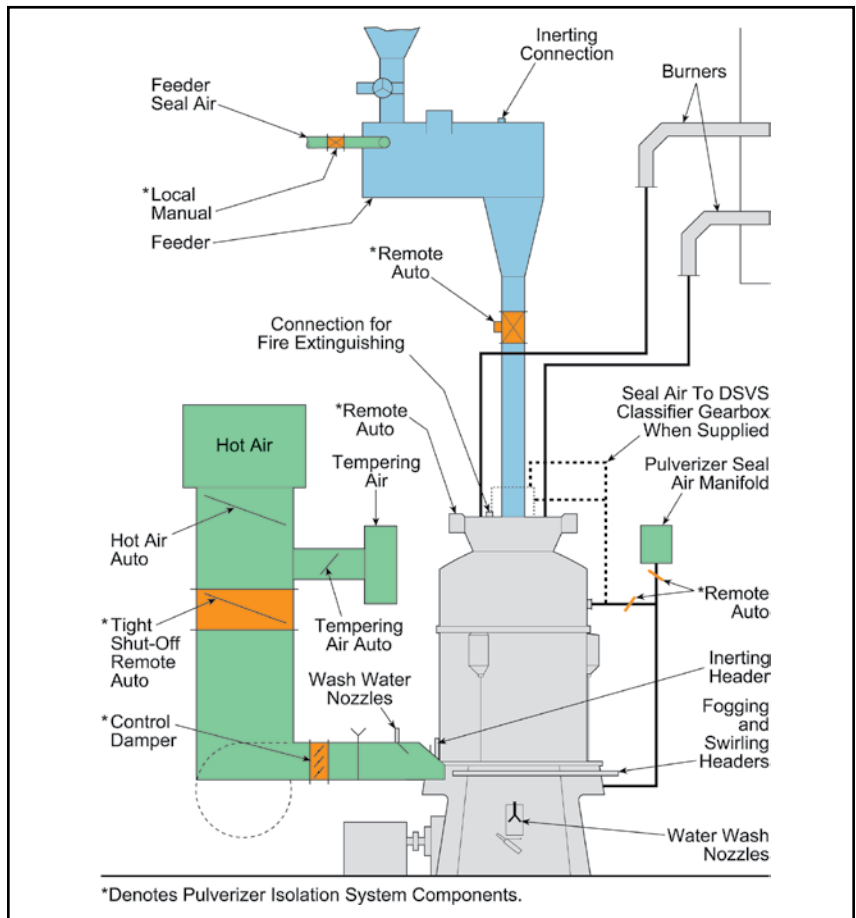


Figure 3 Typical isolation and inerting points for B&W Roll Wheel® pulverizers.

- f. Permit clearing combustible contents to the pyrites system (clearing is to be performed only after inerting or while maintaining an inert atmosphere)
- g. Provide for interlock logic, allowing mill motor operation for clearing without satisfying primary air and seal air requirements

2. For bituminous and sub-bituminous A coals, the pulverizer safety systems should be designed to:

- a. Control fires
- b. Prevent fires in tripped mills
- c. Isolate tripped mills
- d. Inert tripped mills after isolation
- e. Be actuated from a remote location

### **Inerting**

Inerting is intended to prevent explosions. Dilution of the mill's

atmosphere by admission of inert gas or vapor must reduce O<sub>2</sub> content to 15% or less by volume, to successfully accomplish this. See Figures 2 and 3 for recommended inerting locations.

There are three types of inerting systems available. They are classified according to the inerting media used, which are:

- Nitrogen
- Carbon dioxide
- Steam

### **Fire extinguishing**

A fire extinguishing agent is either a gas, liquid, or powder that works to extinguish an active fire by displacing oxygen, by cooling the burning fuel, or by forming a barrier between the fuel and surrounding atmosphere. Typically, a dedicated fire extinguishing system using gaseous or powdered media is preferred. These media will successfully control vigorous fires, but they lack the attributes

of water for prompt cooling and extinguishing of a burning mass.

Water is not considered an inerting medium because it is a liquid. However, it may be used to extinguish fires and flush parts of the pulverizer system.

Admission of water must only be introduced after the system has been inerted to reduce the risk of stirring up the dust in an oxygen rich atmosphere. When admitting water to the pulverizer, caution must be used regarding impingement on hot, cast parts, danger to personnel from steam generated, and the potential difficulty in cleaning the equipment afterwards to assure proper operation on startup.

### **Support**

If you have questions or need any assistance regarding pulverized fuel system fires, contact your local Babcock & Wilcox Field Engineering Services office.

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