Avoiding Powder River Basin Coal Dust Filtration Problems

PRB Coal Dust Collection & Filters

Although there are a myriad of issues to consider for proper selection of air filtration equipment, you need to learn and remember that PRB Coal Dust requires special handling if you are to avoid problems with your filtration system.

Why PRB Coal Dust Is Special

PRB Coal Dust is different from midwestern bituminus coal in four distinct ways:

- Higher content of small particles
- Higher moisture content
- Affinity for spontaneous combustion
- Increased explosive potential

Each of these characteristics require special emphasis in the design of the dust collector and the dust collection system.

The MikroPul Reverse Air Filter design is especially suited to deal with these (4) special PRB Coal Dust collection issues as follows:

High Content Of Small Particles

Filtering a high content of small particles may be approached several ways:

- Using expensive “Teflon” membrane media so no dust cake is required and the small dust particles cannot work their way through the media as they do on plain or singed polyester felt.
- Applying the dust collector at low air/media ratios so the dust cake is thicker and the bags are pulse cleaned less often, so the dust has fewer opportunities to work its way through the filter bags.
- Use standard polyester felt bags with a low pressure reverse air cleaning system that delivers a high volume of air to each bag, to insure: The bag is fully inflated, the dust cake is dislodged from the bag and not fragmented into dust and re-entrained, and has enough time to fall into the hopper. A side benefit to the MikroPul low pressure-high volume reverse air cleaning system is longer bag life.

Higher Moisture Content

PRB Coal often has moisture content from 15-30%. This level of moisture requires certain considerations in the application and design of the dust collector.

Air/media ratios should fall between 4:1 for 30% moisture to 7:1 for 15% and less moisture. The primary reason for this is to keep the bag pressure drop to within normal limits due to the cake density of damp PRB coal.
Hopper and chute slope angles should be at least 60 degrees from horizontal to insure the collected dust slides easily through the filter hopper into the rotary valve or conveying duct.

In colder climates high moisture level means insulated or heated hoppers to prevent dewpoint condensation and the resultant ice formation. Ice builds a dam on the hopper sidewalls and prevents free-flowing of the dust.

**Spontaneous Combustion**

Almost all organic dusts that will burn will also spontaneously catch fire if the right conditions of moisture, air, pressure, and heat are present. PRB coal normally has most of the conditions mentioned, so unwanted accumulations must be avoided. The MikroPul collector design has gone the extra step to prevent coal dust accumulations below the filter bags, and on the clean side above the bags as well. The following design considerations make the MikroPul RAF-IS collector least likely to accumulate residual coal dust:

- Low pressure, simple continuous fan cleaning, sweep arm that not only cleans the bags, but also “blows-off” the entire top surface of the filter bag plate on each revolution. This action insures no accumulation of coal dust on the bag plate floor can happen even if a filter bag were to have a hole.
- Special attention paid to eliminate any large flat horizontal surfaces on the cleaning mechanism, and supports.
- The bottoms of the explosion vents are angled back into the collector's bag section to prevent any ledges for dust accumulation.
- The Vortex Breaker design has thin sharp edges on top vanes and the center hub for ledgeless construction.
- The Involute Inlet not only spins most of the dust out by centrifugal force, but it also insures no material build-up on the inlet floor or walls.
- 60 or 70 degree repose angle on hopper to prevent material accumulation on slopes.
- Flush hopper inspection door to prevent any ledges for material build-up.

**Increased Explosive Potential**

PRB Coal dust has a high potential for deflagration (explosion at a speed less than the speed of sound). MikroPul puts much emphasis into the collector design to insure that all the latest applicable National Fire Protection Association (NFPA), codes are adhered to. The explosion vents are sized to the coal dust’s specific speed of combustion (Kst) and the pressure potential (Pmax). PRB coal has Kst’s over 200 and Pmax’s over 9. This is rather high on the scale of materials. The following design items are incorporated into the RAF-IS collector for fire, safety, and explosion protection:

- Explosion venting per latest NFPA 68 codes.
- Static electricity grounding per NFPA 77.
- Built-in sprinkler system per NFPA 15 codes.
- Independent stress analysis of collector design to insure validated
strength values, (Pred), for proper explosion vent sizing.

- Bag and cage design that insures top of cage’s outer galvanized rim rests on top of steel bag plate for static drain.
- Motors, cleaning fan, and wiring are located outside the collector for maximum safety. Explosion ratings to CI. 2, Division 1, dust groups E,F, & G as required.
- Cleaning fan is built to AMCA-B or C classification for non-sparking construction.
- The outside scroll of the involute inlet is covered with replaceable anti-spark/wear resistant aluminum plates to help prevent sparks and abrasion from entering coal striking steel.

**The Summary**

The MikroPul RAF-IS Coal Dust Collector is especially suited to the collection of PRB coal dust, due in most part to it’s reverse air cleaning mechanism that positively cleans all the bags in the collector and sweeps the bag plate clean every (2) minutes of operation. Special attention to ledgeless construction for prevention of coal dust accumulation, no electrical components inside the collector, strict adherance to all NFPA fire and explosion design codes, and a professional staff of engineers & technicians, insures the proper engineering assistance and machine quality this application requires.

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