



# Underground Dust Control

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*“No Dust with No Fuss!”*

**Joshua Evans**  
**September, 2009**

“Experts in hydrocarbon waste recycling, dust control, and cold weather material handling.”



## **Underground Dust Suppression**

### **Background**

In order to have an understanding of underground dust suppression it is necessary to have a basic understanding of the underground mining process. Since the 1969 Health and Safety Act, the Coal Industry has experienced many changes in the production process. Forty years ago we were mining much cleaner coal seams and production demands were not nearly as great as they are today. During this time period the first dust standard was set at 3/mg<sup>3</sup>. Ventilation requirements and equipment spray systems were minimal. With the loss of coal reserves that offer 40", 50", 60" clean coal seams, we are now mining coal seams that give us 50 to 60% recovery rates. With this change in mining conditions, our dust standard is now set at 2/mg<sup>3</sup> with a "reduced standard clause." There is a strong possibility that the MSHA dust standard will be reduced to 1.0/mg<sup>3</sup>. Underground mining equipment has been modified to be much heavier and faster than ever before to meet production demands. Mine ventilation plans submitted to MSHA are under a great deal of scrutiny during the approval process. These are but a few of the many challenges that the mining industry is confronted with now and in the future. We at AKJ Industries want to be a part of the mining industry effort by offering proven and effective dust suppression solutions that fit well with the mining process.

A typical underground mine will generate fugitive dust in a number of ways. The most prominent are the cutter heads on the continuous mining machine, face equipment traffic, and roof bolting activities. Supply roadway traffic and coal conveyance also create significant amounts of respirable dust. Dust particles generated from these activities will range from 200 to 10 microns in size. The 10 micron and below dust particles are those that are classified as respirable dust. MSHA uses a personnel sampling device to collect particles that are 10 microns and below, while throwing off the heavier particles. The average weight of these samples must not exceed 2mgs/m<sup>3</sup>. It is also not uncommon to contaminate these samples with quartz when mining coal seams that are layered with sandstone rock. This contamination can cause your dust standard to drop well below the 2mgs/m<sup>3</sup>. Whenever this occurs there must be corrective action taken. In most cases, a modification to the ventilation plan that insures dust compliance must be submitted.

Over the past fifteen years, AKJ Industries has worked well with the mining industry to insure compliance with dust levels in the underground work place. Our primary contribution has been with wetting agent chemistry and technology that fits the mining process. The primary element in face dust suppression is that adequate volumes of air must be provided to sweep the face areas and carry fugitive dust to the return air courses. In conjunction with face ventilation, water

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sprays must be provided at impact areas such as the continuous miner and feeder breaker. In coal seams that offer a high recovery rate the above ventilation principles will allow for compliance with the 2mgs/m<sup>3</sup> dust standard. As mentioned before, the high quality coal seams are in the minority, we are now mining coal seams that are layered with shale and sandstone partings that generate much more fugitive dust.

It has been our observation when working with minus 10 micron dust particles in face areas and conveyor belt entries that spray water alone does not do a very good job of allaying these very minute size particles. The surface tension of the water droplets does not allow for the encapsulation of the dust particles. You can see this phenomenon at transfer areas where water sprays are operational, and yet coal dust accumulates on top of water puddles in the walkway. When these conditions are present, the introduction of a wetting agent into the spray water can be remarkable. The surface tensions of spray water droplets are greatly reduced and the encapsulation of minus 10 microns occurs much more readily.

### **Dust Suppression Programs**

Over the past fifteen years, AKJ Industries has implemented many dust suppression programs for the underground mining industry. Many of these applications are located in Alabama, East Kentucky, West Virginia and South West Virginia. Most of our efforts have been with mines that have low recovery rates where shale and sandstone are a part of the mining seam. When conditions of this nature exist, it is very difficult to maintain dust compliance using water spray and ventilation resources at its maximum.

## **Delivery Systems**

AKJ Industries has designed three basic systems for underground use. All of our delivery systems have one thing in common in that each will deliver a preset solution ratio determined by mine management. Each pump is also constructed to withstand the rigors of underground mining.

### **Single Section System**

This unit can be located on the surface or underground area of a mine. Design features include compact construction that allows for equipment moves when the system is located on an active mining section.

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## **Multi Section System**

This unit is usually located on the surface area of a mine or in a general underground area where all active mining sections are being fed a solution ratio. The multi section system unit provides the technology to use preset ratios at all levels of water demand.

## **Longwall System**

AKJ Industries builds systems for both wet and foam applications. In order to achieve maximum effectiveness, we recommend that either of these systems be located out- by the active working face. The system should be mounted on wheels or rail in close proximity to the power center. We have found that geologic conditions change rapidly on a 1,000 foot face area. The shear can come in contact with sandstone on the tail end of the face and encounter shale on the head gate side. The representation of respirable dust levels will also change. These changing conditions can be measured by the number of amps demanded by the shear and crusher. Our system technology allows us to automatically increase or decrease our solution ratio per amperage demand. This controlled method improves results and reduces cost.

## **Support Service**

AKJ Industries prides itself in offering excellent service with all of our products. Our business base is contingent with the services that we provide. In order to select a program for underground dust suppression, we prefer to meet with mine management to insure the most cost effective and efficient plan possible. Our objective is to review compliance history, geologic conditions, mine layout and equipment resources. With this information we can make useful recommendations based on prior experience. We also have instrumentation that can provide instantaneous readings of respirable dust concentrations in mgs/m<sup>3</sup> at various locations inside the mine. This information can be very useful in developing a program that fits your mining process. Should you elect to install a dust suppression system at your mine we, would expect to see the following improvements:

- Significant reductions in respirable dust concentrations.
- Significant reductions in coal float dust accumulations along conveyor belts and transfer points
- Less rock dusting in return air courses and conveyor belt entries.
- Cleaner water supply lines.
- Better cooling efficiency on motors that are water cooled.
- Reduced maintenance for cleaning water sprays and scrubbers.

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