Inept Dust Collection & Blindness

Luanne Huneycutt, American Fabric Filter Co.

All dust collection systems, regardless of size, share a common problem—dust blinding. Simply stated, blinding is defined as when dust particles plug the holes in a filter and stop the flow of air through the filter, resulting in the dust collector performing poorly. All types of collectors, whether stand-alone units, cyclones or full-scale baghouses, are subject to blinding.

To better understand why the filter in a dust collector blinds, one needs to understand how a dust collection system works. The basic principle behind a dust collector is a fan draws air through ductwork or hoses, creating an air stream. The surrounding dust is then pulled into the air stream or vacuum, and is exhausted through some form of filter media to capture the dust and return clean air. Blinding occurs when the dust particles penetrate deep into the fibers of the filter media, and inhibit or prevent the flow of air through the filter. This restriction of airflow creates backpressure and reduces suction, preventing the dust collection system from operating effectively. The two most common causes of blinding are the filter is too small for the unit or the choice of filter media is not the best-suited to the application.

When the filter is too small for the collector, the volume of air entering the collection system is greater than the filter can efficiently vent. As a result, the dust in the incoming air is driven into the pores of the filter media and seals off the

openings through which the air can escape, causing further restriction and backpressure.

To achieve optimal filtration and filter life, it is recommended that there be a large difference between the inlet velocity and the can velocity. Can velocity is the speed at which air enters the filtration device. The primary variable affecting can velocity is vessel size.
Filter cartridges typically have a higher can velocity than large filter bags. Although the filter media in a cartridge is abundant, it is extremely condensed and close to the air stream. This results in a collision of sorts between the dust-laden air and the filter media. A large filter bag, however, has lower can velocity because it is an empty vessel that provides sufficient area for the incoming air to slow, allowing the dust to fall from the air stream before it makes contact with the filter media.

The second major factor in the prevention of blinding is the choice of the filter media itself. The porosity of the filtering material determines the amount of air that passes through it and the size of the dust particles that are collected. Woven cloth, such as the cotton or polyester sateen commonly used in filter bags, is made up of a mesh of threads and holes. Since threads don’t breathe, air can only escape through the holes between the threads.

The openings between the threads that are large enough to pass air efficiently also pass dust with the same efficiency. A tighter weave may trap smaller dust particles, but it also restricts airflow. As the pressure builds inside a woven filter bag, the holes are forced to open wider, letting both very fine and larger dust particles through.

Filter bags can be made from dozens of materials to solve specific dust problems or to properly function in a particular application. For example, a bakery may desire woven fabrics because they are easier to launder for sanitation purposes. Industrial applications with high operating temperatures may call for special fabrics like fiberglass or even stainless steel cloth. However, in a high percentage of applications, the overwhelming filtration fabric of choice is a non-woven felt.

Engineered for strength, durability and consistency, the fibers in felt are needle-punched into a homogeneous pad. Felt breathes over the total surface (as opposed to a woven cloth’s holes) and provides higher air permeability than most woven fabrics. Even though the spaces between fibers are closer together, air has many more pathways to exit, thereby felt allows more air to pass per square foot of surface area while capturing finer dust.

Felts are available in a range of base fibers, and weights or thickness. Thicker felt fabrics provide increased depth-filtration capacity, but with correspondingly less overall airflow.

Specialized surface treatments address specific types of dust and varying applications. Nevertheless, for general dust filtering, singed felt is one of the most popular surface-treated fabrics for its ability to form a dust cake. A dust cake is a desirable layer of dust that builds upon the surface of the filter and provides a

barrier to the actual filter media. It performs the majority of filtration and prevents the incoming dust from impregnating the filter.

As the dust cake builds, it reaches a point in which it can no longer be supported, and it sloughs from the surface of the filter, falling off and leaving behind a very fine layer of dust to restart the constant self-cleaning process.

In conclusion, the prevention of blinding is a balance of filter type, filter size and selection of the filter media used. The right combination ensures effective dust filtration for any collection system.

For more information, please visit www.americanfabricfilter.com [1].

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