Getting it Right from the Start…that's Optimization

Dust Hidden Hazard

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Dust-Hidden Hazard Lurks

A Certain Pharmaceutical company shared their experience on how combustible dust may become “hidden” within a Contamination Control Vacuum System in an article in July 2014 in Chemical Processing Website.

The Contamination Control Vacuum (Exhaust) System was designed to capture dust as a result of bulk powder loading at the blender at the clean room.

A small Dia. 2” hose connect the blender to the system, which convey captured dust via a series of duct (several hundred feet) before it is filtered and exhaust out of the system.

During engineering inspection, dust was found settled on all horizontal surfaces including the inlet plenum of the Contamination Control Vacuum System.

These dust was founded to be much smaller at 12 microns with a minimum ignition energy of only 25 Mj. This is a big difference from all the company safety protocol which had been written around an average particle sizes of 27 microns and a Minimum Ignition Energy of 200 Mj.

These are shocking findings both the particle sizes, Minimum Ignition Energy & the dust settlement.

The dust settlement found also explained the experience that their technicians had been so use to, which is finding the dust collection drum empty.

As part of the safety protocol, the technician have to check the accumulation of material in a small drum under the existing Contamination Control System’s equipment. They have noticed that the drum is always empty in the last 10 years.

The company’s experience is not unique to their facilities or the company.

Many a time, people get used to believing that things are alright especially after seeing the same things over and over again for many years.

A Central Contamination Control Vacuum (Exhaust) System can become complex especially those involving capturing dust with a small flexible hose at source.

Such system are classified in American Conference Of Governmental industrial Hygienists handbook as “low volume high velocity exhaust system”.

The design of such system which PV’s specialized are largely empirical according to the handbook.

In normal large volume; low pressure system, air is considered to be incompressible since static pressure vary only slightly from atmospheric pressure. However, in these system, the need to maintain a minimum conveying velocity to avoid settlement, changes the game totally.

The extremes pressures required introduces problems of air density, compressibility and viscosity which are not easily solved.

Careful planning and design of the ducting/piping systems is required to ensure that dust settlement like what was uncovered in the engineering inspection at the Company is avoided in Design in the First Place.

It is also important to understand that in such Contamination Control Vacuum System that involve dust removal via several hundreds of ducting/piping, particle sizes of dust are usually not what it is at the point of collection.

The rapid movement of such dust within the ducting/piping will break it down into smaller particle which will ignite with a much lesser ignition energy.

The key to avoid such surprise is always:

start from doing things right from the start.

Seeking a Detail Design Submission which capture the necessary production requirement, detailing how the entire system is designed and what are the conveying velocities at various section of the exhaust ducting/piping is most crucial.

At PV, providing such a document had always been our first step to ensure that our delivered system will function well year after year.