HOW IT WORKS?

Milan, 05/09/2016

The study and concept design of engineering that will serve as a basis for implementation of fog cannons technology for particulate emissions combating in the Pellets courtyard area of P1nats1-4 is based onto Hygroscopy is the ability of a substance to attract water molecules from the surrounding environment through either absorption or adsorption.

Hygroscopic substances include sugar, honey, glycerol, ethanol, methanol, sulfuric acid, methamphetamine, iodine, many chloride and hydroxide salts, and a variety of other substances. Sodium chloride is not hygroscopic. The hygroscopy of table salt is caused by traces of magnesium chloride or other innocuous impurities.

Zinc chloride and calcium chloride, as well as potassium hydroxide and sodium hydroxide (and many different salts) are so hygroscopic that they readily dissolve in the water they absorb: this property is called deliquescence (see below). Sulfuric acid is not only hygroscopic in high concentrated form, its solutions are hygroscopic down to concentrations of 10 Vol-% or below.

Because of their affinity for atmospheric moisture, hygroscopic materials may need to be stored in sealed containers. When added to foods or other materials for the express purpose of maintaining moisture content, such substances are known as humectants.

Materials and compounds exhibit different hygroscopic properties, and this difference can lead to detrimental effects, such as stress concentration in composite materials. The amount a particular material or compound is affected by ambient moisture may be considered its coefficient of hygroscopic expansion (CHE) (also referred to as CME, coefficient of moisture expansion) or coefficient of hygroscopic contraction (CHC)—the difference between the two terms being a difference in sign convention and a difference in point of view as to whether the difference in moisture leads to contraction or expansion.
Deliquescent materials are substances (mostly salts) that have a strong affinity for moisture and will absorb relatively large amounts of water from the atmosphere if exposed to it, forming a liquid solution. Deliquescent salts include calcium chloride, magnesium chloride, zinc chloride, potassium carbonate, potassium hydroxide, carnallite and the strong base sodium hydroxide. Due to their very high affinity for water, these substances are often used as desiccants, which is also an application for concentrated sulfuric and phosphoric acids. These compounds are used in the chemical industry to remove the water produced by chemical reactions, to increase the yields.

Hydrophobicity (from the combining form of water in Attic Greek hydro- and for fear phobos) refers to the physical property of a molecule (known as a hydrophobe) that is repelled from a mass of water. Hydrophobic molecules tend to be non-polar and thus prefer other neutral molecules and nonpolar solvents. Hydrophobic molecules in water often cluster together forming micelles. Water on hydrophobic surfaces will exhibit a high contact angle.

Examples of hydrophobic molecules include the alkanes, oils, fats, and greasy substances in general. Hydrophobic materials are used for oil removal from water, the management of oil spills, and chemical separation processes to remove non-polar from polar compounds. Hydrophobic is often used interchangeably with lipophilic, "fat loving." However, the two terms are not synonymous. While hydrophobic substances are usually lipophilic, there are exceptions — the silicones, for instance.

Fog Cannon System works like a combination of a wet scrubber and fabric filter. The generated ultra-fine fogging blanket acts like a fabric filter in that a dust particle cannot pass through it without colliding with a droplets of same size in diameter = 1 micron, 2.5 microns and 10 microns curve...

Since the droplet consists of water polarized and micelled by mechanical friction as seltzer into five different centrifugal disks made of aisis316L, the dust particle does become somewhat wet as in a true flooded scrubber.
This phenomenon can be called agglomeration.

Solving fugitive dust emission problems using ultra-fine water droplet atomisation begins with the theory of agglomeration. Agglomeration can be defined as the gathering of mass into a larger mass, or cluster.

Agglomeration probability is greatly increased between bodies of similar size. The agglomeration of these bodies produces a large enough mass to cause settling. For example, a dust particle of 5 microns will continue to follow the air stream around a water droplet of 200 microns, therefore, avoiding collision. With the dust particle and a water droplet of similar size, the air stream is not as great and collision occurs, causing agglomeration.

Fog suppression is one method to optimize the application of water to dusty materials. These systems use special ultrasonic nozzles to produce extremely small water droplets (10 microns or less) in a dispersed mist. These droplets mix and agglomerate with dust particles of similar size, with the resulting larger combined particles falling back to the material body.
Fog Dust Suppression Systems control virtually all types of less than 5 micron breathable as well as larger size fugitive dust up to 600 microns. Control is accomplished through agglomeration of ultrasonically produced water droplets equal or close to the size of the dust particles. These include silica sand, dried clay, dry sand, limestone, aggregate, road stone, phosphate, coal, quartz, fibreglass and many others. The Fog System suppresses visible emissions from primary and secondary crushing, screening, transfer and loading/unloading facilities such as hoppers, feeders, bins, docks, silos, terminals and vehicles.

The FogCannon nozzles in HD ceramic along without any compressed air supply and simple on/off controls will suppress breathable dust as small as 0.1 to 3 microns as well as larger size particles. The operation costs and maintenance of a Fog System is much lower than aspiration filter. In contrast to the use of large ducts and related equipment, the FogCannon system operates with smaller diameter tubing on as little as 5% of the total energy of conventional systems. Fog systems can be installed for as little as 40% of the installation cost of a conventional bag filter type system.

Dust suppression is an important factor in meeting both environmental and health and safety requirements, while also helping and protecting employees and reducing site emissions. We offer complete solutions for the control of dust in all material handling processes.

Our FogCannon dust suppression system controls airborne dust without wetting the product while adding very little moisture (usually less than 0.1% moisture addition). Our systems are fully installed and integrated into all processes and control dust without the need for expensive extraction systems or chemical additives.