INDUSTRIAL DUST AND OTHER OPERATIONAL DISEASES

Dust in Coal Handling Plant (CHP) and its control systems: Thermal power plants (coal-fired power plants) use coal as their fuel. To handle the coal, each power station is equipped with a coal handling plant. The coal has to be sized, processed, and handled which should be done effectively and efficiently. The major factor which reduces the staff efficiency in operation of coal handling plant is the working environment i.e. a dusty atmosphere and condition. Lots of care is always needed to reduce dust emission. In developing countries, all most all systems used in power station coal handling plants are wet dust suppression systems.

5.1. After dust is formed, control systems are used to reduce dust emissions. Although installing a dust control system does not assure total prevention of dust emissions, a well-designed dust control system can protect workers and often provide other benefits, such as (a) Preventing or reducing risk of dust explosion or fire; (b) Increasing visibility and reducing probability of accidents; (c) Preventing unpleasant odors; (d) Reducing cleanup and maintenance costs; (e) Reducing equipment wear, especially for components such as bearings and pulleys on which fine dust can cause a “grinding” effect and increase wear or abrasion rates; (f) Increasing worker morale and productivity; (f) Assuring continuous compliance with existing health regulations. In addition, proper planning, design, installation, operation, and maintenance are essential for an efficient, cost-effective, and reliable dust control system.

5.2. There are two basic types of dust control systems currently used in minerals processing operations are:

(a) Dust collection system - Dust collection systems use ventilation principles to capture the dust-filled air-stream and carry it away from the source through ductwork to the collector. A typical dust collection system consists of four major components, such as (1) An exhaust hood to capture dust emissions at the source; (2) Ductwork to transport the captured dust to a dust collector; (3) A dust collector to remove the dust from the air; (4) A fan and motor to provide the necessary exhaust volume and energy.

(b) Wet dust suppression system - Wet dust suppression techniques use water sprays to wet the material so that it generates less dust. There are two different types of wet dust suppression: pds_dust_suppression

(i) wets the dust before it is airborne (surface wetting) and

(ii) wets the dust after it becomes airborne. In many cases surfactants or chemical foams are often added to the water into these systems in order to improve performance.

A water spray with surfactant means that a surfactant has been added to the water in order to lower the surface tension of the water droplets and allow these droplets to spread further over the material and also to allow deeper penetration into the material.

i. Surface wetting system: The principle behind surface wetting is the idea that dust will not even be given a chance to form and become airborne. With this method, effective wetting of the material can take place by static spreading (wetting material while it is stationary) and dynamic spreading (wetting material while it is moving). For static wetting, more effective dust suppression arises by increasing the surface coverage by either reducing the droplet diameter or its contact angle. For dynamic spreading, more factors come into play such as the surface tension of the liquid, the droplet diameter, the size of the material being suppressed, and the droplet impact velocity.

airborne_dust_1ii. Airborne dust capture system - Airborne dust capture systems may also use a water-spray technique; however, airborne dust particles are sprayed with atomized water. When the dust particles collide with the water droplets, agglomerates are formed. These agglomerates become too heavy to remain airborne and settle. Airborne dust wet suppression systems work on the principle of spraying very small water droplets into airborne dust. When the small droplets collide with the airborne dust particles, they stick to each other and fall out of the air to the ground. Research showed that, if a sufficient number of water droplets of approximately the same size as the dust particles could be produced, the possibility of collision between the two would be extremely high. It was also determined that if the droplet exceeded the size of the dust particle, there was little probability of impact and the desired precipitation. Instead, the dust particle would move around the droplet.

5.3. System Efficiency: Over the years, water sprays has established the following facts:

(a) For a given spray nozzle, the collection efficiency for small dust particles increases as the pressure increases;

(b) At a given pressure, the efficiency increases as the nozzle design is changed so as to produce smaller droplets. The efficiency of spray dust capture increases by increasing the number of smaller sized spray droplets per unit volume of water utilized and by optimizing the energy transfer of spray droplets with the dust-laden air.

5.4. Sophisticated system like ‘Ultrasonic Dust Suppression’ systems uses water and compressed air to produce micron sized droplets that are able to suppress respirable dust without adding any detectable moisture to the process. Ideal for spray curtains to contain dust within hoppers. The advantages of using Ultrasonic Atomizing Systems for dust suppression can therefore be summarized as: (a) reduced health

hazards; (b) decrease in atmospheric pollution; (c) improved working conditions; (d) efficient operation with minimum use of water.

6.0. Air pollution control devices / equipments for industries, in general – The commonly used equipments / process for control of dust in various industries are (a) Mechanical dust collectors in the form of dust cyclones; (b) Electrostatic precipitators – both dry and wet system; (c) particulate scrubbers; (d) Water sprayer at dust generation points; (e) proper ventilation system and (f) various monitoring devices to know the concentration of dust in general body of air.

The common equipments / process used for control of toxic / flue gases are the (a) process of desulphurisation; (b) process of denitrification; (c) Gas conditioning etc. and (d) various monitoring devices to know the efficacy of the systems used.

7.0. Occupational Hazards / diseases due to expose in dusty and polluted air: There are certain diseases which are related to one's occupation. These are caused by constant use of certain substances that sneak into air and then enter our body.

(i) Silicosis (Silico-tuberculosis) occurs due to inhalation of free silica, or SiO_2 (Silicon dioxide), while mining or working in industries related to pottery, ceramic, glass, building and construction work. The workers get chronic cough and pain in the chest. Silicosis treatment is extremely limited considering a lack of cure for the disease. However, like all occupational respiratory ailments, it is 100% preventable if exposure is minimized.

(ii) Asbestosis is caused by asbestos, which is used in making ceilings. It is also considered as cancer causing agent. Pathogenesis of the disease is characterized as progressive and irreversible, leading to subsequent respiratory disability. In severe cases, asbestosis results in death from pulmonary hypertension and cardiac failure.

(iii) Byssinosis, also referred to as brown lung disease, is an occupational respiratory disorder characterized by the narrowing of pulmonary airways. It is a disabling lung disease, which is marked by chronic cough and chronic bronchitis due to inhalation of cotton fibers over a long period of time.

(iv) Coal worker's Pneumoconiosis occurs due to inhalation of coal dust from coal mining industry. Also referred to as black lung disease. The workers suffer from lung problems. Apart from asbestosis, black lung disease is the most frequently occurring type of pneumoconiosis . In terms of disease pathogenesis, a time delay of nearly a decade or more occurs between exposure and disease onset.

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