13.2 Fugitive Dust Sources

Significant atmospheric dust arises from the mechanical disturbance of granular material exposed to the air. Dust generated from these open sources is termed "fugitive" because it is not discharged to the atmosphere in a confined flow stream. Common sources of fugitive dust include unpaved roads, agricultural tilling operations, aggregate storage piles, and heavy construction operations.

For the above sources of fugitive dust, the dust-generation process is caused by 2 basic physical phenomena:

1. Pulverization and abrasion of surface materials by application of mechanical force through implements (wheels, blades, etc.).

2. Entrainment of dust particles by the action of turbulent air currents, such as wind erosion of an exposed surface by wind speeds over 19 kilometers per hour (km/hr) (12 miles per hour [mph]).

In this section of AP-42, the principal pollutant of interest is PM-10 — particulate matter (PM) no greater than 10 micrometers in aerodynamic diameter (µmA). Because PM-10 is the size basis for the current primary National Ambient Air Quality Standards (NAAQS) for particulate matter, it represents the particle size range of the greatest regulatory interest. Because formal establishment of PM-10 as the primary standard basis occurred in 1987, many earlier emission tests have been referenced to other particle size ranges, such as:

TSP Total Suspended Particulate, as measured by the standard high-volume ("hi-vol") air sampler, has a relatively coarse size range. TSP was the basis for the previous primary NAAQS for PM and is still the basis of the secondary standard. Wind tunnel studies show that the particle mass capture efficiency curve for the high-volume sampler is very broad, extending from 100 percent capture of particles smaller than 10 µm to a few percent capture of particles as large as 100 µm. Also, the capture efficiency curve varies with wind speed and wind direction, relative to roof ridge orientation. Thus, high-volume samplers do not provide definitive particle size information for emission factors. However, an effective cut point of 30 µm aerodynamic diameter is frequently assigned to the standard high volume sampler.

SP Suspended Particulate, which is often used as a surrogate for TSP, is defined as PM with an aerodynamic diameter no greater than 30 µm. SP may also be denoted as PM-30.

IP Inhalable Particulate is defined as PM with an aerodynamic diameter no greater than 15 µm IP also may be denoted as PM-15.

FP Fine Particulate is defined as PM with an aerodynamic diameter no greater than 2.5 µm. FP may also be denoted as PM-2.5.

The impact of a fugitive dust source on air pollution depends on the quantity and drift potential of the dust particles injected into the atmosphere. In addition to large dust particles that settle out near the source (often creating a local nuisance problem), considerable amounts of fine particles also are emitted and dispersed over much greater distances from the source. PM-10 represents a relatively fine particle size range and, as such, is not overly susceptible to gravitational settling.

The potential drift distance of particles is governed by the initial injection height of the particle, the terminal settling velocity of the particle, and the degree of atmospheric turbulence. Theoretical drift distance, as a function of particle diameter and mean wind speed, has been computed for fugitive dust emissions. Results indicate that, for a typical mean wind speed of 16 km/hr (10 mph), particles larger than about 100 µm are likely to settle out within 6 to 9 meters (20 to 30 feet [ft]) from the edge of the road or other point of emission. Particles that are 30 to 100 µm in diameter are likely to undergo impeded settling. These particles, depending upon the extent of atmospheric turbulence, are likely to settle within a few hundred feet from the road. Smaller particles, particularly IP, PM-10, and FP, have much slower gravitational settling velocities and are much more likely to have their settling rate retarded by atmospheric turbulence.

Control techniques for fugitive dust sources generally involve watering, chemical stabilization, or reduction of surface wind speed with windbreaks or source enclosures. Watering, the most common and, generally, least expensive method, provides only temporary dust control. The use of chemicals to treat exposed surfaces provides longer dust suppression, but may be costly, have adverse effects on plant and animal life, or contaminate the treated material. Windbreaks and source enclosures are often impractical because of the size of fugitive dust sources.

The reduction of source extent and the incorporation of process modifications or adjusted work practices, both of which reduce the amount of dust generation, are preventive techniques for the control of fugitive dust emissions. These techniques could include, for example, the elimination of mud/dirt carryout on paved roads at construction sites. On the other hand, mitigative measures entail the periodic removal of dust-producing material. Examples of mitigative control measures include clean-up of spillage on paved or unpaved travel surfaces and clean-up of material spillage at conveyor transfer points.