FACT SHEET – Materials Handling Operations

What is the purpose of materials handling operations?

Raw material preparation includes a variety of blending and sizing (grinding) operations that are designed to provide a feed with appropriate chemical and physical properties. The raw material processing operations differ somewhat for wet and dry processes.

Materials transport associated with dry raw milling systems can be accomplished by a variety of mechanisms, including screw conveyors, belt conveyors, drag conveyors, bucket elevators, air slide conveyors, and pneumatic conveying systems. The dry raw mix is pneumatically blended and stored in specially constructed silos until it is fed to the pyroprocessing system.

In the wet process, water is added to the raw mill during the grinding of the raw materials in ball or tube mills, thereby producing a pumpable slurry, or slip, of approximately 65 percent solids. The slurry is agitated, blended, and stored in various kinds and sizes of cylindrical tanks or slurry basins until it is fed to the pyroprocessing system.

The final step in portland cement manufacturing involves a sequence of blending and grinding operations that transforms clinker to finished portland cement. Up to 5 percent gypsum or natural anhydrite is added to the clinker during grinding to control the cement setting time, and other specialty chemicals are added as needed to impart specific product properties. This finish milling is accomplished almost exclusively in ball or tube mills. Typically, finishing is conducted in a closed-circuit system, with product sizing by air separation.

The finished portland cement is conveyed to bulk storage silos from which it is dispensed for shipping. Portland cement is often loaded in bulk into hopper trucks or rail cars. It may also be packaged in "tote bins" or in 80 lb or 94 lb kraft paper bags. The bags are loaded onto pallets for handling, warehousing, and shipping.

Process fugitive emission sources include materials handling and transfer, raw milling operations in dry process facilities, and finish milling operations.

What Pollutants are emitted?

HAP metals (arsenic, cadmium, chromium, lead, manganese, mercury, nickel, selenium)

How are Emissions Characterized?

In the raw mill, the raw material feeders, stackers, blenders and reclaimers can be a source of fugitive dust emissions. Transfer points on belt conveyor systems and bucket elevators that transport raw materials from storage to the raw mill department can also generate fugitive dust. Dry raw mills and the auxillary equipment are all designed to run under negative pressure to suppress particulate emissions.

During colder weather vents from dryers, raw mills and air separators may exhibit a steam plume that may be mistaken for particulate emissions. Fabric filters in the vent circuits for dryers, raw mills, and air separators must be insulated to prevent internal moisture condensation.

Dust in the clinker has a tendency to become airborne during handling. The free fall of clinker onto storage piles usually creates fugitive particulate emissions. Fugitive dust emissions from open storage piles are mitigated by rain and snow which causes a crust to form on the piles. Clinker in open piles is usually reclaimed with mobile equipment, such as front-end loaders. Clinker in storage halls is frequently handled with overhead bucket cranes.

FACT SHEET – Materials Handling Operations, Continued

In the finish mill, various material-handling system vents are the source of particulate matter emissions. In the bagging and loading operations, particulate emissions are generated from silo openings, cement handling equipment, and the various bulk and package loading operations. The dust generated during the loading of trucks and railcars is controlled by venting the transport vessel to a fabric filter.

What are the Equipment Control Options?

Typically, process fugitive emissions are captured by a ventilation system and collected in fabric filters. Some facilities use an air pollution control system comprising one or more mechanical collectors with a fabric filter in series. Because the dust from these units is returned to the process, they are considered to be process units as well as air pollution control devices. The industry uses shaker, reverse air, and pulsejet filters, as well as some cartridge units, but most newer facilities use pulsejet filters. For process fugitive operations, the different systems are reported to achieve typical outlet PM loadings of 45 milligrams per cubic meter (mg m^{-3}) (0.02 grains per actual cubic foot [gr/acf]).Can you include some discussion of control options for conveyors? These are sometimes significant sources of fugitive emissions.