Cooling, Wetting And Agglomerating Industrial Nuisance Dust By Direct Addition Of Water

Many industrial processes generate dust or ash as an undesirable side product. This nuisance dust is familiar to the coal, steel, cement, brick and various other industries. New and pending legislation in the areas of occupational safety and environmental protection are forcing industry to make dust control a priority.

A proven means of facilitating the handling and/or disposal of nuisance dust involves collecting, cooling (if the dust is hot), wetting and agglomerating.

The dust is first collected through various separation techniques. It may then be mixed with other materials to either neutralize or stabilize it for further processing. Hot dust is then cooled by direct addition of water. This step generates steam as a result of the sensible heat of the dust being converted into the latent heat of vaporization of the water. Generation of steam through the direct contact of water and dust results in a very high rate of heat transfer and rapid cooling of the dust. Additional water may then be added in a controlled manner to further wet and agglomerate the dust.

The enhanced design of the horizontal ploughshare mixer has been used successfully by Littleford for industrial dusts in a wide variety of industries and processes. The special shape of the plows and their exacting location on the shaft in combination with the horizontal drum and the scientifically determined shaft's rotational speed create the intense whirling, separation, and fluidization of the dust. Significantly large dust surface areas are exposed during fluidization which enable rapid and even wetting with a specially designed water injection system. This technology inhibits the formation of lumps and eliminates dry product zones.

The mixer design incorporates features required to accommodate conditions typically encountered in dust handling applications (such as abrasion, high temperature, difficult material handling characteristics, and large vapor volumes).

If the material being processed is abrasive, wear resistant drum liners and special wear resistant plows are available as options. The seal assembly for the Littleford horizontal shaft is protected from high temperatures by a unique cooling and sealing system.

To improve material transport through the mixer, oversized charge and discharge ports are used, in addition to an optimized plow arrangement. Vapor discharge ports are oversized to allow the large quantities of steam generated to exit the mixer at a velocity below the transport velocity of the dust being processed. In many cases the solids content of the vapor steam is so low that the vapors can be emitted directly to the atmosphere. The plow arrangement is designed to move material through the mixer while providing backmixing action to ensure a homogeneous blend. The retention time may be controlled to aid in process optimization.

These design enhancements coupled with the excellent mixing efficiency of Littleford ploughshare mixers allow an initially dusty product to be converted into easily-handled, dust-free agglomerates.

The Littleford horizontal ploughshare design offers great flexibility and may be adapted to many continuous and batch process applications.

Cooling Brick Dust From Rotary Tubular Kilns

Glowing red hot brick dust at a temperature of 1500ºF is extracted from the filter and fed directly into a continuous ploughshare mixer. The appropriate quantity of water required to cool the dust is added directly to the mixer. The final wetted temperature of the agglomerated dust is approximately 400ºF.

Cooling, Wetting And Initial Agglomeration Of Cement Bypass Dust

Cement bypass dust is extracted from an electrostatic filter and fed directly into a continuous ploughshare mixer. Cooling is accomplished by adding water which also moistens and agglomerates the dust. The material is then suitable for transport to an acceptable disposal site. Initial temperature of the dust is approximately 700ºF and the final wetted temperature of the agglomerated dust is < 212ºF.

Cooling And Wetting Slag From A Coal Gasification Process Furnace

Ash at a temperature of 1200-1500ºF is discharged from a coal gasification furnace and reduced to a maximum grain size of 2 inch in a crusher. To prepare this material for disposal, it is cooled and moistened in a ploughshare mixer. The initial temperature of the ash is 1500°F and the final wetted temperature of the agglomerated dust is approximately 212ºF.

Cooling And Wetting Coke Dust From Coke Drying And Cooling Units

New methods of producing coke result in the production of a dust which is removed by a cyclone and filter. The collected dust is cooled and moistened in a continuous ploughshare mixer. The initial temperature is approximately 900°F and the final wetted temperature of the agglomerated dust is < 212°F.

Primary And Secondary Dust From Electrostatic Filters

Converted dust from steel production electrostatic filters is cooled, moistened and prepared for transport to an acceptable waste disposal site. The initial temperature is 500ºF, and the final wetted temperature of the agglomerated dust is < 212ºF

Lime-Treated Fly Ash From Flue Gas Scrubbers

Fly ash from flue gas scrubbers is mixed with lime to neutralize the acid. Sufficient water is added to near ambient temperature ash to hydrate the lime. The resulting mixture is combined with water to agglomerate the fly ash to particle sizes suitable for landfill disposal.

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Where Processing Ideas Become Reality

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