

The Science of Combustible Dust Testing

Each dust compound has unique physical and chemical characteristics. A good understanding of both is essential to understand the hazards, and ultimately the risks, associated with the dust being handled.

Identifying Dust Hazards

A typical first step to assessing a hazard level is to review information in the literature. In the case of combustible dust hazards, dust characteristics directly affecting combustibility hazards are a function of process-specific conditions such as concentration, size and shape, moisture content, and dispersion method and duration. Proper characterization of dusts must then be based on testing data of an actual sample from the process.

Chemical characteristics include items such as flammability and explosibility, as well as thermal degradation, instability, sensitivity to ignition and chemical reactivity. Depending on the type of process unit being analyzed and the potential explosion prevention measures to be employed, a testing plan is selected.

Experienced Professionals

ioKinetic has extensive experience with the evaluation and interpretation of dust hazard test data. We can assist with the development of a cost-effective test plan to characterize dust hazards. Let us help you sift through the complicated list of tests to determine which are appropriate for your operations. After the test is conducted, our experts will evaluate and interpret the data and provide a report of the results. We can offer a single package that includes test plan development, testing and data analysis, and interpretation. Our experts will work with you to determine the level of analysis that is required for your particular needs.



Available Testing

- Explosion Severity Test (KSt, Pmax, (dP/dt)max)
- Minimum Ignition Energy (MIE)
- Minimum Auto-Ignition Temperature (MAIT)
of Dust Cloud in Air
- Minimum Explosible Concentration (MEC)
of Dust in Air
- Limiting Oxygen Concentration (LOC) Test
- Hot-Surface Ignition Temperature (HSIT)
of Dust Layer
- Volume Resistivity and Measured
Charge Relaxation Time
- Electrostatic Charging (Chargeability) Test
- Chemical Reactivity/Calorimetry Testing



Dust Hazards Analysis Testing

Available Testing

Explosion Severity Test (KSt)

The testing will be performed per ASTM E 1226-00ε1, "Standard Test Method for Pressure and Rate of Pressure Rise for Combustible Dust." The parameters measured are the maximum pressure output and the maximum rate of pressure rise. These values are applicable to the design of protective measures, such as deflagration venting per NFPA 68, VDI Method 3673 or ISO Method 6184. The test will be conducted using a spherical 20-L Siwek chamber. Greater than 750g of sample less than 75µm required.

Minimum Ignition Energy (MIE)

The testing will be performed per ASTM E 2019, "Standard Test Method for Minimum Ignition Energy of a Dust Cloud in Air" (this standard is very similar to British Standard 5958, 1991 and European Standard: IEC 1241-2-3, 1994). The test will be conducted in a modified 1.2-liter Hartmann chamber. The powder/dust samples of varying quantities are dispersed in the 1.2-liter vertical tube and attempts are made to ignite the resultant dust cloud with discrete capacitive sparks of a known energy. Greater than 100g of sample less than 75µm required.

Minimum Auto-Ignition Temperature (MAIT) of Dust Cloud in Air

Testing will be performed per ASTM E 1491, "Standard Test Method for Minimum Auto-Ignition Temperature of Dust Clouds." The test method provides a procedure for performing laboratory tests to determine the minimum auto ignition temperature (MAIT) of a dust cloud. The test will be conducted in a BAM furnace. Greater than 80g of sample less than 75µm required.

Limiting Oxygen Concentration (LOC) Test

Testing will be performed per ASTM proposed standard. The tests will determine how much inert (nitrogen atmosphere) is needed to prevent an explosion from occurring when the dust concentration is in the explosive range. Greater than 200g of sample less than 75µm required.

Minimum Explosible Concentration (MEC) of Dust in Air

Testing will be performed per ASTM E 1515, "Standard Test Method for Minimum Explosible Concentration of Combustible Dusts." The test method provides procedure for performing laboratory tests to measure the minimum concentration of a combustible dust (dispersed in air) that is capable of propagating a deflagration. The test will be conducted in a 20L chamber or larger. Greater than 80g of sample less than 75µm required.

Hot Surface Ignition Temperature of Dust Layer

Testing will be performed per ASTM E2021, "Standard Test Method for Hot-Surface Ignition Temperature of Dust Layers." Test will determine the hot surface ignition temperature needed to ignite the material in the dust layer form. Greater than 500g of sample less than 75µm required.

Volume Resistivity and Measured Charge Relaxation Time

Testing will be performed per ASTM D257-99, "Standard Test Method for DC Resistance or Conductance of Insulating Materials" (Modified). Additionally, actual charge relaxation time to 37% and 10% of the initial charge level will be directly measured. Approximately 100mL of sample is required.

Electrostatic Charging (Chargeability) Test

Testing will evaluate the tendency of the material to generate an electrostatic charge and to hold that charge.

Additional costs as needed:

Chemical Waste Disposal per sample
Grinding/Sieving to <75 µm as requested per sample

Reactivity/Calorimetry Testing

Testing will evaluate the chemical reactivity of pure components or mixtures of chemicals: ARC, DSC/DTA, TGA

Other Large-Scale Testing

Large-Scale Testing, Blasting Cap Test