



## Combustion Hazard Testing of Dusts

The Combustion Research Center (CRC) specializes in the *Combustion Hazards Testing* of dusts and liquids, and has been providing combustion test services for over 35 years. All testing is performed in accordance with the requirements of recognized standards including ASTM, OSHA, U.S. DOT, and UN.

### Why Combustion Hazards Testing?

Many dusts, liquids and gases pose fire and explosion risks in the workplace. Common materials of commerce are subject to ignition by various means. Fires can occur in unsuspecting ways due to exposure of materials to elevated temperatures. An explosion can result from ignition of a flammable atmosphere created by suspended dust (dust cloud), vapor clouds and gases that may exist in closed or semi-enclosed process spaces.

Combustion hazards testing can reveal the sensitivity of materials to ignition and the explosion characteristics of flammable atmospheres. Preventing explosions and fires in industrial settings involves many considerations. Central to any Process Safety Analysis is accurate data that represents the ignition and combustion properties of materials used in the workplace.

### Explosion Prevention

Data on ignition sensitivity, minimum explosible concentration, and limiting oxygen concentration of dusts can be used as part of a program to reduce explosion risk by controlling fuel concentrations and limiting ignition sources. The accurate design of explosion control systems such as explosion vents and explosion suppression systems requires data on the *Explosibility* properties of flammable atmospheres such as dust clouds.

**Fire Prevention.** Data on the response of materials exposed to elevated temperatures can be used as part of a process safety program to reduce fire risk.

### CRC Combustion Hazard Test Services

Listed below are the most commonly requested combustion hazards tests

- 1. Particle size (sieve) analysis.** This test determines the size distribution of the sample. Combustibility and reactivity of the material increases with decreasing particle size.
- 2. Moisture Content.** The higher the moisture content of a sample, the less explosive. The moisture content of the sample is determined prior to testing
- 3. Explosibility Parameters,  $P_{MAX}$  and  $K_{ST}$  (ASTM E1226)** This test is performed to determine whether a dust is combustible and indicates the degree of explosion hazard. The  $K_{ST}$  value derived from the test is used as a design parameter for your explosion protection system. (Sample size required, 1000 g)
- 4. Minimum explosible concentration – MEC (ASTM E1515)** This test determines the minimum concentration of a dust cloud that may cause an explosion. (Sample size required, 500 g)
- 5. Minimum ignition energy - MIE (ASTM E2019)** This test determines the lowest electrostatic spark energy capable of igniting a dust cloud. A dust having a very low MIE requires special attention to process conditions to avoid ignition. MIE less than 100mJ indicates a potential for ignition from static discharges from personnel, MIE < 25mJ, from static discharges from movement and bulk handling of powders. If MIE is less than 25mJ, resistivity testing is important to determine the ability of the material itself to generate electrostatic charges. (Sample size required, 500 g)
- 6. Dust cloud ignition temperature -  $T_c$  (ASTM E1491)** This test determines the sensitivity of a dust cloud to a hot environment (Sample size required, 100 g)

7. **Hot surface layer ignition temperature –  $T_S$  (ASTM E2021)** This test determines the sensitivity of a dust to hot surfaces. It measures the minimum temperature at which a dust layer will ignite. (Sample size required, 500 g)
8. **Dust Layer Ignition Temperature -  $T_L$  (Bureau of Mines RI5624).** This test determines the minimum temperature at which a dust layer in a hot environment will ignite. (Sample size required, 100 g)
9. **Limiting oxygen concentration – LOC (ASTM E2931)** This test determines the lowest concentration of oxygen at which a particular dust is combustible. LOC is needed if inerting is used as a basis of safety for explosion protection. (Sample size required, 500 g)
10. **Test Method for Class 4 Division 4.2 (49 CFR 173) Substances Liable to Spontaneous Combustion.** This test evaluates the tendency for a packaged dust to spontaneously ignite upon exposure to a temperature of 140 °C for up to 24 hours. Data is used to classify materials with respect to packaging class. (Sample size required, 2000 g)
11. **Packing Classification of a Dust – Burn Rate Test (UN Test N.1)** This test determines the rate of flame propagation in dusts for the purpose of determining packaging classification. (Sample size required, 500 g)



20-liter test vessel for explosivity testing

### How to Have Materials Tested

The CRC staff will be pleased to discuss your material testing requirements.

- a. Contact the combustion research center at **508 429 3190** or email us at [info.crc.us@hoerbiger.com](mailto:info.crc.us@hoerbiger.com)
- b. Provide us with your company name, address, contact name, email and phone number along with the number of samples you would like tested
- c. A test service proposal will be provided with detailed scope of work, quantity of material required, service price and processing time. All work is performed on a confidential basis as defined in mutually agreed Terms and Conditions that are designed specifically for the special needs of testing services.

**Test Reports** are issued as pdf files and sent as email attachments. Reports include sample descriptions, statement of scope of work, summary of results, detailed test results for each sample and test type, and summary descriptions of the test procedures.

**Retesting of Dust Samples** A change in particle size, moisture content or chemical composition may alter the explosion properties of a dust and pose a new risk. Periodic evaluation of your dusts due to these changes, is necessary to ensure that your explosion protection installation is still effective for a safe operating environment.

### Contact the Combustion Research Center

Telephone: 508 429 3190

Email: [info.crc.us@hoerbiger.com](mailto:info.crc.us@hoerbiger.com)

Website: [www.combustionresearchcenter.com](http://www.combustionresearchcenter.com)

**We look forward to serving your combustion hazard test service requirements.**