Molecular Property Spectrometer™

MPS™ Flammable Gas Sensor
Sand and Dust Reliability

Introduction

Reliable operation is a critical requirement for safety equipment deployed in the harshest conditions in the world. One threat for gas sensors is exposure to high-velocity dust and sand. NevadaNano's Series 7 MPS Flammable Gas Sensor has passed rigorous Military Standard (MIL-STD) sand and dust exposure testing and can be expected to perfom well in environments where sand and dust exposure is common.

Test Specifications

Test conditions and analysis requirements were conducted according to MIL-STD-810G Method 510.5, Procedure I – Blowing Dust and Procedure II – Blowing Sand. All dust and sand exposure was performed at Europhins MET Labs.

Blowing Dust

Dust particle sizes less than 150 µm with a median diameter of 20 ±5 µm are specified for the Blowing Dust procedure. Red China Clay was chosen as the dust material tested. Red China Clay dust is a mixture of various metal oxides, ferric oxide, aluminum oxide, and silicon dioxide.

Test Procedure:

- Three MPS Series 7 Flammable Gas Sensors tested for (1) methane gas sensing accuracy and (2) response time to reach 90% of steady-state value from a step change in concentration (T90) as a baseline.
- Sensors exposed to a dust concentration of 10 ± 7 g/m3 at a velocity of 1.5 to 2.5 m/s for 6 hours.*
- Dust feed stopped, air velocity reduced to 1.5m/s for 1 hour.*
- Dust feed re-started, air velocity back to 1.5 to 2.5 m/s and continued for 6 hours.*
- Test sensors for gas sensing accuracy and T90.

Results:

- Methane gas measurement before and after dust exposure varied <1 %LEL
- T90 was <10 seconds both before and after dust exposure
- Visual inspection found no areas of concern

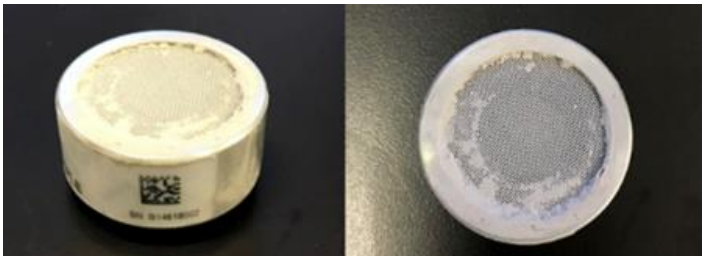

Figure 1: Representative sensor after dust testing

* Note that sensors are not operating during exposure to Blowing Dust or Blowing Sand tests.

Nevada Nano

Molecular Property Spectrometer™

MPS™ Flammable Gas Sensor
Sand and Dust Reliability

Blowing Sand

Sand particle sizes from 150 µm to 850 µm, with a mean of 90 ±5 percent by weight smaller than 600 µm and larger than or equal to 150 µm, and at least 5 percent by weight 600 µm and larger are specified for the Blowing Sand procedure.

Test Procedure:

- Three MPS Series 7 Flammable Gas Sensors tested for methane gas sensing accuracy and T90 as a baseline.
- Sensors exposed to a sand mass flow of 2.2 ±0.5 g/m^3 at an air velocity of 18 m/s (40 mph) for 4.5 hours.*
- Test sensors for gas sensing accuracy and T90

Results:

- Methane gas measurement before and after dust exposure varied 0.1 %LEL
- T90 was <10 seconds both before and after sand exposure
- Visual inspection found no areas of concern

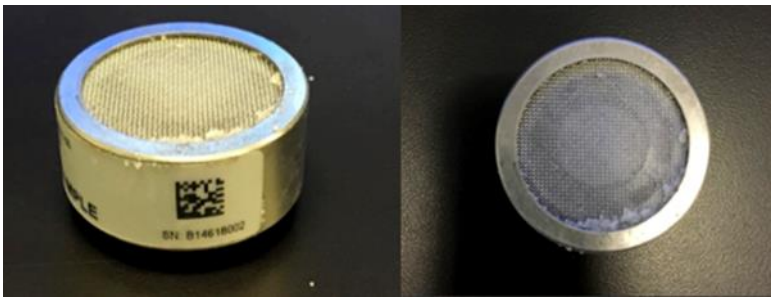

Figure 2: Representative sensor after sand testing

Conclusion

The MPS Flammable Gas Sensor readily passed MIL-STD Blowing Sand and Blowing Dust tests, giving high confidence that the sensor will continue to function within specification when exposed to environments where harsh sand or dust is a concern.

* Note that sensors are not operating during exposure to Blowing Dust or Blowing Sand tests.