

ADVANCING THE ART OF OPTICAL PATH VERIFICATION IN INFRARED FLAME DETECTORS

The primary intention of the Visual Integrity test feature on optical flame detectors has historically been to detect and report the presence of accumulated material on the lens of a flame detector that would prevent it from detecting flame.

Secondarily, the VI test verifies functionality of the various sensors and circuitry of the detector.

The most prevalent self test schemes involve an internal light source that projects a beam through the lens and onto a metal reflector from where the beam is reflected back through the lens and onto the primary sensor where it is detected to verify integrity of the optical path.

Drawbacks of Conventional VI Tests

Reflector-based VI testing has the drawback of requiring the maintenance of the reflectivity of the metal reflector, which is subject to fouling by accumulations of airborne materials and corrosion. These degradations of the reflector result in false VI fault alarms and subsequent costly procedures to clean or replace the reflector. Another drawback is that the lens can have distributed deposits of material that block flame signals, but allow the test beam to pass normally.

The function of this system is easily tested by interrupting the beam of light with any opaque material like a piece of paper, metal or a finger.

Net Safety's Advancement

Net Safety's Triple IR detector employs a system of visual integrity testing that does not use external metal reflectors, and hence, is not prone to false fault alarms that are often caused by problems with metallic reflectors. The method involves 3 beams of multi-wavelength infrared energy that are directed through the lens and reflected off the front surface of the lens and back onto the sensing elements. This reflection is caused by the difference in refractive index at the face of the lens where the sapphire lens material ends and atmosphere begins. The amount of energy reflected from a clean, IR transparent lens is known and measured during each VI test cycle. When material that reflects infrared energy (which can obscure the passage of infrared energy into the sensor and reduce its flame detection sensitivity)

is deposited on a lens, there is an increase in the amount of energy reflected back into the sensors. This increase in reflected energy is detected and, at a predetermined level, causes the VI fault alarm to trip.

In this VI system it is not as simple to interrupt the beam between a lens and reflector to test a VI fault. If a simulation of the VI fault is required, put a disc of plain white paper on the face of the lens. The paper, or preferably the NSM VI Checker, will increase the amount of reflected energy sufficiently to activate the VI fault alarm. Dark colored, non-reflective dry materials placed on the lens do not increase the reflection enough to trigger the alarm.

In practice, particularly in the oil and gas industry, it is rare to find accumulations of material on the sapphire lens that will block the flame detection capability of the Net Safety Triple IR flame detector.

The materials present in these facilities are predominantly hydrocarbon based materials which are substantially transparent to the wavelengths of infrared energy that are detected and analyzed to identify flame in the detector's field of view.

Testing has revealed that a 1 to 2mm layer of thick, black, petroleum based material has little affect on the flame detection

capabilities of the instrument. While such a coating is startlingly obvious to the human eye, and should be removed as a matter of course during routine maintenance, it has little affect on flame detection and hence does not trigger the VI fault alarm. This is in stark contrast to a UV flame detector where even a thin, invisible film of oil will fully obscure the flame detector. While many materials that typically occur in industrial applications, and that could be expected to coat the lens, have been tested, none have been found which will substantially obscure flame detection and not be detected by this advanced VI verification technology.

While the primary intention of the VI test feature has been to detect and report the presence of accumulated material on the lens and secondarily to verify functionality of the sensors and circuitry, Net Safety has presented a flame detector with such immunity to obscuration of the lens, that it could be said that these primary and secondary roles have been reversed.

Net Safety's Triple IR Detector employs a system of visual integrity testing that does not use external metal reflectors, greatly reducing false alarms

 [more information](#)