DET-TRONICS

TIP SHEET

Best practices for fire protection in hazardous locations

Fire is one of the most critical hazards in any facility, and industrial processes that involve volatile and potentially flammable materials present challenges for fire protection.

Hazardous locations and operations call for a fire and gas (F&G) safety system designed to detect the presence of smoke, flames and combustible and toxic gases, and then take executive actions regarding notification and fire suppression. While the design and specification of an F&G safety system requires experts, knowledge regarding best practices can help facility owners and operators contribute to and maintain the robustness of their facility's F&G safety system. Read on for an overview of ten best practices related to life safety fire protection in hazardous locations.

1 Identify fire hazards

The first step is to identify any fire hazards within the area to be protected by conducting a fire hazard analysis (FHA). An FHA determines the expected outcome triggered by a specific set of conditions called a fire scenario, which takes into account the arrangement of rooms/areas in a building, as well as room dimensions, contents, construction materials and potential sources of combustion. The FHA is often conducted with the help of a consulting fire protection engineer (FPE).

2 Be aware of standards and certifications

While there is no global unified standard for fire protection, the U.S. uses the National Fire Protection Association (NFPA) standards while Europe uses BS EN 54. Some geographical areas use a hybrid approach, utilizing attributes of both NFPA and EN 54 to create a performance-based design. As International Electrotechnical Commission (IEC) member countries publish national adoptions of IEC60079-29 series standards, a unified approach to gas detection is emerging. ATEX, IEC and AEx define the zone classification of areas in which flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. The surest way to know that detectors meet the hazardous location and performance standards is to specify equipment that is certified by an accredited third-party agency.

3 Start with gas detection

Combustible gas detectors are considered the first line of defense against fire since they are able to alert plant personnel of a gas leak before the gas ignites. A gas detection system should be capable of giving an early warning of both the presence and the general location of an accumulation of flammable gas or vapor.

Common gas leak detection technologies include point detectors, line of sight (LOS) detectors and acoustic/ultrasonic detectors which detect leaks based on gases' unique sound signatures. Offering proven performance and reliability, catalytic and IR point gas sensors are the types most often employed in industrial plants. Since IR sensor technology cannot detect hydrogen gas, catalytic sensors are used in areas where hydrogen may be present. Catalytic sensors are effective for detection of nearly all known flammable gases.

LOS systems provide continuous monitoring for the presence of hydrocarbon gas concentrations between the transmitter and receiver, typically over long distances. Acoustic leak detectors can respond to pressurized gas leaks the instant they occur.

4 Locate gas detectors carefully

Point detector technologies require gas to travel to the detector. Since the detector must come in contact with the gas or vapor cloud, it should be placed adjacent to the equipment being protected. For detection of gases heavier than air, point detectors should be positioned below the level of exhaust ventilation openings and close to the floor. For detection of gases lighter than air, the detector should be positioned above the level of exhaust ventilation openings and close to the ceiling.

LOS detectors should be mounted to a rigid and stable surface so the optical alignment of the transmitter and receiver is maintained consistently. In addition, component placement must be performed carefully as the system requires an unobstructed line of sight between the transmitter and receiver.

5 Combine gas detection technologies

Since each of the gas detection technologies has benefits and limitations, a common strategy is combining the technologies and placing them in locations that maximize their effectiveness. In many industrial plants, for example, LOS detectors work with point detectors to provide optimal protection. In situations like this, the point detectors should be installed at or near high-risk gas leakage points or accumulation areas to provide gas-level information. LOS detectors, on the other hand, are often installed at plant or process-area boundaries where they can monitor the perimeter and track gas cloud movement in and out of an area.

6 Calibrate and maintain gas detectors

Once in use, all gas detectors require periodic calibration using the appropriate calibration method, as well as ongoing maintenance for proper operation and maximum longevity.

7 Use appropriate smoke detectors

While a combustible gas detector can provide warning of an increased fire risk, a smoke detector provides indication that a fire has actually started. Smoke detectors used in hazardous locations are different from ordinary smoke detectors because they must be hazardous-location rated (either explosion-proof or intrinsically safe). To be effective, smoke detectors should be located and spaced in anticipation of airflow from sources likely to present fire risks.

8 Add optical flame detectors

Flame detectors are line-of-sight devices that detect the radiant energy emitted by a flame. They can employ several sensing technologies: ultraviolet (UV), IR, UVIR and multi-spectrum IR (MIR). When making a selection from these options, system designers must match the spectral response of the detector to the spectral emissions of the fires to be detected. It is also best to choose a flame detector that is performance tested to the fire type of interest in order to determine its effective detection range.

9 Plan for minimizing unwanted fire alarms

UV and IR energy is emitted from fire as well as non-fire sources. It is important that flame detection systems do not misinterpret non-hazardous situations as fire — causing a system to signal nuisance or potentially costly false alarms. IR and MSIR detectors typically differentiate fire from non-fire (e.g., false alarm) sources by using optical filters and algorithms that analyze the characteristics of the IR energy detected. In most cases, non-fire IR sources do not qualify under these algorithms.

Another way to minimize false alarms is to use multiple detectors to monitor the same area in order to validate flame detection. To support redundancy, this type of system must include algorithms capable of handling "voting" circuits (with each detector's interpretation of an event counting as one vote) and making correct decisions based on input from multiple detectors.

10 Manage detection and response with a certified fire and gas safety controller

In addition to gas, smoke and flame detectors, a fire protection system includes a safety system controller (SSC) that receives and interprets input from multiple detectors and takes executive actions regarding notification and fire suppression. The SSC also provides information about detection device status to the facility's process control system (PCS) so personnel in charge of the process are kept informed about important fire-related events. A certified safety controller has, at a minimum, third-party certification for the applicable standards including performance and hazardous location.

Final thoughts

Understanding the best practices above can help plant owners and operators make informed decisions regarding the purchase, installation and maintenance of a fire and gas safety system.

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About Det-Tronics

Det-Tronics is a global leader in fire and gas safety systems, providing premium flame and gas detection and hazard mitigation systems for high-risk processes and industrial operations. The company designs, builds, tests and commissions SIL 2 Capable flame and gas safety products ranging from conventional panels to fault-tolerant, addressable systems that are globally certified. Det-Tronics is a part of Carrier, a leading global provider of innovative HVAC, refrigeration, fire, security and building automation technologies.

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