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DATA CENTER FIRE PROTECTION FIRE DETECTION

Uptime is paramount in mission critical facilities. Therefore the earliest detection and warning of a potential fire allows for investigation and intervention to prevent damage, downtime, or unwanted agent release.

Fire risks in data centers are especially high due to electrical ignition sources and the abundance of combustible materials in an environment of cables and high equipment density. Even a minor short circuit can quickly and easily start a fire.

There are three basic types of fire detecting systems; smoke, fire and flame. Smoke detectors generally provide an earlier warning of a developing fire before fire or flame detectors, they are the preferred detection system for data centers.

There are two primary types of smoke detection, passive smoke detection, typically using a spot smoke detector or active smoke detection, typically using an air sampling smoke detector.

PASSIVE SMOKE DETECTION

Passive smoke detection uses area smoke detectors which utilize a led or laser diode to transmit a light source through the smoke chamber to a light trap to eliminate reflection. As smoke enters the detection chamber the light emitted by the diode is scattered and the detector uses algorithms to determine if the source is dust or smoke. If it is determined to be smoke, the detector goes into an alarm stage. For applications where slow smoldering fires are likely it is recommended to use photoelectric smoke detectors.

ACTIVE SMOKE DETECTION

Active smoke detection uses an air sampling system (aspirating smoke sensing) which actually draws air from the area of coverage and uses a led inside a chamber to sample the air and detect smoke particles. The air sampling system is much faster at responding to smoke than an area detector would be.

ASPIRATING SMOKE DETECTION

Working on the same principle as photoelectric smoke detectors, the aspirating smoke detector continually draws air from the protected space into a pipe system and then sampling this air in a laser detection chamber. The piping system is designed using product specific software that calculates air flow, smoke transport time and hole diameters for the piping network as well as a pipe length for each sampling tube. Unlike basic photoelectric smoke detectors that wait for the smoke to enter the chamber, because the aspirating smoke detector is constantly drawing in and testing new air for smoke, it is considered an active smoke detection system.

Because of its sensitivity and ability to detect a wide range of smoke particulate size, the aspirating smoke detection system is a top choice for data center early fire detection.

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DATA CENTER FIRE PROTECTION

FIRE DETECTION (CON'T)

EARLY WARNING SMOKE DETECTION IN A MISSION CRITICAL FACILITY

VESDA ASPIRATION SMOKE DETECTORS

Although there are a number of active smoke detectors systems that use aspiration technology, VESDA by Xtralis was the first. VESDA is an acronym for **Very Early Smoke Detection Apparatus**. The VESDA system uses an engineered piping network that draws air from the protected space and samples that air quality through the VESDA laser detection chamber. The air first passes through a dual stage filter before entering the sampling chamber. The first stage filter removes the dust and dirt from the air sample. The second filter provides additional clean air to keep the detector optical surfaces free from contamination. The air sample then enters the detection chamber and is exposed to the laser diode light source. If smoke is in the chamber, the light will be scattered and the VESDA detector will indicate the level of alarm on a bar graph display located on the detector itself or at the network annunciator if installed. The VESDA detector can be set for obscuration levels as low as .0015% to 6% obs/ft. Depending upon which model is chosen, the VESDA smoke detector can protect areas from 2,500 square feet to 20,000 square feet.

VESDA is ideal for any area with high airflow. Because the VESDA detector draws air from the protected space through holes drilled in the sample piping network it is not as affected by high air flow as a conventional smoke detector would be. In most data center or clean rooms this is a major consideration for smoke detection coverage.

SMOKE DETECTORS IN A DATA CENTER

Mission Critical facilities use a variety of smoke detection schemes. In some facilities, VESDA and area smoke detection are both provided on the ceiling and area smoke detection under floor. VESDA is used as early warning only and area smoke detectors are programmed as a cross zoned alarm for agent release or pre-action initiation. In other facilities VESDA is used as the only smoke detection both on ceiling, under floor and in CRAH units and provide early warning as well as the initiating device for agent release and pre-action initiation. Other facilities use smoke detection only both on ceiling and under floor and as the initiating device for agent release and pre-action initiation. Duct smoke detection is installed at the CRAH units.

The method of smoke detection for a mission critical facility is typically decided by the engineering firm that is designing the facility with input from the owner's professional staff. Each of the designs listed above have been used and approved throughout the country. In some cases the fire detection system is design/build and as such, care must be taken that the fire alarm contractor doing the design has the ability and resources as well as the experience to understand, design and implement the fire alarm system to ensure the level of protection demanded by the facility. It is highly recommended that any design/build system be reviewed by a registered FPE before the system is approved for installation.

How the VESDA Aspiring Smoke Detector works

The annunciator/display provides four levels of alarm; Alert, Action, Fire 1 and Fire 2. Alert indicates that the smoke levels are above normal and will activate upon smoke thresholds from .0015 to .6218% obs/ft. Action will activate as the smoke levels continue to rise and investigation of the area protected should be initiated by the facility fire protection personnel. Action is initiated by thresholds from .0031% to .6234% obs/sf. Fire 1 is a pre alarm condition and indicates that there is a real danger of a fire condition and immediate action is required. Fire 1 is initiated at thresholds from .0046% to .625% obs/sf. Fire 2 is an extremely serious condition. At Fire 2 automatic fire suppression systems including pre-action sprinkler or clean agent release may be initiated and evacuation procedures will be activated. Fire 2 is initiated at thresholds from .0062% to 6.25% obs/sf (UL limits this to 4% obs/sf).

Special thanks to Bob Hoertsch a Fire Alarm and Detection System Specialist with Low Voltage Contractors for his assistance with this article. www.lvcinc.com

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