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The Monitor

GENERAL MONITORS

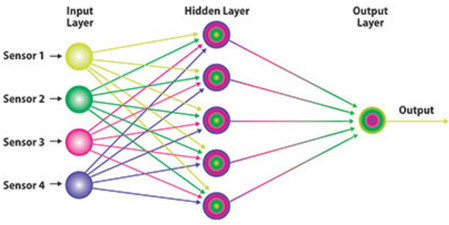
Your total solution provider for gas and flame detection

Neural Networks Provide Unparalleled Flame Detection

Loss of valuable equipment and inventory from the destruction of an undetected fire or the complete shutdown of an entire facility resulting from a false fire alarm are both costly scenarios no company wants to ever experience, particularly when there are preventative measures available to avoid such catastrophe. But deciding how best to protect your personnel, your facility and your investments is a critical consideration. This article addresses the latest ground-breaking technology behind Multi-Spectral Infrared (MSIR) Flame Detection using Neural Network Technology (NNT).

Neural Network Technology

Neural networks are mathematical models that were inspired by biological neural networks. In artificial neural networks, an interconnected group of artificial neurons process information and actually change structure during a learning phase. That allows the network to model complex relationships in the data delivered by sensors in a quick search for patterns.



Simplified view of a neural network

Computer researchers have been inspired by the human brain as far back as the 1940s when a neuroscientist and a logician teamed up to create the first conceptual model of an artificial neural network to solve certain kinds of problems that are easy for humans but difficult for computers – otherwise known as pattern recognition. Neural networks have a range of practical applications, many of which are at work in our FL4000H MSIR Detector.

They include

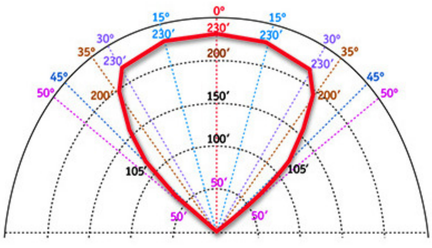
- Pattern recognition
- Signal processing that can filter out irrelevant data
- Controls that manage decisions
- Soft sensors that analyze a collection of many measurements
- Anomaly detection – the ability to generate output when something occurs that doesn't fit patterns thus issuing alerts when something is amiss.

Neural Network Technology (NNT) is in essence, an artificial intelligence. One of the key elements behind this technology is its ability to learn. It learns through a type of apperceptive process; meaning the comprehension or assimilation of something such as a new idea, can then be related in terms of previous experiences or perceptions. NNT operates similarly and is much like a human mind in the way that it enables a person to recognize a face from the distant past. For example, the brain facilitates recognition by matching a face with an image stored as a memory.

Just like a brain, the MSIR Flame Detector has thousands of pieces of data stored in its memory from hundreds of flame and non-flame patterns it has observed in the past. It has been trained to recognize a flame based upon that data, and make decisions about whether it is seeing an actual flame, even if it has not seen that exact pattern in the past.

Greater Range and Field of View Means Fewer Detectors and Cost Savings

General Monitors' FL4000H MSIR Flame Detector combines a complex sensor array with highly intelligent neural network processors to provide new pattern recognition abilities; it has been trained to differentiate between real threats and normal events. MSIR technology allows area coverage up to six times greater than that of more conventional ultraviolet infrared (UV/IR) flame detectors. MSIR technology performs under various environmental conditions and offers faster response times and increased detection distances.



Multi-Spectral IR flame detection offers the longest distance protection and superior false alarm immunity.

Use of a four-sensor array enables the FL4000H MSIR to detect flame and non-flame events. The four sensors sample unique IR spectral wavelengths and convert those signals into a digital format to extract time and frequency data. Four sensors provide more data, increased detection distances, excellent immunity to false alarms, faster response times, and better performance under various environmental conditions. The data acquired by the four sensors is automatically conveyed to the neural network where the real work of determining the threat level is done.

A longer range and wider field of view means fewer detectors can cover larger territory reducing the cost of protection. The FL4000H MSIR Detector reliably differentiates between real fire threats and common activities like random motion, modulation of heated surfaces, hot air flow, reflection off water surfaces, lightning, and arc welding, to name a few.

The FL4000H MSIR Flame Detector's inherent differences lie in a unique marriage of a state-of-the-art artificial neural network and sophisticated sensor arrays. This flame detector can discover fire threats faster, and at greater distances, than any other product of its kind. Combine that with its superior false alarm immunity, and protection from both fire and false alarms is now possible. That can translate into substantial savings for growing industries like mid-stream oil, gas, and petroleum markets with compressor stations and processing plants as well as other large-scale manufacturing facilities.

Industry news

Toxic Gas Detector Receives IECEx Approval

The TS4000H Intelligent Toxic Gas Detector from General Monitors is now IECEx approved, informing General Monitors' customers the TS4000H has been independently evaluated and found to be in compliance with international safety standards for explosive environments. The TS4000H offers protection against a wide range of hazardous industrial gases and is able to safeguard against oxygen deficiency.

The International Electrotechnical Commission (IEC) established the IECEx mark to facilitate international trade in equipment for explosive atmospheres and hazardous locations. Benefits to IECEx approval include reduced testing and certification costs to the manufacturer, reduced time to market, international confidence in the product assessment process, one international database listing and increased international confidence in IECEx-certified equipment and services. General Monitors' customers can be assured that the TS4000H and its manufacturing facilities have been and will continue to be independently assessed for compliance with rigorous international standards.

With its advanced design, the TS4000H Toxic Gas Detector offers many valuable features including event logging, a clearly visible LED, and an indicator for remaining sensor life. The TS4000H is compatible with the HART communications protocol for uniform and consistent communication without disturbing the integrity of the 4-20 mA analog signal, and is also available in a Modbus configuration and with three 8A relays. All of the electronics are contained within an explosion-proof housing so that sensor information can be processed at the sensor site.

Additionally, the interface module's galvanically-isolated, intrinsically-safe design supports sensor field replacement without special tools or hot work permits. Furthermore, the detector is easy to install and can self calibrate by activating a magnetic switch and applying gas. Process engineers who need to protect people, equipment, and the environment will find the TS4000H well suited for a broad range of industries: Petrochemical installations, oil and gas production facilities, water and wastewater treatment sites, and power plants are some of hazardous environments to which the TS4000H can add great value. For worldwide application, the detector also complies with ATEX, CSA, CE, GOST in addition to IECEx, and is certified for use in SIL 2 environments.

The TS4000H monitors a variety of toxic gases like ammonia, carbon monoxide, chlorine, chlorine dioxide, hydrogen, hydrogen chloride, hydrogen sulfide, nitric oxide, nitrogen dioxide, oxygen deficiency, ozone, and sulfur dioxide. The system displays gas concentrations up to 500 ppm, fault codes for troubleshooting, prompts when calibration is needed, and provides complete status to the control room.

Deadline Approaching For Hazard Communication Training

OSHA's Hazard Communication Standard is now aligned with the United Nations' Globally Harmonized System of Classification and Labeling of Chemicals. This update to the Hazard Communication Standard provides a common and coherent approach to classifying chemicals and communicating hazard information on labels and safety data sheets. The first deadline in the implementation phase is Dec. 1, 2013, the date by which employers must train workers on the new label elements and safety data sheet.

OSHA has prepared a number of additional materials that explain the new changes to the requirements of the HCS, including QuickCards, a training fact sheet, a list of frequently asked questions and a brief on labels and pictograms.

HSE Encourages the Review of Alarm Settings

Toxic gas and oxygen deficiency detectors are commonly used thoughout the workplace to warn of potentially harmful exposure to personnel, and of dangerous gas leaks. The detectors employed to perform these tasks are personal (worn in the breathing zone, eg on the upper lapel), portable (typically hand-held or worn on a belt) and fixed (typically connected to a control and warning system). Carbon monoxide alarms are also employed in domestic premises to warn of carbon monoxide leaks.

Current knowledge on alarm setting for toxic gas detectors was reviewed by a literature survey and consultation with stakeholders (eg HSE, various industries, gas detector manufacturers). The purpose of this review was to develop a framework for guidance on alarm setting for toxic gas detectors as information is lacking on the rationale behind setting alarm levels. The available guidance was summarised, the factors which influence the alarm setting process identified, and recommendations made on how this process should be conducted.