

FlameGard® 5 MSIR Flame Detector



Protect your Oil & Gas Platform with the Unparalleled Flame Detection and False Alarm Immunity provided by Neural Network Technology

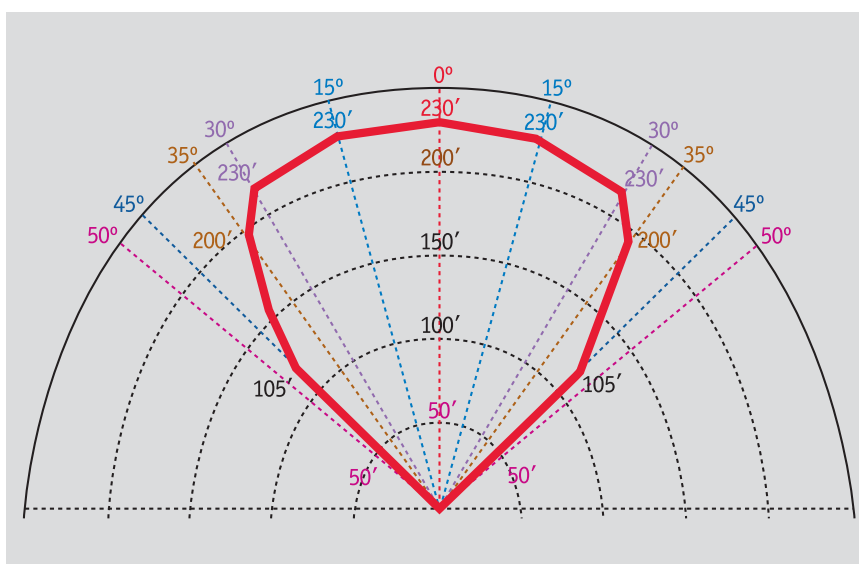
Introduction

In the Upstream Oil & Gas Industry, 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 a catastrophe. But deciding how best to protect your personnel, your facility and your investments is a critical consideration.

This paper will address the latest ground-breaking technology behind MSA's versatile, dependable and durable FlameGard 5 Multi-Spectral Infrared (MSIR) Flame Detector. This field mounted flame detector can discover fire threats faster, and at greater distances, than any other product of its kind. Combine that with our 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 up-stream oil, gas and petroleum markets with compressor stations and processing plants as well as other large-scale manufacturing facilities.

MSA's FlameGard 5 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. A longer range and wider field of view means fewer detectors can cover larger territory reducing the cost of protection. The product sees and identifies real fires first, senses them longest and sees even small fires.

The FlameGard 5 MSIR Detector will reliably differentiate 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. On the other hand, competitive detectors can misinterpret these common activities as an actual fire. The FlameGard 5 MSIR Flame Detector's inherent differences lie in a unique marriage of a state-of-the-art artificial neural network and sophisticated sensor arrays.



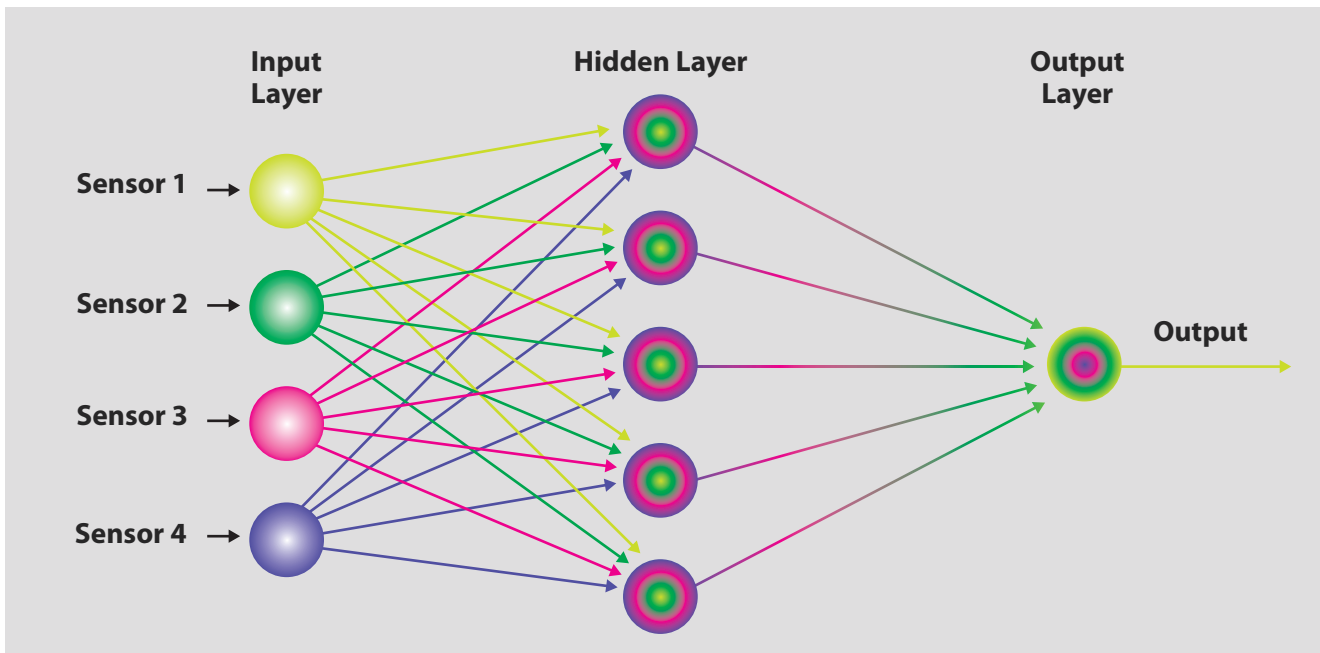
MultiSpectral IR flame detection offers the longest distance protection and superior false alarm immunity

Multi-Spectrum Infrared Sensor

The detector employs a MSIR sensor designed to detect fires such as those produced by alcohol, n-heptane, gasoline, jet fuels and other hydrocarbons. MSIR technology allows area coverage up to six times greater than that of more conventional ultra violet infrared (UV/IR) flame detectors. The MSIR detector has a 100-degree cone of vision that detects a one square foot fire at 230 feet. In addition, MSIR technology performs under various environmental conditions and offers faster response times and increased detection distances.

Use of a four-sensor array enables the FlameGard 5 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 provides 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.

*Because every life has a **purpose...***



Simplified view of a neural network

Neural Network Processors

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.

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.

According to Daniel Shiffman, professor of Interactive Telecommunications at New York University, neural networks have a range of standard uses, many of which are at work in the FlameGard 5 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

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 FlameGard 5 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.

Other products on the market use less sophisticated threshold and ratio decision tree algorithms to attempt flame recognition. By incorporating NNT into the FlameGard 5 MSIR, MSA has created a product unlike any of its competitors. It is the cutting edge technology in fire detection and false alarm immunity.



New Performance Standards for Fire Detection

The FlameGard 5 MSIR sensor array has a range of up to 230 feet, and with NNT, it acts as an integrated microprocessor assembly co-located in the detector's explosion-proof stainless steel housing. Circuit boards are coated to protect against humidity, fungus and corrosive and contaminating atmospheric conditions.

A continuous optical path monitoring (COPM) self-diagnostic circuitry check of both the optical path and the detector's circuitry takes place once every minute to ensure reliability.

The FlameGard 5 MSIR is a unique flame detector in that it has the ability to detect a fire that is one square foot, in less than 10 seconds, at 230 feet away. These impressive results are unrivaled in a competitive comparison test. What's more, the FlameGard 5 Detector has a maximum field of view of 100 degrees at 100 feet and 90 degrees at 210 feet making it an attractive fire detection option for drilling and production platforms, gas turbines, Liquefied Natural Gas (LNG)/Liquefied Petroleum Gas (LPG) processing and storage facilities, fuel loading facilities, compressor stations, electrostatic paint spray booths, aircraft hangars, refineries and chemical plants.

The detector's dependability is enhanced by an ability to function at temperatures of between minus 40° F and 176° F.

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

Because of the FlameGard 5 MSIR Detector's greater range and wider field of view, the number of detectors necessary in many applications can be significantly reduced along with installation costs while achieving greater false alarm immunity.

MSA's FlameGard 5 MSIR Detector offers a wide range of industries a cost effective tool to protect lives and inventory with technology that sees further, faster and with a field of view that covers more ground than other market options making it an ideal fire detection choice for the upstream Oil & Gas Industry.

Our Mission

MSA's mission is to see to it that men and women may work in safety and that they, their families and their communities may live in health throughout the world.

MSA: Because every life has a purpose.

Your direct contact

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