UNDERSTANDING DIFFERENT FIRE DETECTION TECHNOLOGY AND ITS APPLICATION

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HOCHIKI

WHITEPAPER

Introduction

Fire detection equipment is designed to respond during the early stages of a fire, however no single type of detector is suitable for all environments. It is therefore very important to understand your options and install the technology most appropriate for the application. For example, whilst traditional point detectors may be the perfect solution for offices and class rooms, they can fail to cope in more demanding environments such as warehouses and factories.

This white paper has been designed to give you a brief understanding of the following technologies and where they might be applied:

- ✓ Photoelectric Smoke Detectors
- ✓ Heat Detectors
- ✓ Multi-Sensors
- ✓ Wireless Detectors (& hybrid wireless)
- ✓ Beam Detectors
- ✓ Aspirating Systems
- ✓ Flame Detectors
- ✓ Intrinsically Safe Devices
- ✓ SIL approved Devices
- ✓ Linear Heat Detection Cable
- ✓ Marine Approved Devices
- ✓ Water Detection

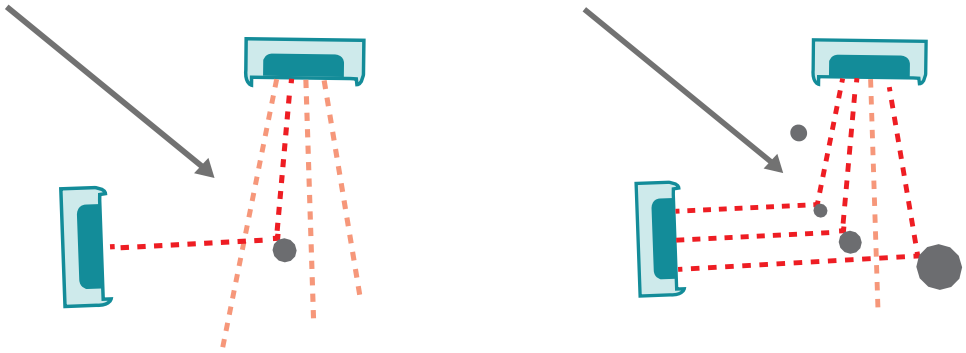
Photoelectric Smoke Detectors

Smoke particles consist of carbon and other pollutants in the air, and it is these particles that a photoelectric smoke sensor can detect optically.

There are two principles to optical detection; backscatter and obscuration.

Backscatter

Within the detector chamber, there will be two main optical components; an infrared transmitter and receiver. When smoke particles enter the chamber the infrared light will reflect off the particles causing it to scatter; the more particles present in the chamber, the more scattered light received, thus triggering the device to go into alarm.

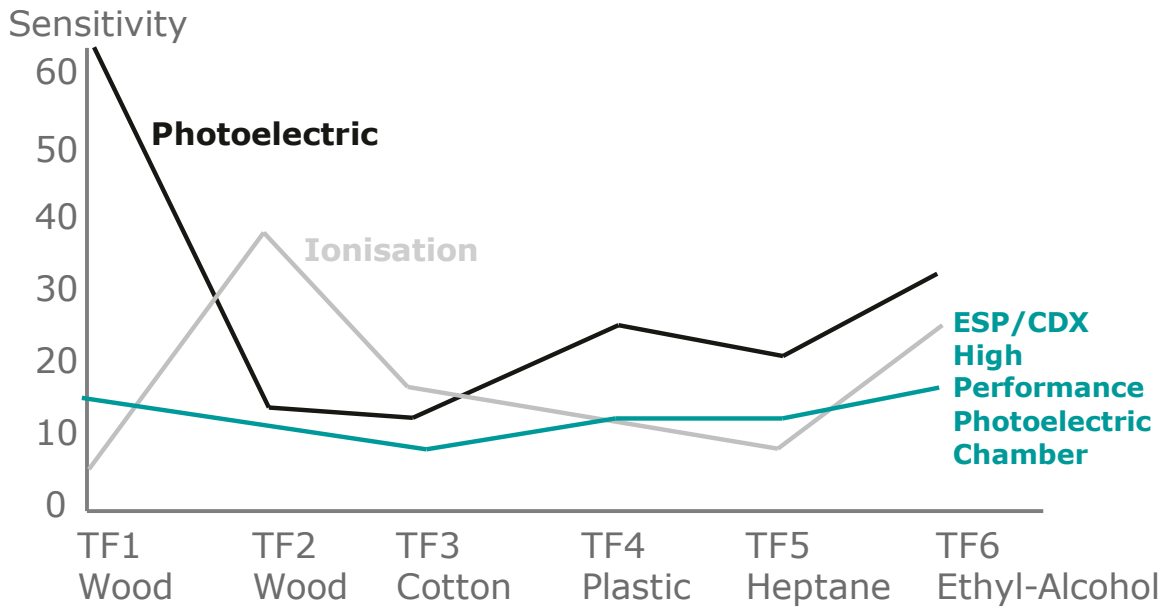


Obscuration

This is the measuring of obscured light as opposed to scattered light. If smoke particles are present, the particles are likely to partially disrupt the beam of infrared light from the transmitter to the receiver. There will be an obscuration threshold and when this is reached, it will trigger an alarm condition.

Typically, Photoelectric smoke detectors are more sensitive to smoke emitted by smouldering fires than smoke emitted from flaming fires. Some installers might therefore install an ionisation smoke detector in areas where there is a risk of very hot fast burning fires. However, Hochiki has developed the 'flat response' chamber in the optical smoke detector which gives very similar results to that of an ionisation smoke detector, making it suitable for most environments.

Typical Detector Characteristics



Ideal for: Schools & Universities, Multiple Occupancy Accommodation, Hospitals, Care Homes, Office Buildings, Airports, Rail/ Tube Stations, Waiting Rooms, Hotels, Retail Units, Super Markets etc.

Heat Detectors

Heat detectors are an alternative to smoke detectors; for example, in an environment where you might find smoke, such as a theatre using smoke machines, a smoke detector would not be ideal.

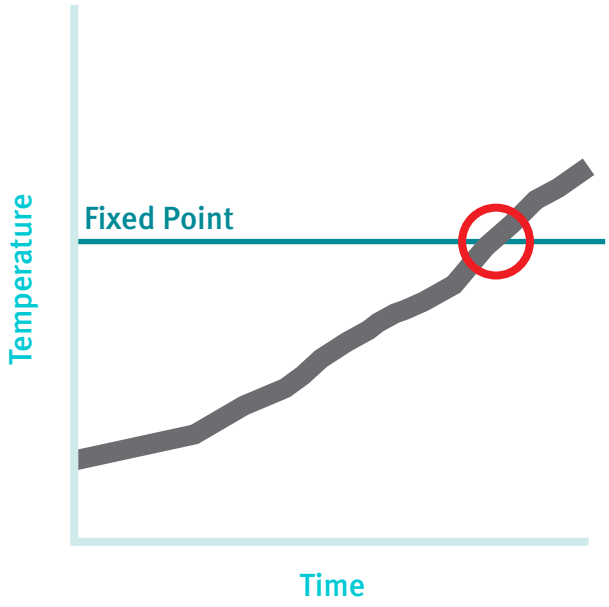
There are two different types of heat detector; fixed temperature and rate of rise.

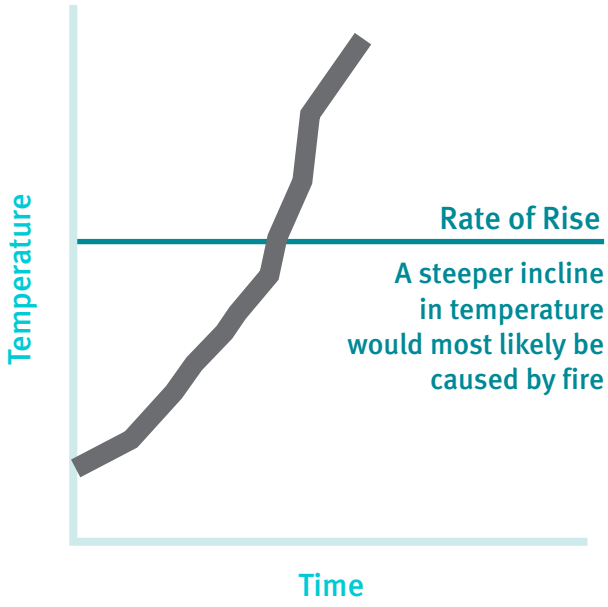
Fixed Temperature

A fixed temperature heat detector is designed to go into alarm when the temperature exceeds a predetermined value.

Rate of Rise

A rate of rise detector not only measures the temperature, but also monitors the speed at which it rises. The sensor will ignore slow temperature fluctuations (perhaps caused by the building's heating system coming on in the morning), but will respond to a rapid rise in temperature most likely caused by a fire.





Ideal for: Retail Food Courts, Garages, Machine Rooms, Theatres etc.

Multi-Sensors

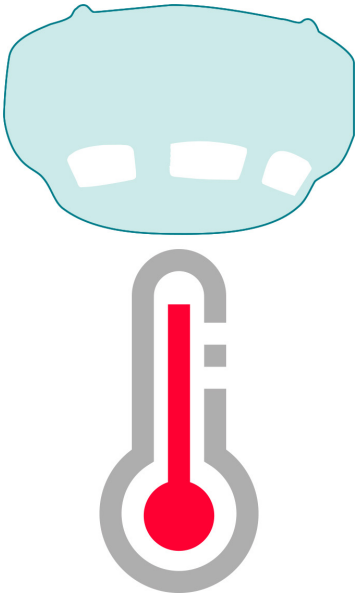
Multi-Sensors use both optical technology and heat sensing technology together to determine a fire condition. This provides an earlier response to fire whilst still maintaining low-false alarm characteristics.

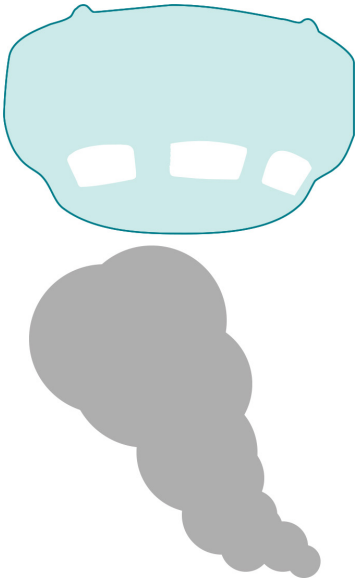
To explain this further, we can look in closer detail at Hochiki's ACC-EN.

ACC-EN

The device can operate in three modes; smoke detection mode, heat detection mode or multi-sensor mode. In multi-sensor mode (default), essentially the device is operating as a photoelectric smoke sensor but the photoelectric sensitivity is enhanced when a temperature rise above 40 degrees centigrade is detected by the heat sensing element. The ACC-EN achieves this utilising a microprocessor with an algorithm. This algorithm linearises the heat detection element and calculates the enhancement to the sensitivity of the photoelectric element.

Ideal for: Hotels, Hospitals, Schools & Universities, Offices, Rail/ Tube Stations, Airports, Spa Facilities, Cinemas, Retail Units, Museums, Show Rooms etc.





Wireless Detectors

A fully wireless system utilises radio technology instead of cabling, making it a very flexible and versatile solution. Quite often, wireless devices are selected for use in buildings where the aesthetics cannot be compromised or when a historic building has been legally protected (listed). Lack of cabling can also reduce installation times; therefore, wireless systems might be the preferred solution if the project has a tight time scale.

In some instances, it might be necessary to create a hybrid wireless solution whereby wireless devices are interfaced with a wired system via a module. For example, wireless detectors could be installed in a remote school building or a new doctor's office and interfaced with the existing wired system in the main building (subject to compatibility).

Hochiki's FIREwave devices have a range of 150m in open air, but greater distances and complex architecture can be addressed with expander and router modules (subject to survey).

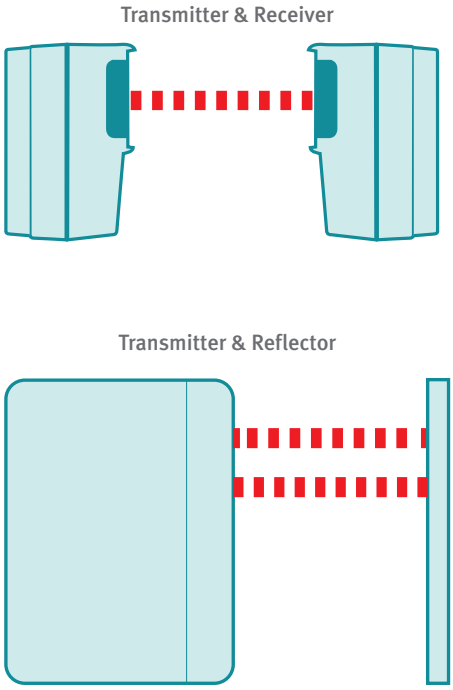
Ideal for: Castles, Cathedrals, Museums, Remote Buildings, Banks, Prisons, Hotels, Offices etc.

Beam Detectors

There are two types of optical beam detector;

- a transmitter with a separate receiver
- a reflective beam detector

Both, however, work on the same principle; obscuration.



Obscuration: When sufficient smoke blocks the infrared light beam, it reduces the signal strength, and when the obscuration threshold is met a fire condition is generated. (see page 4)

At height, there is often very little unwanted obscuration, however well designed beam detectors (such as the SPC-ET and the FIREbeam) use a sophisticated algorithm that distinguishes between unwanted obscuration, such as a bird breaking the beam, and a genuine fire.

Hochiki offer both styles of beam detector, both of which have enhanced features such as auto re-alignment, and a range of compatible accessories such as an anti-fogging kit.

Optical beam detectors are ideal for large open spaces and can be installed at a height of up to 40 meters.

Ideal for: Shopping Centres, Sports Halls, Museums, Cathedrals, Warehouses, Atriums etc.

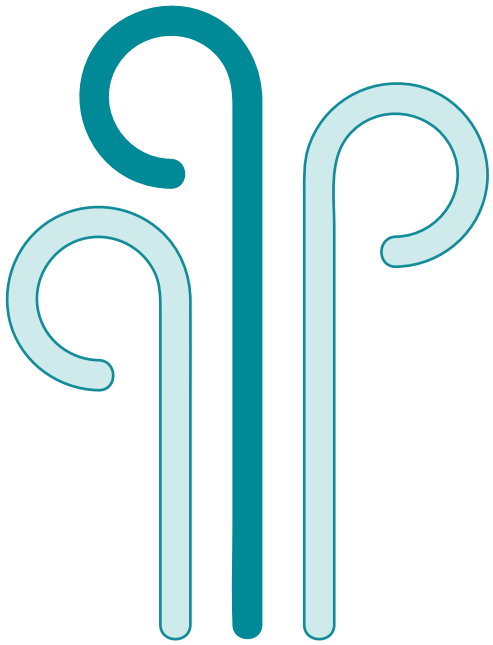
Aspirating System

Where a large volume is to be covered and high sensitivity is required, an aspirating system could be a viable option.

Air sampling systems consist of lengths of pipe with strategically placed sampling holes along its length. An air impeller is then used to draw air along the pipe from the sampling holes and through the detector measuring chamber.

Most high sensitivity aspirating detectors use the obscuration method, and when a pre-defined density of smoke fills the chamber, the system will go into alarm.

Ideal for: Clean Rooms, Computer Rooms, Prisons, Animal Enclosures, Large Storage Facilities or Cold Storage, etc.



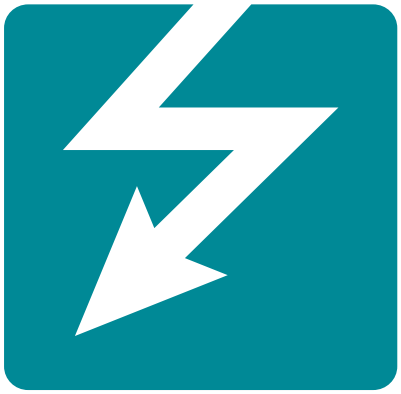
Intrinsically Safe

For a product to be 'Intrinsically Safe' it must be incapable of igniting an explosive atmosphere by either spark or heat; Intrinsically Safe fire detection products are therefore designed to operate at a much lower voltage (even the quiescent current is much lower).

This low power also means that there is no chance of receiving an electric shock due to excess thermal energy and arcing.

It is crucial to remember that, the whole circuit must be considered, not just the device in isolation and so an Intrinsically Safe mounting base must also be used.

If interfacing between hazardous and non-hazardous areas, you must use a module and an intrinsically safe barrier to reduce the current, but both the module and the barrier must be installed on the non-hazardous (safe) side.



Ideal for: Hazardous-defined areas, oil refineries, petroleum production facilities, coal mining, gas processing, chemical engineering, air-borne powder facilities (flour, paper, synthetic fibres etc).

For further information about intrinsically safe certification, you can visit the following websites:

www.baseefa.com
www.brecertification.com
www.iecex.com

SIL Capable

S.I.L is an acronym for 'Safety Integrity Level'. This is a system used to quantify and qualify the requirements for safety instrumented systems.

All products, including fire detection products, must be independently assessed and approved by the International Electro-technical Commission (IEC); products will then be awarded a SIL approval level (SIL1, SIL2, SIL 3 and SIL4).

For example, Hochiki's SIL products have been awarded SIL2, which means that they are approved for use in a SIL2 low demand safety function.

It is important to note that SIL approved products are not the same as Intrinsically Safe Products. SIL approved products are for use in high risk industries, Intrinsically Safe products are for use in classified hazardous areas.

Ideal for: High risk areas that have specified SIL approved products.

Marine Approved Devices

Marine approved products are independently assessed by third parties such as Germanischer Lloyd and LPCB to the MED approval scheme. Products are tested to ensure that they can withstand demanding marine environments.

Companies, such as Hochiki, have comprehensive ranges of both addressable and conventional fire detection equipment, to ensure the rapid and reliable detection of a genuine fire at the earliest stage.

Ideal for: Container Ships, Yachts, Submarines, Off-Shore Installations, Oil and Gas Platforms, Wind Farms etc.

Linear Heat Detection Cable

LHDC is an acronym for Linear Heat Detection Cable. LHDC is designed to provide early detection of fire and overheating in circumstances where other forms of detection would not be viable, either due to inability to sustain the environment requirements or through prohibitive costs.

There are two types of LHDC; analogue and digital. In an environment such as a tunnel, where the distance could be vast, extensive single zonal lengths of the digital cable would be ideal, as it has the ability to trigger alarms for hot spots occurring on very small sections of the overall distance; thus allowing you to pinpoint the location of the heat source.

Ideal for: Tunnels, Car Parks, Recycling Plants, Food Processing Facilities, Conveyor Systems, etc.

Flame Detectors

Flame Detectors use infrared and/ or ultraviolet sensors which respond to specific wavelengths of light (or black body radiation). The spectrum of light is vast, even human bodies generate some black body radiation, flame detectors are therefore designed to only respond to objects further along the spectrum.

High quality flame detectors are also designed to monitor flicker patterns to eliminate false alarms caused my sunlight or man-made flames from welding torches etc. When selecting a flame detector, you should also consider the importance of the detection of hydrocarbons, as some detectors cannot detect fuels, such as hydrogen and fluorine, through glass.

Ideal for: refineries, waste recycling facilities, biomass storage facilities, engine rooms, fuel stations etc.

“What does water detection have to do with fire technology and applications?”

Good Question.

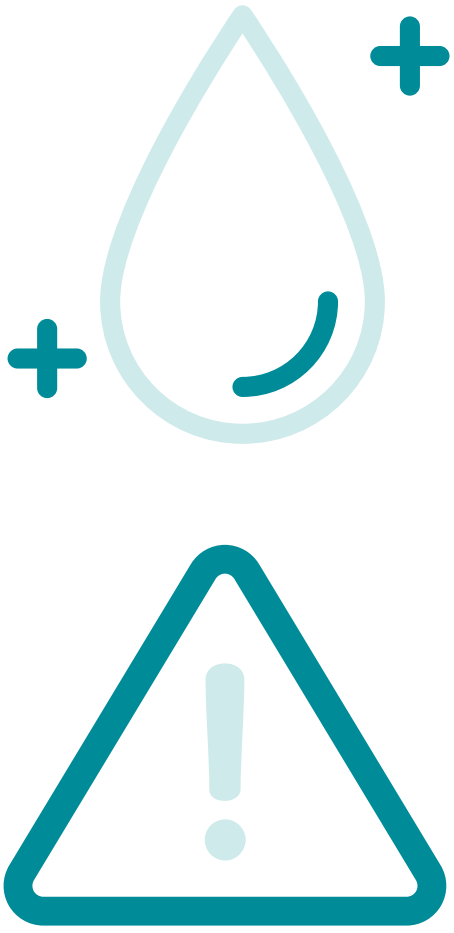
Water Detection Systems

Whilst fire is a major concern for building owners, it is actually water damage that is the most common insurance claim made by UK commercial building owners.

Much like fire detection systems, water detection systems have been designed to detect a leak at the earliest stage, thus mitigating the damage to not only the building and its contents, but also the damage it can cause to business continuity.

Similar to fire detection solutions, water detection systems can; be conventional or addressable, consist of point detectors and/ or detection cable, include sounders and/ or visual indicators, and are managed by a central panel.

Hochiki’s range of water detection equipment, LEAKalarm, is a brand-new solution to the market and is based around Hochiki’s ESP protocol. Therefore, if you are conversant with Hochiki fire products, you might wish to consider adding another string to your bow!



Ideal for: Offices, Call Centres, Data Centres, Computer Rooms, Food Factories, Libraries, Museums, Archives, Paper Storage Facilities etc.

Summary

It is very important to understand your environment and be aware of what fire detection (and water detection) solutions are available to you.

We hope this white paper has given you a brief understanding of the technologies available and where they might be applied

Information Links

For more information on -

Addressable detectors please visit -	www.hochikieurope.com/esp
Conventional detectors please visit -	www.hochikieurope.com/cdx
Wireless detectors please visit -	www.hochikieurope.com/ekho
Aspirating systems please visit-	www.hochikieurope.com/firelink
Intrinsically safe devices please visit -	www.hochikieurope.com/is
SIL products please visit -	www.hochikieurope.com/silapproved
Marine detectors please visit -	www.hochikieurope.com/marine
Linear Heat Detection Cable please visit -	www.hochikieurope.com/lhdc
Water detection please visit -	www.hochikieurope.com/leakalarm