EXTENDING YOUR REACH

Advances in detection technology are coming from intelligent combinations and extensions of existing technologies rather than any revolutionary new ones, says **Stuart Ball** of System Sensor Europe.

WHILE THE OPTICAL SMOKE DETECTOR IS WELL established as the best overall general-purpose device for the majority of applications, it has its limitations. The most well known problems are that the technology is relatively insensitive to fast flaming fires that only generate a small amount of particulate material, and the risk of false alarms can be significant if only a single sensing element is used to detect a fire. The ionisation detector is a very efficient detector of fast fires, but one that is now out of favour on environmental grounds.

Consequently, considerable work has been done to improve the response of optical detection technology. The preferred solution, the bi-sensor photo-thermal detector, uses a rate-of-rise and fixed temperature sensor to augment the optical chamber, extending its responsiveness without increasing the risk of false alarms by overly increasing the sensitivity.

Suitable though the point optical detector is for most applications, there are a number of situations where an alternative approach is needed – if the system is to function at maximum effectiveness and give the best possible protection through detection of fire and rejection of false alarm threats.

It is in the area of specialised detectors that much of the recent System Sensor research and development activity has been concentrated, resulting in a number of major new products brought to market over the past few months – with more to follow. The underlying logic is simple: it is unlikely that any significant advances can be made that will dramatically

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improve the performance of the optical detector technology and any improvements are likely to be evolutionary rather than revolutionary. So this drives the need to provide new technology to increase detection effectiveness across multiple fire types and improve false alarm rejection. The main developments – COPTIR, aspiration detection and radio signalling – not only offer significant advances in performance but also, depending on the product, significantly reduce installation costs. They also either extend the fire system's coverage into areas that previously were difficult to cover, or provide highly sensitive and low false alarm protection for enterprise-critical areas of the building. End users benefit from increased protection, enhanced system configurability and lower false alarm rates, while the fire and rescue service will welcome a reduction in the potential number of attendances as the result of false alarms from automatic systems.

Four-in-one

The COPTIR combines independent carbon monoxide, photoelectric smoke, thermal, and infra-red detectors, all managed by an embedded microprocessor running a set of very sophisticated and responsive algorithms in a low profile housing. By measuring and processing the individual sensor outputs with intelligent algorithms, the detector is ultra-immune to non-fires and very sensitive to fires. The basis for COPTIR's detection of fire and rejection of false alarms is the fact that however variable the fire, and however different are the characteristics of the inflammable material, all fires have three elements in common: they all produce carbon monoxide, heat, and particulate matter. The proportions change from one fire to another, as does the time for each phase, but in every case, to a greater or lesser extent, each of these three elements will be present (although in many phases the amount of each of the three elements may be very small). In cases where the fire is flaming, it will also produce a changing light signature as a result of the flame generation.

Smoke detection is still the base technology in use, but COPTIR monitors for each of the four major elements of a fire (particulate matter, heat, light and CO), not just the generated particles, so that the presence or absence of specific elements can be used to adjust the sensitivity of the other sensing elements. This continual monitoring of all four major elements of a fire has enabled the creation of a detector that responds far more quickly to an actual fire, has the highest immunity to nuisances, and is highly configurable from the panel, allowing the detection system to be profiled to changes in the use and occupation of the protected building. It is normally configured so that it operates at a high immunity level, changing to become very sensitive to fires when well-defined fire characteristics are sensed. In this way, transient nuisances are monitored and ignored, reducing the false alarm rate.

In a very extensive programme, COPTIR was tested for 21 different false alarm tests and 29 different fire alarm tests – probably one of the most comprehensive series of tests ever run by any manufacturer during the development of a new device. It did not return a false alarm in any of these tests, while other single and multi-criteria detector technologies alarmed. The fire tests selected were biased to the flaming end of the scale because it is known that these are less favourable to the photoelectric smoke detection technology, which is the primary sensor of the COPTIR. While the ionisation detector is rightly reducing in popularity as the result of environmental concerns and legislative constraints, there is no denying that, for detecting fast flaming fires, it is a better technology than photoelectric. The tests show that it can be used as an alternative to an ion detector without any reduction in performance.

Hybrid aspirating system

Until System Sensor developed the high sensitivity Pinnacle laser optical point detector, aspiration systems were the most effective way of providing very early warning protection for areas such as manufacturing clean rooms, telecoms facilities, high-tech diagnosis equipment in hospitals, data centres, computer suites, control rooms and other high value environments. Given that such environments will often be temperature and humidity controlled with dust filtered out of the atmosphere, it is possible to increase significantly the sensitivity of the smoke detector to as high as 0.005% per metre – without running the risk of frequent nuisance alarms. A dedicated network of pipes is installed in the protected areas, and air is sucked through the pipes to a central remote detection chamber containing a highly sensitive smoke detector, typically a large chamber optical type using a laser as the light source. Although aspiration systems are significantly more sensitive to incipient fires or overheating equipment than general application optical smoke detectors, they do nevertheless have several major disadvantages. They are a separate independent system, installed in parallel to the main fire protection system and so incurring additional cost and, unlike an addressable detection system, the location of an alarm condition can only be identified to a general area, not a specific detector position. But they have some significant advantages. They are an effective method of providing high sensitivity protection for 'difficult' areas such as under-floor cable voids in computer rooms, where air velocities can be quite high as the false floor is typically used to feed cooling air into the enclosures housing the equipment. They also have obvious applications for difficult to reach areas, and by incorporating suitable filters in the inlet pipes, dusty and dirty areas can also be effectively protected.

The System Sensor hybrid aspiration system takes the best of both worlds. It uses the classical aspiration pipe network in conjunction with loop communications technology through the high sensitivity Pinnacle laser detector, addressed from the fire system loop as the detector for the aspiration system. The units are available as single channel or dual channel devices. In the single channel version, a second Pinnacle detector can be fitted to give double-knock detection, a mandatory requirement if the system has automatic initiation of sprinklers or gaseous extinguishing systems as one of its features. The second detector can alternatively be used to give automatic redundancy capability, a particular benefit for installations in remote, unattended buildings such as mobile communication base stations. A fan in the unit is used to draw air through both single and dual channel systems; for VdS approved installations, pipes can be up to 75m in length (up to 750m^2 coverage) in a single channel unit, and up to 50m each (up to 1000m^2 coverage) in a dual channel device.

The hybrid system potentially offers considerable installation cost savings, and

allows the system's reach to be extended into areas that would be difficult or impossible to protect using only point detectors.

Radio waves

Having radio communications between detectors, call points and panel provides greater flexibility in the design and implementation of a system. The primary role of a fire detection system is to protect the buildings and occupants from a fire. But in some cases, such as heritage sites and listed buildings that can be under strict rules about can and cannot be done, the building must be protected from the possible damage caused by an installation. While these rules may conflict with health and safety and fire service requirements, a radio system could well be the best way of providing adequate fire protection while respecting the architecture and fabric of a building. Other sites, where running cables into particular areas is difficult if not impossible because of the construction methods and materials, are another example, as are those where continual occupation and use makes it very difficult to have access for the time needed to run cables.

The System Sensor radio system can be used either as an extension to an addressable hard wired system, or as a stand alone system. If the application demands a 100% radio solution, a stand alone conventional system provides support for 32 devices across two zones. Alternatively, if the radio part of the system is to be a minor part of the overall installation, deployed only in a specific area, an addressable wired system can be extended with up to 99 radio detectors and up to 98 radio call points per loop. The detector gateway interface occupies one module address on the loop; up to 99 detectors can be addressed through the module, with each detector being seen as a unique address by the panel. The translator module is externally powered and should ideally be sited in the geographic centre of the area to be protected.

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Most important in a life safety system is the integrity of the communication channel between the detector and the control panel. The System Sensor system provides 24 bi-directional discrete channels in total. Automatic frequency and channel changing through channel monitoring guarantees robust communications between the module and devices. The gateway module sequentially interrogates each radio detector and radio call point every 90 seconds in order to get status information about the welfare of the devices. A further key feature is the battery condition monitoring in each device that sounds a warning approximately 90 days before the battery voltage approaches a critically low level, giving ample time for the battery to be replaced.

System Sensor's recent developments offer substantial advances in both core detector technology and the provision of additional systems capabilities. COPTIR has ultra high immunity against false alarms while responding far more quickly to an actual fire. It is also highly configurable from the panel, allowing the detection system to be profiled to changes in the use and occupation of the protected building. With false alarm rates an increasing concern for both system integrators and the fire and rescue service, COPTIR provides an opportunity to reverse the recent increase, while simultaneously improving protection levels.

Aspiration and radio-based systems extend the capabilities of hard-wired point detector systems into new areas while also reducing total installed costs, enabling the fire system to provide more comprehensive and reliable coverage throughout the protected building. 2006 saw these major product introductions; later this year will see further introductions.

Enquiry 100

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Facing page: The COPTIR combines independent carbon monoxide, photoelectric smoke, thermal, and infra-red detectors. Below: Radio based detection and alarm systems are one way of providing greater flexibility in design and installation