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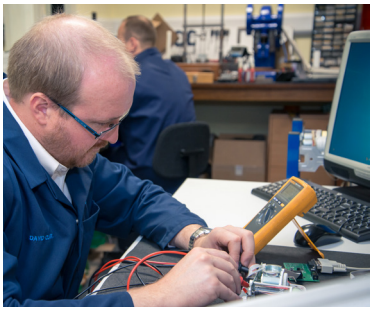

Radio vs Acoustic Control

Wireless Technologies used in the Fire Industry

by David Clark, Research and Development Engineer at Geofire

For:

Fire safety professionals

Care home owners

Education establishments

Health care establishments

Maintenance professionals

Facility managers

Summary

- The choice of technology is often a result of how quickly the system is to be installed or how easily it can be managed.
- Installing fire door holding devices need not involve extensive disruption and cost.
- Smaller ad hoc systems lend themselves to acoustic actuation, while larger installations are much more suitable for radio systems.
- Radio controlled Salamander devices facilitate quick, centralised configuration.
- Acoustic Agrippa units are standalone and may be installed when and where required.

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As time goes on, more and more products are appearing across many consumer markets utilising wireless control. The fact there is a choice of wireless control technologies available may not be apparent, plus choosing the technology appropriate for a given application may involve various considerations that might point in a specific direction.

The Salamander radio controller

Two of the prominent options in the fire industry for wireless control of fire door holder/closer devices are radio and acoustic systems, but which will be best for your particular requirements?

The technologies

Radio

Radio control is a long-standing technology which has an inherent reliability created by the regulations surrounding correct use of the radio spectrum. Radio systems can be programmed to react to specific triggers that would detect any adverse effects that may occur in the environment, making them intelligent and robust systems.

Devices that employ radio control are able to communicate with each other enabling quick, centralised configuration, remote fault and status monitoring, and actuation units can work across a wide, possibly inaccessible area. The regular and predictable operation of a radio system allows it to be adaptable to changes in the environment allowing either uninterrupted operation when possible, or obvious fail-safe behaviour of affected units. Coverage of a single radio device is large, typically 50m indoors, and may easily be extended by deploying signal repeaters to cover an entire building.

A radio system requires an initial radio environment survey to guarantee system coverage at all unit locations, further improving its reliability.

Despite all the characteristics of radio technology that ensure correct operation, radio signals can encounter problems when interference or particular obstacles are present in the environment. Lift shafts or plant rooms can reduce the strength of radio signals creating shadows in coverage; however these effects will be highlighted in a signal survey which means they may be predicted and negated in the system installation.

Radio devices also form systems of units and as such, it is not possible to buy a standalone unit to cover one location as infrastructure for radio control will also need to be installed.

Acoustic

Devices which actively use sound for decision-based actuation are relative newcomers to the industry. In the UK there is guidance surrounding sound levels and sounder profiles in the design of fire alarm systems that make reliable sound response achievable while minimising false actuations. Since a unit is controlled by a local sounder, acoustic units are standalone and may simply be installed when and where required.

Advanced digital filtering implemented in some acoustic units means that the specific frequency range and sound pressure level that the local sounder produces may be used to identify a fire alarm state. This minimises false actuations as the effects of spurious noises are much reduced or ignored entirely during the acoustic environment analysis. Configuration only requires the brief sounding of the fire alarm system to allow the unit to record and process the sound profile.

While there may be full diagnostic output of the unit's state at the unit, there is no means of relaying this information to a more convenient location instead requiring active inspection of individual units e.g. battery level.

Correct operation of a device relies on the operation of a sounder which therefore needs to be within close proximity of the unit making these installs short range. If the sounder circuit is silenced, or the local sounder is faulty, the unit will not respond in the case of a fire as the trigger will not be present. It is not possible for an acoustic unit to detect this failure of the sound path, so the unit will not fail safe.

Another area of uncertainty is the sound environment itself. If there is sufficient background noise at a location an acoustic unit will likely interpret this as a sounder and release the door. This can be overcome by installing a unit with advanced digital filtering, but it is important to ensure that there is no background noise during configuration. The unit will then respond only to the sounder itself.

Applications

It may already have become apparent that the two technologies lend themselves to being installed in different situations. The discussion below outlines further the strengths of each in specific applications.

Installation size, fitting and control

The physical size of an installation, as well as the number of units required within it, are both important in determining the amount of work required during fitting and configuration. They

will also indicate how much installation effort and management time will be necessary in administering the system.

In a radio door holder/closer system, there is generally a central control panel that is used for configuration, control, and monitoring the whole system. Signal repeater units extend the radio range through the building so that the door holder and closer units will all receive a reliable signal. As the size of the installation increases, there will be the overhead of the additional infrastructure necessary to extend the radio signal around the building. However, the increased time and cost invested during installation will be offset by the ease of use of the system: the whole system is controlled from the central unit which, due to it being connected to the fire panel, can be relied upon to activate all the units as well as providing a central point for manual actuation and unit monitoring – the control panel will have a release function as well as displaying visual fault and unit status outputs. By utilising the control panel in this way, the user is only required to visit one unit to ascertain the state of the system, unless a specific unit then needs to be inspected or maintained.

An acoustic system may be installed in a much more ad-hoc manner as the units are standalone requiring no central control. As an installation size increases, the number of units required increases, with no additional infrastructure required. Configuration may not however be so scalable: if a unit with advanced digital filtering is used each unit must be set up to listen to the sound of the local fire sounder. In order to do this, the fire alarm must be running for an extended period during initial set up and the user must visit each unit in this time to start the process. If the number of units is significant, the number of times the fire alarm is actuated will rise significantly, increasing disruption to any day-to-day users of the building. Maintenance of the system also gets more complex as the installation size increases. In order to check on a unit's state it must be visually inspected on an individual basis. The battery level, etc., while output visually, are only available at the unit itself as there is no central control.

The Agrippa acoustic door holder

The choice of technology therefore comes down to how quickly the system is to be installed, and how easily it should be managed during everyday use: smaller ad hoc systems lend themselves to acoustic actuation, while larger installations, or installations that would benefit from central control and monitoring, are much

more suitable for radio systems.

Changing the system

As a building's use evolves and changes, it may be necessary to alter the location of units, or install additional units extending the system.

In a radio system, changing or adding to it is straightforward. An existing unit may be moved to another location without any re-configuration as long as the radio environment covers the new location. Additional units may simply be enrolled at the control panel and fitted in place. In either case, the unit will synchronise itself with the system once installed, providing feedback at the control panel.

An acoustic unit, in a similar way, may be moved to any location with a local fire alarm sounder. Additional units may simply be installed in the required location. In both cases, if the units include advanced digital filtering, the unit must be put through the learn cycle. Even if a unit was previously installed, the sound characteristics at the new location are unlikely to be the same as at the old.

When it comes to changing the system, each option requires some potentially disruptive noise during the fitting of the unit. However, the acoustic unit requires the sounding of the fire alarm potentially further disturbing users of the building.

Acoustic environment

The acoustic environment is key to the correct operation of an acoustically triggered device. While acoustic units may be programmed to recognise the sound characteristics of a particular fire alarm sounder, any persistent loud noise that exhibits the same frequency range and is louder than the fire alarm sounder may cause the unit to actuate. This may mean that units in consistently noisy environments (e.g. school corridors, airports, railway stations, etc.) may be subject to false releases. Acoustic units also require a clear sound to listen to meaning that large spaces that cause echoes are also unsuitable.

If these circumstances occur in the proposed installation environment, a radio system may well be the more suitable solution.

Category of actuation

The legislation which surrounds the design and installation of fire alarm and associated equipment defines categories of actuation based on both the system characteristics and it's response to fire alarm. For fire alarm holders and closers, the standard to which to refer is BS7273 part 4 (1). Broadly speaking, the categories (Indirect [or C], Standard [or B], and Critical [or A]) define how much fault monitoring is performed within the system and of the system by the fire alarm panel, plus the response time to various failure conditions. The category of

actuation required will be decided by the user of the building, possibly in conjunction with a fire officer or adviser, and will dictate which technological option(s) is available.

A radio system may satisfy the requirements of all these categories as it has a direct connection to the fire alarm panel and may therefore be monitored by it, while an acoustic system is generally Indirect [or C], possibly Standard [or B] in some circumstances. This means that the path from the fire alarm system is acoustic, therefore no monitoring of the unit is possible and the fail-safe nature of the unit can not be guaranteed in the case where a fire alarm sounder is faulty, or the sounder circuit is silenced.

Alarm system

Depending on the type of installation, the fire alarm system may be a battery powered detector and sounder for a domestic dwelling, or as complex as an addressable loop system consisting of detectors, sounders, call points, etc.

With a simple detector/sounder in a domestic dwelling, there is no scope for wiring in a control panel as would be required for a radio system. There is also no incentive in this type of environment to install a full fire panel and devices to accommodate one. In this case, an acoustically triggered device is the only option.
A large fire alarm system might include sounders, sirens, bells, or voice alert for their output. An acoustically triggered device would work well with a sounder or siren, and may be tuned to a bell in certain circumstances. However, a voice alert is unsuitable. Regardless of the sound output used, a radio system wired into the fire alarm panel will be triggered into an alarm state with the fire alarm system.

Phased evacuation

Phased evacuation is sometimes desirable in large buildings for various reasons. In order to provide this functionality, the fire panel sounds different zones at varying times. Since a radio system is hard wired into the fire panel, it would be difficult to configure it in the same way to provide a phased operation. Unit locations are not as well defined as in a hard-wired system, depending on the radio environment rather than physical location, meaning that units may not release as required. An acoustic unit listening to the sound of its local fire alarm sounder is guaranteed to operate only when that sounder operates automatically providing the phased evacuation required.

Geofire products

Geofire is a leading manufacturer of fire door holding and closing products for both the radio controlled and acoustically triggered sections of the market.

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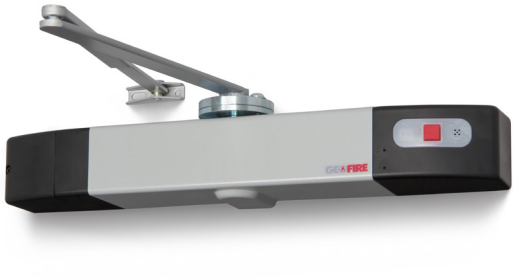
The Salamander free-swing and fixed hold open closer



The Agrippa acoustic free-swing closer

Its Salamander radio controlled range of products includes both closers, which include free-swing and fixed hold open functionality, and holders, which may be installed as bought or with an extension bracket or a chain keeper to suit different requirements. Subject to a site survey of a building's radio environment, this centrally controlled radio system is wired directly to the fire panel to provide central control and monitoring of units distributed throughout a building. Site surveys, installation, and support of Salamander systems are available through a fully trained network of installation companies, full details of which may be found on the Geofire website shown below.

The Agrippa acoustically controlled range of products again includes both closers, whose attractive slim-line design boasts free-swing functionality, and holders, which may also be installed as bought or with an extension bracket or a chain keeper to suit different requirements. These units are available through distributors and may be installed by any person competent at DIY. Installation instructions are available in written and video format on the Geofire website.

For all product enquiries and sales or technical information, please visit **www.geofire.co.uk** or email **enquiries@geofire.co.uk**

1. BSI. BS 7273-4:2015
Code of practice for the operation of fire protection measures - Part 4: Actuation of release mechanisms for doors.