

A whole new world for VSD



Smoke and flame detection using video analytics has been around for about 14 years, during which time the technology has found a useful niche in aircraft hangars, turbine halls, and road tunnels. Jose Maria Sanchez de Muniain talks to the man often dubbed by others in the industry as “the father of video smoke detection”, and to a company that is poised to take the technology to a whole new level of applications and ease of installation, where VSD will be available off-the-shelf and without the need for specialist cameras – or indeed specialist installation personnel.



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When Ian Moore first came across VSD it was being developed as part of a partnership between British Nuclear Fuels and ISL (Intelligent Security Ltd) – he quickly saw the potential for the concept and joined ISL as managing director. Within a year a commercial solution was developed and that part of the company started growing 100% year on year to the extent that a joint venture was created to further develop it, and (after some further corporate buy-outs) the well-known company D-Tec was born.

Within a few years the company won the prestigious Queen’s Award for Innovation in the UK and was confirmed by an IMS Research report as holding the leading position in VSD. Blue chip clients included the Royal Airwing Hangar complex at Dubai International Airport, as well as the Sydney Harbour Tunnel. “The biggest headache of all was standards and approvals, and it stopped the technology from taking off faster. We had to

demonstrate to each customer, but nine times out of ten customers would see the demonstration in their premises and then buy it; however once we picked up FM approval in the US it took off again.”

Ian Moore has been out of the VSD market for a few months, after deciding to look for pastures new after 10 years in the business. Today, he is MD of Elmdene International, a manufacturer of electronic products for the security, access control, CCTV and fire industry, but he is still keen to see VSD succeed as a technology that is fit-for-purpose in the right environments. If anybody knows VSD’s limitations, it is he. “VSD is a constantly moving feast and being a visual software algorithm, sees new phenomena every time it is in a new environment, because each application has different cameras, different lighting levels and different background motion. So it must constantly develop to match the new circumstances.”

In some applications – such as large enclosed spaces – the technology works well. In others it doesn’t: “It wouldn’t be effective in railway tunnels because as a visual system it requires space for smoke to develop. If a train is sitting in a tunnel, there is no space for the camera to see the smoke. In road tunnels however, where vehicles don’t move across the cameras, VSD works well.” Similarly, in areas such as offshore oilrigs, the large quantity of background motion generated by the sea for example, can flood the system with motion readings – even if there are ways round this with filters and IR.

Today, although widely used, VSD has little presence in codes. Moore points out that it is mentioned in NFPA 72 and BS 5839, but a lot more work is needed if further recognition is to be gained. “It is the testing criteria that are the problem. Because the system is software-based, it will perform to whatever criteria are set. If you don’t want it to see smoke at 100 feet but instead at 200 feet, it will do that – and vice versa; however standards require a constant set of performance criteria.”

This has meant that typically an experienced engineer has to install the system in order to adapt it to a particular environment – in some challenging environments this can take a week to set up. “This conflicts with every standard on external influences to a system, because VSD requires adjustment of standard settings.”

ASL Vision – the next generation of VSD

Based in East Sussex (UK), for a number of years ASL has been working on video analytics, focussing on the supply of driver assisted applications for the likes of BMW, Jaguar, Land Rover, and other blue chip automotive companies. The company estimates it has delivered around 200,000 units of mission critical, high priority video analytic units that are used in both low-speed, high-accuracy and high-speed applications (eg automated parking and collision avoidance) where there is no room for false detection. Aline Crespin, Business Development Manager, takes up the story: “These environments are a lot more challenging than stationary ones so we decided to move there because we have people with the skills in video image processing and analytics. We have been working on VSD for two years now, and we are at the stage of finishing trials.”

Testing for ASL’s product is coming up with some interesting results. Research Engineer Nauman Javed says that at the moment smoke is being detected within one minute, and flame within 30 seconds. “Compared to conventional beam detectors taking upto 30 minutes.”

ASL's solution differs from current solutions on the market in a variety of ways. For one, it consists of a plug-and-play unit that connects to an existing CCTV system, which means no specialist new cameras are required. "It is not server based, instead it is an embedded video network encoder with inbuilt video analytics for fire and smoke detection. So it is much more robust than running a program on a PC server," explains Crespin.

Interestingly, the new system is – says Nauman – unfazed by traditional hurdles of lighting and motion. "It is robust enough for all types of illumination, be it indoor, outdoor, clouds, rain or snow. Other companies we have seen so far use specialised cameras to detect the smoke and we think that makes it more expensive. They also do a lot of on-site optimisation as well, while we are looking at just a box that is plugged to any analogue or IP cameras."

Crespin adds: "We don't have to go to every project and do the

set up ourselves – the idea is for the end user to carry out the configuration themselves, and it is very simple. We can do some optimisation if needed but the idea we are targeting is that the system works best in most scenarios already mentioned"

ASL has worked on the problem of VSD within environments featuring moving objects, such road and rail tunnels. "We have had a good response in those environments and are confident it will work. We have been developing an algorithm that looks for certain features that identify smoke even in the presence of moving objects. We have found a lot of smoke characteristics that have enabled us to differentiate them from other false objects."

The fact that the new system can be used outdoors and is impervious to lighting conditions means ASL is looking at new markets not touched by traditional VSD suppliers. These include care homes, boiler rooms, naval ships, and even forest fire detection.

ASL's next generation VSD system will be launched in the next few months.

Video smoke detection takes off

Malcolm Gatenby, Sales Director at BSS-ME (D-Tec's video smoke detection partner in the Middle East) considers the growing application and benefits of CCTV-based VSD for fire safety in the testing aircraft hangar environment which – due to the sheer size and volume of such structures – can prove problematic for more traditional approaches.



The critical issue for aircraft hangars is ultimately whether a solution, once commissioned, actually has the potential to detect smoke before a large-scale fire has taken hold and what impact, if any, factors such as stratification and temperature layering are likely to have on the speed of response.

Worst case scenario

Sadly the effects of a blaze can be, quite literally, devastating both in terms of the irretrievable damage to the hangar's structure, equipment and any aircraft it contains, and the associated injuries – or worse – for workers inside and the firefighters tackling a blaze. This potential for large-scale disruption was amply demonstrated by a fire in a maintenance hangar at Brussels International Airport in May 2006 where, despite the best efforts of more than 100 firefighters, the hangar – which at the time contained four large aircraft – completely collapsed. The severity of the fire was such that it was only 36 hours later when it had been completely extinguished.

Early warning

So what can be done to address this problem? When it comes to providing an early warning of fire in aircraft hangars there is one

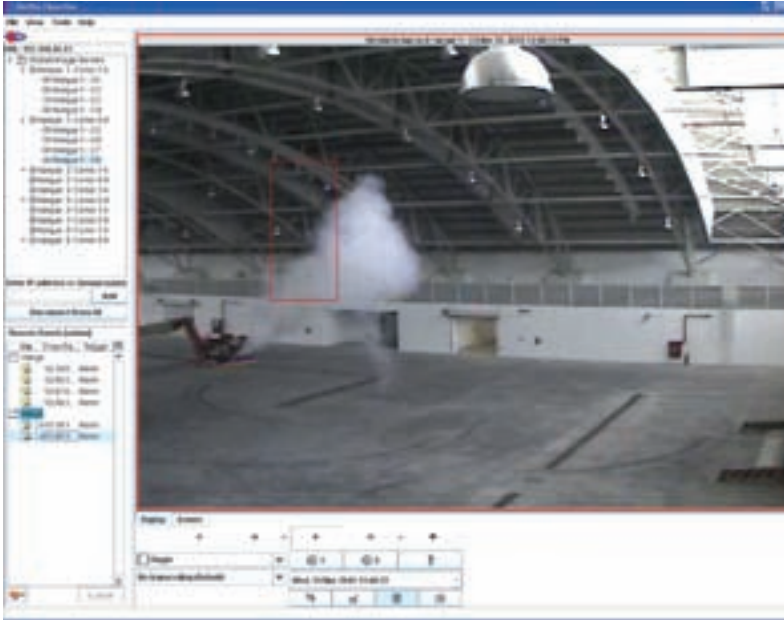
type of technology, based on the intelligent analysis of CCTV images, which is being increasingly deployed to protect these valuable assets. This CCTV-based solution is aptly referred to as Video Smoke Detection (VSD) – a technology pioneered by D-Tec – and is a capability that is now operational in a wide range of commercial and military aviation sites across the globe.

The benefits of VSD

The beauty of Video Smoke Detection (VSD) is that it takes detection to the fire rather than waiting for the fire to come to the detector. This approach is ideally suited to the large voluminous nature of aircraft hangars where high airflows are present and it is just not possible, practically, to place conventional detectors close enough to the area of risk to provide effective detection.

In lofty, extensive structures such as aircraft hangars there is a high reliance (where traditional fire detection solutions are concerned) in smoke overcoming distance, stratification and temperature layering, before being detected. This can mean, with conventional detectors, that it can be many minutes before an alarm is activated – if at all – making it much more problematic to tackle a blaze as it is likely to have reached a more advanced stage. This is not a limitation faced by VSD as it is able to utilise

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Commissioning and testing of the FireVu systems at Riyadh took place over a four-day period to ensure that the camera views in each hangar were optimised for the VSD's operation – leaving no critical gaps in coverage.

images from standard CCTV cameras and analyse these, by applying sophisticated algorithms to detect the presence of smoke in seconds and automatically alert control room operators to the danger. Consequently VSD is not reliant on the proximity of smoke to a detector. Whether the camera is 10 or 100 metres away from a risk area, VSD will detect smoke in the same amount of time.

Although it is claimed other camera-based systems are able to detect smoke, the reality is that these are often motion detectors or obscuration-change detectors which are unable to differentiate between smoke and other sources of movement and so are prone to false alarms. In terms of practicality, the CCTV cameras associated with VSD can be fixed in conveniently accessible places, rather than being positioned well out of reach, as is the case with conventional detectors. Additionally CCTV can cover a much larger area, so less cameras would normally be required (compared to detectors) for a given size of hangar.

FireVu for government maintenance hangars facility – Riyadh and Jeddah

Turning to a high profile project in the Middle East, which has just been completed, networkable FireVu VSD systems from D-Tec (part of AD Group) have been supplied and commissioned by us (at BSS-ME), for five large (90m (L) x 90m (H) x 33m (W)) hangars at the Royal Maintenance complex at King Khalid International Airport, 35 kilometres north of Riyadh (Saudi Arabia). This application further extends the growing installation base of VSD in the Middle East region.

In terms of the final installation the CCTV-based VSD solution adopted for the Royal Maintenance complex consists of eight cameras carefully positioned around each hangar with these in turn connected to two – four-channel – FireVu systems, giving a total of 40 cameras and 10 FireVu units across the project.

With regards to the actual selection process for VSD at the Riyadh Airport project, initially linear heat detection had been specified in the open roof void of the new hangars as the primary means of fire detection. This decision changed in preference to the faster and potentially more reliable CCTV-based FireVu VSD system solution, following a presentation by BSS-ME to the client; specialist fire and security contractor Modern Building Est (Riyadh); and the main contractor Saudi Oger.

A question of installation

The decision to discard linear heat detection and ultimately move

to VSD was driven, in part, by the significant installation savings which BSS-ME was able to demonstrate – around 35% less than the original solution (if you include all the installation and fixing of linear cables) – by using the CCTV cameras specified for the project. Additionally, being able to link-in to the IT network the VSD solution did not require extensive additional works or cabling.

Another key advantage, highlighted by BSS-ME, was the proven speed of response offered VSD which has made it so attractive for voluminous aircraft hangar projects. The detection of smoke at source, typically within 10 seconds, which FireVu would be able to offer, is especially critical in a hangar given the value of the aircraft that are maintained there.

In the case of Riyadh the large-scale hangars are designed to be able to house aircraft as large as the Boeing 747. The drawback with a linear heat cable being used in this case is that, realistically, temperatures would have to reach 75 °C on the roof before an alarm would be raised which, with factors such as stratification and temperature layering, can be minutes rather than seconds, with the consequences which flow from this in terms of whether an incident can be tackled before a fire has the chance to take hold. As a result, there were real concerns that if the project had moved forward with linear heat cables that in the event of fire serious damage could, potentially, be caused to the parked aircraft by the time either the smoke or heat reached the detectors.

Construction of the five new hangars at Riyadh started in June 2009 and was completed in April 2010. The commissioning and testing of the FireVu systems took place over a four-day period to ensure that the camera views in each hangar were optimised for the VSD's operation – leaving no critical gaps in coverage – and training was also provided for the client's personnel who would ultimately be controlling the system. The smoke testing proved to be extremely successful and all the parties involved were impressed with the speed of response, typically in under 10 seconds, which was in line with expectations and the fact that no false alarms were generated.

Growing take-up of VSD

From a BSS-ME perspective we have now provided D-Tec's VSD solutions for a number of landmark projects in the region, including the world's largest privately-owned aircraft hangar – the massive Royal Airwing Hangar complex at the Dubai International Airport in UAE and the Royal Hangar at Seeb International Airport, Oman. In addition to the project at the Royal Maintenance complex at Riyadh, which has now been commissioned, FireVu VSD will soon be operational in a further three hangars in Saudi Arabia, this time at Jeddah Airport. On a wider note the success of the Riyadh hangar project has opened up other opportunities for BSS-ME and we have been asked by the same contractors to tender for a number of road tunnels in Saudi Arabia.

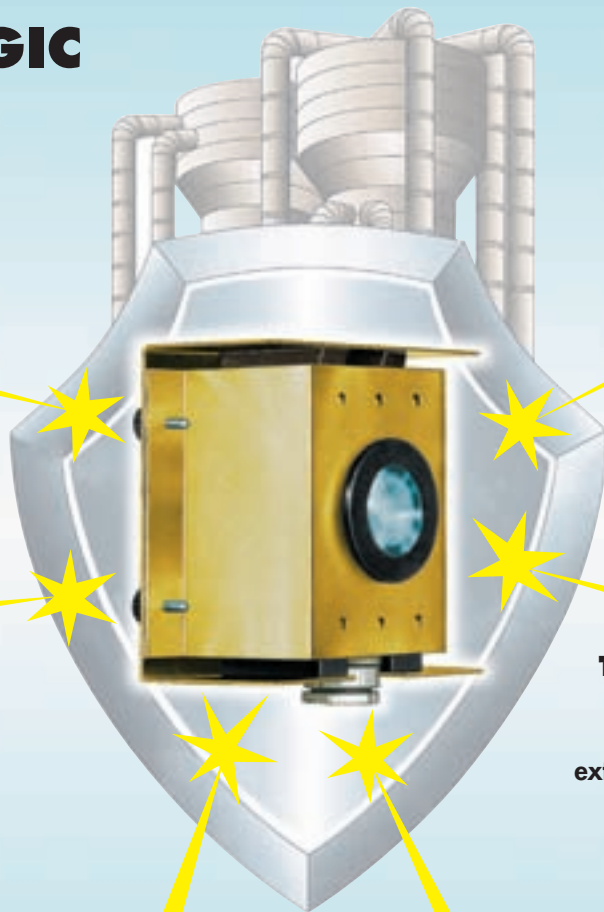
Looking ahead, these are exciting times for VSD. VSD's capabilities have been further enhanced by the potential for images and alarms to be distributed, for review, over the network to a number of viewing platforms. This is being realised through solutions, such as D-Tec's FireVu system, which readily integrate the well-recognised advantages of VSD with IP (internet protocol) based functionality. In practical terms, this advance means that, for ease of management, it is perfectly possible for a number of geographically dispersed aircraft hangars to be monitored from the same control room and more to be added.

There is also the ability, with this flexible approach, for changes to configuration, testing and diagnosis to be carried out remotely – removing cost and delay. Another advance for the FireVu VSD offering which we plan to roll-out for future projects is the ability to bring together video smoke and flame detection so at a practical level we can offer customers a layered response.

A new guide to video smoke detection has been published by the UK's Fire Industry Association in recognition of the increased role this technology now plays in protecting people and assets from the threat of fire. Further information is available online at: www.fia.uk.com

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