Although checkpoint explosive trace detection is urgently needed, hand-held systems have proved disappointing. But Andrew Goldsmith argues recent technological advances put detection power back into the screeners' hands

UP CLOSE WIT

In today's security climate, security screening officials are always seeking new methods and technologies which can help enhance the screening process, make it more efficient in terms of time and cost, and maintain the high standards that are expected at all times. One area that has seen increasing attention in the past year has been that of explosives trace detection (ETD) via hand-held detectors. This is because a terrorist attack could be executed using an explosive device incorporating materials that, in the past, have been difficult to trace or detect. The need to protect the general public and armed forces alike is driving law enforcement, defence, transportation, and private security personnel to focus their attentions on this threat vector and seek new methods to identify potentially deadly explosive materials at checkpoints.

It was reported in 2014 by analysis firm IHS that the market for explosives, weapons and contraband (EWC) detection equipment for airports was more than $740 million globally, with an expected compound annual growth rate of six per cent within the next four years. The reasons behind this growth were cited as the constantly evolving threats to the industry and the US Department of Homeland Security's announcement in July 2014 that new screening measures will be introduced on international flights into the US amid concerns that terrorists may carry out attacks in airports and on aircraft using body-borne improvised explosives devices (BBIEDs). As the threat of BBIEDs gains momentum worldwide, IHS is also predicting that these screening methods will be implemented in other regions as well.

Yet it is not just airports that are faced with the threat of explosives; it affects all customs and border control, defence, event security, law enforcement, ports and even critical infrastructure sites. The need for efficiency and portability is key when conducting security screening at these locations, but screening officials have, in the past, been weighed down with bulky equipment that is difficult to use and expensive to maintain. It is for this reason that there is now increased demand for more agile, cost effective and reliable hand-held devices screening devices. But what options are available? And will they be able to deliver real results?

The concept of hand-held explosive detectors is not new. They have been available as part of the checkpoint screening of passengers, luggage, cargo and vehicles for a number of years. The next generation of security checkpoints looks to utilise highly secure, advanced technologies that offer new phases in design and development. As a result of emerging terrorist threats, today's checkpoints are able to screen and inspect more than just baggage and people – security officials at checkpoints can now scan high volumes of people, cargo, baggage and vehicles using a variety of specialist equipment. As hand detectors work alongside other solutions – such as body scanners, baggage and parcel scanners, vehicle gantry scanners, radiation detection technologies, etc – it is now possible, for example, for a vehicle in a public facility to be screened for hidden explosives and weapons without passengers even having to vacate a vehicle.

But hand-held explosive trace detectors have been plagued with a number of drawbacks, which has meant that, although they have played an integral part in the security screening process, it has not always been a positive experience for the screening operators. Historically, there have been three primary disadvantages with hand held explosive detectors: they produce high false positive rates; they are bulky and not user friendly; and they are expensive to maintain with costly consumables. None of these elements are conducive to an efficient screening process.

As with other security technologies, if a solution is producing a high level of false positives it means that, although it may be effectively identifying threats, additional time and resources are being used at the checkpoint to carry out investigatory work to determine what the threat may be, when there may be none. The devices have also been very cumbersome and difficult for the screening operators to use, both in terms of handling and the complex user interfaces. They also have been known to take time to "warm-up" before they are ready for use, and the operators need to go through extensive training in order to effectively use them. Finally, it has been found that these devices can offer little in terms of return-on-investment (ROI) as they are expensive to purchase. Moreover, if a device was to break, or if one of the parts needed to be replaced, this can prove to be very costly for the operating authority to fix. All of these elements lead to lower throughput and reduced efficiency at the checkpoint.

But technology is now available in the market that addresses all of these issues. As the threats to the industry have evolved, so too has the technology that is used to detect them. There has been much focus on the need for manufacturers to develop solutions that focus on enhanced inspection capabilities as well as addressing the need for lower total cost of ownership (TCO), increasing operational effectiveness and providing a greater ROI. This development is particularly evident in the recent development of

©Getty Images

Checkpoint traces: detecting explosives and component chemicals can be challenging

TH EXPLOSIVES

hand-held explosive trace detection devices.

It is now possible for authorities and government bodies seeking this type of equipment to find devices that are ergonomically designed, lightweight and which feature rapid and accurate detection capabilities, having been developed with high throughput and high detection capabilities in mind.

In terms of the systems used for the scanning of explosive materials, there are a number of methods that could be adopted. X-ray machines have long since played a role in this ecosystem, but newer technologies have also started to emerge. For example, mass spectrometry (MS) is one such technology that has been linked to explosive trace detection (ETD). It is argued that the use of mass spectrometry technology should lower false alarms rates that in the past have been associated with ETD. But the drawback with this technology is that is it primarily used in desktop ETD systems. While it can be adapted for a smaller form for the use of hand-held ETD, it has been noted that this has been known to compromise performance.

Another promising approach is the use of real-time ion mobility spectrometry (IMS) technology that is coupled

UP CLOSE WITH EXPLOSIVES

©Rapiscan Systems

Hand-held explosive trace detection technology is now more reliable and cheaper to operate than in the past

with sophisticated sampling systems in order to provide a true hand-held explosive trace detection experience. This method allows for the detection of trace explosives in both particulate and vapour form on surfaces that may have directly or indirectly absorbed explosive residues. It also detects picogram-nanogram quantities of a broad range of common commercial and homemade explosive materials, including nitrates, peroxides, plastic explosives and their associated physical and chemical markers. These systems are also capable of detecting and alarming on multiple explosive materials within the same sample.

For more sensitive, accurate and rapid detection, some of the devices now available also offer a swipe sampling system that includes a touch-free inhalation sampling method for threat scenarios that involve highly unpredictable explosives compositions. Manufacturers have been working diligently to ensure that these easy-to-operate hand-held devices are designed to detect a broad range of common commercial and homemade explosive materials that may exist within a single sample, thereby achieving lower false alarm rates.

Another feature of these new devices is that they have a lower total coast of ownership (TCO) than their predecessors. They have been designed with the aim of minimising operating costs and increasing uptime; operating authorities will therefore see an immediate saving in both expenditure and time resources, as the devices require only a small number of consumables and do not have the same number of maintenance steps typically associated with explosive trace detection systems.

For any of these new devices to be successful they must be completely designed with the end-user in mind. Authorities and operators not only want a solution that detect threats with tremendous accuracy, but also one that also features an intuitive user interface. Operators of some of these new systems require as little as an hour's training to be up and running with the device, indicating how easy they are to deploy.

If an authority were to make a checklist of the capabilities that an explosives trace detection device should possess, they should be looking for: a fast start-up time, with fully automatic continuous self-calibration; optional continuous, or variable timed sampling mode; and less than three seconds of detection time. This will make a device ideal for security situations where both high throughput and high detection probability are required. You also want it to be easy to use. Some of the older devices can take time to warm up in spite of the need for a device that is ready to use in less than eight minutes from cold – ideally with an automated start-up process. For ultimate ease of use, alarms should be configured with audible and/or visual detection indicators, on a LCD screen protected by impact-resistant glass, so that they can be used in all light conditions and remain resistant to the scratches, drops, and bumps of everyday use.

As international agencies consider new methods of screening to further improve security, innovative technology such as agile hand-held explosive trace detectors are being introduced. The ability to select the optimal mix of security screening solutions at the checkpoint screening stations is complex, and can be driven by variation in the threat landscape, customs priorities and regular changes in the commercial market. It is important, therefore, for the selected screening solutions to offer flexibility and to be capable of future enhancement to allow authorities to maintain the high levels of security screening that are expected.

The on-going threat of international terrorism is one that we are likely to face for many years, with the threat of trace explosives remaining high on the agenda. The security measures of the future not only have to anticipate and contend with these emerging threats, but also need to combine the best screening technologies with advanced integrated solutions to strengthen the first line of defence.

Andrew Goldsmith is the global vice president of marketing for Rapiscan Systems. Prior to joining Rapiscan, he was the vice president of strategy and marketing for Global Telecom and Technology, which he helped take public in 2006. Mr Goldsmith was a senior manager at PricewaterhouseCoopers and holds an MBA from the University of Chicago and a BA from Columbia University.