Forensics Lab Piloting RFID System for Automated Supply Tracking

During the coming months, the Houston Forensic Science Center will expand the pilot to begin tracking firearms and biological evidence, as well as evidence regarding crime scenes, to reduce manual inventory labor and the risk of loss.

By Claire Swedberg

Tags: Inventory / Warehouse Management

Jun 18, 2017—Justice systems demand that every piece of forensic evidence gathered at a crime scene must be accurately stored, accessed and processed. Therefore, the agencies and companies that are responsible for that evidence use what can be exhaustive and often manual tracking methods. For laboratories such as the Houston Forensic Science Center (HFSC), this can mean taking scientists away from the work they are there to do.

To make the management of its equipment and evidence automatic, HFSC is piloting an ultrahigh-frequency (UHF) radio frequency identification system, initially to track lab equipment and supplies. In the long run, the same technology will automatically track and manage the locations of firearms, biological evidence and evidence collected at crime scenes. JPL RFID, a software and hardware integration company, provided the tags and readers, as well as its own software and database to manage the data, says Jason Pitcock, JPL's president.

JPL's Jason Pitcock

David Leach, a CPA and HFSC's chief financial officer and treasurer, presented the solution at the RFID Journal LIVE! conference and exhibition, held last month in Phoenix, Ariz. (see Award Finalists Session: Best RFID Implementation—Houston Forensic Science Center).

HFSC manages controlled substances, crime scene evidence, digital and multi-media evidence, firearms, forensic biology and DNA, latent prints, toxicology and trace (arson-based evidence). "We don't store evidence, so this is always shifting as we process evidence and return the evidence, after testing has been completed, to the law-enforcement agencies," says Peter Stout, HFSC's CEO. "At any point in time, we have several thousand items in process in the laboratory."

Approximately two years ago, Stout says, HFSC first began looking into an RFID-based solution. The group decided to start with general lab supplies since they are less critical than the evidence that the tools and supplies are used to process. HFSC did not maintain an inventory of these supplies; they were simply ordered when needed by multiple personnel. Therefore, supplies often arrived at the lab in multiple quantities and variations—in some cases, more than were actually needed. In addition, the supplies were stored in a variety of places with little accountability.

This, Leach explained, led to the inefficient use of scientists' time, since they may be ordering and managing equipment. The agency found that if it better managed purchasing, it could better negotiate pricing and reduce the need for multiple types of the same product, as well as the limited space availability created by storing the same items at multiple locations.

With the use of RFID technology, the lab was able to create a single storage room for all of its lab supplies, with an RFID reader installed at the doorway and tags on each piece of equipment and every box of supplies. "If it wasn't for RFID," Leach stated, "we wouldn't have been able to do this."

HFSC's David Leach

As each new item is received, a UHF RFID tag is attached to it. The tag is encoded with a unique ID number linked to that particular supply item. Supplies are then placed on the shelf where they belong in the storage room.

A fixed Impinj Speedway Revolution reader with Times-7 antennas is installed at the egress to the supply storage area. Technicians and other lab workers each carry an ID badge that comes with a built-in RFID tag. The badge's unique ID number is linked to the user's identity in the lab's software.

As a worker enters the storage area, that person's tag ID is captured, and as he or she leaves with a piece of equipment, the item's ID is captured along with the badge ID, in order to identify what was taken. In that way, the software has an up-to-date record of what is in the storage room and what needs to be replenished at any given time. HFSC uses a kanban method to identify low supply levels and place reorders.

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To conduct periodic inventory counts, staff members carry a Convergence Systems Ltd. (CSL) CS108 handheld RFID sled reader through the storage area to reconcile what is in the system with what is actually on the shelf. While those counts took hours to complete when performed manually, they can be accomplished within a matter of seconds with the RFID reader.

For the RFID handheld reader, says Jerry Garrett, CSL's managing director, "We are using the same composite antenna material that we used in the powerful CS101 handheld reader. This antenna provides the key element for the CS108 to achieve an 18-meter reader range—the longest read range in the industry for a handheld. More power means a high reliability in data capture."

HFSC's Peter Stout

One challenge, however, was ensuring that there were no spillover reads of items or badges not passing through the doorway. "To ensure we eliminated any issue with over-reads," Pitcock says, "we performed a lot of signal measurements with a variety of antenna placement and settings."

The software provides multiple alerts, Pitcock adds. A user can set up maintenance alerts on lab equipment, for instance. "The software also offers the ability to set up entry and exit email alerts for items," he says, "and overstay alerts for items that have remained in their current location over the specified time."

Since the RFID pilot began, Leach reports, "We always know exactly how many we have. One person does the ordering and makes sure we have the right amount." However, he adds, this was just the first phase of the RFID deployment plans. "This project was more about the technology and its potential to help HFSC with evidence management than it was about controlling supply room inventory. We needed to prove out our hypothesis and show it will actually work on something of low risk before implementing with actual evidence."

The next phase will include tracking firearm and toxicology evidence. When it comes to firearms, without an RFID system in place, the lab sends two workers to count all guns periodically—a process that takes two days to complete. Now, the lab will apply RFID tags to each gun, thereby reducing that inventory count and enabling Geiger counter functionality. All guns are expected to be tagged by the end of this month. In that way, guns can be accounted for in inventory counts, and individual guns can be easily located when needed.

Toxicology tracking, which is expected to begin within a few months, will consist of applying an RFID tag to a kit that comes with a blood sample, typically collected when a person is charged with driving while intoxicated. After a technician is finished processing the sample, he or she will place the kit in an RFID-enabled receptacle called an evidence drop box. The reader built into that box will capture the tag ID, and the software will then alert employees to pick up the kit from that location. For forensic biology (DNA), fixed readers will be installed in the evidence storage area as well.

CSL's Jerry Garrett

Sexual assault kits will also be tagged within six to nine months. RFID tags will be affixed on each piece within the kit, creating a parent, child relationship with the tagged kit itself.

Another phase will take RFID into the field. In about a year, Stout said, the lab intends to begin using the technology at crime scenes. When personnel arrive at a reported the crime scene, a handheld CSI RFID sled reader allows them to log in all evidence, including their GPS coordinates, which is then brought to the truck for transport back to the lab. Tools brought to the scene from the lab will also have RFID tags applied to them, while RFID antennas on the truck will capture each tagged item's ID number as it is returned. If an item is discovered to be missing, an alert will be sent to those on the scene.

"We want to get tags associated with evidence as near to the point of collection as we can," Stout says. "So, ideally, pre-labeled packaging that departs the vehicle is then accounted for as having returned to the vehicle."