

Bechtel Jacobs is now attaching EPC Gen 2 RFID tags to all trucks hauling hazardous waste for disposal at the East Tennessee Technology Park.

By Claire Swedberg

Mar. 3, 2010—After a yearlong pilot project of an RFID-based solution designed to manage and track material for the largest decontamination and decommissioning (D&D) effort undertaken at the [East Tennessee Technology Park](#) (ETTP), [Bechtel Jacobs](#) is now expanding its usage of the technology. The solution, described as "a fully automated electronic shipping system," is designed to increase transportation operational efficiencies within the organization.

Bechtel Jacobs is responsible for the cleanup of the ETTP, located in Oak Ridge, Tenn. The decontamination and decommissioning of the K-25 building complex, as well as various auxiliary and support buildings, are the contract's primary scope. The K-25 project, alone, has been estimated to generate more than 300,000 cubic yards of waste materials (more than 30,000 shipments) for packaging, transportation and disposal.

The solution employs passive EPC Gen 2 RFID tags and interrogators, in conjunction with [GlobeRanger](#)'s iMotion platform.

Cleanup activities within the [U.S. Department of Energy's Oak Ridge Reservation](#) address environmental legacies from the Manhattan Project and nuclear energy research. These activities include environmental remediation, the decontamination and decommissioning of radioactively contaminated facilities, and disposition of the radioactive waste. Transporting and disposing of contaminated and hazardous waste products require compliance with numerous transportation, health and safety, radiological, physical security, classification and nuclear material control and accountability requirements. Every shipment of waste generated from the D&D process requires information regarding that waste, the trucks that carry it, and the results of inspections performed. Once the waste is delivered to the disposal facility, additional information must be captured documenting the shipment's receipt, as well as the waste's disposal within the facility, explains D. Dean Newton, director of information technology at [Turnkey Transportation](#), which is managing Bechtel Jacobs's RFID initiative.

Bechtel Jacobs transports as much as 3.5 million pounds of construction debris to the disposal facility per day. As of this month, Newton says, the system tracks approximately 136 shipments daily, based on current D&D activities. The system has eliminated the amount of paperwork previously required for each shipment, while improving operational efficiency and establishing 'best practices' for the Department of Energy's environmental sustainability programs.

"We have seen more than 25 minutes of cycle time savings per truck shipment for the disposition of waste from the project to/from the disposal facility, as well as reductions in manual data entry errors," Newton states, "and have fully automated on-site observations and scale operations, ensuring consistent data quality."

Bechtel Jacobs decided to implement the solution using [Alien Technology](#) EPC Gen 2 passive RFID tags made with Alien's Higgs 3 RFID chips, in addition to Alien 9900 fixed readers and [Motorola](#) 9090G RFID handheld computers.

When a truck first enters the fleet, its identification data and tare weight are written to an RFID tag attached to that vehicle. After the truck has been loaded, a transportation specialist in the field uses a Motorola handheld to select specific shipping information, based on the project assignment and material types. Once the specialist completes a visual inspection, project-shipping data is encrypted and written to the vehicle's RFID tag. A process that originally required three forms of shipping documents totaling eight sheets of paper has now been reduced to employing a reusable passive RFID tag. Portable RFID sensor units—6.5-foot-tall towers containing Alien fixed interrogators—read each tag as the vehicle enters the route. The truck is weighed, and gross and net weights are automatically recorded from the scale and added to Bechtel Jacobs' waste transportation management system (WTMS).

Currently, Bechtel Jacobs has eight portable RFID sensor units deployed. Each contains two Alien 9900 readers, eight Alien circular polarized antennas, a network switch, an internal climate control, an inverter/power management system, a 48-hour backup battery, vehicle detectors, a solar controller with an external solar panel, external low-voltage signal lighting, and remote diagnostic and reporting capability, with internal and external temperature, humidity, vibration and tamper sensors.

Managers can observe the movements of vehicles via an interactive dashboard. Trucks move quickly through the system, having to stop only once to be weighed, thereby allowing an uninterrupted flow of vehicles to the disposal facility. Once a truck arrives at that location, operators in the disposal cell interrogate the RFID tags and write disposition data back to each tag, identifying cell activity. All activity is monitored by several groups within Bechtel Jacobs—namely, the company's D&D, transportation, physical security and disposal facility operations.

"Our goal was to enable the disposal facility to turn 240 shipments a day, to accommodate increased D&D activities supporting the American Recovery and Reinvestment Act," Newton explains. "With this system in place, we accomplished that goal, as well as eliminated many manual processes which were time-intensive, allowing us to focus on the health and safety of our employees supporting Bechtel Jacobs' mission."

According to Newton, a single tag on a vehicle will be encoded with information as frequently as six to eight times each day, and will be read between 40 and 50 times within that same period.

All data is collected and sent to GlobeRanger's software, which resides on a Bechtel Jacobs back-end server. The system provides two dashboard options for management. One shows the trucks' movement within the system and displays alerts when certain conditions are met, with an icon indicating each vehicle's location, based on observations in the field collected by the portable sensor units. The other dashboard is exclusively for use by the disposal facility, providing an "air-traffic controller" display of

information identifying estimated times of arrivals for all incoming shipments to the facility. This functions much like an advance shipping notice, allowing disposal facility managers to accommodate the various types of vehicle entering the site, as well as the preassignment of dump ramps, based on vehicle type, cell volume and staff availability.

The elimination of manual paperwork from the waste-shipment process, as well as the resulting decrease in truck idle time, supports Bechtel Jacobs' sustainable-development goals, Newton says. In the 12-month period following the project's initial deployment, he notes, the use of the RFID-enabled solution has led to a reduced consumption of fuel by approximately 60,000 gallons. In addition, nitrogen dioxide emissions were reduced by 6,500 pounds, and carbon dioxide emissions by 350,000 pounds. With a paperless process, Newton states, approximately 100 pounds of air pollution and two tons of paper were avoided, thus saving 40 trees, 12,500 gallons of water and 7,500 kilowatt hours of electricity that would have otherwise been used in paper-production processes.

What's more, management can now analyze the data and determine how trucks need to be prepared and dispatched, in order to improve overall operational efficiencies. Newton says he is now in the process of rolling the system out in other DOE sites, though he declines to specify which ones.

Bechtel is utilizing RFID at another hazardous waste-disposal location, the [Hanford Nuclear Site](#) (see [RFID Helps Hanford Manage Waste](#)). But in this case, it is using active RFID tags. At the ETTP site, Newton says, the use of passive tags reduces the cost of the overall system. It "has been a huge cost advantage," he says. "The system turned one year old on March 2, and has supported over 22,000 shipments, including ARRA projects, and is adopted at three DOE facilities. This project has played a huge role in supporting DOE initiatives."