

The company is offering the system, developed in partnership with JPL RFID, to its oil and gas customers, to ensure that samples from a drill site can be tracked.

By Claire Swedberg

Tags: Asset Tracking, Energy, Inventory / Warehouse Management

Apr 15, 2015—Weatherford Laboratories, a provider of rock and fluid analysis services for the oil and gas industry, is tracking earth samples via radio frequency identification as they move from the laboratory's warehouse to an offshore drill ship, and then back to the lab for testing and storage. The system was piloted this year on a single drill ship; based on the results of that trial, Weatherford is now offering the solution to other customers. The technology, provided by Houston asset-management software company JPL RFID, reduces the potential for loss of materials extracted for the lab's analysis, while saving man hours previously spent searching for missing samples, or counting and identifying samples as they move from the drill rig to the lab.

The lab sends thousands of empty sample containers to offshore drilling customers, who then fill those bags, bottles or canisters with samples of core material (rock) or fluids extracted from a drilling rig. They can check those samples for the presence of oil, among other features, in order to determine if the location would make a lucrative site for the oil and gas company.

Traditionally, these samples are not individually tracked, explains Sara Johnston, Weatherford Laboratories' well-site special projects manager. Instead, bottles, metal cylinders and plastic bags filled with sample material are simply sent in estimated required numbers, and oil-rig workers known as mud loggers fill them. Rig personnel note the depth at which the samples were taken and send them back to the lab. That means, however, that the samples can become lost during the shipping process, and that if they are moved into storage, they could later be very difficult to locate.

Johnston says many customers have described occasionally experiencing a loss of samples in large volumes. "We had a client that had lost a 30-foot piece of core," she adds, while smaller samples can end up missing even more frequently. Manual audits are often performed by oil and gas companies, or by Weatherford Labs personnel. However, she explains, standard protocol does not include audits. "Onsite personnel, such as mud loggers or other individuals handling the samples, would be the ones responsible for capturing, packaging and shipping the samples to wherever the client wants them to go, such as storage or lab analysis," she says.

"There are expectations of how many samples come back from the rig," Johnston states, adding that manual audits take a lot of time to perform. "It can be a month or longer to know that samples are getting lost."

Weatherford Labs' solution employs EPC ultrahigh-frequency (UHF) passive RFID tags to track each sample extracted and transported to the company's testing facility. The firm initially considered using bar-code labels to identify the containers, but found that bar codes would not easily withstand the rigors of the offshore oil rig environment, and could be too dirty or damaged to be read. Scanning bar codes, Johnston says, would also be time-consuming, since the lab can receive hundreds or thousands of samples at a time.

Once the company decided on an RFID solution, it worked with JPL RFID to identify the most effective tags, as well as the best placement and orientation, to obtain the necessary read range. The companies then conducted a pilot.

Weatherford is using Motorola MC9190Z and MC3190Z handheld readers and JPL custom-designed polyester labels (attached to non-metallic sample containers), made with Alien Technology Squiggle H3 inlays. For sample containers composed of metal, the company is using Metalcraft Universal Mini on-metal labels. The tags are being printed and encoded on a Zebra Technologies RZ400 RFID printer.

Technology provider JPL RFID is located just a few miles from the Weatherford site, in the Houston area. The company, founded in 2010, provides either bar-code- or RFID-based solutions for tracking inventory in the oil and gas industry, explains Jason Pitcock, the company's founder and CEO. JPL RFID offers Pipeline Track, a solution for managing the movements of pipes at oil well sites and construction sites, and also developed the Offshore Track system for monitoring assets offshore, which it has modified for Weatherford as a solution specific to tracking earth samples. This involved changing the terminology, Johnston says, in order to accommodate the kinds of variables found among the sample types. Weatherford calls the modified software

RockTrac.



Weatherford
Laboratories' Sara
Johnston

JPL RFID needed to customize the tags in order to ensure that they could withstand the oil rig's harsh environment and still be read even if smeared with crude oil or some other material. That consisted of encasing the tag in a polyester cover. JPL worked closely with Weatherford to identify the best location to affix the tag to each item, as well as the best tag orientation, so that they could be interrogated in a wet environment containing a high degree of metal. Between 300 and 1,500 12-inch-long metal cylinders used to capture and store test gasses, for example, can be packed together in a single shipping container, and these must be read using a handheld reader waved near that container.

First, the tags are printed and scanned into the system, to link them with descriptions of each container type (primarily cloth bags, metal cylinders and plastic jars). The containers are then packed into cardboard boxes that are loaded into a larger, appropriately sized shipping container. The tags are interrogated using the handheld devices before they leave the Weatherford warehouse. The software on the handheld captures the read data and forwards it to the cloud-based server via a Wi-Fi connection, thereby updating each container's status to indicate that it is en route to the offshore drill site.

In addition, labels are attached to the cardboard boxes, as well as to the shipping containers, and those tag ID numbers are married to the IDs of all empty containers loaded within. In that way, when a shipping container's tag is read, all other tag IDs are automatically included in the software update regarding that shipment.

The loaded crates of empty sample containers are transported to the port, where a crane transfers them to a vessel that travels from the shore to the offshore oilrig. At that time, the containers' tag IDs are read by individuals loading them onto the vessel.

Once on the oil rig, the sample containers are removed from the shipping container. Weatherford field staff stationed on the rig read the tag IDs using another handheld unit, in order to update the cloud-based software that they have been received. Because there is limited Wi-Fi access on the vessel, that data is stored on the handheld software and is submitted once a Wi-Fi connection becomes available. Rig personnel then send an e-mail to update the inventory status as "captured," which lets Weatherford Labs know that those specific samples have been collected.

Once the containers are filled with earth samples, the tags are read again, thereby indicating that they are filled, and another read event takes place as they are returned to a shipping container and loaded onto the shore vessel. Additionally, onsite personnel record the depth and GPS coordinates of the specific hole from which the sample was extracted, and link that information to the tag ID number. Weatherford can then access that data on the cloud-based server to find out the exact type and number of samples on their way.

When Weatherford receives those containers, workers can then the tags once more, confirming which items have been delivered. If laboratory personnel are seeking a specific sample, they can put the handheld reader in Geiger counter mode and walk around the shipping containers until the reader emits an audible tone, indicating that the correct sample's tag has been detected.

In the event that a sample needs to be saved after being tested, it can be moved into the laboratory's warehouse, and can later be located via the handheld's Geiger counter function. In this case, a staff member could input a specific item's ID number or description and then carry the reader around the area in which samples are stored until the device's software detects a read from that item's tag.

After 10 months of testing, the system was taken live on a single drill ship in January of this year. According to Johnston, Weatherford now intends to implement this RFID solution at all of its 43 locations worldwide, many of which serve clients both offshore and on land.

With the technology, Johnston reports, the company expects to reduce its rate of sample loss by 95 percent. This is due, in part, to the fact that if sample containers are unaccounted for at one point in the movement offshore and back, the software knows the point at which they went missing. The savings based on reduced losses will be significant, she adds, since the equipment used to extract the samples of underwater earth costs hundreds of thousands of dollars a day to operate. As such, drilling for additional samples can be very expensive.

What's more, Johnston notes, the time that workers spend looking for missing samples "will be dramatically reduced.... It should drop from hours to minutes."

Johnston will describe the solution and how it was developed on Friday, Apr. 17, at the [RFID Journal LIVE!](#) conference and exhibition, being held this week in San Diego, Calif.