

**More than a dozen colleges and companies have joined a consortium under the guidance of the University of Wolverhampton, to pilot RFID technology as it tracks the movements of fish, wine, pork and cheese through production and on to retailers.**

By Claire Swedberg

Oct. 28, 2011—A European project overseen by the [University of Wolverhampton](#) and a consortium of universities, technical institutes and commercial entities is determining how radio frequency identification technology can benefit the perishable-goods supply chain. The project, known as [Farm to Fork \(F2F\)](#), was launched last year, with half of its funding provided by the [European Commission's ICT Policy Support Program](#)—aimed at stimulating innovation and competitiveness—which includes a half-dozen pilots throughout Europe to track pork, fish, wine and cheese through the production process and on to stores.

The project's objective is to determine how well RFID can be used to improve supply chain visibility, provide authentication of food's origin, reduce the amount of waste due to spoilage or other supply chain problems (by tracking environmental conditions), and increase the efficiency of the supply chain itself. The pilots, which all employ EPC Gen 2 ultrahigh-frequency (UHF) passive RFID tags (including [Confidant's](#) Halo tag; [UPM RFID's](#) ShortDipole, DogBone, Web and Hammer models; and [Alien Technology's](#) Squiggle tag) and readers, are designed to determine whether the benefits gained from the RFID data will provide a return on investment for users. In August of this year, the project's participants began deploying the RFID technology, which will remain operational until August 2012. At that time, the participants and the university will review the results, calculate the ways in which RFID technology may have improved the supply chain, and publish their findings on the Farm to Fork Web site.

The University of Wolverhampton and eight other colleges launched the project in Brussels in May 2010, under the leadership of Robert Newman, a professor of computer science at the university, according to the school project monitoring officer, Marek Hornak. The companies participating in the pilots include two retailers in the United Kingdom: [Green Fields Farm Shop](#) and [The Deli@Bewdley](#), as well as food and wine producers located in the United Kingdom, Slovenia, Italy and Spain. The university's technology lab developed software that each participant is presently using to interpret and manage data from RFID read events, as well as Electronic Product Code Information Services (EPCIS) software to enable the sharing of data with other supply chain members, if the companies so choose. All information remains under the control of its respective owners—the pilots' participants—according to Hornak.

The first year of the project involved conducting research into the existing supply chain management systems, including pork processed in the United Kingdom and then sold to British stores, fish farmed and processed in Spain and Slovenia for a Europe-wide market, wine tracked from vineyards in Spain and Italy to stores, and cheese processed in England and sold domestically at grocery stores. Three of the pilots—involving fish, wine or pork—already have at least some of the RFID infrastructure installed, and the participating companies have begun reading tags as the products are processed, while the U.K.

cheese provider plans to begin utilizing the RFID technology by January 2012.

[Buttercross Farm Foods](#) a pork producer and retailer located in Market Drayton, a town in North Shropshire, England, is employing RFID to track meat from the point at which the carcasses are delivered to Buttercross, through processing and, eventually, to its stores. The company raises free-range pork, and sells bacon, sausages, shoulders and pork loin to the British market. Initially, the company is only tracking the meat through the cold storage and production process at its own facility. The solution was installed by [IT Futures](#), which serves as the university's technology service provider.

The pig carcasses are hung on wheeled racks in Buttercross' storage area, so that they can be moved around the facility. A worker uses a handheld RFID interrogator to read the ID number encoded to an RFID tag attached to each rack, and that ID is then linked to that particular group of carcasses, as well as the animals' slaughter date and the name of the slaughterhouse.

The carcasses' movement from cold storage to the processing room is tracked as the racks are rolled through an [Impinj](#) reader portal. The carcasses are processed into bacon, sausage, chops and other cuts of pork, and the meat products are then transferred to bins also equipped with RFID tags. With RFID reader portals and handheld interrogators, the company can track the meat's location as it enters cold storage, and later in the bins. The meat, once packaged, is placed in RFID-tagged baskets (multiple packaged goods are loaded into a single basket). As each piece of meat is packaged, its bar-coded label is scanned and married to the RFID ID number for each basket in which meat is loaded. Every finished-goods cold-storage area is also equipped with RFID readers, in order to capture basket ID numbers, thereby creating a record of the number of baskets being stored at that location, along with the exact stock within each basket.

When the Buttercross facility receives an order, the requested pork products are placed within a shipping box also equipped with a [CAEN RFID](#) temperature logger, the RFID ID number of which is read. RFID data from the processing room enables Buttercross to monitor the movements of the racks and shipping boxes, to ensure that the products are stored at optimum temperatures, and not for an excessive amount of time. Soon, the Green Fields Farm Shop in Telford will also begin reading the temperature logger and delivery box tags upon receipt, using a fixed Impinj reader portal at the loading dock.

In addition, wine pilots are currently underway at two sites. [Vigne Mastrodomenico](#), in Italy, installed a set of ultrahigh-frequency (UHF) wireless sensors and receivers at its vineyard, in order to create a weather station. Sensor data, including wind speed, outdoor temperature, solar radiation, humidity and rainfall, is being measured by sensors, and then sent to a [Davis Instruments](#) Vantage PRO 2 receiver, while soil moisture, temperature and leaf wetness are also being measured and transmitted to the same device. The Vantage PRO 2 receiver forwards that information to the software via GPRS or Wi-Fi (once the vineyard is wired for Internet connectivity). The sensor data will allow the winery to track the winemaking process, and ensure that grapes and wine are being produced properly—and at the correct temperatures.

Inside the winery, the company is installing sensors to track temperature and humidity levels. The sensors are wired to RFID tags that send the data to a handheld reader. UHF RFID tags are also attached to storage tanks and barrels. Once the crates full of grapes enter the winery, they are automatically interrogated by an RFID reader, and each step of the winemaking process is then subsequently tracked via RFID readers, to be stored in the EPCIS software. Tags are read using handheld readers on the barrels, while RFID tags on the boxes loaded with the bottles are read by an Impinj fixed reader while passing down a conveyor en route to being transported to a store.

A similar system is in use at [Vitivinicola del Ribeiro](#), in Spain, in a pilot overseen by the [University of Vigo](#). After harvesting is completed, handheld readers are used in the vineyard to read tags on containers in which picked grapes are packed, in order to collect a record of when and where the fruit is picked, as well as its category—such as the variety of grapes being picked. An NPH EasyTag-3 handheld reader interrogates tags attached to the wine tanks as the wine is processed. The interrogators are used to read the tags as processes are completed, and a record of those processes is then stored in the software. These read events not only helped track how and when the wine was processed, but also which category of grapes was included in each batch.

During the fermentation process, sensors will track chemical and temperature data, which will also be read as the tag attached to each vat filled with a particular batch of grape mix is read. When the wine is processed and bottled, the product is packed within a tagged box, and is then placed on a conveyor belt equipped with a single fixed reader. Another fixed reader was attached to the warehouse forklift, to store data regarding products' movements within the warehouse.

Once the bottled wine is shipped to a retailer, customers can access data about the product's processing via the company's server—such as when processing took place, and where and when the grapes were harvested—by scanning a bar code, or by reading the serial number on a bottle or box, and then inputting that information into the server.

The [Technical University of Cartagena](#) is overseeing a fish-farming project being undertaken by [Grupo Culmárex](#), in Aguilas, Spain, while the [University of Ljubljani](#) is advising a project involving [Fonda](#), in Slovenia, to track sea bass from the growing farm through harvesting. In both cases, fish are placed in growing cages tagged with UHF Gen 2 passive RFID tags. The water temperature is tracked via a sensor logger, also connected to an RFID tag. A handheld reader captures the temperature data being stored on the sensor's RFID tag, as well as the unique ID number on the growing cage itself, and information about the fish is input into the system using software from the University of Wolverhampton. Once the fish are grown, the cages are then emptied into commercial tanks, in which they remain until the animals are ready for slaughter. They are then placed in transporting tanks to be moved, which are also equipped with RFID tags, and the data is linked to the ID number on the tank's RFID tag via a handheld reader.

The transporting tanks are driven by truck to a new location, where the fish are poured into a machine

that transfers them to various pools, according to size. An RFID portal is used at this location, with a fixed reader and several antennas, that read the EPC tag located within the tank in which fish were raised, as they are emptied into the pool. These tanks also employ temperature loggers, so the temperature data is read as well, and is stored in an EPCIS database.

After slaughter, the fish are placed within RFID-tagged boxes that pass down a conveyor, where an RFID portal with a fixed reader will interrogate each tag and store the box ID number in the database's EPCIS software. The box tag IDs are read one final time while being loaded onto trucks destined for retailers. In addition, sensor loggers in the rooms in which they were stored transmit data regarding the conditions of the cold storage in which the boxed fish were held.

Fonda and Culmárex will use the data to track the processing of fish, to ensure temperatures remain appropriate and to track fish inventory levels during any part of the processing. What's more, the information will be shared with customers who log into the producers' servers.

The dairy pilot participant is [Mr. Moyden's Handmade Cheese](#), in Shrewsbury, United Kingdom. The initial plan is to apply tags to containers of milk as they arrive at the cheese company's processing plant, in order to allow movement within the facility, and to enable the milk's storage and temperature data to be tracked. As the cheese matures, it is stored in a series of containers that will also be tagged. Temperature loggers wired to UHF RFID tags will capture temperature data and transmit it to handheld readers, to be stored on the RFID software residing on the company's database. To date, the firm has installed only the software; the RFID hardware is expected to be deployed next month.

The Green Fields Farm Shop will soon be equipped with a fixed RFID reader, to interrogate data regarding the arriving Mr. Moyden's cheese products, as well as the wine and pork. (The Green Fields stores do not sell imported fish, so they will not receive tagged shipments of fish from the project's participants in Slovenia and Spain.) Additionally, the researchers will provide RFID readers to The Deli@Bewdley, in Market Drayton, which will receive the fish and be able to read the RFID tags on the boxes in which they are received, thereby extending supply chain visibility.

Altogether, the pilots involve more than a dozen participants, including universities, end users and integration providers. "The project has a good consortium of partners," Hornak says. However, he notes, it is difficult to keep the group from straying from the project's primary mission—finding ways in which RFID can most clearly provide a benefit. "It's challenging to always focus the project energies in the right direction, but I think the results will be quite interesting." By 2012, he adds, "We will hopefully have positive feedback from the participants, and obviously, we hope they will continue [to use the technology] to make their own [supply chain] systems more successful."