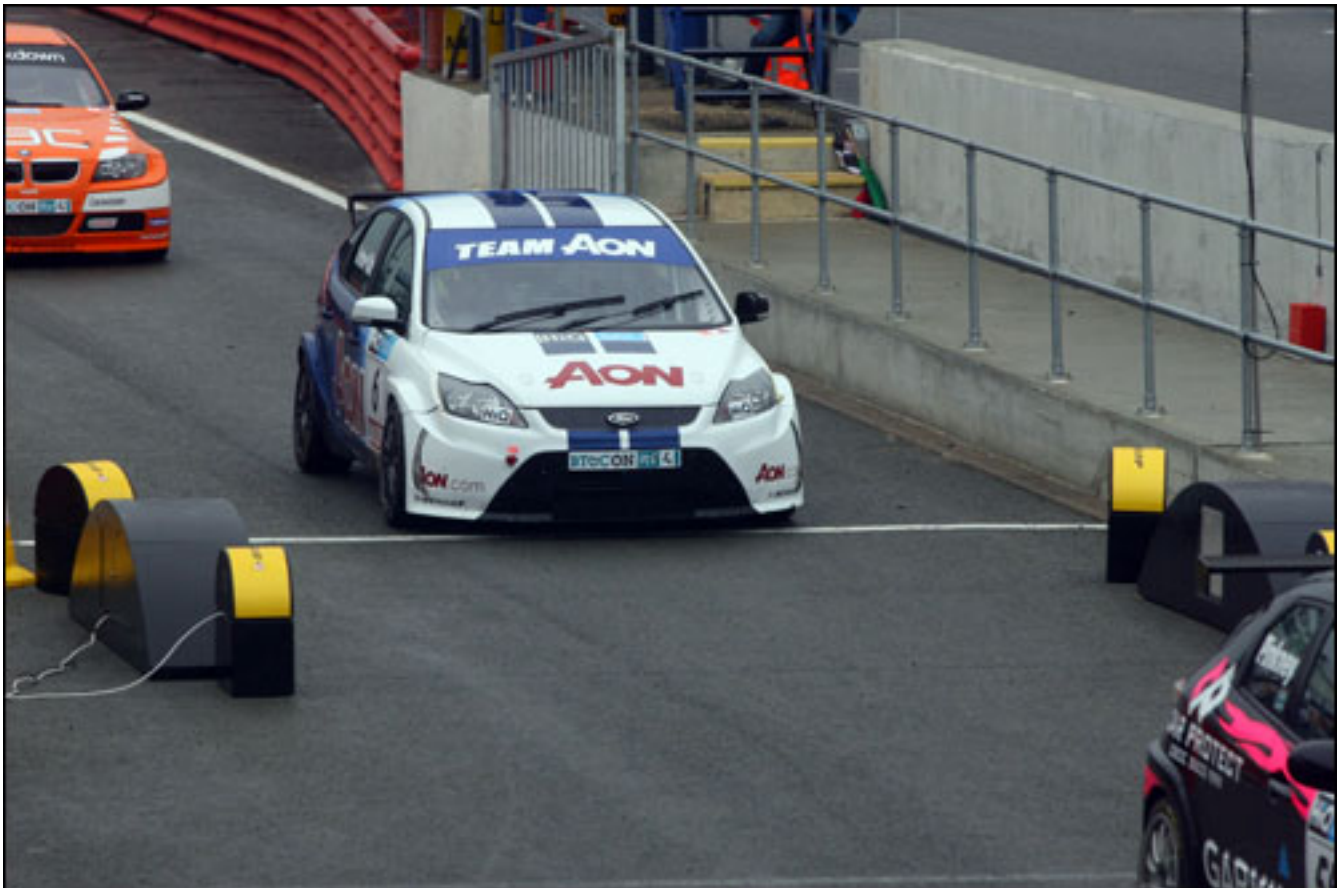


EPC Gen 2 RFID tags built into the tires' sidewalls enable the race organizer to identify which tires a team uses during a race, and allows the manufacturer, Dunlop, to track its own tires through the supply chain.

By Claire Swedberg

Dec. 31, 2009—All race cars competing in the [British Touring Car Championship](#) (BTCC) since late 2008 have used [Dunlop](#) tires embedded with RFID tags to track the usage of those tires by the team, thereby helping track which tires, and how many, were used—without requiring the car to stop. This deployment follows an initial pilot of the system during a race in 2008.

The BTCC, a car-racing series held each year in the United Kingdom, was established in 1958. The use of tires in the race is monitored to ensure that no team takes an unfair advantage by having more or better tires than another. Until 2008, the tires were tracked using a bar-code system provided by software company [Datalinx](#), says Melvin Fletcher, the company's director.



Two RFID interrogators on each side of a pit lane read the tire tags, while a third interrogator captures a vehicle tag's ID number.

The RFID-based tire-tracking system was developed by a collaborative group, including The BTCC, the [Goodyear Tire and Rubber Co.](#)'s Goodyear Innovation Center in Luxembourg, [Dunlop Tyres](#)—a British firm owned by Goodyear—and Datalinx. The tags not only enable the BTCC to electronically regulate tire usage during races, they can also be used to track when the teams stop for maintenance, thereby allowing the race organizer to make information available online to the media and fans regarding the vehicles and the tires they use.

The BTCC's tire rules stipulate that each competitor must use only specific tires allocated for the practice and race sessions for each set of races, says Robert Lionetti, Goodyear Innovation Center Luxembourg's principal engineer. Otherwise, some teams that select their own tires could attain an unfair advantage over others. All competitors are allowed 16 tires per race. By tracking each individual tire, the BTCC ensures that each car utilizes the correct and allocated tires at all times, and that all competitors adhere to the tire rules.

Prior to using RFID-tagged tires, the race staff had to manually record every serial number of each tire used in every practice session and race for each car, using pen and paper or bar-code scanners. The vehicle had to be at a standstill for that data to be recorded. To make this system more efficient and eliminate any human errors, such as recording the incorrect serial number for a specific tire, the group began developing an RFID system to replace the bar-code label that was scanned by employees when the vehicle was stationary. Dunlop began embedding tags on the BTCC-destined tires, and the Goodyear Innovation Center then built and installed RFID interrogators on both sides of the lane through which the cars pass. Those readers capture each tire tag's unique ID number as the vehicle enters the pit for maintenance, thus enabling the BTCC to reduce the number of individual inspectors required to manually track the tire ID numbers.

The first trial was conducted in May 2008, at the [Thruxton](#) circuit in the United Kingdom. Datalinx, which had already provided software to the BTCC for the management of race data, integrated the technology into its race-tire-management system.

With the system, UHF EPC Gen 2 RFID tags, manufactured by [Hana Microelectronics](#), are built into the tire's sidewall during production at the Dunlop plant. The tags have been tested, Lionetti says, to ensure they can withstand the heat and pressure of the vulcanization process—the heating of rubber to improve its elasticity. Each tag is encoded with a unique ID number that can link to other data, such as the time of the tire's manufacture and shipping, as well as the team that will use the tire once it arrives at the BTCC. The tags are first read after being manufactured, and again when they enter the warehouse, when they ship to the BTCC and when they arrive at the race organizer's facilities—all with handheld readers designed by the Goodyear Innovation Center using off-the-shelf components.

At the racetrack, tags are again read when the tires are allocated to teams, and by the fixed pit-lane readers each time a vehicle enters or exits during a race. Those interrogators can capture a tire tag's unique ID number on a car moving at a speed of up to 40 miles per hour, at a distance of several meters—the lane itself is approximately four meters (13 feet) wide. Three readers are placed on each

side of the pit lane, where the tags will come within a few meters of them as a car passes on its way to the pit for servicing during the race. Two readers on each side are used to capture the tire tag data, while the third captures the ID number of an EPC Gen 2 RFID tag attached to the vehicle itself.

This information is then sent, via a cabled connection, to Web-based software known as Datalinx Tyre Tracking—which interprets and stores data related to the tire IDs, indicating which tires are being used, and by which vehicle. The data is then available, in real time, to the BTCC's technical scrutineering staff, which oversees the race teams' tire usage and maintenance. In the future, fans may be able to access data regarding the number of allocated tires that have been used by their favorite team, as well as determine if that team is using a set that is new, or one that that has been broken in during practice.

Datalinx Tyre Tracking also disseminates the information to interested parties. "This may be the organizers, to ensure that the tire usage is within the rules; the teams, to see which tires are being run where; or the media, to know who is on new or used tires," Fletcher says. Dunlop also utilizes the data to monitor the supply chain, tracking each tire's date of manufacture and shipment to the BTCC, its arrival at the race organizer's site, its installation onto a car and, finally, its removal from that vehicle (based on the readings of a new RFID tag). Thus far, the system is reducing the manpower required by the BTCC to track tire usage, and is also providing Dunlop with better visibility into its supply chain. Although Lionetti declines to reveal the price for the tags, he notes, "The benefits [from greater supply chain visibility] outweigh the costs."

One challenge for Dunlop involved ensuring the tags could be read when cars pass at up to 40 miles per hour. According to Lionetti, the company has achieved a 100 percent read rate despite the vehicles' speed—and the even greater speed at which the wheels revolve.

Dunlop currently only tags its BTCC-destined tires. However, Lionetti notes, "We are looking at other opportunities for this technology."

In a similar application, Goodyear attached RFID tags to its tires destined for race cars competing in [NASCAR](#) (see [Goodyear Using RFID for NASCAR from Cradle to Grave](#)). In that case, NASCAR teams leased sets of tires for each event, then returned them at the end of the race, whether they were used or not, to ensure a team could not stockpile tires or have more than another team. Dunlop drew on Goodyear's NASCAR experience, Lionetti says, to help it determine where and how to embed the tags on the tires.