

London Underground Keeping the Capital Moving



RFID enabled escalator maintenance

The escalators of London's underground railway system carry 3 million passengers from the street to the platforms and back every day. To ensure that the escalators on the London Underground system continue to operate safely and reliably, London Underground operates a carefully managed maintenance routine.

But, with over 30,000 individual escalator steps across the network, the challenge of ensuring that each step is tested, repaired when faulty, and then monitored when it is returned to use is a formidable one. To solve the problem, London Underground turned to RFID technology. To help them deliver their project they chose CoreRFID.

Taking Steps

Millions of passengers use the escalators on the London Underground every day. The steps that make up these escalators are subject to constant wear from the feet of passengers and from the mechanical movement on the escalator track. A failure could cause serious injury. If an escalator step were to fail during the rush hour, lives could be put at risk and serious disruption to travellers would result.

To prevent such an event, London Underground have an inspection and maintenance regime that ensures the structural integrity of every step is checked at least once during the course of every year but, with almost 30,000 separate escalator steps needing to be checked, this maintenance approach requires significant effort by their engineering staff.

The problem is complicated by the time needed to carry out tests. Because of the effort involved, only a small number of steps can be removed from the escalator to be tested during an over night maintenance shift. These steps are exchanged for already tested ones. Any one escalator consists of an ever changing set of steps. Knowing when each step was tested and replaced is a major challenge. On some occasions steps were removed from escalators simply in order to identify them.



RFID tags on escalator steps makes it easier to forecast potential failures.

London Underground needed a system that would collect data automatically from individual steps, that could cope with the problems of dirt and grease and that would be robust enough to stand up to the constraints of one of the world's most heavily used mass-transit systems. They turned to RFID as a technology to help them and CoreRFID as their technology partner.

"The trial delivered by CoreRFID was 100% successful and showed the solution would be more reliable than other approaches." London Underground Asset Engineering



The Step Tagging Trial

After having tried a number of alternative approaches, London Underground was determined to prove the suitability of RFID with a trial application. CoreRFID developed the solution and provided the necessary tags and reader to allow a full scale operational trial on the Number One escalator at St Paul's station on the Central Line.

The trial was designed to show that tags could be attached reliably to steps so that they would not become dislodged while in use and that tag data could be read from the steps while the escalator was in running at its normal operational speed.

CoreRFID provided a solution based on the use of Confidex Ironside® UHF RFID tags, Nordic 3000 readers and CoreRFID developed application software. The Ironside tags have a read range of up to 8 metres, are designed for use in demanding environments and for successful use when attached to metal. The Nordic 3000 readers are compact, rugged, hand-held computing devices running the Windows CE operating system. CoreRFID worked with London Underground to determine the best method of fixing tags to steps for the trial and to determine the best location for fixing the tags on each step as well as the best way to mount the Nordic 3000 reader. CoreRFID also helped to develop a method of packing data into the 64 bits available on the tag as a way of ensuring that maximum read speeds could be achieved.

Tags were installed on each of the 92 steps of the St Paul's Number One escalator. Data, including the step number, its year of manufacture and elements of its service history, was then written to each tag. Encoding the data on step tags proved that the work could be done well within the time available during a normal out-hours service shift.

Following the installation of the tags, the escalator was run at normal speed to test how successfully data could be read from the steps of a moving escalator. In the trials, data was successfully read from 100% of the steps with one or at the most two complete rotations of the escalator a very substantial improvement on previous systems which required the escalator to be inched forward a few steps at a time and involved the escalator being out of service for 45 minutes or more.

Following the success of the trial, London Underground are now in the process of implementing the solution across their network, working with their escalator suppliers to have new steps tagged at the point of manufacture and with CoreRFID to help develop and implement the operational system and to train London Underground engineering staff in its use.

The London Underground experience shows how a complex RFID project can be given a greater chance of success with careful planning and a well-executed pilot.

The Benefits

London Underground's RFID based escalator maintenance system provides:

- Improved public safety through reduced risk of escalator failure
- Better service levels by avoiding unplanned "out-of-service"
- Reduced effort in checking the requirement for scheduled maintenance
- Data can be collected without taking the escalator out of service.
- Step data collection uses only one engineer – previously two were needed.
- Data captured can be easily integrated with existing asset management systems.

As a result of the successful trial, London Underground are now rolling out the system to over 30,000 escalator steps.

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