

# For whom the



Sean Sparham

**W**hatever your personal views on congestion charging, there can be no denying its impact on political thinking. Enabling legislation to allow local authorities in England and Wales to impose congestion charging schemes already exists and, from 2006, a national distance-based charging scheme for heavy goods vehicles (HGV) is expected. It is likely that another road-user charging system for all motorists will follow sometime after 2011.

So what are the practical and political implications for this policy? Is the available technology accurate and robust enough to handle the huge volumes of data that national schemes will require? Perhaps more to the point, is the technology accurate enough not to sink the whole idea before it has even begun?

Even within the current generation of tolling environments, problems continue to exist. There are issues of accu-

racy for detection, classification and enforcement, and of performance degradation, caused either by adverse weather conditions or creeping deterioration in the equipment over time. Additionally, while the advancing sophistication of software-based solutions has done much to minimise the risks inherent in inaccurate data, they have not been eradicated.

Yet, unless these issues can be adequately addressed, the outlook for genuine open-road tolling - such as is envisaged in the UK and elsewhere - looks bleak.

In essence, ETC (Electronic Toll Collection) systems are required to detect the presence of a vehicle, classify it, deduct the correct toll fee and, if necessary enforce non-payment. In achieving this, a number of solutions have been proposed, most of which require the integration of a range of technologies.

On inter-urban routes, detection of the presence of a

# tolls?

vehicle is generally performed either by an under-carriageway electro-mechanical device known as a treadle, or through the use of overhead or side-mounted light-curtains or ultrasonic sensors. These trigger a short-range communications system to read the vehicle's on-board unit and confirm payment.

Both of these methods are subject to performance degradation over time and/ or under extreme weather conditions. In the high-speed conditions found in open road tolling, treadles are ineffective, while side-fire systems will not deal with multi-lane environments.

Moreover, the mechanical feature of the treadle makes it inevitable that it will fail after a finite number of operations. This is usually in the order of IM activations, or about once a year.

In urban situations an altogether different approach has been adopted. In London, for example, reliance is placed on computer software attached to CCTV cameras for the detection and enforcement process. The resulting back-office costs of the system are extremely high and London is presently looking to replace the system with more advanced technology.

For the future, there has been much talk of deploying GNSS (Global Navigation Satellite System) technology and other advanced systems of vehicle location for use in express tolling. But, self-evidently, such systems will still need a classification and enforcement arm in the event of non-payment.

In essence, what is required is a system that is not only highly accurate under all conditions, including high-speed, multi-lane driving, but also robust enough to require little or no maintenance. Surprisingly, it seems that it is 'old' technology that may provide the answer.

Installed loops like those of MIDAS (Multiple Incident Detection and Automatic Signalling) and SCOOT (Split Cycle Offset Optimisation Technique) systems have been in existence for a number of years, dealing with issues of traffic management on motorways and urban streets. The Highways Agency has an ongoing programme of fitting the MIDAS system on all English motorways and SCOOT and its various derivatives is in use in urban environments throughout the UK and a number of other countries.

What has prevented the widespread use of loops in electronic tolling is the relatively high error rate of around 1:100. While this figure is statistically insignificant in traffic management terms, is wholly unacceptable in the tolling environment.

But times have changed. Huge strides in computer software technology over the last decade have allowed very high levels of accuracy to be obtained in the use of these loops, typically increasing the error rate from 1:100 to 1:10,000. Much of the credit for the improved accuracy rate belongs to Diamond Consulting Services, which has developed a series of complicated algorithms.

This advance, coupled with the replacement of the usual treadles and piezos found in most tolling plazas with electronic sensors, has meant that problems of wear and tear



Sean Sparham

Will installed loops, like those of MIDAS and SCOOT, be the future for UK congestion charge toll collection?

and low data accuracy levels have been overcome. Diamond Consulting claims its software-based Idris solution will last as long as the road surface under which it is built. It is also unaffected by weather conditions and capable of performing all the functions required of AVC (Automatic Vehicle Classification) within a single, integrated structure.

This is of importance not only for tolling operators, but also for policy makers. After all, if motorway tolling is to be introduced in the UK sometime after 2011, it is open road tolling - as opposed to tolling plazas - that will be required. There must be no delay to a motorist's journey caused by the need to collect the toll.

But without the controlled environment of a plaza, the ETC system must be able to handle not just detection, classification and enforcement but high-speed driving, lane straddling, tail-gating, signal over-spill - caused by larger vehicles hiding smaller ones within their electronic shadow - and stationary or slow-moving traffic.

Nor can there be any mistake in the classification process upon which the toll is based. Hence, while the light-curtain detection method is capable of providing up to 12 classification categories based on the overhead 'view' of the vehicle by the laser beam, it cannot classify a vehicle according to the number of its axles. Additionally, some claim the system is subject to errors in certain extreme weather conditions, including snow.

On the other hand, the revised installed loops use a continuous stream of pulses and a computer processor to read the unique 'signature' of each vehicle as it passes overhead. This provides precise and consistent outputs, regardless of traffic flow and environmental conditions, including queuing or slow moving traffic, and vehicles travelling in the wrong direction.

When read in conjunction with an in-vehicle tag, the system either allows the vehicle to go on its way or triggers an optional VES (Vehicle Enforcement System) camera and supporting procedure for payment and enforcement purposes.

It is still too early to say what, precisely, the Government has in mind for its proposed road-user charging policy, however the broad, technical parameters are clear enough. The final free-flowing toll system will need a high level of accuracy and operate cost-effectively under all operational conditions. ■