

EXTRATERRESTRIAL ENCOUNTERS

Following the successful implementation of a number of innovative, satellite-based tolling systems in Europe over the past decade, the future looks bright for GNSS technology and the road authorities that invest in it

➔ Ten years ago, we witnessed the dawn of a new era in electronic tolling. The German Toll Collect system was launched, using extraterrestrial Global Navigation Satellite System (GNSS) positioning. For the first time, satellite-based technology was used to automatically charge distance-based fees on a comprehensive road network. Initially, the tolling scheme for all trucks over 12 tons focused on all the German highways, approximately 12,000km (7,456 miles) in length. In the meantime, the system has been extended to include 1,136km (706 miles) of major federal roads. Each year, €4-5bn (US\$5.1-6.4bn) are generated by the GPS-based tolling system. Now, more than 800,000 onboard units (OBUs) have been professionally installed in trucks traveling on the German road network, and the number of users opting for a manual toll declaration is steadily declining.



European Space Agency

Five years later, Slovakia introduced the world's most modern satellite-based tolling system. All trucks and buses above 3.5 tons traveling in Slovakia are required to have a 'plug and play' OBU installed on the windshield, which can be made by the driver in a matter of minutes. From the beginning of 2010, after an implementation period of only 11 months, the Slovak tolling system had a total length of 2,400km (1,491 miles), making it the second-largest tolling system in the European Union (EU), after Germany. For the first time in a nationwide tolling scheme, a greater proportion of the tolled roads were main roads (as opposed to tolling primarily highways). In 2014, the Slovak system was extended to a majority of public roads, adding another 15,000km (9,321 miles). Slovakia thus has the longest single tolled road network in the EU (see the article from Skytoll on page 60).

PROOF OF PROGRESS

Gone are the days when tolling technology preferences for national tolling schemes were the subject of heated discussions at European conferences and seminars. Only

a few years ago, microwave lobbyists still argued that GNSS technology was either too expensive or not yet mature enough for large-scale tolling systems. The Slovak example of increasing the tolled road network to more than seven times its original size in just a few months seems to have settled this debate once and for all, since such broad extensions would be completely unthinkable with an infrastructure-based microwave approach. However, there are now several examples of tolling implementation across Europe that confirm GNSS technology has become the technology of choice.

Hungary was the third country to launch a nationwide truck tolling system based on GNSS technology. Since July 2013, tolls are charged for all trucks above 3.5 tons on 6,500km (4,039 miles) of designated sections of the public road network. The distance-based fees can be paid either by manual ticketing (one ticket per trip) or through the purchase of a satellite-based tracking device at one of the registered Toll Declaration Operators. These devices, typically used for fleet

management, automatically record all the traveled routes liable for tolling and forward this information to the national toll operator, within 15 minutes.

As a result of this unique approach, in which 21 service providers support the use of 50 various tracking devices, the implementation of the Hungarian GNSS-based truck tolling took less than three months. After one year of operations, more than 80,000 GNSS devices are deployed to automate more than half of the total number of toll declarations made in the system. Taking advantage of the innate flexibility of GNSS technology, the Hungarians were able to quickly implement a cost-effective tolling system, which generates more than €500m (US\$636m) per year, and is now the second largest in the EU.

In 2014, contracts for the implementation of nationwide truck tolling schemes were awarded in Belgium and Russia. In both cases, the use of GNSS technology was mandatory. Furthermore, the use of Russian GLONASS satellite positioning was obligatory not only in Russia, but also in Belgium. The Belgian tolling system requires



(Above, left) GALILEO, the GNSS built by the EU and the European Space Agency
(Above right) GNSS facilitates accurate, flexible tolling operations

that the positioning algorithms use GNSS multiconstellation and augmentation (i.e. GPS, GLONASS, EGNOS and GALILEO signals simultaneously) to receive the most accurate positioning data possible. In 2015, GALILEO early services will be made available, and now most GNSS chipsets on the market are already prepared to take advantage of GALILEO and GLONASS, in addition to GPS. In other words, GNSS positioning availability, accuracy and reliability is improving constantly.

NO LIMITS

As these examples illustrate, an investment in GNSS technology provides a cost-effective approach to tolling, particularly on complex road networks, in which thousands of road segments can be charged accurately, and in which extensions to the tolled road network can be easily implemented. By comparison, infrastructure-based toll systems rely on the construction of gantries for every toll segment, and are only implemented on a few hundred toll segments.

These limitations became obvious in the Czech Republic, where the expansion of the tolled network to the major road network was drastically reduced. There, a tender is now ongoing for the consultancy firm that will draft the tender for a new tolling system – certainly one which will be more flexible and easily expandable. Also in Austria, where an infrastructure-based system has been in operation for more than 10 years, the political debate about extending the

tolled road network to the major federal roads has now intensified.

Siemens has been at the forefront of GNSS technology from the very beginning. The implementation and extension of the Slovak tolling system illustrates the extraordinary flexibility of the technology, due to many years of research, development and practice. As a result of the advances in satellite-based technology, there are virtually no restrictions to the types of tolling policies that road administrations can develop to best meet their goals of financing the maintenance and development of their road infrastructure. The sky's the limit. ■

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