

E-470 Going Going Cashless

To be or not to be cashless? That was the question E-470 Public Highway Authority (E-470) asked back in 2007.

In June 2007, E-470 made the business decision to transition to an all-electronic toll collection (AETC) system, in other words, a cashless road.

The transition for E-470 to an AETC facility was accomplished in two phases. The first phase, on the 1st of January 2009, was the introduction of license plate toll (LPT), or video tolling whilst retaining the ability for the customer to pay cash. The second phase was the removal of the cash facility which took place on the 4th July 2009; Independence Day.

E-470 is a toll road, to the east of Denver, Colorado, USA, and prior to July 4, 2009, had a mix of automatic cash machines, manual, and express (high speed) lanes. The toll road opened in 1991 and since opening, road users have had the option of paying their toll by cash or EXpressToll.

EXpressToll is the, transponder-based toll collection system used by E-470, the Northwest Parkway, and the I-25 tolled express lanes in Colorado. These customers have their tolls deducted automatically from a pre-paid toll account. Since E-470's inception, all mainline plazas have had the main highway lanes through the middle of the plaza and thus have highway speed multi-lane nonstop tolling.

LPT is the alternative option introduced in January 2009 for road users to pay their toll and is a method of payment for users without an EXpressToll transponder. Cameras photograph the vehicles' front and rear license plate, and for all tolls incurred in a month, one bill is issued to the registered owner of the vehicle. For all EXpressToll customers, payment options have not changed; they continue to pay via their pre-paid account. EXpressToll customers pay a lower toll rate on E-470 over the LPT customer.

The first phase commenced when E-470 switched over the high speed express tolling lanes to AETC six months prior to closing the conventional cash lanes and thus going completely cashless. This period allowed for both E-470 and the travelling public to get used to this new way of working in a gradual transition. On the 1st January 2009--what would have previously been a violator in the

express lanes--became new LPT customers for E-470.

Prior to this first phase taking place, the violation enforcement system (VES) had to be evaluated as a revenue collection system, rather than solely as a violation system, for LPT to be successful. The results of the evaluation determined that an upgrade of the technology would be required to improve revenue assurance. Several systems were evaluated and the PIPS Technology solution of front-and-rear shot PIPS SpikeHD cameras, was selected by E-470 to provide the upgraded VES.

The E-470 VES originally only took rear license plate shots. The upgrade to the new VES involved taking front and rear image shots thus increasing the ability to automatically identify a vehicle. This works for both cars and trucks because Colorado mandates front and rear plates for all vehicles, which better enables identification of the vehicle owner.

The major integration work for this project was introducing the PIPS cameras into the E-470 lanes and testing the software and back-up strategy. In normal operation, the cameras are triggered by the lane controller from information supplied by the Idris system and the resulting images are dealt with in real-time. If the lane controller fails or is taken out of service for maintenance or upgrade, then the cameras go into an automatic trigger mode. In this mode, the cameras self-trigger on recognition of a license plate and store the data locally on the camera. Once the lane controller is operational, it downloads the stored images from the cameras, and the tag reads from the tag readers which have also been storing AVI date whilst the lane controller has been non-operational. This date from both sources is then time-correlated to provide complete tolling records. This backup system to the lane controller has proved to be very effective in the rare cases that a lane controller has failed.

The new camera installation work for 106 toll collection locations began on November 10th 2008 and was completed on all toll lanes by May 2009. The installation of the cameras was completed through the coordination of the E-470 Information Technology team, including the Idris team, Operations, Roadway staff, and utilising two contractors for any infrastructure work. Danna Smith, E-470 Accountant, commented, "Through the use of License Plate Toll bills, E-470 could have experienced a loss of revenue from image rejections, customers not paying their bill, not being able to capture license plates in order to bill the registered owner, and a quantity of returned bills due to

bad addresses. After considering these impacts, we realised we needed to work on our camera system and that is what prompted the implementation of front-shot cameras by getting the new PIPS camera solution.” This resulted in E-470 leveraging its software capabilities, working with the PIPS software and Idris development teams to design and deploy new software.

Phase two of the AETC project took place on the 4th July 2009 and saw an end to payments by coin and cash - E-470 had become an AETC facility. The timetable put in place to achieve AETC was extremely ambitious, and credit needs to go to both the E-470 and Idris engineers throughout the technical integration process for their tight coordination and ability to work together as a team.

AETC brings with it changes throughout the toll facility, from the road up. If you go cashless, there needs to be serious thought given to the back office operations, acknowledging all the key parts of the system. A major influence is the number of images now generated and which need to be looked at as people without transponders become customers rather than violators. For E-470 this meant various stakeholders had to develop new business rules to meet the needs of how they wanted to implement AETC and their back office. Once the business rules were established, process and system architecture design meetings were held. The outcome was making changes to the current back office rather than re-developing the whole system.

Although the time-scale for a change from a mixed environment of manual, ACM and high speed ETC lanes to AETC at first sight appeared to be very optimistic, it was in fact very achievable because the base technologies in place on E-470 didn't require any major changes. Their main classification and detection system (Idris) already had front trigger capabilities, the engineering skills of the team ensured the integration for the cameras happened in good time and was in place to meet the various operational deadlines. Idris Managing Director, Bob Lees, commented “For Idris it was a slam dunk, the Idris/DCS involvement of the whole process was the integration of the PIPS camera within the lane and the enhancement of the System Monitor & Control web browser interface. There were a few new technical challenges but the team work of E470, Idris and PIPS generated the results!”

Communication with the public and toll road users played an important role through the transitional period. Roadway signs were updated and altered accordingly, identifying the changes to lanes as

developments took place. An early ongoing PR campaign ensured the public were well informed and regularly updated on progress. Jo Snell, Manager of Community and Public Relations for E-470, and her team had worked since early 2008, informing the public, communicating the changes which would take place, and the benefits of these actions. Jo said “The public had a very easy time with the transition to a cashless system and the introduction of License Plate Toll. They heard it from the media early and often. The media was a good friend to E-470 in covering the story time and time again. The news coverage really helped us get the word out to the public.”

All this team effort meant, on the night of the switch over, E-470 just followed the script they had laid out for themselves and the whole activity went according to plan. Director of Operations at E-470, Dave Kristick's comment summed up the feelings of everyone involved with the AETC project, “The cooperation of the departments was the most proving experience in my time here at E-470. It gave us cause to work together in the same direction with the same guidance and motivations to make this project successful.”

The work carried out by E-470 has generated a new AETC package with the results speaking for themselves. In the words of Ed DeLozier, Executive Director, “I think every employee at E-470 should be extremely proud of their accomplishments. What they did over the past two years is nothing less than phenomenal. We worked together as one unit, and we’re still working closely together today. Our employees are still doing their jobs at an exemplary level. That’s the kind of organisation E-470 is and the kind of organisation the employees make it. I’m very proud of every single individual in this organisation and the facility we provide to our clients.”