PrePass®

Driving Cost Savings with RFID and Electronic Tolling

Toll roads and bridges are increasingly being relied on to generate revenue, and like any business, toll authorities work to maximize revenue by improving efficiency in their operations and providing benefits to their customers, in this case, toll road and bridge users. In 2022, tolling generated $18 billion using the following strategies:

- **Reduce traffic congestion.** Commercial fleets opt to use toll roads to avoid stop signs and traffic lights, so toll authorities work to prevent long queues at toll collection booths.
- **Increase capacity.** Open traffic lanes accommodate more customers. Toll booths and toll plazas need entry and exit lanes for leaving and merging into traffic, cutting into the overall road capacity.
- **Save customers on fuel.** Free-flowing traffic is the most fuel-efficient. Decelerating to make toll payments and accelerating afterward consumes more fuel.
- **Lower toll road operating costs.** Many toll roads are eliminating staffed toll booths and their associated costs.
- **Improve time in transit.** Fleets continue to use choose toll roads that provide reliable uninterrupted travel to satisfy their customers.
- **Control vehicle emissions.** Toll roads operate under state and local emissions constraints. Commercial vehicles that do not need to stop and start, slow down and speed up, have reduced emissions.
- **Enhance financial auditing.** In any business, cash transactions present the most difficult and time-consuming payment method to track and audit. Toll authorities prefer automated payments from established accounts and provide incentive to do so.
- **Incorporate robust data collection.** Automated payments by established accounts also allow the collection of robust customer data, helping the toll authorities better plan and promote their operations.
- **Reduce accidents.** Road users and toll authorities want to avoid the time and cost of accident litigation, not to mention the risk to health and damage to vehicles and infrastructure.

This is not a hypothetical laundry list of the issues toll road authorities may consider when developing or updating their routes and operating methods – these strategies derive from studies toll operators commissioned and from academic research conducted by PhD candidates on improving toll road operations. Many of those PhD dissertations contain complicated algebraic equations that mathematically confirm what toll road operators have learned from practice:

- **Staffed toll booths prove costly and inefficient.**
- **Toll booths, toll road entry and exit gates, or any situation which requires vehicles to slow down, discourages Fleets from operating on toll roads and bridges. Even a lane with toll machines where customers merely insert a ticket or toss in coins slows traffic, creates lines, and frustrates drivers.**
- **Accidents on toll roads most frequently occur where customers are forced to switch lanes to make a toll payment or choose a payment methodology – cash or credit -- and then merge back into traffic, often while juggling money, cards, and receipts.**
- **Vehicle emissions rise dramatically where customers must change speeds or wait in lines.**

Fleets that route trucks on toll roads do so despite the unpredictable costs and administrative burden of tolling. Often, the competitive trucking industry and cost controls drive that decision, but the same considerations toll road authorities make to improve their operations also benefit fleets. They share an interest in avoiding traffic congestion, saving fuel, reducing time in transit, cutting vehicle emissions, and, most importantly, curbing accidents.

That is why Fleets should also take note of the solution that toll operator research found best achieves their business goals: all-electronic tolling or AET (sometimes called Electronic Toll Collection, or ETC).

Most toll roads deploy two AET methods to identify and invoice toll road users:

1. License Plate Reader (LPR) systems that rely on gantry mounted cameras to photograph license plates.
2. Radio Frequency Identification (RFID) transponders and antennae.

Either method allows commercial vehicles to continue down the highway without stopping, a major benefit of so-called "open road tolling." AET works best with RFID transponders. Here's why:

RFID transponders, mounted on a truck's windshield, transmit radio frequency signals to the overhead antenna. Those signals reliably, accurately, and securely communicate to the toll road agency three things:

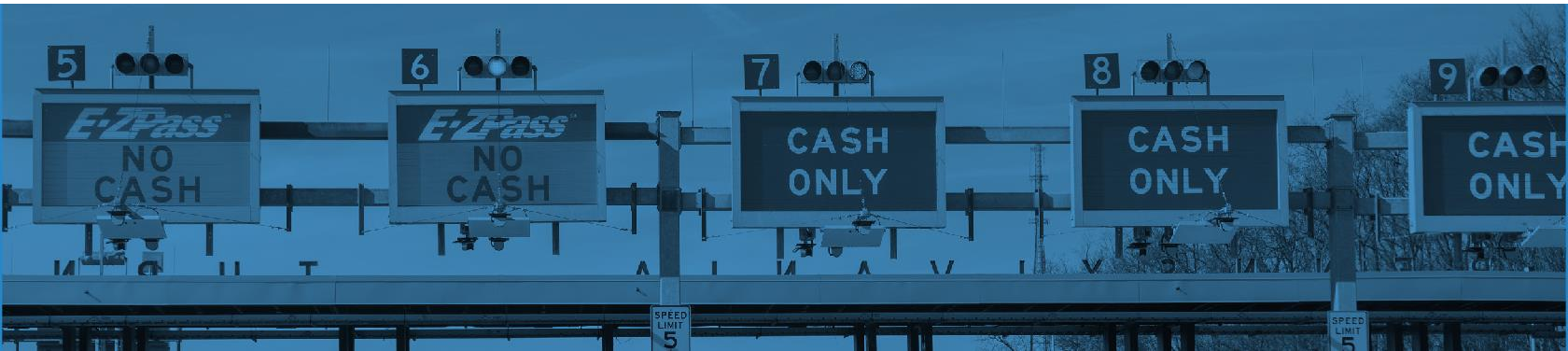
1. The company's identity.
2. The vehicle or combination type to assess the proper toll rate.
3. The payment or security method for the toll charge.

That's it. The toll road's work is done! For the motor carrier using an RFID transponder, there is no slowing, stopping, changing lanes, merging into traffic, or handling cash, credit cards or receipts. The toll transaction automatically posts to the correct account, providing the fleet with a ready accounting of where its trucks drove and what tolls were charged.

By contrast, the AET method which photographs license plates ("toll-by-plate" or "plate reads") requires the toll road authority to read license plates and associate them with the registered trucks and truck owners. This method costs less to administer than placing an attendant in a toll booth to collect tolls. However, cameras still cost more than RFID and are far less accurate. RFID works with 99.9% accuracy.

License plate readers fail to identify trucks for a variety of reasons:

- License plates and camera lenses get dirty and obscured.
- LPRs have difficulty distinguishing some lettering colors or against busy backgrounds.
- Direct sunlight or lack of it can blur images.
- Flat license plate lettering is harder for cameras to recognize than raised lettering.



These common issues lead to mistakes in toll charges, and which customer receives the bill. So, at times, toll facilities must use manual accounting to properly assign vehicles to the right customer. The toll operator may need to pay a third-party vendor to match out-of-state license plates to the proper party.

Mistaken tolls lead to lengthy and time-consuming dispute resolution processes. Toll-by-plate disputes occur only after the toll road mails a paper bill to the assumed vehicle owner, long after the transaction took place. With RFID transactions, both the toll road and the motor carrier have information immediately, allowing for quick resolution of any discrepancies.

To be clear, even fleets that use transponders will have their vehicle license plates photographed from on high – toll operators stay alert to violators that do not have an active account with the facility. But once the transponder signal indicates an active account, all is well.

The best reason to deploy RFID transponders versus the "toll-by-plate" approach is the cost. Toll roads pass on all the administrative costs associated with "toll-by-plate" transactions. That results in significantly higher toll rates for "toll-by-plate" transactions than for transponder transactions.

A 2018 study by the Minnesota Department of Transportation found that transponder transactions cost 10 cents per transaction for the toll authority to process, while "plate read" or "toll by plate" transactions cost the toll operator 35 cents per transaction to process. The study also showed much higher rates of "leakage," or uncollectable tolls, with LPR toll collection than with transponders. Toll operators collect that lost revenue from other "toll-by-plate" customers.

As the Maryland Toll Authority, which uses both video cameras ("toll-by-plate") and transponders, emphasizes on its website:

> **"VIDEO TOLL RATES ARE 1.5 TIMES THE BASE TOLL RATE… VIDEO TOLL RATES ARE THE HIGHEST RATES TO OFFSET THE HIGHER COST OF PROCESSING VIDEO TOLLS."**

Toll roads got it right in concluding that AET best met their business goals, such as reduced time in transit, lower toll road operating costs and less traffic congestion. And it is equally clear that AET using RFID transponders does so at much lower cost to the motor carrier. With RFID transponders, Fleets have improved ***efficiency***.

But, aside from the higher rates associated with "toll-by-plate" transactions, is there data to support the other business goals, such as curbing accidents, cutting emissions and saving fuel? Yes – thanks to those PhD candidates!

SAFETY

According to the National Transportation Safety Board (NTSB), the most dangerous locations on the highway are toll plazas. In 2006, NTSB found that 49% of crashes in Illinois occurred at toll plazas, with three times as many people killed there than on the remainder of the same roads. On the Pennsylvania Turnpike, 30% of all crashes occur at toll plazas; in New Jersey, the number is 38% and in Florida it is 32%.

Researchers demonstrated that toll collection methods often led to the crashes. At so-called "Hybrid Mainline Toll Plazas," where customers had to select the correct toll booth, switch lanes, and then merge back into traffic, crash incidents occurred at higher rates than on regular segments of the expressway. With open road tolling, made possible by AET with an RFID transponder, those complex lane-choice decisions and maneuvers are not necessary.

EMISSIONS REDUCTION

Researchers also looked at the environmental and health impacts of implementing AET. A study of a toll road in Taiwan measured concentrations of ultrafine particles (UFP) and particulate matter (PM) both before and after introducing AET. Even though the traffic volumes during peak travel times remained steady, the fact that AET meant customers no longer needed to decelerate, idle, and accelerate for toll payments brought significant reductions in emissions downwind from the toll road. In addition, calculations showed that "excessive lifetime cancer risks from exposure to particularly harmful emissions were reduced 49.3%" after the implementation of AET.

Similarly, a study of toll roads in India measured levels of carbon dioxide (CO2), carbon monoxide (CO) and nitrogen oxide (NOx) during the initial stages of AET implementation, when only one traffic lane was AET-equipped. Doubling the traffic volume through that one AET lane reduced CO2, CO, and NOx by 42%, 22% and 64%, respectively. In other words, more traffic with fewer emissions. Everyone breathes easier with All-Electronic Tolling! And AET with an RFID transponder works best of all.

FUEL SAVINGS

It comes as no surprise, given the emissions reductions associated with AET eliminating deceleration, idling and acceleration for toll payments, that AET must also save fuel. Fuel consumption produces vehicle emissions. U.S. Department of Energy figures say that rapid deceleration and acceleration – as necessary to enter a toll plaza lane and then merge back into traffic - can increase fuel consumption by 15% to 30% at highway speeds and 10% to 40% in stop-and-go traffic. Of course, Fleets want to maintain highway speed for reduced and reliable time in transit. AET eliminates those interruptions – and saves fuel at the same time.

Fleets know that their business success depends on attracting and retaining customers, offering a superior product, and lowering operating costs. Toll authorities operate with the same principles. Where the interests of the trucking and toll industries meet is where All-Electronic Tolling exists. By using AET with an RFID transponder, carriers benefit from reduced and reliable time in transit, the safety and efficiency, the emissions reduction and fuel savings they seek at the lowest toll rates available.

ABOUT PREPASS:
STRATEGIC CONSULTANTS AT WORK FOR YOU

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