RFID Automates Payments at Regina's Snow Dump

The Canadian city's system depends on UHF RFID tags and readers to identify arriving trucks, authorize their admittance and automatically bill customers.

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Oct 19, 2016—The Canadian city of Regina is using radio frequency identification technology to automatically bill companies that dispose of snow at its municipal snow storage facility. With the system, the city provides RFID stickers that can be attached to truck windshields so that RFID readers can identify each time a vehicle arrives to dump a load, enabling the city to bill the owner accordingly.

The solution was provided by the city's security and access-control technology vendor, Reliable Security and Controls, says Norman Kyle, Regina's director of roadways and transportation.

When a truck comes within range of the Times-7 reader antenna suspended overhead, a Feig Electronics reader captures the unique ID number encoded to its windshield tag. A traffic light installed beside the reader then turns green, signaling the driver to proceed.

Regina typically receives approximately 40 inches of snow annually. After a heavy snowfall, companies (usually private contractors) remove any snow that may be obstructing businesses, parking areas and private roads, then transport it to Regina's snow storage facility, located on the city's east side. Until the impending 2016-2017 winter season, companies that clear snow in Regina have been able to dump their snow at the storage site free of charge.

Norman Kyle, Regina's director of roadways and transportation

The city changed its rules this year, however, based on the cost of running the facility and on recommendations from the city's official community plan, Design Regina. The expenses include the moving of snow as it piles up at the facility, the maintenance of proper drainage as the snow melts, the disposal of trash that remains once the accumulated snow has completely disappeared, and the cost of maintaining the 140-acre property itself. During a typical winter, a total of 30,000 loads of snow are hauled into the storage site.

However, Kyle says, collecting the appropriate payments from each customer proved challenging. The city did not want to add expenses related to staffing the gate 24 hours a day, so it needed to find a way to automatically identify trucks and their size, provide them with site access and bill the owners accordingly. "We got the idea [for an RFID system] from toll booths," Kyle recalls, citing, as an example, the E-Z Pass system used in the United States to access vehicle account information and enable drivers to pay for road and bridge tolls.

The city sought a system that would be easy for drivers to use, so that they would not need to come to a full stop upon arriving at the lot. The resulting solution that Reliable supplied uses RFID hardware from RFID Canada, as well as software provided by Lenel to manage the collected RFID read data. RFID Canada supplied the adhesive tamper-proof RFID labels (made with Confidex RFID tags) that are attached to the passenger side of each truck's windshield.

At the entrance gate to the snow storage site, Reliable installed a Feig Electronics LRU 1002 reader with a circular-polarized ruggedized Times-7 A5010 antenna suspended overhead. The RFID labels come in four different colors that signify a truck's size and type, such as blue for a ¼-ton or ½-ton vehicle without a trailer, and yellow for a semi-truck. Cameras are used to identify the truck and confirm that it is the proper vehicle for that particular tag. The system, Kyle says, "reads your card, tracks the vehicle ID, knows you came through with a load of snow, and bills you for it."

Drivers are currently in the process of acquiring the RFID labels, which cost $10 apiece. The unique ID number encoded to each tag's memory is linked to data regarding the company that owns that vehicle, as well as its license plate and size. This information is stored in the Lenel software.

The adhesive RFID labels come in four different colors that signify a truck's size and type, and are affixed to vehicles' windshields.

With the first snow event this winter, drivers will begin bringing loads to the storage site. When a truck reaches the gate, a motion sensor detects its arrival; if no vehicle is ahead of it (as detected by the RFID reader), a traffic light installed beside the reader turns green, allowing the driver to proceed. If another truck is ahead of it, however—within range of the RFID reader—the light will

remain red until that vehicle has passed.

When the driver comes within range of the reader's antenna, the device captures the unique ID number encoded to that vehicle's tag. The reader forwards that data, via a wired connection with a Wiegand interface, to the Lenel software, which confirms that the truck is authorized to enter the lot. As the truck proceeds, a Mobotix M15 camera photographs the passing vehicle and measures its size. Beyond the gate is a second traffic light with an arrow indicating the direction the truck should follow to dump the snow load, assuming the tag ID is approved and matches the size of the entering vehicle. If the truck does not have an approved tag appropriate for its size, the arrow points in the opposite direction, toward the exit, explains Marvin Skinner, Reliable's division manager.

The system includes a photo-electric sensor that detects a beam of light transmitted across the road leading to the dumping area. In the event that a truck has been denied entrance but crosses that beam anyway, the solution determines that an unapproved dump is about to take place. Another camera onsite captures the vehicle's license plate number and records video footage of its actions, so that the driver can be contacted.

As the truck enters the facility and its tag is interrogated, the Lenel software (which Lenel customized for this application) forwards the usage data to Regina's billing department software. The city charges $5 to $35 per visit, based on the vehicle's size, as reflected by its RFID label's color. The software offers both billing and prepayment options, so the amount of the dump can be deducted from the prepaid balance, or else a bill can be sent to the hauler.

At the exit, a solar-powered vehicle gate opens automatically as the vehicle approaches. This allows the truck to exit the site, while preventing other vehicles from entering through that gate.

Reliable Security and Controls' Marvin Skinner

"We've tested the system at 35 kilometers per hour," says Skinner, while the maximum speed at the gate is set at 15 kilometers per hour. If a driver slows down excessively, he adds—coming to a full stop, for instance—that can interfere with the camera's measurements, so the system is designed to encourage drivers to continue moving forward.

Because snow and ice pose some environmental challenges for RFID technology, Skinner says, Reliable simulated snow on windshields that might block RF signals transmitted by a reader or tag. The company placed soaked papers over a vehicle's windshield, for instance, and found that its tag could still be read.

According to Kyle, the city expects to sell windshield labels to about 115 companies, and many of those are being applied to the vehicles of businesses that haul multiple loads each winter. So far, no snow collection has yet taken place in Regina, but the season typically begins in November. Some haulers have complained about the cost of paying for a service that was once free. In response to such concerns, Kyle says, "The idea is not for the city to make money, but to offset the cost of operating the facility."