

Understanding RFID Choices in Waste and Recycling

There are several different types of radio frequency identification (RFID) offerings available in the marketplace today, but the two most commonly talked about for the trash collection marketplace are Ultra High Frequency (UHF) and Low Frequency (LF). Though the theory of operation between these two is similar, there are unique differences that separate these two offerings.

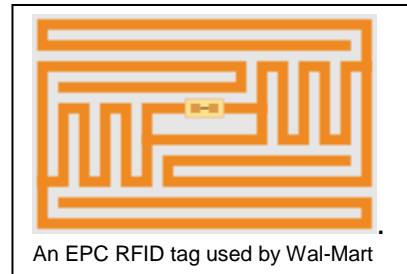
LF uses magnetic or inductive coupling between the RFID antenna and the tag, where UHF uses electromagnetic coupling between the antenna and the tag. Without going into a physics lesson, LF RFID will provide a read range between a few inches to perhaps a foot, where UHF will provide a read range between a few inches to 30 feet or more. LF is referred to as a contact read, meaning that the tag must be in very close proximity to the antenna. Ranges may vary depending on physical, temperature, and environmental conditions associated with the read zone area. The increase in RFID activity in the last few years has been largely due to new developments in the UHF space, with applications moving quickly from LF to UHF to take advantage of the additional range and speed of UHF systems.

UHF also allows for “Near Field” effects, where the tag can perform like a lower frequency tag at a shorter range, but have the range benefits of a UHF tag at further ranges. For waste and recycling collection applications, a variety of ranges distances are required or desired based on the multiple types of collection systems. The ability to distinguish a RFID tag from a frontload recycling container or a RFID tag affixed to a frontload trash container needs to occur at maximum range. By utilizing UHF, the driver can be alerted to wrong material types, wrong pick up days or stop service locations before the forks are placed in the pockets of the container. In the case of fully automated residential sideload pickup, the UHF antenna can be gained down to only read the RFID tag in the container in front of the arm. By gaining down the antenna and reading only the data in front of the arm, misreads and non serviced carts are not read. Therefore a UHF offering is a better choice for trash collection applications from a read range standpoint as it combines the advantages of the LF technologies with the extended range UHF offers.

UHF RFID affords your industry the ability to define the event validation process. By utilizing the variable read distances of UHF, an event data capture system can distinguish the difference between a rolloff box delivery, a dump and return, a box switch and box relocation for rolloff trucks systems. A UHF RFID data event capture system can track all container activity and associate those activities with the trucks that read the tags. A rear load manual collection system is the most basic process flow in the waste and recycling industry. In order to automate data collection for this process, UHF is the only suitable solution. If recycling bins are RFID tagged and the contents are manually dumped in the rear hopper of a truck, a read range of at least 10 to 15 feet is required to read

the tags on the bins. A UHF RFID data event capture systems can then associate those recycling bin tag reads with the assigned account and provide accurate data to determine the true effectiveness of recycling initiatives.

An international standards group under the stewardship of GS1 called EPCglobal is focused on creating data standards for RFID based systems. Much of the work in this group in the past few years has focused on UHF RFID, because as an emerging technology there is a desperate need for standards amidst a rapidly growing number of use cases. Along with



Waste and Recycling Collections, Retail, Manufacturing, Health Care, Logistics, and Asset tracking have all been important areas of growth. Returnable assets in particular have been a hot button item in the last few years, and shared implementation information as well as data standards to allow systems to be used across industries are constantly under development. Standards create stability and confidence in a new technology, speed adoption, and reduce costs.

In the area of returnable assets there are many successful implementations involving full pallets, totes, and specialized trash containers (metal dumpsters and plastic carts for example). The majority of the successful applications have involved UHF RFID simply because of the range advantage. Typically, even in situations that are considered fairly “close range” (an employee carrying a tagged item through a door, or reading a box of tagged items on a table top) UHF prevails because the longer range gives much better tolerances for all of the thousands of exceptions. Generally, when humans are involved, UHF works best because the process or products’ path of flow can change quite a bit, and having a 1 or 2 foot maximum range doesn’t allow for much tolerance in this space.

No truer words have been spoken regarding your industry when discussing data, “Garbage in...Garbage out. Any RFID technology can only have a relevant effect in your business if you understand what you want to accomplish. Before implementing any RFID based technology, a large amount of time must be committed to understanding the existing process flow and the events that are to be captured in that process flow. The solution of automating data collections can only occur if you have defined the problem.

About the author:

Justin Patton is Managing Director of the RFID Research Center at The Sam Walton Business School, University of Arkansas. Justin Patton earned his undergraduate degree in Physics from Hendrix College and his master’s degree in Computer Engineering from the University of Arkansas. As Managing Director he oversees the world’s only academic EPCglobal-accredited lab in exploring

various industry research and implementation areas with several RFID partner organizations, including technology vendors, retailers and suppliers. Justin also serves as co-chair of the EPCglobal Performance Test Center Council.