



The 7 Costs of RFID Real-Time Location Systems for Logistics

Every year, companies lose millions thanks to the multitude of errors made and the thousands of employee hours spent managing valuable assets, often with very different life cycles. Why? Because they remain wedded to manual asset tracking systems like paper records and digital spreadsheets that require human input.

For one thing, nobody's perfect. As a result, people unwittingly make costly mistakes, particularly when they are entering, updating, auditing, and reporting reams of data by hand in an ever more complex regulatory environment. For another, time is money, primarily when it's devoted to keeping up with assets like tools, equipment, and vehicles that have divergent life cycles and constantly move around. What's more, as businesses grow, so do the number of assets they own and lease, which means a lot more data to maintain and resources to monitor. So, you can imagine the increased potential for human error, not to mention the extra staff

time required - both of which will likely harm the bottom line.


That said, organizations of all types and sizes across multiple industries are moving beyond manual tracking methods to invest in a real-time location system (RTLS) such as AirFinder by Link Labs.

And in doing so, they are realizing significant returns when boosting productivity and profitability while minimizing risk and loss.

Just imagine having a system that can increase tracking accuracy by more than 90% while increasing staff efficiency by as much as 75%.

90% Tracking Accuracy

75% Staff Efficiency



Of course, a growing number of asset management solutions are grounded in a wide range of RTLS technologies that vary in function, complexity, and expense. But for indoor positioning, systems incorporating Radio Frequency Identification (RFID) can be a cost-effective option for locating assets and people.

The Basics of RFID

RFID has come a long way in a relatively short time. Rooted in WW2-era radar technology, the first RFID devices hit the market in 1966 in security tags, followed by RFID chips in 1979.

Then in 1987, European countries began incorporating this technology in toll road payment systems; by 2000, they had submitted more than 1,000 patents for RFID. Now, 20+ years later, RFID continues to drive the rapidly growing RTLS market worldwide.

As a form of wireless communication, RFID employs powerful radio waves to send and receive messages from asset tracking tags, which, when "read," provide information about both asset identification and location.

These tags comprise an electronic chip for storing data, an antenna for signal processing, and a reader for transmitting and receiving radio waves. Moreover, there are two types of RFID systems—passive and active. Both can be read in transit, storage, or used under various environmental conditions and without physical contact. Yet, although they perform similar functions, they use very different technologies.

Passive RFID systems use a high-power, low-frequency actuator to emit radio signals that "wake up" a tag, which then responds with a coded message at a higher frequency and lower power. In doing so, they use either handheld readers or fixed at specific choke points through which assets move in and out of a designated area. These passive tracking tags are, by design, small and thin. Moreover, they are not only inexpensive—between \$0.10 and \$1.50 per tag—they do not require batteries (so they last for many years). But on the downside, the overall system infrastructure is expensive and can only detect the "presence" of a tag and not its exact location. Likewise, tags have a relatively short read range of around 20 feet. Active



RFID systems, on the other hand, use battery-powered tags working in concert with Bluetooth beacons to connect to various access point readers throughout a designated area and transfer data to the server or cloud. While active tags are heavier (because of the battery) and more expensive (\$10+) than their passive counterparts, the requisite infrastructure is much cheaper.

In addition, they have a more extended read range of up to 300 feet, and the real-time location information they provide is more accurate. So, they offer an excellent return on investment in theft and loss prevention, as well as improved productivity—making them an increasingly popular choice. Indeed, according to a recent study by Research and Markets, experts predict that by 2027, there will be 267 million active RFID asset trackers in use worldwide in industries like manufacturing, logistics, construction; healthcare and hospitality; agriculture, and mining.

Investment Cost

In choosing one type of RFID RTLS solution over the other, you will need to consider the

trade-offs between accuracy, coverage, and complexity within the context of investment costs—both fixed and ongoing. Here is a breakdown of seven costs inherent in active and passive options to help you get started.

Equipment Costs

If you select a passive system, you'll want to factor in the price of the RFID reader, along with the additional costs of cabling and antennas. For example, an Impinj Speedway fixed reader could run around \$1,500. But when you factor in the additional cabling and antenna costs, you might be looking at a total expense of \$3,000 per reader.

And to ensure all assets are trackable in a typical manufacturing facility, fixed readers are needed for all entry/exit choke points and common material storage areas.

Likewise, to get the location granularity you require, you will probably need a dense network of these readers—so be sure to budget accordingly. On top of that, you typically have to run power over Ethernet (PoE) to passive RFID devices, which can add to your equipment costs.



Conversely, active RFID equipment is significantly less expensive, given that this tracking method eliminates the need for costly fixed readers at multiple choke points. Unfortunately, consequently, the requisite equipment isn't as powerful or technologically sophisticated.

Although a standard Bluetooth-based active RFID system may have fluctuating levels of accuracy, AirFinder, for example, uses a hybrid approach. Location beacons are strategically placed with either high or low density, depending on the desired accuracy level, making them highly affordable.

Active systems using ultra-wideband (UWB) radio technology are beginning to enter the market. Yet while they are incredibly accurate (generally down to a few centimeters), that level of precision comes with a cost, given the number of antennas required. UWB systems can also be even more costly—by as much as ten times over Bluetooth systems like AirFinder, sometimes rivaling the costs of passive solutions.

Installation Costs

Passive RFID must be installed by an expert who is well versed in turning the equipment, directing the antennas, running the necessary connectivity tests, and configuring all of the settings and networking details.

The readers are typically connected via a local area network (LAN) to a central server, usually on-site, that processes all the RFID data. Likewise, these passive RFID systems' specialized antennas must be installed and carefully calibrated to ensure appropriate performance. So, you look at high installation costs when all is said and done.

On the other hand, active RFID systems like AirFinder that use Bluetooth beacons can be installed in as little as one day, making the process simpler and less cost-prohibitive.

For the most part, active readers can be positioned wherever it's most convenient, negating the expense associated with reconfiguring your facility. At the same time, however, UWB-based RTLS comes with installation costs that can exceed even those of passive RFID.



Tag Costs

The low cost of passive RFID tags is one of the primary benefits you will realize with this type of system. But, of course, the price goes up slightly if you need to track a metal object.

As for active RFID, tags are one of the few actual costs you will encounter. Although RF beaconing-style tags are still less expensive than those used for alternative technologies like UWB, you can expect to pay up to (or more than) 100 times as much for an active RFID tag than for a passive one—\$5 to \$15. But there are many times when the additional expense is well worth it.

For example, Link Labs offers an innovative product—AirFinder SuperTag—which couples active, Blue tooth-based RFID tags with wide-area technology like cellular and GPS to provide seamless indoor/outdoor locating and tracking. So, the higher cost makes perfect sense for companies that want to ensure end-to-end asset visibility throughout the supply chain journey.

Battery replacement is yet another cost factor for active RFID tags, in that some systems have disposable tags. In contrast, others make it possible to exchange batteries after reaching the end of their useful life. Either way, the battery life cycle, and associated labor expenses must be factored into the equation when calculating overall tag costs for an active RTLS.

Software Costs

Both passive and active RFID readings are useless without asset management software, which can cost you a large sum, depending on the capabilities you seek in real-time location system software.

Generally, the software's complexity and specialization drive its cost. So, a rudimentary tag reading software could be open source, whereas an integrated RFID enterprise application might cost hundreds of thousands of dollars to maintain. And there are active RTLS systems like AirFinder that use a cloud SaaS model, in which the software expense is bundled with other system costs.



Ongoing License Costs

While active RFID licensing costs are typically rolled into the overall software expense, the opposite is typically for passive RFID licensing costs, which are often ongoing to cover service support and software upgrades. As they can be pretty expensive, they should be calculated upfront before signing the contract for a passive RFID system.

These license charges are widespread for Wi-Fi-based RTLS systems where the location technology is an add-on to existing Wi-Fi access points. For instance, Cisco Meraki is one such Wi-Fi-based active RTLS with an ongoing license fee.

Maintenance Costs

The recurrent maintenance costs associated with both active and passive systems are, for the most part, pretty much the same—although the causative factors are usually different.

For example, passive readers are more complex than active readers due to their extensive cabling and antennas, which means they are

also reasonably large. Consequently, they're at greater risk of being snagged or bumped in busy industrial settings, which could lead to costly maintenance issues, especially without structural facility modifications to accommodate the hardware.

As for active RFID systems, they are less complex, but their tags include batteries that will need to be maintained anywhere from a few months to every few years, depending on their life expectancy. This is why you will want to take a long, hard look at active solutions that sip rather than gulp power.

Training is another aspect of ongoing system maintenance and one that customers sometimes fail to consider. For an RTLS deployment to be successful, all staff must be trained initially and on an ongoing basis to realize the return on investment fully.

Integration Costs

Integration costs can be high, especially if you purchase your RTLS from an integrator. However, these companies typically make a team of experts available to help you design a solution that best fits your



unique business needs. So while you'll likely pay a premium over what you would pay if you went directly to the technology provider, the additional expense may be worth it. But before you do, check out RTLS technology providers that furnish installation, design, and support services for their products. For example, Link Labs bundles these services into the ongoing system costs for its proprietary AirFinder RTLS.

Cost Isn't Everything: The Iron Triangle of Asset Tracking

While investment expense is an important variable—especially when your budget is stretched—it would be wrong to say that choosing a right fit RTLS should be based solely on cost considerations. For example, the price tag for a passive RFID system is often nearly the same as for an active RFID system when you factor in all the component costs that comprise the total.

Each option comes with strengths and shortcomings, depending on a variety of factors that have an impact on your selection: riety of factors that have an impact on your selection:

- » The value (monetary and otherwise), as well as the material composition (e.g., metal, plastic, or fabric) of the assets you will be monitoring.
- » The size and shape of the area in which the tracking technology will be deployed will affect the number and location of RFID readers required to meet the accuracy level and read range you need
- » The amount of wear and tear your RFID devices are likely to undergo.
- » The quality and functionality of a system compatible with your desired price point.

So, for example, let's say you are the purchasing manager for a large enterprise or a company with a complex use case. You would probably opt for standalone asset tracking software to run several tracking and sensing solutions.

But like most organizations, yours might be better served with a full-stack RTLS solution. And if you choose an end-to-end solution, you won't have to deal with the headache of integrating the hardware and software. AirFinder is one proven active RFID solution that hits the mark on all three points of the



asset tracking iron triangle: quality, affordability, and functionality. And if you'd like to learn more about this trailblazing product and how it might be the “right fit” choice for your unique business needs, contact us today to learn more.

About Link Labs

We pursue answers to complex technical challenges without bias, innovating ourselves and leveraging the innovations of others. We further embrace the challenge of making these innovations easy to use and cost-effective, creating an ever-expanding set of possible applications and impacts. Link Labs uses patented and innovative technology to deliver easy, affordable, and impactful IoT solutions. Link Labs' flagship product offering, AirFinder, is an asset monitoring solution that delivers real-time location intelligence to customers in the hospitality, healthcare, manufacturing, supply chain, and more.