



RFID IN THE LOGISTICS INDUSTRY

HOW RFID IS TRANSFORMING THE
LOGISTICS LANDSCAPE

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THE LOGISTICS INDUSTRY IS ALL ABOUT MOVING AND TRACKING GOODS



360° inventory management



Time efficiencies



GPS location



Office to warehouse data

Knowing what is where at any point in the supply chain – in the factory where the goods are made, assembled or finished; in the truck that moves them from factory to warehouse; on pallets or shelves in the warehouse; in transit to the retail store or direct customer; in the store's goods-in area, stock room or out on the shelves.

That's a lot of tracking, of a lot of goods, and it would be impossible to do efficiently without technology and automation.

IBIS World, in its report, 'General Warehousing and Cold Storage in Australia', identifies 250 key success factors for this industry, with two of the top four being:

Automation - Using automated technology tends to reduce labour expenses and provide industry operators with competitive advantages.

Use of most efficient work practices - Efficient work practices minimise labour costs and ensure profitability is maintained.

AIDC (AUTOMATED IDENTIFICATION AND DATA CAPTURE)

The primary tracking technology used in the logistics industry is collectively known as Automated Identification and Data Capture (AIDC). AIDC technology helps logistics organisations to automatically identify objects, read data about them and enter it into operational systems, with no (or minimal) human intervention.

TRADITIONALLY, THE MOST WIDELY USED AIDC TECHNOLOGY HAS BEEN BARCODING – EITHER 1D OR 2D PRINTED LABELS THAT CAN BE SCANNED BY BARCODE READERS TO IDENTIFY AND KEYS TABS ON THE GOODS.

The other key AIDC technology is Radio Frequency Identification (RFID). RFID adds increased functionality over barcoding and is becoming more widely used within the logistics industry. Radio Frequency technology isn't new – it was first used in radar systems to identify aircraft as friend or foe (IFF) during the second world war.



However, the issue for logistics relatively recently was a commercial one – cost made the widespread use of RFID impractical, and it was used only on large infrastructure items or expensive goods. Change was driven by two significant factors in the early 21st century:

Firstly, the development of a standardised coding format. Widespread adoption of the Electronic Product Code, or EPC, drove a 75% reduction in the cost of RFID tags.

The second influential factor was the US Department of Defence and retail giant Wal-Mart mandating that all their suppliers enabled RFID tracking on their products.

THE PRICE CONTINUES TO DROP, WITH INDUSTRY SOURCES PREDICTING THAT IT WILL REACH 5C BY 2025.

WHAT IS RFID?



So what is RFID, and what are the benefits for the logistics industry compared to barcode labelling?

How can RFID labelling help logistics organisations to drive even greater efficiencies and offer opportunities for differentiation, growth and future-proofing?

An RFID system stores unique identifying data on a tag. The identifying data is in the form of an EPC, which links to an inventory database. The tag may contain more detailed product information, including date of manufacture, destination, sell-by date stock number and batch number.

The information in the tag is captured by a reader via radio waves. The reader transmits an encoded radio signal which is received by the tag, which responds with its identification information.

Difference between RFID and barcoding

Whilst there are certainly similarities between RFID and barcode labels, the RFID tag offers several benefits over barcoding:

1. An RFID tag stores information about an individual product, whereas a barcode is linked to a product category, using the same code for every instance of that product.
2. RFID tags can be much smaller than a barcode label, allowing them to be used on a wider range of products.
3. Because they use radio waves, RFID readers do not require line of sight to the tag they are reading.
4. Barcodes can only be read individually – RFID technology allows multiple tags to be captured in a single read, including the entire contents of a box, pallet or room.
5. RFID tags broadcast information, whereas barcode labels are passive.
6. RFID tags can be made to be far more rugged than barcode labels.
7. RFID readers can be fixed in place, for example at entry and exit points of a warehouse or store, or on the shelf, to automatically detect and track movement of tagged items.
8. RFID tags can incorporate additional technology, monitoring of conditions such as temperature and humidity, enabling them to be used to monitor against mandatory storage conditions for perishable items.
9. An RFID tag can hold more data than a barcode can.
10. RFID tags tend to be more robust, and less prone to damage such as tearing and smudging.

HOW DOES RFID WORK?

An RFID system consists of a tag and a reader, linked to backend software systems such as an inventory database.

Tag

The tag holds the unique identifying information and is attached to the item it identifies. There are two categories of tag – passive and active.

Components of the tag are:

- a chip with non-volatile memory – read-only (RO), write-once, read-many (WORM), or read-write (RW).
- an antenna.
- a substrate – the chip and antenna are attached to the substrate.
- a battery – active tags only.
- additional on-board electronics (sensors, microprocessors, and input/output ports) – active tags only.

Passive	Active
Chip	✓
Antenna	✓
Substrate	✓
Battery	✓
Electronics	✓

Passive tags

A passive tag has no power. On receiving a signal from the reader, it wakes up and reflects back a signal which the reader can interpret. The range of a passive tag depends on the frequency used, with three main frequencies giving read ranges of 1-10cm (used typically in farming applications, for tagging livestock), 1-100cm (typically used for access control) and up to 30m (the most commonly used in logistics for tracking items).

A passive tag can be small, flexible and have a range of formats, the most common of which are:

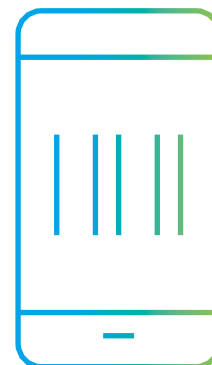
- Dry – the tag is mounted on a web-like substrate.
- Wet – the tag is mounted on an adhesive layer, effectively being used as a sticker.
- Paper face – a wet tag with a paper surface, useful for when the tag needs to be printed.

Active tags

An active tag has its own battery power source, giving it a longer read range than a passive tag and a larger memory bank to store more information. An active tag may also have additional functionality, such as monitoring environmental factors (e.g. temperature, humidity).

There are two kinds of active tag:

- Transponder – a transponder active tag, like a passive tag, waits for a signal from the reader before sending out information. When out of range of the reader, it conserves its battery.
- Beacon – a beacon, as its name suggests, actively transmits information, typically every 3-5 seconds. It typically has a very long read range (up to 100s of metres) and its constant location update sees it used in, for example, cargo tracking.



HOW DOES RFID WORK?

Tag technology continues to advance, primarily in the areas of:

- Miniaturisation – as tags become smaller, the chances of a tag becoming detached is reduced.
- The range of environments in which they will work - earlier tag technology was not 100% reliable if the product contained metal or liquids.
- Durability – the lifetime of a tag. The majority of tags are applied at the point of manufacture, so have to be able to last the entire journey along the supply chain.

Passive vs Active tags

- The type of tag used by an organisation will depend very much on the application. Each type of tag has its pros and cons: passive tags are cheaper, smaller and have a longer life, whereas active tags have a longer read range and a wider range of applications.



Passive Active

Power	No	Yes - battery
Size	Small – can be the size of a grain of rice. Thin, flexible	Larger, more rigid, less flexible
Cost	Cheaper – few cents 7-15c in 2016 (US) predicted at 5c in 2025*	Higher - dollars
Read range	Shorter (few metres)	Longer (30m)
Life	Long (could be 20 years+) as no battery replacement	3-5 years before new battery needed (replacement of tag)
Usage	Product information and EPC (serial number)	Beacons – real time location information. Can include added sensors to detect e.g. Temperature, moisture; High speed reading e.g. road tolls

*Data from EPC Global

RFID APPLICATIONS AND BENEFITS



SMART LABELS

Smart labels incorporate both RFID and barcode technologies. They consist of an adhesive label embedded with an RFID tag inlay along with a printed barcode.



BENEFITS OF RFID FOR LOGISTICS

Compared with barcode labelling, RFID offers faster data capture about a wider range of objects, active tags enable a far wider range of applications. This generates real time data accuracy, faster, improved tracking of inventory and assets, and reduced labour costs.



READER

- Hand held – used by staff, similar to a barcode scanner, and the predominant form of reader at present.
- Vehicle mounted.
- Fixed:
 - Transition readers – fixed (often overhead) are set up entry and exit points e.g. of a warehouse or store, to create a tightly controlled interrogation zone, which enables the tracking of stock from part of the supply chain to another and detection of theft.
 - Shelf readers – to detect low stock, out of stock.
 - Integrated POS readers – for swifter checkout in retail stores.



INVENTORY VISIBILITY AND ACCURACY

Logistics companies can achieve faster processing of delivery and dispatch, fulfilling customer orders more efficiently. They can support their retail customers who want to adopt a 'just in time' stock holding system. Data from a study of 10 UK retailers (Measuring the Impact of RFID in Retailing: Keys Lessons from 10 Case-study Companies, by Emeritus Professor Adrian Beck of the University of Leicester), showed inventory accuracy improving from 65%-75% (before RFID) to 93% to 99% (with RFID).

RFID APPLICATIONS AND BENEFITS



ENABLING OMNI-CHANNEL RETAILING

For retailers, and the logistics organisation that support them, supply chain visibility underpins the ability to offer omnichannel retailing, which is for many, their number one transformational priority.



ASSET TRACKING

Having the right storage and transportation materials in the right place at the right time is essential in logistics, and RFID can be used to track and therefore maximise the use of pallets, racks, crates and boxes.



SHRINKAGE PROTECTION

RFID can be used to detect goods that leave a retail store without payment or leave a warehouse without authorisation.



TRACKING OF SHIPMENTS

RFID can be used to track entire shipments, not just individual items, enabling complete visibility as they move throughout the supply chain.



SECURITY ACCESS

Control of restricted areas to authorised personnel.



VEHICLE LOGISTICS

RFID technology can track vehicle movements, optimising routes for faster deliveries and reduced costs.

RFID APPLICATIONS AND BENEFITS



STOCK LEVEL ACCURACY

Accuracy of stock levels allows logistics organisations to optimise their stock holding, re-ordering when stock levels reach a pre-determined level, reducing capital outlay whilst ensuring no stock outs occur. This in turn increases sales and customer satisfaction.



STAFF PRODUCTIVITY

The speed of RFID data capture, the non-line of sight and the ability to capture multiple items in a single action drive increased staff productivity and savings.



To learn more about industry technology and changes, go to:
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