Ramp

RFID Tagging Explained

A clear guide to passive UHF RFID for better control of inventory and assets.

Introduction to RFID

RFID stands for Radio Frequency Identification. At its core, RFID is a way to use radio waves to identify and track objects. You can think of it as the evolution of the barcode. Unlike traditional systems, RFID doesn't need a clear line of sight. And it delivers accuracy rates above 99 percent.

If you've ever tapped a contactless card, you've already used RFID. The big difference is scale. You have to scan barcodes one by one. Whereas RFID can read hundreds of items in seconds. Even if they're stacked, packed, or moving down a conveyor.

90.82% of your time saved performing asset tracking.

That speed and flexibility make RFID invaluable for industries where every item matters. Industries like, retail, logistics, healthcare, construction, and manufacturing. It helps track pallets, cages, surgical kits, or high-value tools. All with less effort and fewer mistakes. The result is efficiency, accuracy, and near real-time visibility across operations.

There are two main kinds of RFID tags.

Passive RFID tags don't have a battery. They draw power from the reader signal. It's like an echo. The reader sends out a signal, the tag picks it up and echoes it back. The echo is strong enough for reliable reads up to 10 meters but will fade with distance. That's why you won't get a read from 100 meters away.

Active RFID tags carry their own power source. Their built-in energy extends the range but also raises the cost. Which is why active tags are only used in specific scenarios. You might use an active RFID tag for vehicle tracking or mining. They can also be good for monitoring environmental conditions.

In practice, accuracy is often more important than distance. Correct setup of passive RFID systems allows them to reach near 100 percent accuracy. The reliability is more valuable to most businesses than an extra 5 meters of read range.

RFID systems also run on three frequency bands:

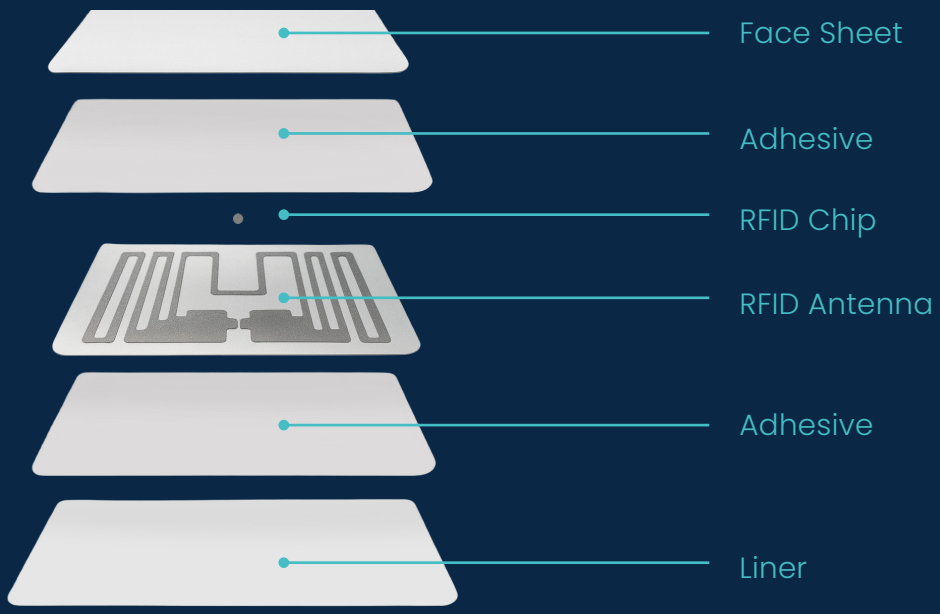
Low Frequency (LF)
Used for animal tracking and access cards. Range up to 10 cm.

High Frequency (HF)
Used for library books and smart cards. Range up to 1 m.

Ultra High Frequency (UHF)
Used for inventory, logistics, retail, asset tracking. Range up to 10+ m.

This guide focuses on passive UHF RFID. It offers the strongest balance of range, speed, and affordability for inventory and asset management.

The Anatomy of an RFID Tag



Every RFID tag has three core parts:

RFID Chip (IC)
Holds the data, usually a unique ID that ties the tag to an item.

Antenna
Picks up and sends the radio signal.

Substrate
The material that supports and protects the chip and antenna.

You can combine these elements in different ways. The type of chip, the shape of the antenna, and the choice of substrate all affect how the tag performs. This is why you'll often hear about finding the right tag for the right job. The tag that works well on a cardboard box in a warehouse might fail on a steel tool in a workshop.

Why RFID Tag Choice Matters

Not every tag fits every situation. The environment, the type of item, and how you plan to read the tags all play a role in what will work best. This is why speaking with an RFID expert before buying in bulk is worth the time. The right match ensures accuracy, durability, and a better return on investment.

Common form factors for RFID tags:

RFID label tag
A flexible sticker that attaches to packaging, pallets, or retail items.

RFID hard tag
A rigid design, often screwed or strapped to assets that need durability.

RFID on-metal tag
Built with special materials to work on metal surfaces.

RFID inlay
A bare chip and antenna, embedded into other materials or products.

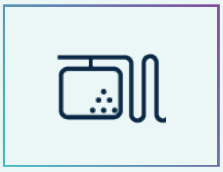
You can fix RFID tags in place with:

- Adhesive backings (sticky labels)
- Rivets
- Epoxy
- Cable ties
- Magnetic fasteners

RFID Tag Placement

Getting the most out of RFID starts with putting the RFID tags in the right places. Good tag placement means reliable reads. Poor tag placement can create blind spots.

Do's



Keep it Flat

Place RFID tags on smooth, non-metallic surfaces wherever possible.

Face Reader

Ensure RFID tags are aimed toward where the reader signal comes from.

Test First

Try different positions on a sample batch of items to see where reads are strongest.

Don'ts

Don't Use Wrong Tag

Standard tags don't work on every surface. Don't fight it. Match the tag to the material.

Don't Block or Bend

Don't bend or block them with material like foil or metal that can be hard for RFID to read through.

Don't Overcrowd

If RFID tagged items are stacked too tightly, reads could be missed. Plan for spacing.

Hot Spots and Cold Spots

RFID signals don't always move in straight lines. They can bounce, overlap, or weaken, which creates stronger or weaker reading areas.

Hot spots: Areas where the signal is stronger than expected. This can stretch the normal read range of an RFID Tag. With some systems, that might sound like a risk. What if the same tag gets read again and again?

With Ramp RFID, that never happens. Our software prevents double counts. You can undercount if a tag isn't found, but you can never overcount. That means if the RFID system says you have one left, you can trust that you have one left.

Cold spots: Areas where the signal is weaker and tags may be missed. To prevent this, our team tests your space with sample RFID tags before rollout.

By mapping where reads are strong or weak, we can fine-tune antenna angles or add readers so coverage is even across your operation.

How Items Get Tagged

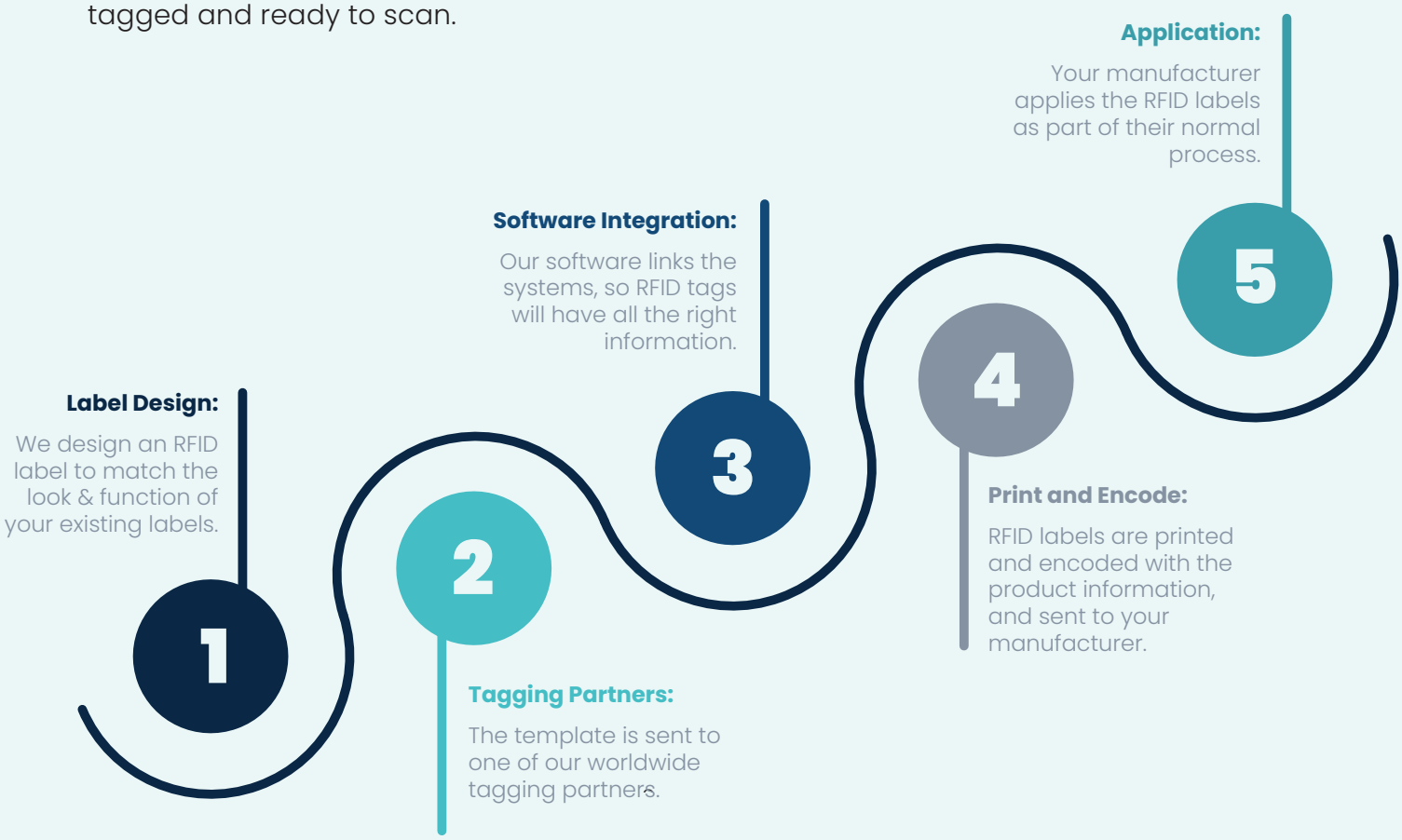
One of the first questions people have about RFID is simple: when and how do the RFID tags get put on? The answer depends on the type of item and where it sits in the supply chain. In reality, most businesses use a mix of approaches.

Source Tagging

The most efficient option is to tag items with RFID at the point of manufacture. This means RFID tags are applied by the supplier or manufacturer before the goods ever leave the factory. By the time they reach your site, they're already tagged and ready to scan.

Source tagging saves time at receiving, ensures every unit is tagged in the same way. It's ideal for high-volume products.

Because it uses an existing step in production, it doesn't add extra work for your on-site team. The only setup needed is an integration between our RFID software and your existing system. That way information flows seamlessly to the tagging partner.



Warehouse Tagging

Sometimes goods arrive without tags. In this case, they can be tagged in the warehouse, often as part of the receiving process. Your team applies the labels as goods come in, so everything is tracked before it moves further into your operation.

This approach is useful during the transition to RFID, or when dealing with mixed stock that didn't get tagged at source. The trade-off is additional labour. Adding tags in the warehouse takes time and planning to avoid slowing down operations.

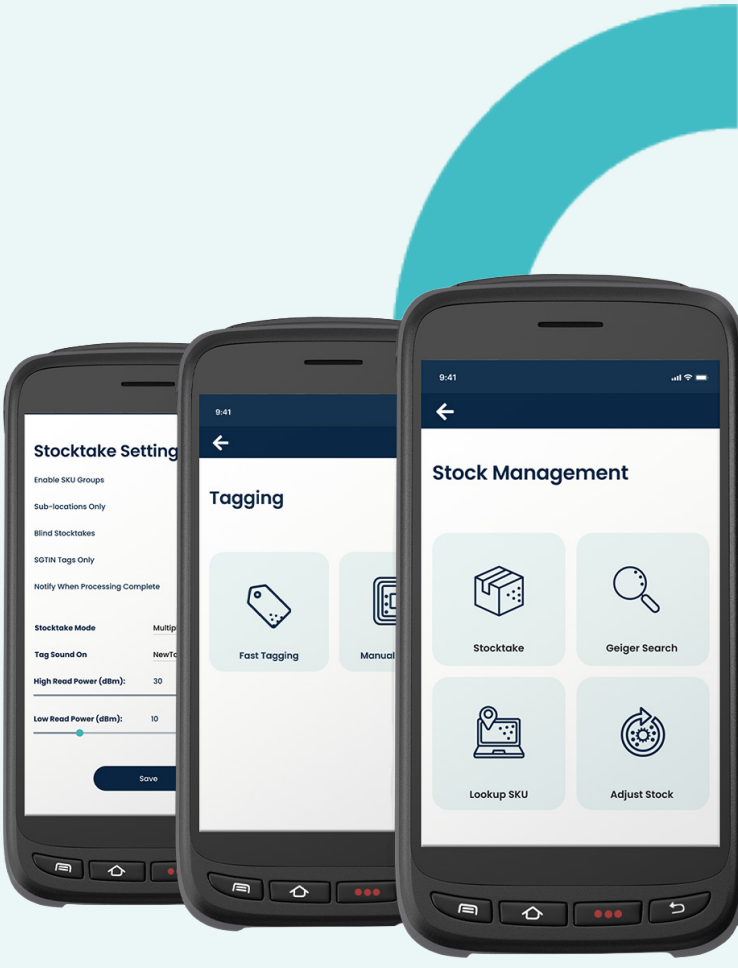
In-Store Tagging

For retailers, there are times when tagging happens right in the store. This is common in the early stages of a rollout, or when certain items arrive untagged. Staff can use handheld RFID devices or desktop printer-encoders to generate and apply tags on the shop floor or in the back room.

In-store tagging gives flexibility, but it's also the most labour-intensive. To make it work smoothly, many retailers schedule tagging during quieter hours, and train staff on how to apply tags correctly.

Blended Approach

In practice, most companies use a mix: source tagging for products that move through in bulk, warehouse tagging for items that slip through, and in-store tagging to cover exceptions. The right balance depends on your supply chain, the type of goods you handle, and how quickly you want to see results.



An RFID System

Once items are tagged, the rest of the system takes over. Readers, antennas, and software work together to capture movements and turn them into the visibility your business needs.

Hardware

Every RFID system has three main parts. The RFID tags themselves, a reader, and an antenna. Readers can be fixed in place, like at a dock door or entry point, or handheld for mobile use. The antenna is what sends and receives the signal. Together, these pieces capture where your items are and when they move.

Software

The real power of RFID comes from the software. It takes every read from the hardware and turns it into usable information. What was found, where, and when. It can flag missing items, misplacements, or unauthorised movements. This information can be viewed in a dashboard, a mobile app, or built directly into your existing systems.

Integration

RFID doesn't replace the systems you already rely on. It enhances them. When an inbound pallet is scanned, your ERP updates automatically. When a tagged tool is checked out, it's logged against the right job order. When returnable crates move through your operation, you see where they are in real time.

Reduce shrinkage and loss by more than 50%

FAQs

Do RFID tags replace barcodes?

Not necessarily. Many businesses use both. Barcodes are cheap and simple, while RFID gives you speed and accuracy at scale. Often, RFID tags are designed to look like your existing labels, which include your barcodes, so staff don't have to change how they handle items during regular processes like at the point of sale.

Can RFID tags be reused?

It depends on the tag type. Labels are usually single-use, while hard tags and on-metal RFID tags can be reused many times. The right choice depends on whether you're tagging disposable packaging or durable assets.

Will RFID work in my environment?

Yes. Tags are made for different surfaces and conditions, including metal, liquids, and outdoor use. During design, we test in your actual space to make sure coverage is reliable.

How far can RFID read?

Most passive UHF RFID tags read reliably up to about 10 meters. But distance isn't the most important fact. Accuracy is. With the right setup, you can reach near 100% accuracy, which is almost always more valuable than an extra couple of meters of read range.

What happens if a tag isn't found?

You can undercount with RFID. It's possible to miss an item, but if the system is set up correctly, and staff are properly trained, you can significantly mitigate this risk.

What if you read the same tag multiple times?

This isn't possible with Ramps RFID solutions. The system is designed to only read one tag once. You can never overcount. If the system says an item is there, it's there. Which means you can trust the numbers without second guessing.

Do we have to change our existing systems?

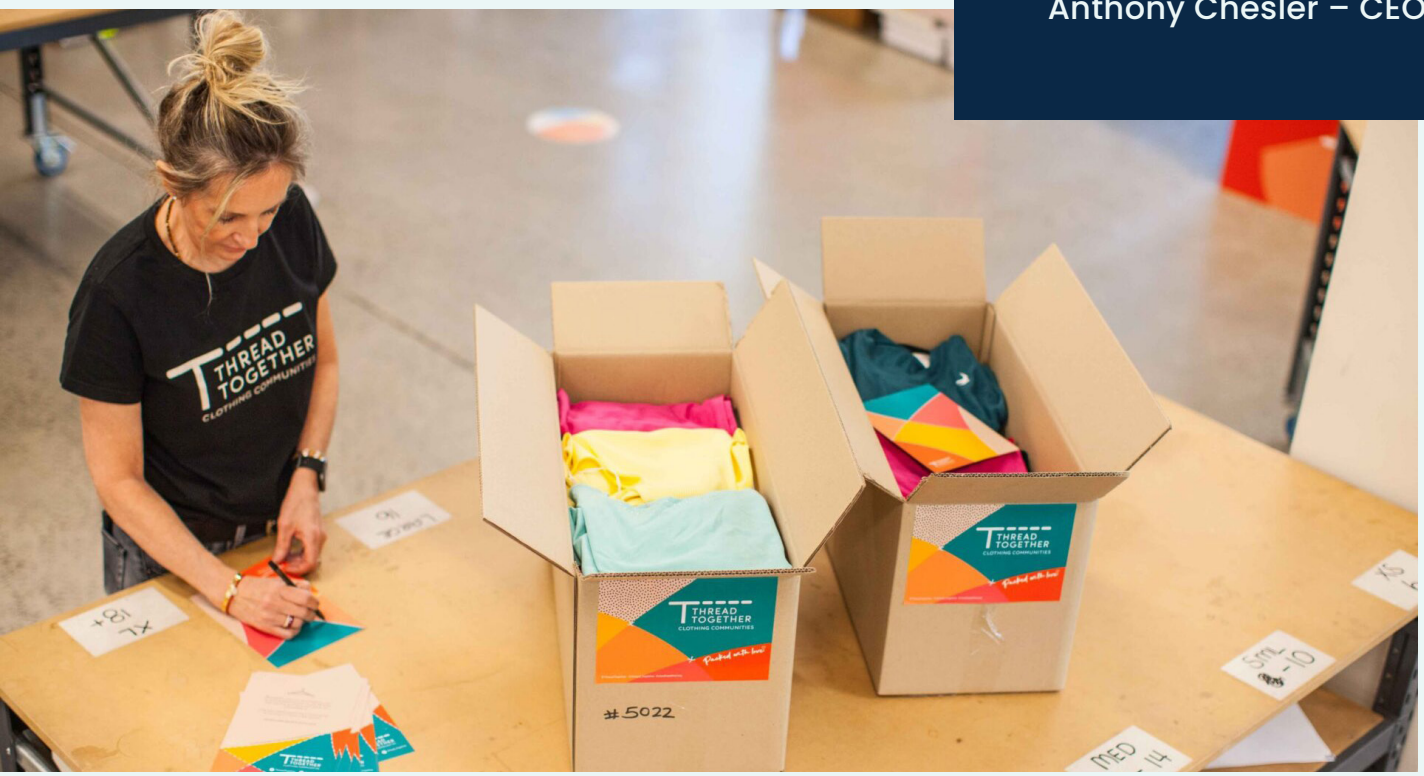
No. RFID doesn't replace your ERP, WMS, IMS, or any other business as usual systems. It enhances them. We integrate so data flows through your existing tools.

Real World Use Cases

THREAD TOGETHER

Thread Together is a charity that distributes new clothing to people in need while reducing landfill. Managing millions of donated garments by hand was slowing them down. Ramp introduced RFID tagging, handheld readers, and cloud-based software to give real-time visibility of stock, sizes, and locations. Volunteers can now process items more quickly, monthly stocktakes are simple, and the charity can respond faster to urgent demand. The system freed up resources, improved environmental outcomes, and made it easier to focus on their core mission of restoring dignity through clothing.

> "Ramp's RFID technology enables us to tag items immediately after they have been sorted into categories and sizes. By being able to do this, with ease, we are now able to rapidly determine the amount of inventory on hand and of equal importance to us, understand where the items are located."
>
> Anthony Chesler – CEO



ARK SWIMWEAR

Ark Swimwear, a fast-growing online retailer, wanted a way to keep scaling without slowing down operations. Working with Ramp, they began tagging items at the point of manufacture and integrated RFID with tools like Inventory Planner, Adobe Commerce, and Starshipit. Receiving times dropped from weeks to days, full stocktakes of 100,000 items can now be done in one day, and shipping accuracy stayed at 100 percent even with seasonal staff. The solution replaced the need for an expensive WMS and gave founder Renée Kirby the confidence to grow the brand knowing every order would be fulfilled on time.

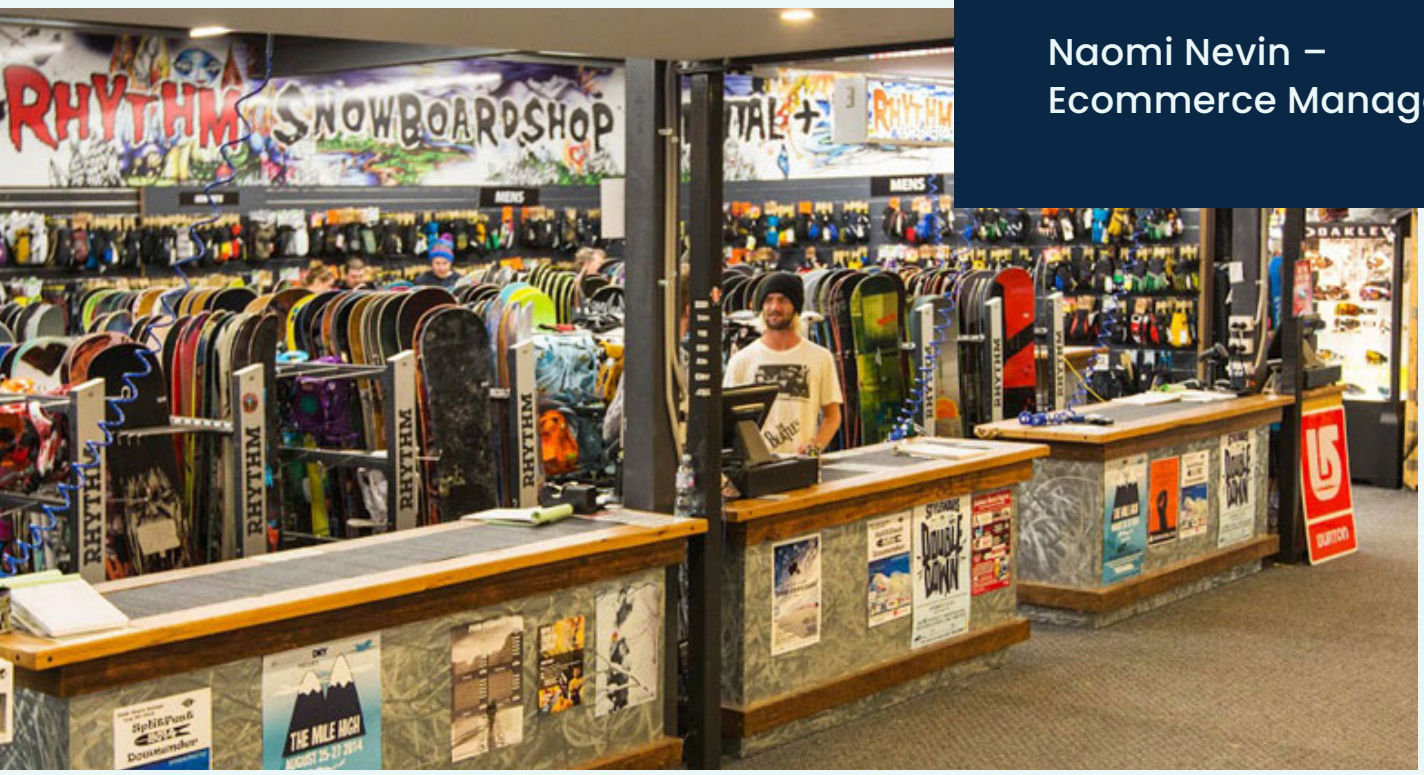
> "The Ramp team worked closely with us through the system design and implementation phase. They were also extremely helpful in setting up the tagging at point of manufacture, which is a critical part of the overall RFID solution."
>
> Renée Kirby, Founder

RHYTHM SNOWSPORTS

Rhythm Snowsports, a 24-hour retail hub in Cooma NSW with over 200 brands, struggled with manual spreadsheets, week-long stocktakes, and an outdated security system. Ramp implemented RFID integrated with their Retail Express POS, tagging items on arrival to enable fast counts and accurate tracking. Staff now use handheld readers to locate items quickly, stocktakes take hours instead of days, and transfers between stores are easier to manage. The result is fewer out-of-stocks, faster online order fulfilment, and better customer service.

"Ramp RFID makes it so much easier to find stock in store or in the warehouse to fulfil online orders. The team can literally cruise the store with a handheld reader to find what they need and ship it immediately. We have reduced out-of-stocks and increased customer satisfaction."

Naomi Nevin – Ecommerce Manager



AUSTRALIAN PARLIAMENT HOUSE

Parliament House in Canberra manages around 8,000 artworks displayed across thousands of rooms, with pieces frequently moved due to political events. Traditional audits were time-consuming and disruptive. Through Smarttrack, a partnership between Ramp and International Conservation Services, RFID tags were introduced along with Ramp's software and the Vernon Collection Management System. This gave real-time visibility of where artworks are, made audits faster and less intrusive, and reduced handling to help preserve the collection.

"Our collection is large and extremely mobile. Not only does it need to be tracked with frequent moves, but we needed a solution that allowed quick audits of artwork in MPs offices with minimum interruption."

Justine van Mourik – Director Art Collection & Exhibitions.

FLINDERS PORTS ADELAIDE CONTAINER TERMINAL

At Adelaide Container Terminal, Flinders Ports needed a faster and more reliable way to manage truck movements and allocate equipment. Manual checks of arrivals and container requirements were slow and labour-intensive. Ramp's RFID system automated truck processing, reducing manual transactions to less than one percent. The system also provided forecasts of container volumes, which improved equipment allocation. The terminal now runs more efficiently, with lower labour costs, higher productivity, and smoother service for transport partners.

"Significant improvements in vehicle tracking efficiency and productivity have been achieved through the implementation of a vehicle tracking system based on RFID technology from Ramp."

Jai Alexander – Yard and Transport Superintendent.

MMG DUGALD RIVER MINE

MMG needed visibility of concentrate production, stock levels, and container movements across its mine, rail, and port operations. Harsh conditions, steel-heavy structures, and limited power made this a complex challenge. Ramp fitted containers with RFID tags and installed read stations at key points, linking the data with MMG's sampling and weighing systems. Extensive onsite trials ensured reliability. The result is real-time monitoring, more efficient yard management with minimal rehandling, quality assurance on shipments, and a system proven to work in one of the toughest industrial environments.

"Partnering with a company, such as Ramp, with both high levels of working experience in complex physical environments and technical expertise in RFID and associated technologies is crucial."

Brad Winks – Senior Technology Consultant & Project Manager

Resources

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