

Pilot Key Learning Summary:

FMCG BAG Pilot and Implementation Work Group



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Purpose

- Summarize pilot key learnings shared by EPCglobal BAG Pilot and Implementation working group members.
- Key learnings are grouped into categories for ease of lookup. Identical experiences reported by multiple companies were reported only once, while similar ones are included to demonstrate common practices. Please see the full presentations, available in eRoom or the EPCglobal US website to understand the complete context of the learnings.
- In addition to key learnings, the Pilot and Implementation Working Group is collecting and documenting outstanding implementation issues. These will be reviewed and prioritized by EPCglobal member companies based on their overall impact on adoption. Identified high priority issues are tracked by the Pilot and Implementation working group and will be reviewed quarterly on their progress.

Contributors – in presentation order

- **Procter & Gamble:** 11/2004
- **Georgia-Pacific:** 11/2004
- **Pfizer Consumer Healthcare** (by EDS): 11/2004
- **Pacific Cycle** (by SAMSys): 11/2004
- **IBM:** 11/2004
- **CHEP:** 12/2004
- **Kimberly Clark:** 12/2004
- **Sara Lee:** 12/2004
- **HP:** 1/2005
- **Metro Group:** 1/2005
- **Wal-Mart:** 1/2005
- **Abbott Labs:**2/2005
- **Nestle Purina:** 3/2005
- **Gillette:** 3/2005
- **NEC:** 4/2005
- **US DOD:** 4/2005
- **International Paper:** 5/2005
- **Eastman Kodak:** 5/2005
- **Savi:** 6/2005
- **BP Lubricant:** 7/2005
- **DHL:** 9/2005

Strategy, Vision, Objectives

Pilot Target and Success Criteria:

- Identify use cases of supply chain benefits for customer, consumer, and supplier.
- Gather RFID impact on operations.
- Identify the minimum cost of compliance---now and future.
- Understand RFID impacts to business processes both internally and externally.
- Conduct technology proof-of-concept.
- Use EPC data collected from retailers to create new ways to analyze your business relationships.
- Validate the functionality and performance of RFID middleware and label applicators.
- Test products/packaging and develop a matrix to represent all products and packaging types in working with RFID.
- Benchmark RFID performance against existing control procedures. (WMS vs. RFID receipts)
- Assess costs associated with RFID tagging (automatic vs. manual) in box plants, converting lines, and distribution centers.
- Test the Interface with conveyor and palletizer PLC to aggregate case tags with pallet ID.
- Investigate flexibility to change as technology and processes mature.
- Explore supply chain efficiency: (From a retailer's perspective)
 - RFID provides potential to lower warehouse cost;
 - reduces time needed to inspect incoming goods;
 - reduces loading errors;
 - reduces idle time at delivery;
 - identifies and eliminates data transfer errors;
 - improves product availability (fewer out-of-stock)
- Use collaborative learnings to:
 - identify what is needed for deployment;
 - minimize deployment cost;
 - understand the importance of standards and interoperability;
 - work with suppliers on tag placement/applications;
 - learn how the data will be used to improve the speed of products to the shelves.
- 4-wall pilot --- test asset tracking/license plates read performance.
- Measure reduction of time for asset traceability (compare RFID to current barcode scanning)
- Look for ways to reduce/eliminate charge-back from retailers.

Key Strategy Lessons Learned from Pilots

- Have a vision, and create a multi-year roadmap.
- Secure funding for research and development.
- Data synchronization is a key pre-requisite.
- Adjust as you learn. Focus on the customer's needs.
- Challenge conventional wisdom. Think outside the box.
- Respect the technology. Consider change management.
- Remember that RFID is a *tool* not a system: it is a stepping stone to a global digital supply chain strategy.
- Keep an open mind --- focus on quality and work together to improve performance.
- RFID is a disruptive technology – all functions and business units will ultimately be “touched”
- Tagging is a means to an end: Deriving information from RF captured data, and sharing that information within/across enterprises, to add value, is the end game
- Focus on scalable options versus what works today.
- EPC/RFID spending today is largely compliance based. It needs to be tied to strategic initiatives to look for the business benefits.
- A business case / product testing / 4-walls pilot alone does not comprise an effective evaluation of RFID feasibility in an organization
- Manage business expectations versus technology capabilities.
- Keep in mind that business expects the least-cost solution and to not change existing processes. Once the benefits are identified, business expects immediate savings.
- Commitment to objectives can lead to significant benefits, such as reduction in inventory, reduction in theft and loss, and reduction in labor cost. But it may take some time!
- RFID ROI – Areas for consideration
 - Customer retention
 - Current process refinement
 - Business process redesign – this is the hidden treasure of RFID

Overall Pilot Approach

Planning and Scoping

- Pick a representative scope.
- Measure Key Performance Indicators (KPI's) and conduct before-and-after analysis.
- Determine baseline data relative to success criteria PRIOR to pilot testing.
- Provide written pilot plan with clear scorecard/measures PRIOR to pilot testing.
- Prepare and document scope of work – what is in the pilot and what is not, collaborate on work process changes being considered.
- Constantly update the business case throughout the project.
- Identify the key triggers for your implementation and understand the risks.
- “Average” KPI measurements can be very misleading.
- Minimize change variables in each pilot.
- Be prepared for a steep learning curve.
- Watch out for escalating costs. (Cost items that may pop up during the pilot)

Key Approach Lessons Learned from Pilots

- Without standards, RFID is just another unique solution for each customer/supplier combination. Don't simply repeat your EDI experience.
- Everyone is learning and implementing at the same time, there may not be clear answers on many implementation issues. Even industry standards are evolving *in parallel*, not prior to, hardware and software development
- Most key lessons are learned early in the pilot.
- Log as much peripheral learning from the pilot as possible. It can often provide the most interesting information.
- Learn from technology penetration / identification of options.
- It can be very difficult to debug problems as various components of the RFID/EPC architecture come from a multitude of vendors and there is no clear documentation.
- Measure cycle time between supply chain handoffs.
- Controlled roll-out to priority customers until costs drop and ROI becomes more evident.
- Manage expectations, as pilots may add effort and complexity. (For example, average time to load a truck = 2.5 hours versus 40 minutes previously)

- Get unions onboard!
- Concept of RFID may be valid but a different (or supplemental) pilot or implementation approach may be required.

Organizational Design

- Top level alignment is a pre-requisite.
- Senior management support and funding is required.
- Identify global center of expertise (team & responsibility)
- It is important to have business process skills in the RFID core team.
- RFID is a cross-company experience, so you must organize the team this way too. Form an RFID steering council with key stakeholders.
- Suggested RFID cross-functional team members:
 - executive sponsors
 - supply chain management
 - operations
 - financial
 - IT architecture
 - networks
 - site union
 - site management/safety
 - RF engineering
 - customer services
 - trading partner representatives
 - technology providers/consultants
- Have representatives from all areas of process and form a multi-disciplinary team project.
- Appoint a strong project manager to drive the effort.
- Obtain input and buy-in from the “shop floor”-- after all, they know the business processes well.
- Obtain agreement within the organization relative to involvement in troubleshooting the process and technology.
- Keep your options open. Multiple suppliers are a real necessity.
- Get help if you don't have the required technical skills in house. This will speed up the learning curve.
- Watch out for the RFID skill shortage!

Business Process Design/Management

Key Business Process Management Lessons Learned from Pilots

- RFID testing needs to aim for “Three C’s” of Supply Chain
 - Capability: can complete the process
 - Consistency: can predict completing the process repeatedly
 - Capacity: and in the required volume throughput
- There is no substitute for knowing what is really going on in your Supply Chain at a detailed level.
- RFID provides visibility revealed on asset movements that was not previously known.
- RFID is a complex “integration” proposition.
- Successful pilot does not always lead to a rollout decision. Need to manage expectation.
- Identification of ROI may not be achievable with a single pilot (or with partial rollout).
- In production does not mean routine operation – next trading partner, next site, and next dock door might face new challenge and require some new details.
- Privacy and public policy needs to be addressed. (for example: information to workers council)
- Barcode will be with us for quite a while, serving as a safety net aids RFID implementation.
- Very few best practices are available.
- Earlier experiences in tagging at box plant and conducting open-air encoding at finished goods converting lines indicated that the solution is possible but not consistent as this point.
- “Slap and Ship” is still popular, however, the earlier in the process you apply the tag, the more opportunities you can benefit from it through process improvements.
- “Slap & Ship” works for low case volume (less than 250,000 cases a year). Case volume greater than 750,000 will require “Automated” tag application in the forms of either pre-tagged corrugated boxes on in-line tagging using automated label printer/application station. Cost of labor and automated application station, as well as encoding time will be key challenges to overcome.
- RFID means utilizing warehouse employees more effectively (no barcode reading).

- Three common EPC encoding options:
 - Order pre-encoded tags from vendors;
 - Encode tags ahead of time in a controlled encoding environment (reel-to-reel);
 - Encode (print) and apply the tags at the same time.
- Why encode tags ahead of time? (onsite or offsite)
 - QC tags similar to product labels;
 - An alternative to box supplier providing the pre-tagged boxes;
 - Less complexity to high-speed finishing lines.
- Combine case tag with case barcode label
 - Pre-encode/print case and pallet tags
 - Manually apply case tags on packing line
 - Pallet aggregation at palletizer
- Set up a homogenous, centrally managed RFID reader configuration to control multiple operation locations

Business Process Do's and Don'ts

- Identify opportunity where RFID might resolve current issue and focus on that specific issue in the pilot. ("Could we save or make money by rolling out this, even if we don't do anything else?")
- Align with measurement system to evaluate progress, review collectively.
- Reconcile EPC reads to retailer status reporting: measure 'missed reads', validate sequence of reads, etc.
- Don't mix RFID with operational tasks.
- Avoid "parallel" processes in high volume fast moving environments – things will go wrong. This may mean tagging all output from the same site earlier than planned.
- Baseline the existing process and have very *real* baseline data.
- Expect business process changes as a result of the technology, and irrespective of the technology. Augmenting, not replacing, what you do.
- Expect RFID technology to improve and ensure you can adapt to the changes.
- Balance the 3-leg stool: operations, RF engineering and IT (infrastructure, application, and data).
- Stay focused on the business goals and timelines and don't get distracted solving problems that don't need to be dealt with right then.
- You must learn by **DOING** in the field. Some issues require testing in SCALE to identify.
- Improve understanding of internal processes through the trial.

- Identify process improvement opportunities.
- Take external factors into account --don't focus exclusively on RFID.
- Focus on workflow/business proposition value. Leverage RFID as well as other technologies and people to achieve the goal.
- Business processes must change to reap the reward from RFID
- Processes and software need to support UHF penetration ("red light/green light" reconciliation, operational time-lags)
- Converting line operators need to be notified (with light stack and buzzer) when fault condition is encountered.
- Light stack helped to confirm appropriate read and load.
- Tag placement on boxes is a big factor. Artwork on boxes may need to change to accommodate tag placement.
- There can be more process-related problems than RFID technical problems with read rates.
- Identified problems arising from automation of manual processes (unexpected SW adjustments for situation that was previously solved outside of SW in the "manual process")
- Read rates may be influenced by operational handling. For example, pallet labels facing the fork lift

Technology

- Don't assume technology will work the first time you try it.
- Just because the technology doesn't work doesn't mean the pilot is not successful.
 - RFID is an immature technology, it will improve
 - Don't define project success criteria solely based on technology

Environmental Factors:

- There is no "cookie cutter" or "plug and play" RFID implementation. Each site is unique and it is necessary to test and refine on each site.
- High internal read rates do not translate into high read rates at trading partners.
- Tag reads depend on resonance, even for labels on plastic containers.
- Things seen and unseen will affect readability of tags
 - Moisture content
 - Packaging materials
 - Pallet patterns
- Factors that affect read rates include :
 - ESD (electric static discharge),
 - humidity
 - temperature
 - wireless or radio devices
 - line layout
 - building construction
 - product materials
 - IT infrastructure
 - density of readers and tags in the field
- RFID hardware is not hardened enough for elements in manufacturing environment, such as vibration, dust, temperature, and humidity. (e.g. there was a reported defect on reader power connector due to vibration in the converting lines)
- Need to understand product and environment characteristics.
 - Unique interfaces
 - Process flow and read points
- Be aware of production environmental factors and the differences from lab testing.
- A lab built in real operational environment is proved to be very valuable. It can benchmark equipment and solution, provide training and product testing, and minimize interruption to production.

Frequency and power regulation requirement varies from region to region. Writing and reading the same tag at different frequencies will impede performance.

Tags and Tag Application:

- Get the right tag for the job. Tag polarity should match the reader. You can improve tag read rate!
- Some companies reported that they overcame the problem of tagging metal objects.
- Tag pricing is directly related to quantity produced, volume is the name of the game.
- Tag supply can be sporadic
 - Inlay supplier performance is still not good enough
 - Label conversion process is critical to ensure tag quality
- Tag failure rate is still too high, especially for automatic label applicator encoding and applying tags at converting line speed.
- Current printer/encoder/applicators cannot operate reliably at manufacturing production speeds.
- RFID label applicator does not work well with bad tags or gaps on a tag roll.
- Need to compare the cost and complexity between pre-tagged flat boxes and in-line encoding and tag application.

Readers and Reading:

- Multiple types of readers and reader configuration can be useful. For example, readers suited for conveyor are different than readers for pallet station or dock doors.
- Few companies reported 100% case read (X-Ray) on pallet. It is achievable however as a result of multiple read points of that pallet.
- Pallet reading at stretch wrapper with rotating arm proved to be more effective than portal read.
- Cannot integrate reader into flying-arm stretch wrapper. (such readers not available as of April 2005)

Antennas:

- Custom designed antennas can sometimes provide better control in the read zones.
- Customized antenna configuration helped to focus reading of right pallet in right portal.

Positioning of devices:

- There is no space available in existing production floor for applicators, accumulators, and diverts.
- Adjustable mounting kits provide flexibility during field trials and pilots to position barcode readers and RFID readers/antennas at the converting lines. Once the position and location are confirmed for the rollout, the fixed mounting kits provide consistency and reliability.
- In-line encoding antenna should be positioned at least a few inches away from the passing tagged cases to provide an adequate encoding zone.

Service and Update:

- RFID technology will change rapidly. Design and fund with changes in mind.
- Actively manage technology migration.
- Don't underestimate the level of support you will need from your solution providers, especially in the early days. And the support needs to be where you are!
- RFID readers without support are like cars without gas.

Software & Data Management

- Expect to upgrade RFID middleware frequently to match reader development., at least in the earlier stage
- RFID middleware comes in two flavors:
 - Standalone
 - Bolt on
- Use the middleware to control and allocate EPC codes.
- Be aware of clear explanation of data reads, exchange of data and agreement of shared values by customers.
- Integration between middleware and PLC (Programming Logic Circuit controlling palletizer, converting lines, etc.) is critical but not commonly available.
- The data, when it comes, will overwhelm you. Data filtering and data mining are critical!
- Mine the data and look for competitive advantage!
- Data handling speed and cost is critical.
- Be aware of re-aggregation at MRI, and de-aggregation of cases. (for damaged cases, QA samples, partial pallets)
- High volume of data with noise and gaps is not useful at this time.

Partners

- Increase collaboration with “trading/supply chain” partners.
- Share your vision, make partners part of the plan.
- Maintain an intensive partnership with solution providers and suppliers.
- Choose technology partners wisely, you may be the ‘best site’.
- Need to provide technology suppliers with written specifications and requirements, and verify that they are understood and implemented as intended. Specs can mean different things to different people.

High Priority Implementation Issues

General – process, standard, regulation, security, privacy, etc.

1. **Business cases** – Need to identify sample business cases with product or product categories that have positive ROI for all parties (possibly short shelf life, high shrinkage, high value, pedigree required, or behind the locked counter)
2. **RFID practices** – Need to document representative EPC/RFID practices from end user companies (what/how to tag, where/when to tag, what application systems to integrate with, tag aggregation, etc.) to serve as a guide or reference.
3. **Rollout strategy** – Need to define a rollout approach agreed by Retailers and suppliers/manufacturers.

Hardware

1. **Hardened RFID equipment** (readers/antennas, printers/encoders, applicators) to stand the test of production environment elements such as static discharge, vibration, dust, moisture and temperature.
2. **Encoders/tag applicators that work at line speed.** Current printer/encoder/applicator cannot operate reliably at manufacturing production line speed of 20 to 50 tags per minute.
3. **Mobile readers** (forklift based/ handheld RFID readers, or hybrid readers in Europe)

Software

1. **Device management** – need software standards that enable network-attached RFID devices, including RFID readers and printers to be effectively managed at scale. Functionality should include at least health monitoring, hot-swapping, device restart, configuration, firmware upgrade, alert management, etc.
2. **Data filtering** – current data and data formats received from Retailers are not consistent. Need to form pilots to clean up (or explain) the data.
3. **Integrated EPC/RFID application** – EPCglobal community should develop requirements for integrated RFID application station. (For example: RFID readers, barcode readers, product diverters, tag encoders/applicators, PLC control software)