RFID Solutions
Identifying the Value Proposition
What is RFID?

Radio Frequency Identification (RFID) originated with technology used in World War II. The Identification Friend or Foe (IFF) system was used by aircraft to transmit an identifier from miles away to enable the ground radar crew to establish if the aircraft was a friendly or an enemy.

RFID now is a generic term for using radio waves to automatically identify objects. RFID has many uses, but essentially it makes organizations more effective and efficient by supplying real-time information and complete visibility.

RFID Benefits include:

• Ability to read many tags simultaneously. As compared to reading a barcode, which is picking up each individual item to scan, reading RFID is triggering a reader and reading all RFID tags within the reader’s range.

• Unlike barcodes which require line of sight, RFID can read through RF transparent objects. Common practice is to read RFID tags from 6-8 feet away.

• Unlike using barcodes, the simplicity, speed and efficiency of RFID allows organizations to perform necessary inventories with an increased schedule and with non-dedicated personnel. RFID scanning and inventory is so efficient, that personnel can be used for many functions in addition.
**What is an RFID tag?**

RFID tags are the finished product for use by a retailer, supplier, etc... We are focused on a subset – passive (without a battery), Gen2 (which follows a set of standards selected by the industry) and UHF (ultra-high frequency).

Some terms which you may see are as follows:

- **Dry Inlay** – this is the combination of the antenna and chip on a substrate. The substrate (backing) is typically made of a plastic film (PET).
- **Wet Inlay** – this is the dry inlay with adhesive applied
- **Paper faced inlay** - It is the inlay combined with a paper facing where printing can be applied
- **Chip** – this is the smarts of the tag. When combined with the antenna it can be encoded with specific information (Electronic Product Code) and read by a reader. The Primary chip manufacturers are Alien, Impinj, and NXP.
- **EPC** – Electronic Product Code is what is stored on the tag by encoding. This EPC is layman’s terms is the barcode with a unique serial number to make each tag unique to another.
What makes up the Electronic Product Code (EPC)?

<table>
<thead>
<tr>
<th>Header</th>
<th>Filter</th>
<th>Partition</th>
<th>Company Prefix</th>
<th>Item Ref</th>
<th>Serial</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 bits</td>
<td>3 bits</td>
<td>3 bits</td>
<td>20-40 bits</td>
<td>24-4 bits</td>
<td>38 bits</td>
</tr>
</tbody>
</table>

- **Header**: Tells the reader what format the tag is and how to translate the data.
- **Filter**: This portion is basically the electronic version of the UPC (GTIN). This provides the same information as the barcode.
- **Partition**: This is the unique serial number for that specific item. In combination with the company and item information, this item is unique and allows users to track each independently.
What is a bit and why is it important for us to understand?

A bit is a binary representation of a number. We normally work in base 10 which is 0-9. Binary is base 2 which is 0 and 1 only.

The importance in understanding binary in Electronic Product Codes is the portion related to serialization. We never want to have duplicates in tagging. Duplicates will look to the reader to be the exact same product. The serialization portion is how we make one product with the same GTIN (barcode) look different from another.

On a 96 bit tag, 38 bits are allocated to the serialization. 38 bits represent almost 275 Billion unique serial numbers for a given product. This can simply be calculated by $2^{38}$.
Specific Customer Requests for the Serialization

At times, customers will desire to hold some of the serialization bits for their own purpose. A specific example is when they want to identify who is doing the actual encoding of a tag.

One retailer, for instance, requested that we encode the tags with a prefix of 110. The 110 will take the first 3 bits of the 38 bits reserved for serialization. Upon scanning, they will know that the specific tag is an r-pac tag if it starts with a 110 for the serialization portion of the EPC.

This still will provide us with over 34 Billion unique numbers for a style/color/size of a specific UPC. This also guarantees that r-pac’s numbers will be unique to others encoding even the same product since each will have the serialization start with a different 3 bits.
Why is encoding tags important and how do you ensure you meet customer requirements?

Since duplication negatively effects the benefits of each customers’ use case for RFID, eliminating duplication is a tremendous benefit. Each product is counted, inventory accuracy is achieved leading to other benefits such as shelf availability, etc...

Simply stated, use a partner to experience to provide finished tags worldwide, on schedule, at competitive prices and can guarantee that no duplicate serialization is produced. Use a partner that has an interface that guarantees success for our customers.

Most importantly – use a partner that is approved at the retailer your are providing tagged product into. There really are 2-3 choices only.
What are Business / Use Cases that customers are trying to achieve?

More than 60 Business / Use Cases have been identified and new ones are thought of almost daily. The primary focus of the apparel industry at this time is:

- Inventory Accuracy,
- Shelf Availability,
- Out of Stocks
- Replenishment

Other use cases include:

- Anti-Counterfeiting
- Electronic Proof of Delivery (EPOD)
- Shrink visibility
- Returns (price paid and if it was sold by that retailer)
- Improved visibility throughout supply chain
- Cycle Counts
- Promotions tracking
- Country of Origin
- Etc…
What is an example of how a retailer is using RFID?

There are many examples of RFID currently in use. Most retailers are using hand scanners to read the tags on the product they are interested in. In doing so, they increase the accuracy of inventory and get visibility of the product beyond what they ever had previously. Increased visibility and accuracy allows the retailer to do many things. They can compare the what is currently on a rack or shelf with the plan-o-gram and adjust the what is available to the consumer accordingly. The read may show that there are no items of a particular size/style/color or it may show that there are too many of a specific type. The store associate can then adjust to ensure that shelf availability is as it has been planned. This also allows for not only for a real time replenishment from the back-room, but replenishment from the store DC or new orders from the supplier. The frequent reads and a bit of business intelligence allows the retailer to have product available to the consumer for sale.

A retailer can’t sell a product if they don’t have it available to the consumer.

Through simple use of RFID, retailers have the product available to sell. Hence sales increases have been seen between 6 and 26% - just by keeping product on the shelf.
Studies have been done identifying Business Cases for both suppliers and retailers. The University of Arkansas and Auburn University are a wealth of knowledge in this area. These can be found at: http://rfid.auburn.edu/research-papers.cfm

Business cases are abundant. Utility can be found at all levels of the supply chain. Once a product is tagged and visibility through readers is achieved, many low hanging fruit are achieved.

- The proper tagging and reading of product allows for natural successes in: inventory accuracy/control and cycle counting; operational efficiency; production planning; track and trace; out of stock prevention; etc...

- The use cases depend on each users business focus. Each will have varying processes that cause labor intensive operations and are prone to error. EPC enabled product will ease these areas and provide benefit beyond what is imagined.
Initial Steps- What are your organization’s goals?

**Retailer**
- What are the Business / Use Cases I want to focus on?
  - What is the measurement of success?
- Am I partnering with my suppliers to simplify the process while achieving what my goals are?
  - Am I being reasonable and realistic? Am I considering other retailer mandates and aligning requirements to eliminate the need for multiple tagging demands for the same supplier product inventory?
- Am I allowing for the best solution and partnering with the Solution Providers to ensure the “best-value” solution?

**Supplier**
- Meet retailer mandates
  - Which retailers are you tagging for? (retailers do not necessarily have common requirements)
  - Which products are you tagging and for what retailers?
- To achieve a Business / Use Case within my own “four walls”
  - What Business / Use Cases and how do I measure success?
- Do I want to manage the print and encode operation or do I want to ease my burden and use a proven RFID Service Bureau? Do I need to use an in-plant print operation to meet schedule demands? Do I need a mix of Service Bureau and in-plant printing? Do I want the same infrastructure to manage both operations?
Both suppliers and retailers can avoid the majority of pitfalls by planning and understanding what the technology can do and not do.

- Retailers can increase the likelihood of success by communicating their goals to all suppliers and major solution providers.
- Suppliers can increase the likelihood of their success by:
  - planning for which retail customers they need to support initially AND in the likely in the future;
  - which business cases they desire to achieve;
  - what print and encode strategy;
  - which proven tagging provider (that can supply for all retailers) and provide all needed support and guidance.
### What Retailers are using RFID

<table>
<thead>
<tr>
<th>Retailer</th>
<th>Approved RFID Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macy’s</td>
<td>by inlay but r-pac and Avery on Macy’s approved list</td>
</tr>
<tr>
<td>Walmart</td>
<td>by inlay on Auburn list but r-pac, Avery and SML</td>
</tr>
<tr>
<td>HBC / L&amp;T / Saks 5th Ave</td>
<td>by inlay on Auburn list but r-pac, Avery and SML</td>
</tr>
<tr>
<td>Kohl’s</td>
<td>primarily r-pac, Avery, and SML</td>
</tr>
<tr>
<td>Target</td>
<td>primarily r-pac, Avery, and SML</td>
</tr>
<tr>
<td>JCP</td>
<td>r-pac, Avery, and SML</td>
</tr>
<tr>
<td>Sears / Kmart</td>
<td>by inlay on Auburn list but r-pac, Avery and SML</td>
</tr>
<tr>
<td>Others under NDA</td>
<td></td>
</tr>
</tbody>
</table>

Note: to make it easier for inventory, it would be best to have one inlay that is approved across all retailers supplied. This is not as easy as you would think. You must be very selective and careful to plan for future needs.
## Part 1 – Sampling of Use Cases

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Use Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Outbound automation</td>
<td>16  Item level data</td>
</tr>
<tr>
<td>2  Inbound and outbound audit processes</td>
<td>17  Claims accuracy</td>
</tr>
<tr>
<td>3  Electronic proof of delivery</td>
<td>18  Potential to eliminate claims</td>
</tr>
<tr>
<td>4  Right tag on product</td>
<td>19  Brand visibility in store (integrated)</td>
</tr>
<tr>
<td>5  Supply chain data quality</td>
<td>20  Speed and accuracy</td>
</tr>
<tr>
<td>6  Could eliminate audits &amp; manual inventory</td>
<td>21  Inbound quality</td>
</tr>
<tr>
<td>7  Smart inspect</td>
<td>22  Outbound quality</td>
</tr>
<tr>
<td>8  Country of origin</td>
<td>23  FTZ and first sale</td>
</tr>
<tr>
<td>9  FTZ (Free Trade)</td>
<td>24  Track returns</td>
</tr>
<tr>
<td>10 Trade agreements</td>
<td>25  Tracking through processing areas</td>
</tr>
<tr>
<td>11 Traceability through supply chain</td>
<td>26  Drive accurate costing</td>
</tr>
<tr>
<td>12 Track defectives &amp; recalls</td>
<td>27  Vendor pack accuracy</td>
</tr>
<tr>
<td>13 Pick/pack speed</td>
<td>28  Case pack accuracy</td>
</tr>
<tr>
<td>14 Pick/pack accuracy</td>
<td>29  Source validation</td>
</tr>
<tr>
<td>15 Detail of available data</td>
<td>30  Shipping validation</td>
</tr>
</tbody>
</table>
### Part 2 – Sampling of Use Cases

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>Plan-o-gram compliance</td>
</tr>
<tr>
<td>32</td>
<td>Shelf replenishment</td>
</tr>
<tr>
<td>33</td>
<td>EAS consolidation</td>
</tr>
<tr>
<td>34</td>
<td>Reduce cycle count time</td>
</tr>
<tr>
<td>35</td>
<td>Receiving accuracy</td>
</tr>
<tr>
<td>36</td>
<td>Eliminate physical inventory counts</td>
</tr>
<tr>
<td>37</td>
<td>Carton accuracy</td>
</tr>
<tr>
<td>38</td>
<td>3rd party consolidation efficiency</td>
</tr>
<tr>
<td>39</td>
<td>Increased store PI accuracy</td>
</tr>
<tr>
<td>40</td>
<td>Country specific shipping documentation</td>
</tr>
<tr>
<td>41</td>
<td>Country specific care labels and placement</td>
</tr>
<tr>
<td>42</td>
<td>Inventory tracking within DC</td>
</tr>
<tr>
<td>43</td>
<td>Product recall</td>
</tr>
<tr>
<td>44</td>
<td>Electronic proof of delivery</td>
</tr>
<tr>
<td>45</td>
<td>Counterfeit tracking</td>
</tr>
<tr>
<td>46</td>
<td>Inbound quality</td>
</tr>
<tr>
<td>47</td>
<td>Outbound quality</td>
</tr>
<tr>
<td>48</td>
<td>PI accuracy</td>
</tr>
<tr>
<td>49</td>
<td>Shelf replenishment</td>
</tr>
<tr>
<td>50</td>
<td>Dormant inventory reduction</td>
</tr>
<tr>
<td>51</td>
<td>Reduce shrink</td>
</tr>
<tr>
<td>52</td>
<td>Electronic proof of delivery</td>
</tr>
<tr>
<td>53</td>
<td>Shopper item interest vs. purchase</td>
</tr>
<tr>
<td>54</td>
<td>Density and space planning</td>
</tr>
<tr>
<td>55</td>
<td>Multi-channel inventory management</td>
</tr>
<tr>
<td>56</td>
<td>Inventory tracking</td>
</tr>
<tr>
<td>57</td>
<td>Security and shrink reduction</td>
</tr>
<tr>
<td>58</td>
<td>Shrink due to employees</td>
</tr>
<tr>
<td>59</td>
<td>Accurate export documentation</td>
</tr>
<tr>
<td>60</td>
<td>Store to store transfers</td>
</tr>
</tbody>
</table>
General Findings of Various Studies and Published Use Cases

- Increased sales directly attributed to RFID tagging – range indicates between 6 and 26% sales increases. A retailer sales increase directly translates to a supplier sales increase.

- Significant improvement in inventory accuracy from approx. 65% to 98+%. An increase in PI Accuracy leads to a reduction in safety stock throughout the supply chain. The reduction in safety and cycle stock allows for a lower risk of obsolescence of product in inventory. Burdens related to cycle counting can be almost eliminated.

- Improved backroom to shelf replenishment which can also translate into a replenishment from the supplier when fully implemented

- Improved inbound and outbound operations at all levels of the supply chain

- Automated audit processes for internal use and to reduce compliance issues leading to chargebacks.

- Reduction of inventory related costs due to 1) reduced shipping and receiving costs 2) reduced errors in shipping and receiving

- Increased inventory visibility also can lead to other improvements such as reduction in shrinkage, forecasting, etc....

- Benefits can be achieved at every spot in the supply chain.
What were your top three reasons for implementing RFID?

Source: ChainLink Research
r-pac has developed a system consisting of:

- High performance RFID inlays for virtually all product types.
- Out of the Box software solution made to be modular and affordable to provide manufacturers, distributors, and retailers a complete solution.
- Hardware solutions to affordably launch the system to achieve ROI quickly and effortlessly.
r-trac

• Complete system to manage data and serialization.
• Is used for RFID and non-RFID.
• Is used for both Service Bureau and in-plant print solutions
• Customized portals to suit individual customer needs
• Complete reporting and dashboards
• Online proofing to expedite production
r-pac has r-trac™ and the experience to provide finished tags worldwide, on schedule, and at competitive prices.

r-trac is a simple to use interface that guarantees success for our customers. Through this cloud-based interface, users can design tags for their specific needs and guarantee that no duplicate serialization is produced.

Since duplication negatively effects the benefits of each customers’ use case for RFID, eliminating duplication is a tremendous benefit. Each product is counted, inventory accuracy is achieved leading to other benefits such as shelf availability.

*Over a Billion tags produced without encoding error and with no duplication*
r-trac Retail Services

• Complete solution for factories, distributors, and retailers to implement use cases associated with RFID.
• Solutions for the entire Retail and Retail Supply Chain
• Hardware agnostic software
• Customized interfaces to suit individual customer needs
• Complete reporting and dashboards
The complete Retail and Retail Supply Chain using r-trac Retail Services
Features and Benefits

**Inline Tagging/Receiving**
- Second tag vs. wet inlay
- Printer/encoder
- Advanced shipping information

**Stocking & Replenishment**
- Back stock Mgt
- Execution enablement
- Touch screen for convenience

**Cycle Counting**
- Inventory location management/maintenance
- Mobile reader item locator

**Point of Sale**
- RFID item capture/checkout
- Serialized status update
- POS system Integration

**Analytic & Reporting**
- Alerts and Exceptions
- Activity monitoring and reporting
- Integrated to corporate or other portals

**99% Accuracy**
- RFID receive (fast and accurate)
- ASN validation
- Employee process enablement

**Increased Sales**
- Optimal sales floor
- Elevate customer satisfaction
- Decrease OOS
- Remove human errors

**Reduced Labor**
- Fast and accurate
- Reconciliation
- Loss visibility
- High employee adoption

**Speedy checkout**
- Performance validation
- Improve customer service
- Enhance Security

**Identify/Remove Distortion**
- Heartbeat monitoring
- Increase Security/Loss prevention
- Reduce Shrinkage
r-pac International Corporation
www.r-pac.com

identify with us!