RFID in Business Processes

What is RFID?
Radio frequency identification (RFID) first appeared in tracking and access applications in the 1980s. Because it allows an item to be identified without the need to make contact with it, RFID is effective in environments where barcode labels cannot survive.

A basic RFID system consists of three components:

- **Antenna**
- **Transceiver (with decoder)**
- **Transponder (tag)**

Depending on the power output and the radio frequency used, the read range varies between a few centimetres and several metres. There is a range of bandwidths defined for RFID: 125KHz, 13.56MHz, UHF (860-930MHz) and 2.45GHz. They have different acceptance and performance criteria across global regions, mostly due to the impact of local regulations.

Choosing the right frequency for your solution requires a good understanding of the underlying principle of physics and some analysis of both the requirement and the environment of the solution to be built. Environmental conditions such as water, humidity, metal, field characteristics and tag design, as well as the performance of the system (including data transfer range, operating range, anti-collision speed and duty cycle), all have to be accounted for.

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**Highlights**

- Enables products and components to be identified automatically, decreasing labour costs
- Get realtime information about the location and movement of your goods along the supply chain or within your work in process
- Enhances customer service due to new possibilities of getting and sharing information
When an RFID tag passes through the electromagnetic zone created by the reader, it is activated through induction. The data, encoded on the tag’s integrated circuit (silicon chip), is then transmitted to the reader. The reader decodes the data and sends it to the computer system, which then creates valuable business information by combining the automated RFID data with your corporate data information system.

There are tags that can only send data, but others are able to store and even record data while your goods are on the move. Tags and antennae come in various sizes to fit most applications. Therefore, there are many areas where RFID technology may be employed.

Developments in RFID technology continue to yield larger memory capacities, wider reading ranges and faster processing. It is highly unlikely that the technology will ultimately replace the barcode because even with the inevitable reduction in raw materials combined with economies of scale, the integrated circuit in an RF tag will never be as cost-effective as a barcode label. However, RFID will continue to grow in its established niches where the barcode or other optical technologies are not effective. The more that common standards come to be adopted – whereby RFID equipment from different manufacturers can be used interchangeably – the more likely it is that the market will grow exponentially.

**How does it operate?**

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**For which applications is it most suitable?**

IBM has identified four primary areas across the industry value-chain where RFID may play a valuable role. This segmentation should help you to identify any similarities in your own business environment.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Application examples</th>
<th>Product maturity</th>
<th>Functionality</th>
<th>Regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.45GHz</td>
<td>Vehicle access</td>
<td>Emerging</td>
<td>≤ 2m US</td>
<td>EU: 0.5W, d=100%, 4W, d=15%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>≤ 0.7/2m EU</td>
<td>US: 4W, d=100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>≤ 1m Japan</td>
<td>Japan: 0.1-1W, d=100%</td>
</tr>
<tr>
<td>862-928MHz</td>
<td>Container ID</td>
<td>Innovation</td>
<td>≤ 7m US</td>
<td>EU: 0.5W ERP, d=10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>≤ 3m EU</td>
<td>US: 4W, d=100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Longest range, influenced by water</td>
<td>Japan: no band</td>
</tr>
<tr>
<td>13.56MHz</td>
<td>Pallet ID</td>
<td>Mature</td>
<td>≤ 1.5m</td>
<td>Worldwide harmonised</td>
</tr>
<tr>
<td></td>
<td>Box identification</td>
<td></td>
<td>Shielding by metal only</td>
<td>100% duty cycle</td>
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<tr>
<td></td>
<td>Reusable crates</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Access and laundry</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>125KHz-136KHz</td>
<td>Beer keg ID</td>
<td>Mature</td>
<td>≤ 2m</td>
<td>Worldwide harmonised</td>
</tr>
<tr>
<td></td>
<td>Animal identification</td>
<td></td>
<td>Solution for metal environment</td>
<td>100% duty cycle</td>
</tr>
</tbody>
</table>

**Frequency selection: summary**

**Work in progress**

**Industry focus: manufacturing**

**Description:**
An object down an assembly line or tracked through the process of manufacture

**Container tracking**

**Industry focus: federal**

**Description:**
Tracking the vessel of transport – pallet, crate, train, trailer or truck

**Asset tracking**

**Industry focus: vendor direct**

**Description:**
A depreciating good – tools, hardware, equipment or leased items

**Product tracking**

**Industry focus: distribution, CPG, retail**

**Description:**
Tracking of a saleable good through the value chain

**Smart tag solution areas**
1. **Work in progress:**
   **RFID in manufacturing**

The work in progress solution focuses on the passage of components down an assembly line. RFID can automate the flow-through tracking of components at speeds up to 2m/sec (metres per second) and more than 60 items per container. An RFID tag is attached to components as they go through the manufacturing process.

**Key benefits:**

- **Sub-components can be linked to a whole assembled item**
- **Components are tracked as they go along the line. Items tracked include product numbers, characteristics and configuration, among others**
- **Validation at various points along the assembly line.**

*Example:*

Imagine an automobile plant. After colour-spraying the chassis, the doors are separated from the main component. Following some additional manufacturing processes applied to all the parts, the chassis is reassembled. In this case, it is vital that the right parts are brought together again. This situation offers a prime opportunity for RFID tagging and, in fact, some manufacturers already use it.


2. **Container tracking:**
   **RFID in the supply chain**

This:

- **Minimises the need for any reworking by ensuring the accuracy of piece part manufacturing, capturing and maintaining data at source, and allowing for event-based actions**
- **Improves the efficiency of the production line by speeding the location and retrieval of the appropriate part, facilitating the staging of products and reducing manual processes**
- **Lowers manufacturing costs by alleviating labour-intensive processes such as manual barcode readings**
- **Helps to eliminate recalls by automating part-integration tracking**
- **Ensures fewer line stoppages by maintaining a continuous inventory of parts in passage.**

**Key benefits:**

- **Reliability is based on automation**
- **Automated collection / transfer of data cuts the number of redundant processes and data-reads**
- **Minimal human intervention is required for data collection event(s)**
- **Immediate integration of data allows for automated recognition of alert events or special condition notifications by ID property.**

*Example:*

Suppose your manufacturing plant in the Far East ships an amount of goods that you ordered to your headquarters in Paris. The containers are marked as soon as they are loaded and, as they leave the plant on a truck, your headquarters is notified automatically that the shipment is on its way. When the container arrives at the harbour and is loaded onto the ship, another notification is sent telling you that your products are at the next stage of their journey. As a result, you always know where your goods are, right up to the point that they arrive at their destination.
3. Asset tracking:  
**RFID in travel and transportation**

For manufacturers, RFID provides detailed product information about your assets as they proceed through a point of transfer, so reducing the opportunity for theft and shrinkage. In the leased vehicle industry, it allows for the rapid identification of vehicles entering and leaving a parking area.

**Key benefits:**

- Provides detailed product information of assets through the point of transfer
- Provides for realtime inventory management and end-to-end visibility.

**Example:**

Consider the situation of a reusable container manufacturer who rents his containers to his customers. His assets – reusable containers – are charged to the customer upon usage. Each container is tagged with an RFID label and whenever containers leave the yard, they are automatically time-stamped in the system ensuring the correct billing on the customer account. When they return and enter the gate, they are marked as returned and the lease period ends. RFID optimises the usage time for the rental of the containers.

4. Product tracking:  
**RFID in retail**

IBM has produced a demonstration of the concept of the supermarket “self-checkout”. It enables us to demonstrate that the technology works, and that it can be made customer friendly and easy to use. It is part of the product tracking segment.

The solution shows a self-checkout scenario in a retail environment. It simulates the experience of shopping for items that are tagged in addition to an ID card that represents the customer shopping. An IBM cashier system with touchscreen display completes the retail set-up. The customer sees a “Welcome” together with a list of “Items picked” on the screen, and can accept the purchase and receive a printed receipt for the items bought.

**Example:**

Think about a retailer of white goods, such as refrigerators. The manufacturing plant tags each refrigerator when it leaves the manufacturing line. When a shipment is arranged, all the refrigerators on a pallet announce that they are ready for shipment and the gate automatically checks that the right refrigerators are loaded onto the truck for that particular destination. When they enter the distribution centre, they are automatically included in the inventory as soon as they are moved into the back store. When the floor is replenished, items are moved from the back store to the floor and again automatically updated in the inventory. This is achieved by the use of gates at the door that forward the data to the information system. As soon as the products pass the point of sale, they leave the supply chain management system, but the RFID tags can still be used for such purposes as return and warranty.
When considering RFID as a new technology in your corporation, it is important to:

1. Understand your business processes and identify their potential for effective RFID deployment

2. Calculate the return on investment in order to understand the potential for your company

3. Integrate your existing environment

4. Evaluate the change required compared to your existing processes.

Of course there are other things to consider, but they focus on the details that you do not need to be concerned with. In fact, as a proven end-to-end service provider, IBM takes care of them for you. As a result, you can focus on the really important questions such as: “When does my investment pay off?” IBM covers all the necessary aspects of your business, and with our partners, even cover in-depth technical aspects.

IBM is able to pick the required modules that are necessary to successfully implement your specific project from its vast portfolio of IT Consulting. The modules can be business- or IT-orientated, in the “strategy” phase of your project, in the “implementation” or even in the “run” phase. Consequently, when we take care of the sourcing for your project, you are free to focus on your core competence.
The preferred approach of IBM

What does IBM offer?

The IBM phased engagement allows us to streamline the process of knowledge transfer, business analysis and solution creation to meet your company’s needs. At each stage, we make sure that all the parties are still working closely together and that everybody knows and agrees on the intended goal. The stages also serve as milestones for you to check and verify if your business targets are being met.

When do we meet for our briefing session?

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