White Paper: RFID Opportunities in Airport Security & Logistics Management

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REVISION HISTORY

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EXECUTIVE SUMMARY

RFID (Radio Frequency Identification) is an excellent tool to improve business efficiencies and reduce operating costs. RFID uses a secure radio signal between a reader and a tag affixed to an asset. The RFID reader is tightly integrated with the business' information technology environment thereby exploiting the business' investment in key systems. RFID is secure and because the interaction between reader and asset tag is contactless, there is a significant increase in operational flexibility. The human resource burden is also reduced because the interaction between reader and tag is much less proximity sensitive. Implemented properly, RFID will:

- Reduce logistics costs
- Reduce point-of-sale labor costs
- Improve inventory accuracy thereby reducing the requirement for contingency inventory
- Improve forecasting accuracy, thereby facilitating greater precision in planning
- Reduce theft
- Improve customer experience

1.0 Introduction

RFID (Radio Frequency Identification) is a technology using radio frequencies to wirelessly load and subsequently query data stored on tags (sometimes referred to as transponders[1]. The term *tag* is used throughout this paper). These tags are in turn attached to or inserted in an asset. Use of implantable or digestible RFID tags is also evolving.

With RFID technology using radio frequencies, the path linking the reader with the tag doesn't have the same proximity constraints as traditional magnetic or bar code based technologies. In addition, the option to operate RFID in different parts of the radio spectrum further expands options with regards to proximity parameters of the interaction between reader and tag.

2.0 RFID Benefits

Reduce Logistics Costs – No more need for the laborious activity of 'point-and-read' bar codes on pallets, cases, cartons or baggage. Locate items in expansive areas (such as baggage handling facilities) with great accuracy.

Reduce Point-of-Sale Labour Costs – Effortless proximity scanning expedites check out. Self check out is supported by RFID.

Improve Inventory Accuracy – Improved accuracy and the ability to macro scan inventory improves the precision of inventory data thus reducing the need to hold contingency inventory.

Improve Materials Forecasting Accuracy – Visibility improvements throughout the supply chain can help to improve the forecasting capabilities to help better track where inventory is and what is happening to it throughout the supply chain. Efficiencies in the planning process can therefore be realized.

Reduce theft – With RFID, products can be tracked through the entire supply chain to pinpoint where a product is and eliminate inventory errors that can cause shipments to go missing.

Improve Customer Experience – RFID expedites materials processing time and improves record accuracy.

2.1 The RFID Tag

Every RFID tag has two fundamental components:

- An integrated circuit to store data and modulate/demodulate the radio frequency signal

- An integrated antenna

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[1] A device that relays electrical signals not necessarily in the same form or on the same frequency as received.

RFID Tag Embedded in Adhesive Label	RFID Processor Chip in Centre with Antenna Surrounding It	RFID Tag Kit For Beehives

RFID is standards based through the ISO (International Standards Organization) 18000 series. This series references architecture and defines the parameters to be standardized. Common RFID air interfaces are located at:

- 135 kHz (and below)
- 13.56 MHz
- 2.45 GHz
- 860 MHz to 960 MHz
- 433 MHz

These frequencies have different propagation characteristics, allowing the user to leverage the laws of physics to meet the conditions of their operating environment.

Tag Types & Characteristics

Type	Power Source	Range	Characteristics
Passive	Induced on the tag by backscatter from a tag reader or like device.	11 cm to 10 meters[2].	The absence of an on-board power source means the tags are comparatively small[3].
Semi-Passive	Embedded power source to supply the chip embedded on the tag for data storage. While the transmit side of the radio frequency link is passively powered, the receive sensitivity is enhanced through active pre-amplification on the tag.	Up to 100 meters.	Enhanced radio frequency sensitivity (typically 100 times that of passive tags), reduces latency (fewer retransmit requests) and increases range over passive tags.
Active	Embedded power source	Hundreds of meters.	Most reliable link quality because of greater immunity to interference from ambient radio frequency energy. Larger form factors.

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[2] Range can be extended to 183 meters using a phase array antenna system at the premises.
[3] The Hitachi the μ-Chip measures 0.15×0.15 mm (not including the antenna), and is thinner than a sheet of paper (7.5 micrometers) and are relatively inexpensive to produce.

2.2 Bands of Operation & Typical Applications

Band	Application
30-300 KHz (LFID)	Human & animal identification.
30-300 MHz (HFID)	Credit card form factor.
300 MHz-3 GHz. (UHFID)	Embedded in labels.

2.3 Common RFID Applications

- Passports
- Baggage tracking
- Access to secured areas/buildings
- Public transit passes
- Electronic toll collecting on motor vehicles
- Stored value cards for vending machines, fast-food restaurants and supermarkets
- Vehicular traffic flow control
- Railroad asset tracking
- Ski lift access
- Asset tracking including:
  - Identification of cattle (origin of herd etc.)
  - Books
  - Jewelry
  - Apparel

- Shipping:
  - Pallet tracking
  - Shipping container locating
  - Truck and trailer location within shipping yards
  - Commodity tracking (e.g.: coffee)
  - Inventory management throughout the entire supply chain (warehouse to consumer)
  - Proximity carding (13.56 MHz within a distance of 10 mm)

2.4 Integration of RFID

With RFID's seamless integration into common business and industrial information technology platforms, it becomes relatively straightforward to automate a number of traditional manual or semi-automated processes (such as data capture/analysis, asset tracking etc.) directly from the core IT environment. Accurate real time queries and tracking become a reality.

The read-write abilities inherent in RFID mean that data affixed to a given asset or group of assets can be modified and updated – all without the necessity of being within line-of-sight of the assets. Too, the data capacity of certain RFID tag types is far greater than traditional bar code or magnetic stripe technologies, allowing richer data storage capabilities including the use of metadata. Finally, as a result of its non line-of-site characteristics, RFID is more tolerant of environmental variations because an optical relationship between scanner and tag is not required.

2.5   Opportunities in Materials Management (Logistics) At Airports and Other Transportation Facilities

The International Air Transport Association (IATA) conducted a study in 2005 where it found that transfer baggage mishandling accounted for nearly two-thirds of all baggage delays (61 percent). The second most common cause of lost luggage was failure to load at originating airport (15 percent of all incidents).

The deployment of an RFID solution for baggage handling addresses:

- Tracking baggage in real time
- Preventing incorrect loading or misplacement of baggage
- Sorting errors by the baggage handling system
- Reduce the time needed to match passengers and baggage
- Improve the handling of unclaimed baggage
- Matching passenger data against dangerous baggage in real time
- Immediate access to the passenger information of suspicious people in real time

When generating the label, an RFID tag is affixed to it. Included in the tag data is the itinerary of the passenger associated with the luggage. Any security flags are also stored on the tag, ensuring that as the baggage moves, real time alerts are communicated to the appropriate authorities.

2.6   Opportunities in Securing Airport, Seaport and Railway Stations

RFID is well suited in securing the airport perimeter, or a portion thereof. Both the people and materials can be tracked and where appropriate, restricted to designated areas.

RFID systems can be used to track employee and passengers in real time. RFID access control and tracking systems ensure that only those authorized can enter restricted areas. In an emergency, the whereabouts of both employees and passengers is immediately known. Employee movement through sensitive areas can be monitored, again in real time. Tamper detection ensures authorities are aware prior to any kind of breach.

RFID has the added benefit of augmenting security with efficiency. The end result is passenger movement is expedited through RFID.

Travel agencies could issue RFID tagged tickets in a number of passenger-friendly form factors. Passenger movement within the airport complex could therefore be controlled based on their itinerary. At the gate, an RFID reader replaces the labour intensive and slow ticket collection process.

In summary, RFID Systems can:

- Contain passenger movement to permitted areas
- Protect employees by ensuring only those authorized enter secured areas
- Locate employees in emergency situations
- Expedite passenger check-in and boarding

3.0   Conclusion

RFID offers a significant opportunity for Airports and other transportation faculties to expedite the movement of people and materials while also improving security.