Warehouse Management using RFID

“THE SOURCE FOR ACCURATE INFORMATION FOR ANY BUSINESS’S IDENTIFICATION NEEDS”
What is RFID?

**RFID (Radio Frequency Identification)** is a technology that allows automatic identification of objects, animals or people.

**RFID is not just a better bar code**

**Capabilities**
- More data, greater accuracy, automated delivery
- Line of sight not required
- Reads 1000’s of items simultaneously

**Benefits**
- Improved accuracy, visibility, operational efficiency and security
- Opportunities to quantify processes and map improvements
- Opportunities for exception based management
**RFID Components**

**Tag**: It is a transponder that is made up of an integrated antenna and an electronic circuit. The information can be written and rewritten on a tag. The ID written on the tag is known as the EPC (Electronic Product Code).

**Reader**: An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves; the tag responds by sending back its data.

**Host Computer**: It reads/writes data from/to the tags through the reader. It stores and evaluates obtained data and links the transceiver to applications.
How RFID works?

Radio command signal issued from reader
Modified signal containing data returned
Why RFID?

- Why RFID (Radio Frequency IDentification)?
  - To avoid reading & typing errors
  - To enable the data entry directly from the point of activity
  - To make sure the accurate data entering into SAP-WMS
  - To speed up the transaction activity by enabling faster data-collection

RFID / Barcode

- Improve accuracy and reduce latency of existing transactions

Automated Facilities

- Automate physical Inventory handling With Auto-ID

Manual Inventory

- Human Dependent & Error-prone

Volumes

Complexities

Capabilities
Our Approach

Business Process Study
- System Study & Site Survey
- Prepare a comprehensive Study report

Technology Selection
- Handheld terminal & Printers selection
- Symbology and performance factors

Design & Architecture
- Enterprise level architecture design
- Handheld management & handling

System Integration
- Seamless integration with ERP
- Complete end-end Implementation

Support Services
- On going h/w & s/w support services
- Supply of Consumables

Auto-ID Solution Consulting

Design, Develop & Implement

Ongoing Support
Our team’s experience

Our **Team**
- Team of Hands-on Experience professionals
- Sound understanding of Solution Development

**Comply with Standards**
- Comply with GS1 Standards of solution
- Quick scalable approach

**Our Eco-system**
- Established global partner links for Auto-ID Solutions
- Strong partnership with OEMs

- Consultants experience:
  - Implemented RFID & Barcode based Assets Management Solution
  - Enabled Warehouse process automation
  - Handheld based inventory management
  - AVI Solution
Potential Benefits of technology

On Time Delivery
- Overall performance and timely deliveries
- Streamline the overall operations

Improved Availability
- Improve order accuracy
- Increased inventory visibility

Complex SKUs
- Manage high number of SKUs
- Increased throughput & accuracy

Low Cost
- Reduce the inventory carrying costs
- Improve the resource efficiency
RFID as Process Enabler

Inbound
- Receiving
- Put-away
- Picking

Processing
- Staging
- Despatch

Outbound
- Despatch

RFID based data collection at each of the proposed process stage

RFID on SKUs
Wi-Fi HHTs for data collection
Wi-Fi Access Points
Enterprise Application Service / Connectors
Way Forward

- Process Study: Current / Proposed Processes study
- Information Gathering: Identification of touch points & site environmental factors
- Analysis: Enterprise Application touch Points & checks
- Integration Approach: Analyze the primary and secondary data / details
- Solution Proposal: Proposal along with BoM, SoW and Implementation Schedule
Products

RFID Readers & Labels

Data capture

UHF RFID Readers

HR Solutions

Mobile Computers & Terminals

Application Software

Integration & Custom Development

Smart cards

Mobile Computers & Terminals

Application Software

Integration & Custom Development

Smart cards
UHF Class 1 Gen 2 General Purpose
Tagging strategy

With many inlay types on the market for all types of FG material (i.e. Concrete Blocks, Cement Blocks, Boards etc.), We helps you decide which inlay works best and where it works best on your products to ensure it is read properly.

Installation & Continued On-Site Support

Through on-site services and support, We will help you maximize your RFID investment by ensuring that your solution is properly installed and achieving your targeted goals
Material Inward Flow (SAP)

1. Supplier
2. MES/GR
3. MIGO
4. QA
5. Unrestricted stock
6. Subcontractor
7. Production Floor
8. Finished Goods
9. Finished Goods store
General SAP process for data entry

User feeds the data into SAP screen by bringing the document to SAP terminal.
Why RFID Solution

To avoid Manual reading, Read Miss & typing errors

To enable the data entry directly from the point of activity to ERP / Applications.

To validate the data before entering into SAP.

To speed up the transaction / physical activity by enabling faster data entry.

Automate the Verification and authentication on real Online Mode.
Typically a LAN Based RFID Reader is connected to LAN to scan the RFID Labels on items / FG. This allows the faster and accurate data entry into ERP database with the help of Middleware application on real time data sharing basis.
RFID & SAP (Scenario-II)

Using Mobile computers allows the direct scanning of RFID on products and update the transactions through flat files.

- Allows limited validations on data
- Stores the data on hand held memory
- Needs a PC for communication with SAP
Using RF system allows online transaction with SAP system directly from hand held computers using a middleware software communicating with SAP using RFC/BAPI interface.
RFID Scanning Modes Possible

- Batch
- Wireless
- Fixed Station
RFID Scanning Modes Means.....

Wireless / Batch
Inventory Management
Where is it? What is it?
What is inside the box?

Material Handling
By Destination
Where is it going? Where has it been?
Should it be here?

Material Handling
Aggregate / De-aggregate
What have I assembled or disassembled?
How many do I have? Do I have enough?

Material Handling
Inspecting / Maintaining
Has this been repaired?
Is this under warrantee?
Has this been inspected?
Is this complete?
What is the asset’s status or state?
Complimentary Long Range and Short Range Passive RFID

Container Tag associated to a…

Pallet Tag associated to a…

Carton Tag associated to …

8 UID Packaging Tags each with 1 associated UID item
**Trend**

Over 90% of warehouses and distribution centers are still only partially automated or completely manual-based.

RFID solutions for improving back-end processes are available today and are proving their value every day in a variety of business environments.
Warehouse Management

Application Opportunities
1. Receiving and Shipping
2. Cross-docking
3. Put away and Cycle Counting
4. Forward pick Replenishment
5. Order Picking, Consolidation and Staging
6. Physical Security

Solution components
1. Read / write RFID tags
2. Handheld computers with RFID and Wi-Fi and colour display for supervisory use
3. Vehicle Mount RFID Units
4. CISCO WLAN backbone
5. Planning, integration, implementation and education services
## Various Data Capture Points

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Assets Tracked</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Conveyor Scanning | • Manufactured Items  
• Each product inside of case  
• Cases  
• Containers | • Verification of each product w/o opening case  
• Lot tracking of cases  
• Read/Write of data to case  
• Each product for reg., warranty of distrib. |
| Entry Way Scanning | • Pallets  
• Containers  
• Shipment Units | • Automated delivery & shipment notification  
• Prevent mis-shipments  
• Automated bill of lading  
• Improved cross dock / dock utilization |
| Stretch Wrap Scanning | • Cases of product on pallet  
• Every product on pallet | • Each product or case level verification prior to shipping |
| Overhead Scanning | • Oversized Items  
• Pallets  
• Containers | • Automated delivery notification  
• Inventory management  
• Staging operations  
• Improved Conveyance usage |
| Hand Held Mobile | • Inventory management  
• Material handling  
• Destination  
• Inspection  
• Aggregate/De-Aggregate | • Allows for exception processing  
• Rapid searching or inventorying  
• Rapid pallet or shipping unit build |
RFID scanners with vehicle mount computers
1. Untagged blocks at receiving

2. RFID System enables tagging of blocks.

3. RFID tagged blocks stored in the warehouse. WMS updated.

4. WMS creates a pick list in response to a shipping order, pick list includes ID on blocks RFID tags. Warehouse personnel start aggregating the pallets for the container.

5. RFID reader on forklift reads the RFID tag on blocks. WMS validates correct pallet is picked up.

6. RFID reader at the dock door reads RFID tag data on pallet and container. WMS ensures correct pallet goes into the container. Container content info. updated in the Equipment Mgmt System.
1. In the Manufacturing Yard

- Automated yard management systems use RFID tags on trucks and trailers to track their movement in real time and can use the information for efficient, automated routing and workforce management.

- It also helps to locate the correct Cement blocks which may look similar in shape and design, whereas they are made for different purpose and may be for different project.

- The system can also generate reports of the material storage time line, availability of the storage area, Tailors Parking are availability etc. to smoothen the operation issues, and allows management to keep focus on more productive activities rather than resolving avoidable issues as hand.
2. On the Cement Blocks

• Permanently identifying Blocks / Pallets and other items logistics with RFID tags facilitates automated tracking systems that reduce manual data handling and dwell times.

• Application software can take advantage of the accurate, automatic identification to improve asset visibility and issue management alerts when items are missing or wrong material being picked up or moving out of warehouse / store on automatic mode / manual mode.

• The net result is improved asset & resource utilization that lets you run your business with less safety stock and minimum wrong shipment and related mobilization cost – and more capital.

• A study by the MIT Auto-ID Center and Accenture found companies could reduce their fixed assets one percent to five percent by taking advantage of RFID.
3. At the Receiving Dock at own Yard or Site

- While gate readers can identify an incoming shipment at client site or in Warehouse or Yards or storage area, other RFID system can track individual Blocks, Segments and cases of accessories etc., as they are unloaded.

- RFID readers at the dock door can expedite the identification of pallets in an entire shipment and log them into warehouse management or inventory control systems in seconds.

- Handheld or stationary RFID readers can save valuable time in cross docking by instantly locating needed items and accurately recording their transfer to outbound shipments.

- The benefits of RFID-assisted receiving at distribution centers can be replicated at individual store locations. A study by Accenture found retailers could reduce in-store receiving expenses by 65 percent with RFID.
4. In the Finished Yard / Warehouse

- RFID readers also can be mounted on forklifts or at key storage area entry / exit points to monitor inventory movements.

- This practice can produce near 100% inventory accuracy and eliminate the need for cycle counts and reduce out-of-stock emergencies.

- Improved product availability translates directly into increased sales, as much as seven percent according to a report by various Research’s in India and overseas.

- Accenture and Forrester Research also studied RFID’s impact on inventory accuracy and visibility and predicted sales revenue gains of between one percent and three percent.

- Accurate delivery also save the cost of reshipment / stock holding / any penalties etc.
Bill of Landing
Material Tracking
5. At the Shipping Area

- RFID can error-proof shipping operations by ensuring all the items needed to fulfill an order are present, QC done, processed and prepared before the order is dispatched.

- Bar coding is effective for shipment verification, but is still prone to errors because the application relies on operators to manually scan each item.

- The item data is written to the pallet tag to create a master record. UHF RFID Tag & readers can record the data and information as segment pass various locations and the data is transferred to a SAP enterprise resource planning system to record inventory levels and status.

- Systems like these produce timely information that improves visibility and provides the flexibility to utilize the pallet tags for other tracking, shipping and receiving operations.
6. In Loading and Dispatch

- Using RFID, logistics providers can create shipment manifests by reading pallet tags during the loading process.

- Tagged pallets facilitate accurate and efficient cargo transfers, especially in break-bulk operations.

- This can drive excess inventory out of the supply chain by making it easier to get the right product to the right store at the right time.
7. Within the Infrastructure

- Receiving, Cross-Docking, Put-Away, Inventory Management, Order Management and Shipping.

- The examples presented here have all described RFID use with warehouse management, inventory control and other enterprise software applications.

- Flexible, standards-based RFID equipment can integrate with current information system infrastructures to enhance and extend the benefits of successful applications.

- Getting started with RFID doesn’t have to mean starting over with supply chain applications.
## RFID For Warehouse

### Common Applications

<table>
<thead>
<tr>
<th>Common Applications</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiving</td>
<td>Optimize inventory - Support JIT - Improve order-to-cash cycle</td>
</tr>
<tr>
<td>Cross-Docking</td>
<td>Improve load balancing - Reduce expediting - Increase fill rate</td>
</tr>
<tr>
<td>Put-Away</td>
<td>Optimize space allocation - Maximize stock rotation - Shorten lead times</td>
</tr>
<tr>
<td>Inventory Mgmt</td>
<td>Improve capital usage - Reduce shrinkage - Optimize stock rotation</td>
</tr>
<tr>
<td>Order Mgmt</td>
<td>Reduce fulfilment time - improve order accuracy - Reduce returns</td>
</tr>
<tr>
<td>Shipping</td>
<td>Increase accuracy - Improve speed</td>
</tr>
</tbody>
</table>
Why RFID in Warehouse/Distribution?

- Most logical first step for most manufacturers:
  - Better Visibility into Location of Inventory throughout the distribution chain.
  - Reduced Warehouse Labour Costs
  - Reduced Inventory Write offs (Refabricating, EOL, shelf life)
  - Reduction in errors - Improved Accuracy
  - Increased Throughput
  - Lower Inventory Levels
  - Improved Customer Satisfaction
Stoke Reconciliation:

Solution provide total visibility in the Procurement & WMS operation.

- Dispatch
- Receiving
- Staking (Directed and stack and CBBs association)
- Picking (FMFO on Batch Basis)
- WIP sequence / Blocked Material

virtual Stoke Reconciliation can done on the basis of random selection of bays to verify the reliability of system.
Comparison between Barcode and RFID

<table>
<thead>
<tr>
<th>RFID</th>
<th>Barcode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can read up to 300 feet and through materials.</td>
<td>Requires a direct sight to the printed barcodes, a maximum distance of 15 feet.</td>
</tr>
<tr>
<td>Up to several hundred RFID tags can be scanned in a single second by one reader.</td>
<td>Barcodes are scanned once at a time.</td>
</tr>
<tr>
<td>RFID tags are typically more rugged, since the electronic components are better protected in a plastic cover. RFID tags can also be implanted within the product itself, guaranteeing greater ruggedness and reusability.</td>
<td>The printed barcode must be exposed on the outside of the product, where it is subject to greater wear and tear</td>
</tr>
<tr>
<td>Some (not all) RFID tags allow information to be modified.</td>
<td>Once printed, a barcode cannot be modified.</td>
</tr>
<tr>
<td>RFID tags allow more sophisticated forms of data protection.</td>
<td>Data on barcode could be encrypted; however, they provide no protection from being copied.</td>
</tr>
<tr>
<td>NO Line of Sight required.</td>
<td>Line of Sight required.</td>
</tr>
<tr>
<td>Typically unattained reading.</td>
<td>Typically attained reading.</td>
</tr>
<tr>
<td>In few cases Reusable.</td>
<td>Non Reusable.</td>
</tr>
</tbody>
</table>

Typically in cases where Dust / Moisture is there RFID is more successful then Barcode because it doesn't need line of sight.
Phase 2 Implementation

Warehouse Mapping using **RFID Tags:**

Tag on every location in Warehouse used to identify and associate with Cement / Concrete Blocks to maintain FMFO and visibility in stock.
Stacking:

Boards on the Bay to guide and Identify the Location ID of the warehouse location.

Standard Association as per the Protocols existing.
Identify the stake to be loaded based on the Pick sheet generated by application S/W using Digital display at the loading gate or Hand Held Reader.
1. Receiving dock at Warehouse

- CBBs will pass through a RFID Dock door setup.
- Here systems will check the desired pre requisite with the actual process like FIFO, Sequence of the Box, Grade of the Material etc. online.
- This will generate the data & validated against the Stock request and same will be imported in ERP.
Loading/Dispatch at Warehouse:

- Trolley carrying CBBs will pass through a dock door setup.

- Here systems will check the desired pre requisite with the actual process like FIFO, Sequence of the Box, Grade of the Material etc. online.

- This will generate the PGI data for ERP.
LOADING / UNLOADING AREA – RFID SCANNING GATE
RFID In Container Shipping Process

1. RFID tag on container read by RFID reader at container depot.

2. RFID reader at warehouse dock door records container arrival.

3. RFID tagged container aggregated and loaded into container. WMS ensures correct pallet gets loaded onto the container using tag info from container and pallet.

4. RFID reader at warehouse dock door records container departure.

5. RFID tag on container read by RFID reader at container yard entrance at seaport.

Equipment Management System (EMS). Updated on container's movements, location and contents.

Warehouse

Container Yard

Sea Port

Container Depot
ISO 18000 6C: Generic Memory Mapping

<table>
<thead>
<tr>
<th>BANK</th>
<th>Reserved 00</th>
<th>EPC 01</th>
</tr>
</thead>
<tbody>
<tr>
<td>word byte 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 MSB</td>
<td>KILL PWD</td>
<td></td>
</tr>
<tr>
<td>1 MSB</td>
<td>ACCESS PWD</td>
<td></td>
</tr>
<tr>
<td>2 LSB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 MSB</td>
<td>CRC16</td>
<td>20</td>
</tr>
<tr>
<td>4 MSB</td>
<td>PROTO CNTRL</td>
<td>0 1 0 1</td>
</tr>
<tr>
<td>5 LSB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 MSB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 LSB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tag ID 10

| word byte 0   |             |        |
| 0 MSB         | CLASS ID    | 1F     |
| 1 MSB         | cont..       |        |
| 2 MSB         | TAG DSN.    |        |
| 3 MSB         | OPTIONAL (e.g. tag ID) | 1F |
| 4 LSB         |             |        |
| 5 MSB         | TAG MODEL   |        |
| 6 LSB         | user organized... |    |
| 7 LSB         |             |        |
18000 6C Tags Memory Banks Structure

Reserve Bank (0)
- Kill Password
- Access Password

EPC Bank (1)
- EPC Number (up to 498 bits)

TID Bank (2)
- Gen 2 Tag
- IC Mfg
- IC Model
- 64-bit Factory Programmed Unique ID

User Bank (3)
- Block 1
- Block 2
- Block 3
- Block 4
- Block 5
- Block 6
- Block 7
- Block 8
Why US for RFID SOLUTION?

• Only AIDC company focused for 100% working solution delivery with worlds best Reader / RFID Labels / Software.

• We knows your business and how RFID can help you be more successful

• Alliance with Major RFID companies / Software Companies like TAGEOS / STAR INTERNATIONAL / WIPRO / HCL etc.

• OUR RFID solutions provide more information to make existing automated data capture systems even more productive

• Expertise in other AIDC technologies like Bar-coding, Biometrics, Wireless etc.
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- Reduction in errors - Improved Accuracy
- Increased Throughput
- Lower Inventory Levels
- Improved Customer Satisfaction
- Customer Mandates
RFID Standards

Many to choose from!
RFID Standards

ISO 180006C - Freight containers — RF automatic identification

ISO 180006C - Supply chain applications of RFID - Freight containers

ISO 180006C - Supply chain applications of RFID - Returnable transport items

ISO 180006C - Supply chain applications of RFID - Transport units

ISO 180006C - Supply chain applications of RFID - Product packaging

ISO 180006C - Supply chain applications of RFID - Product tagging
Standards

RFID for Item Management Air Interface (ISO 18000)

- ISO/IEC 18000-1 - Generic parameters - Air interface
- ISO/IEC 18000-2 - Parameters for air interface below 135 kHz
- ISO/IEC 18000-3 - Parameters for air interface at 13.56 MHz
- ISO/IEC 18000-4 - Parameters for air interface at 2.45 GHz
- ISO/IEC 18000-6 - Parameters for air interface at 860-960 MHz
Implements knowledge-enabled logistics through fully automated visibility and management of assets in support of the warfighter.

Using good information to reduce bad inventory.
Contact US

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