RADIO FREQUENCY IDENTIFICATION (RFID)

You can't manage what you can't measure
INTRODUCTION
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Provides professional services and education for any company looking to improve business through innovative RFID technology.
www.rfidtec.co.za

Provides turnkey innovative RFID enabled Solutions for automatic identification, management and tracking of products, people and processes
www.innorfid.co.za
INNOTRACK has years of experience in RFID system evaluation, design, development and deployment.

Associated with the RFID Institute.SA in deploying their 20 years of Developments.

We consistently seek to facilitate 100% effective RFID system deployments in South Africa and abroad that utilise best fit technologies.

We are internationally accredited and associated with CompTIA & EPC Global.

Some of our corporate clients are listed below:
From surveying a site to implementation, or any component in between - the RFID Institute.SA has the expert team.
Anglo Platinum (World’s largest platinum producer) - responsible for the feasibility analysis, design and implementation of RFID technology projects in order to enhance safety and security and to improve productivity and operating efficiencies across the group:

• Identified more than 50 significant applications for RFID.
• Completed separate feasibility projects on personnel location, vehicle detection, collision avoidance, mining logistics, emergency evacuation, sample tracking, access control and cathode tracking.
• Rolled out a US$10 million mining logistics management system pilot looking to enhance safety and production. Net present value calculated to be circa US$30 million over 5 years.
• Prepared capital budget estimate and benefits case for the potential deployment of US$100 million group wide RFID based mining logistics management system.
4 Mining Applications & Benefits...

1. Planned Maintenance
2. Asset Management
3. Tracking Relevant Equipment & Employees
4. Mining & Process Waste Management
5. Rapid Rail Loading
6. Ore Blending
7. Ore Processing
8. Ore Sample Tracking
9. Electronic Waybill System
10. Logistics Management
11. Lamp Room Safety
12. Opencast Blast Block Mapping
• Undertook a feasibility and RFID Mine Trial (pilot) for Kumba Iron Ore.
  Results showed that RFID could be used to track samples, measure blast movement, and track ore from Pit to Port, resulting in reduced ore losses with an estimated improvement in annual revenue of R2.1B.

• Compiled a RFID Benefits Analysis for Vodacom in order to automate their existing Asset Management System (AMS) across their 30 distribution stores, 300 vans and 7800 radio towers.
  The value of the identified benefits revealed a NPV of between R100M and R200M dependant on the AMS model adopted.

• Completed a Feasibility Study for Woolworths to investigate the potential and benefits of RFID Technology for Asset (Lugs) Tracking and Management within their organisation throughout the supply chain.
  The value of the identified benefits revealed a savings of R22.9M. The majority of the financial benefit of the AMS would derive from the improved utilisation of assets and reduction of losses.
Achievements

Nominated for “International RFID Breakthrough Awards“

South African Mining Company, Kumba Resources, has been nominated for the Best Pilot Award at the RFID Breakthrough Awards 2006. The Mining company, who use the tags to track ore from blast to customer, have been nominated by their technology supplier RFID.SA, who will be hoping that their customer will be picking up an Award at the RFID Breakthrough Awards evening Dinner on November 8th at Banqueting House, Whitehall, London.
INNOTRACK is a suite of RFID enabled track and trace solutions that has evolved as a major technology enabler for automatically identifying, managing and tracking goods, raw materials and assets within all sectors of industry. RFID Technology facilitates continuous real time measurement of people, process, assets and materials.
Case Studies

TYRE CORPORATION
First global roll-out of tagging truck tyres for track and trace, fleet management and retread process.

SWAZILAND SUGAR ASSOCIATION
Tagging of 1 tonne export and local bags (re-usable) for logistics, traceability, re-call and quality control.

KELLOGGS
Pallet tracking through distribution network.

ANGLO AMERICAN – KUMBA IRON ORE MINES
Monitoring and tracking of ore grade from pit to port
RFID
HOW DOES IT WORK
• RFID is a system involving electronic tags containing identification numbers or other data that is encoded on to an Integrated Circuit (IC).

• A device called a Reader sends an electromagnetic signal to the Tag. Upon receiving the readers signal, the tag transmits code to the reader.

• By monitoring Tag ID’s, the RFID System can track the presence and location of a tagged object as it moves through the organisation.
USES OF RFID

- **Security and Authentication**
  RFID stores data within items which are linked to a process.
  E.g. People / Access, SKU / Production, etc.

- **Track and Trace**
  Tracking the location of a particular object helps you monitor its movements. You can track critical items, pallets of products, personnel, and other items within the daily work process.

- **Real Time Locating (RTLS)**
  By placing readers at strategic designated zones, tags are automatically read and the location reported real time.

- **Environment Sensing and Monitoring**
  You can integrate RFID technology with devices that sense and monitor various environmental conditions.
GENERAL BENEFITS OF RFID

- **Serialisation**
  Each item has a unique ID, therefore each item can be individually tracked.

- **Reduced Human Intervention**
  No human intervention is required. This reduces the error cost and labor involvement.

- **Better Time Management**
  As this is scanned automatically, many items are scanned simultaneously, thus more items are accurately scanned in less time.

- **Real Time information flow**
  The scanned information is updated “real – time” across the supply chain
RFID REGULATIONS

The legislative body responsible for the licensing, licence exemption and allocation of radio frequencies in South Africa is the Independent Communications Authority of South Africa (ICASA).
The Electronic Product Code, (EPC), is a family of coding schemes created as an eventual successor to the bar code.

The EPC was created as a low-cost method of tracking goods using RFID technology.

It is designed to meet the needs of various industries, while guaranteeing uniqueness for all EPC-compliant tags.
WHY RFID

<table>
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<tr>
<th>Bar Code</th>
<th>RFID</th>
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<tr>
<td>Requires Line – of – Site</td>
<td>Does not require Line – of – Site</td>
</tr>
<tr>
<td>Requires correct orientation</td>
<td>Does not require orientation</td>
</tr>
<tr>
<td>Easily obscured by dirt</td>
<td>Not affected by dirt</td>
</tr>
<tr>
<td>Easily scratched or damaged</td>
<td>Unaffected by scratches (encapsulated)</td>
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<tr>
<td>Contents cannot be modified</td>
<td>Can modify data stored in tag</td>
</tr>
<tr>
<td>Can only read one label at a time</td>
<td>Can read multiple tags at once</td>
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</table>

BARCODES
A barcode is a strip of bars and gaps that represent numbers. Barcodes typically encode a serial or stock keeping unit (SKU) number and identify a class, or types of products rather than identify a single unit.
RFID COMPONENTS

The RFID enabled system consists of both **hardware** and **software** components. The hardware components are responsible for identifying and capturing data. The software components of an RFID system are responsible for managing the data transmitted between the **tag** and the **reader** and between the reader and the **host system**.
DATA TRANSFER PATH

BUSINESS APPLICATION
- Connect to multiple LOB apps
- Orchestrate business process
- Leverage B2B / BPM capabilities

RFID EVENT PROCESSES
- Manage devices at the edge
- Add context and turn raw events into business process relevant information
- Interpret events at the edge through filters, rules & alerts

DEVICE LAYER
- Connect to multiple LOB apps
- Orchestrate business process
- Leverage B2B / BPM capabilities

PHYSICAL LAYER
- RFID tags, barcodes
- Biometrical systems
- Environmental sensors etc...
TYPICAL READ STATIONS
RFID TAG TECHNOLOGY

- **Terminology:**
  - The **non-changing** (product) identifier is known as the **Global Trade Item Number (GTIN)**. This only identifies the product type or stock-keeping unit (SKU) rather than an individual instance of a particular product type.
  - The **serial number** must be added to the GTIN to identify the specific instance of that product within the EPC. This is the **Serialized Global Trade Item Number (SGTIN)**.

- **EPC SGTIN-96 Format as Defined by the EPCglobal Tag Data Standard V1.6**
RFID TAG TECHNOLOGY

- Bar codes have the product SKU but not the serial number.
- The EPC can be thought of as:

  ![Diagram showing UPC containing GTIN and SGTIN](image)

Define the product (a product SKU) (but not the instance of that product)

Defines BOTH the product and the specific instance of that product
# RFID TAG TECHNOLOGY

## Attribute

<table>
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<tr>
<th>Attribute</th>
<th>Feature</th>
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<tr>
<td>Authentication</td>
<td>Unique 64 Bit TID&lt;br&gt;Factory Programmed</td>
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<tr>
<td>Security</td>
<td>32 Bit Read/Write Passwords&lt;br&gt;Block Level Access</td>
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<tr>
<td>Memory</td>
<td>512 Bits of User Memory&lt;br&gt;Extensible EPC Number (e.g. 96 – 496 bits)</td>
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</table>
DATA WRITTEN TO TAG - BAG FILLING

RFID Reader

Data written to Tag
TAG FORMATS
- Tag format / packaging
- Tag size
- Tag attached to what / how
- Read range / speed
- Fixed or Mobile Readers
- Reader “Interrogation “ Zone
- Environment
- Data storage / Memory
- Real time or last seen
- Volumes
- Cost
RFID ENABLED SUPPLY CHAIN
Data through product lifecycle

1. Field
   - Harvest date: November 3, 2001
   - Method of harvesting:

2. Factory
   - Production data:
     - Product: Tuscan olive oil
     - Manufactured at: Factory 3
     - Date: November 5, 2001
     - Process: cold press
     - Temperature: 108 Celsius

3. Ship
   - Shipping data:
     - Container number: 0003589
     - Contents: 1,000 pallets of Tuscan olive oil
     - Origin: Rome, Italy
     - Routing: Rome to London to New York
     - Container last opened:
Data through product lifecycle

**Retail store shelf data:**
- Contents: 30 bottles of Tuscan olive oil
- Shelf life: 10 months
- Price: $5.00
- Stock-out alert level: 10 bottles

**Receiving/loading data:**
- 100 cases of Tuscan olive oil
- 20 bottles per case
- Date and time received: 12/30/2001; 09:26:48 (EDT)
- Destination: Store X

**Checkout data:**
- Shopping cart contents include:
  - one bottle of Tuscan olive oil
- Total: $125.38
- Debit card no.: xxxx xxxx xxxx 1234

**Pick and pack data:**
- Pick list: 10 cases of Tuscan olive oil
- Bin location: aisle F, row 4
Data through product lifecycle

6 Home

Pantry data:
- One 34-oz bottle of Tuscan olive oil
- Expiration date: November 5, 2002

7 Recycling center

Recycling data:
- Material: clear glass
- Weight of material: 3 oz
RFID Enabled Distribution Operation

1. Receiving Process:
   - RFID Tag fitted to component
   - Register in Track and Trace
   - Unique ID assigned to each item
   - Confirmed Stock In
   - Automatic update of Stock Inventory

2. Conveyor Reads:
   - Much higher read rates
   - Fewer “rejects” that require manual handling

3. Inventory Management:
   - Accurate stock information
   - Reduced need for manual counting

4. Item Search:
   - Reduced Stock take duration
   - Locate unique items

5. Cross-Docking Area:
   - Increased cross-docking accuracy

6. Shipment Process:
   - Automated “green light” shipping through pick verification (“pick, pack & ship” match)
   - Improved “right product, right door, right store” compliance
   - Automatic Stock update

7. Asset Control:
   - Improved utilization
   - Reduced theft
   - Improved returns process
RFID - Enabled Direct Store Delivery

1. Supplier Depot:
   • Improved warehouse management
   • Improved product track & trace

2. Store Delivery:
   • Potential for “off hours” check-in & delivery
   • Automatic match of products received & shipment notification
   • Improved turnaround times & fleet utilization for DSD suppliers
RFID - Enabled Store Operations

1. Store Deliveries
   • Improved delivery accuracy
   • Reduced congestion/improved turnaround times
   • Better labour/asset utilisation

2. Backroom
   • Verified “hands free” receiving, with alerts for discrepancies
   • Accurate stock information
   • Better stock location management
   • Improved stock rotation

3. Sales Floor
   • Accurate stock information
   • Improved on-shelf availability
   • Reduced administrative activities
   • More efficient, even-driven replenishment

4. Yard
   • Secure receiving doors
   • Better product/asset control and returns

5. Compactor/Baler/Waste Area:
   • Reader to confirm that cases were emptied and removed from the stock pile
Supply Chain Management

• RFID technology enables accurate, real-time and dynamically updated data.
• By tagging inventory items or containers, information about location, quantity and movement of those items is available at all times.
• The possibility of human error is eliminated through RFID tagging (and human resource cost efficiency is improved).
• Inventory re-ordering becomes more effective due to the fact that replenishment decisions are based on accurate information (improved stock management).
• The process of pick-and-pack is greatly improved through knowing the exact location of inventory items within the warehouse, even when misplaced (picking and load accuracy).
• Thus delivery lead-times are reduced and a high level of customer-satisfaction is maintained.
• It is easy to see how RFID solutions can be used to achieve the highest level of productivity and a smooth flow of processes in every operation of the supply chain.
PROJECT APPROACH
PHASED APPROACH

Learn about RFID technology → Seek independent advice to assist in the technology evaluation → Identify the business case

Define your specific technical requirements → Determine the best technology solution

Carry out some form of pilot program or trial → Implement a workable solution

Start Here

User develops (or has a 3rd party consultant develop) a Business Case with goals to be supported by RFID technology

RFID Services are engaged

A Process Analysis is conducted

Is RFID optimal for User's goals?

Are success criteria met or exceeded?

System signed over to the User with performance levels meeting or exceeding expectations

User and Vendor arrive at consensus on 'success criteria' for system performance measurement

Business Case revised or abandoned accordingly
## PHASED APPROACH

<table>
<thead>
<tr>
<th>ANALYSIS</th>
<th>DESIGN</th>
<th>DEPLOYMENT</th>
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<tbody>
<tr>
<td>- Understand the technology</td>
<td>- Select applications for deployment</td>
<td>- Select and assign vendors</td>
</tr>
<tr>
<td>- Identify all priority applications</td>
<td>- Design system</td>
<td>- Manage Deployment (Pilot / Rollout)</td>
</tr>
<tr>
<td>- Assign appropriate technologies</td>
<td>- Qualify vendor products</td>
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<tr>
<td>- Establish deployment costs and benefits</td>
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RFID COST

- RFID is **not** a homogeneous technology.
- Different variants have different capabilities.
- Tags can cost between R1 & R1,000.
- Readers can cost between R2,000 & R50,000.
- Many things require consideration:
  - **Available Technologies** – what is the most appropriate technology for the clients specific needs;
  - **Environmental Considerations** – does the physical environment present special challenges or requirements (eg. impact on medical telemetry);
  - **Business User Requirements** – do all of the organisational stakeholders understand the capabilities of RFID and have all possible applications and user requirements been considered;
  - **Integration Constraints** – can the selected technology integrate with legacy or planned ERP’s and other systems (eg. SAP / HIS / e-HR);
  - **Organisational Impact** – what will the organisational impact of the planned system be, taking into account processes, people and facilities;
  - **Standards and Interoperability** – does the selected technology comply with international & domestic standards and is it suitably interoperable with other standards compliant technologies;
  - **Deployment and Maintenance Costs** – is the selected technology competitively priced and reasonably maintainable with suitable longevity, and
  - **Financial and Non-financial Benefits** – are the anticipated benefits properly quantified and do they mitigate the associated costs and risks
RFID System Design
3 to 6 Weeks

RFID System Deployment
3 to 6 Months

Project Communications – Steercom; Integration; Project Management

Change Management Strategy Design & Deployment

Process Engineering
- Analyze & Design
- Draft Procedures
- Develop Training Material
- Conduct Training

Technology & Comms
- Functional Specification
- Technology Testing
- Technology Specification
- Vendor Qualification
- Procurement
- Middleware & Software
- Install Hardware
- Test, Integrate & Commission

Application Development
- Detailed User Requirements
- Application Analysis & Specification
- Application Selection Criteria
- Application Procurement
- Programme Application
- Application Testing
- Train & Install
- Review & Optimise

Organisation & Facilities
- Organisation Design
- Facilities Design
- Recruitment & Selection
- New Way of Working Installation
- Supervisor Mentoring
- Design Compliance Audits
- Conduct Compliance Audits

Information Management & Evaluation
- Information Requirements Design
- Management Cycle Design
- Management Reporting System Design
- Information System Integration
- MC and MRS Testing
- MC & MRS Installation
- Effectiveness Review
- MC & MRS Optimisation

Benefits Case Tracking
- Benefits Case Tracking Design
- Benefits Case Evaluation
- Base Data Source Verification
- Benefits Case Tracking
- Benefits Case Evaluation
- Benefits Case Refinement
PROJECT APPROACH

- **Analysis (Feasibility)**: 2 Months
- **Design & Spec**: 3 Months
- **POC / Pilot**: 6 Months
- **RFP / Tender**: 1 Month
- **Deployment (Rollout)**: Ongoing

12 Months
“From farm to fork”  
Sugar traceability

Case Study  
Traceability & Recall/  
Warehouse Management

Swaziland Sugar Association
SSA Traceability Project

• The objective of the project is twofold, namely;

• Bagged Sugar Traceability (Export – Single Trip): Track and trace bagged sugar from the mills through the distribution process to the customer. Provide a facility to locate and recall bagged sugar by product or batch.

• Local – Multi Trip Bag Management: The tracking and management of the 1 Ton sugar bags from manufacture throughout the lifespan of the bag.
The Track and Trace system provides the following functions:

- Uniquely identify each bag
- Link any bag to the point of origin (batch, date/time/mill)
- Real time stock update
- Remote bag identification
- Associate bags to delivery note / customer
- Recall functionality at bag or batch
- Track and update the usage cycle of local Bags
- Information is maintained in a database at both mill and industry level providing full traceability across all sites
Examples of Tagged Items

1 Ton Bag – Local Multi Trip Bag

Delivery Note
Process

Bag Manufacturer

RFID Tags

Bag Filling

RFID Tag Sewn into 1 Ton Bag

Write Tag Data

Stock

Delivery Note

Reporting available on www

RFID Tags

Write Tag Data

RFID Tags
Delivery Note Encoding
Dispatch Process via “Gate Portal”

32 off 1 Ton Bags
Or up to 600 off 50 kg Bags
Hand Held Reader
RFID tagged crate received from supplier (tagged at source)

Auto Read crate RFID ID and marry product to crate. Place in stock.

Auto Read many crates - Out scan

Auto Read many crates - Unit Batch

Auto Read many crates - Product ID - In Store - Update Stock

Auto Read many crates - Product ID - Out Store - Update Stock

Manual Scan - Stock Take - Product Search

Auto Read many crates - Product ID - Marry to Waybill

Auto Read many crates - Product ID - Enter DHL Boksburg - Verify Goods Received against Waybill
Return to References Home Page
### Origin of ore

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