RFID enabled Solutions

TYRE MANAGEMENT
Why RFID ...

<table>
<thead>
<tr>
<th>Bar Code</th>
<th>RFID</th>
</tr>
</thead>
<tbody>
<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>
</tr>
<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>
</tr>
</tbody>
</table>

YOU CAN’T MANAGE WHAT YOU CAN’T MEASURE
# Active vs. Passive

<table>
<thead>
<tr>
<th><strong>ACTIVE TAGS</strong></th>
<th><strong>PASSIVE TAGS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Active tags have an internal power source,</td>
<td>Passive tags have no internal power supply and are instead activated by the reader.</td>
</tr>
<tr>
<td>such as a battery. They have longer ranges</td>
<td>Passive tags have read distances ranging from 2mm through to 4.6m, depending on</td>
</tr>
<tr>
<td>and larger memories than passive tags and</td>
<td>the frequency of individual tags. Passive tags can operate at low frequency (LF),</td>
</tr>
<tr>
<td>usually operate at 455 MHz, 2.45 GHz, or</td>
<td>high frequency (HF) and ultra high frequency (UHF).</td>
</tr>
<tr>
<td>5.8 GHz and have a reading range from 20 to</td>
<td></td>
</tr>
<tr>
<td>100m</td>
<td></td>
</tr>
</tbody>
</table>
YOU CAN'T MANAGE WHAT YOU CAN'T MEASURE

Typical System Architecture

Business Applications
- Connect to multiple LOB apps
- Orchestrate business process
- Leverage B2B / BPM capabilities

Business Intelligence
- SQL / SQL BI for data analytics

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
- RFID fixed and mobile readers
- Barcode scanners
- PLCs etc.

Physical Layer
- RFID Tags, Bar Codes
- Biometrical Systems
- Environmental Sensors etc.

Distributed sites running RFID services

Manufacturing  Quality Assurance  Inventory  Packaging  Warehouse  Distribution  Reception
Typical Project Approach

Start Here

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

- Business Case revised or abandoned accordingly

- RFID Services are engaged

- A Process Analysis is conducted

- Is RFID optimal for User's goals?
  - Yes
    - User and Vendor arrive at consensus 'success criteria' for system performance measurement
  - No
    - Are success criteria met or exceeded?
      - Yes
        - Site Installation is performed and the system is tested
        - System signed over to the User with performance levels meeting or exceeding expectations
      - No
        - Are 'success criteria' supportable?
          - Yes
            - A Site Analysis is performed
          - No

YOU CAN’T MANAGE WHAT YOU CAN’T MEASURE
Typical Read Stations

- GATE / DOCK DOOR
- PORTAL
- HAND HELD
- CONVEYOR
UHF Passive Tags
Tyre Registration

Note: Each RFID Tag has a unique Non erasable ID.

Asset Register logs all tyres tagged

Host Server

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Tyre Dispatch

YOU CAN’T MANAGE WHAT YOU CAN’T MEASURE
Scan tyres upon receiving:
• Verify POD against goods sent
• Log and record – ownership (Tyre Asset Register)
Customer

- Enter Truck VIN
- Enter Tyre Position
- Scan Tyre RFID S/N
- Scan Wheel S/N

Tyre / Wheel Management System
Add on benefit to End User
The main development criteria was not purely focused on the ability to track a “tyre” but to determine and evaluate:

- the method of dispersing the Tags
- the volume of Tags required per site
- the properties of the tyres
- the behavior of a Tag within a tyre
- the read percentage accuracy of tyres at reader locations
- The survival rate of Tags throughout the tyre manufacturing process
Tyre Management

Tyres can extend their life by retreading processes. However, their identification has long been a tedious and dirty job, not to mention the tracking process of multi-thousands of tyres moving in and out of the retreading factories.

Each RFID provides an unique ID and storage memory for saving useful information such as manufacturers, production date and expiry date.

RFID System can capture the RFID tag information automatically, and since each ID is unique, the history can be used for preventive maintenance or tyre replacement plan.

The RFID Solution on Tyre Management can automatically visualize and keep track on the flow of tyres, moving in/out of the retreading factory and Km usage on vehicles. The whole history of the tyres can be linked with the vehicle ID and even which side it is being mounted onto.

Benefits:

• Better Management
• Cost Reduction
• Quality & Safety
• Environmental

YOU CAN’T MANAGE WHAT YOU CAN’T MEASURE
RFID uses are extensive and varied with new and innovative applications being created daily. Their main uses include, asset tracking, personnel safety and registration, stock control (from livestock to freight containers) and even vehicle tolling/licence control.

Assets are only assets when you have information about them, such as, where they are, what they do, where they have come from and where they are going. Effective stock and asset control using RFID can assist in implementing a structured and reliable solution to track, trace and audit products during all phases of its lifecycle.

Stock and asset control is vital for profitability but is also time consuming. Automated RFID systems provide a valuable cost effective performance improvement.
There is a range of RFID tags, patches and readers to suit every requirement for the unique identification of truck, OTR and passenger tyres.

RFID tagging greatly improves the traceability of the casings throughout their complete lifecycle (new, re-grooved, retread and (scrap) without the adhesion and replacement issues associated with traditional bar-coding and branding.

RFID technology allows for relevant data such as, make, size, pattern, phase to be written and stored within the microchip. This data can be retrieved with any reading device and used to track and record its current status and whereabouts. This can assist in controlling theft, stock audits, tyre inspections, and legacy reporting.
Tyre Management

The RFID enabled system for fleet, truck, trailer, bus and passenger tyres, make the tyre inspection process easy, accurate, fast and enables instant reporting.

Tread depths and pressure are captured automatically and electronically transmitted via Bluetooth to a hand held computer (PDA, Smartphone or tablet PC). Other supporting information on phase, dimensions & patterns, tyre defects and required actions are also recorded during the inspection process.

Benefits

• Life cycle management of tyres
• “Real” data acquisition
• Electronic “Best Practise”
• Common tools and process
• Accurate data, captured once, multiple uses
• No paper, no manual errors
• Inspection & service at the vehicle
Manufacture stage

The tags are fitted in the tyre’s sidewall during original manufacture or bead to bead retread, and are therefore protected against tampering and outside elements.

Retrofit

Retrofit RFID tag is encased into a rubber patch and is fitted in exactly the same way as a repair patch. The RFID patch is applied to the inside wall of tyre using a cold, chemical or heat cure process.

All tags and patches can withstand the temperatures endured during multiple retread processes and stay with the casing for its complete lifecycle.
The single greatest cause of tyre damage and failure is incorrect tyre pressure.

- TPMS enables tyre temperature and pressure readings to be transmitted during inspection using UHF readers.

- **TPMS Sensor** & **RFID** are passive devices and do not require batteries TPMS sensor is completely hermetic, impervious to liquids and chemicals that may be present in the tyre.

- RFID may be embedded in the patch creating a “TPMS Ready” RFID patch as a standard product.

- RFID may be included within the TPMS sensor housing. External antennas provide improved read range and reduced sensitivity to tyre compounds and construction.

- TPMS sensor (and RFID if within TPMS housing) is a field replaceable unit that does not require specialist tools.

- Used in conjunction with **OTR Probe**
Our tyre management software solutions allow fleet operators and tyre service providers, to obtain precise information regarding the tyre operational conditions and how this can affect the performance and costs.

We enable our clients to make informed tyre purchase and maintenance decisions based on the accurate data captured during the inspection process.

Our tyre management solutions can be adapted to any customer site, existing software and data reporting environment.

**Our Tyre Management Software Provides:**

- Complete tyre lifecycle management (cradle to grave)
- Tyre tracking throughout all operations
- Tyre projections and legacies
- Stock control & maintenance
- Performance analysis
- Fully integrated data reporting
- Real time communications
- PC based and Web based architectures
We offer various “field-ready” PDA’s and protective cases to receive and manage the captured data.

**Features**

- Fully integrated wireless tyre inspection solution.
- Wireless hardware for electronic measurement of tyre tread & pressure.
- Rugged design for outdoor use.
- Automatic real time reporting.
- Internet centric data management.
- Bluetooth wireless technology.
- Worldwide compatibility.
- Easily integrated into existing business and software systems.
Tag Features

- UHF Passive (No Batteries)
- Unique non erasable ID
- Read / Write capabilities
- Survive harsh environment
- Customised – Shape, Size (25mm +), Density (SG 1.0 – 4.4) and colour
- Non Contact / No line of site required
## Tag Memory Structure

### Tag Identifier (UTID) – Permanently Locked Data

<table>
<thead>
<tr>
<th>IC Manufacturer</th>
<th>Chip Version</th>
<th>64-bit Factory Programmed Unique ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>E200</td>
<td>3412</td>
<td>0614 1411 0073 4886</td>
</tr>
</tbody>
</table>

### EPC Memory (up to 496-bits)

<table>
<thead>
<tr>
<th>Header</th>
<th>Filter</th>
<th>Partition</th>
<th>Company Prefix</th>
<th>Item Reference</th>
<th>Serial Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>3</td>
<td>5</td>
<td>0614141</td>
<td>100734</td>
<td>203886</td>
</tr>
</tbody>
</table>

### USER Memory (up to 512-bits)

- **Extended User Memory**
  - 9064 6431 2073 4836 0604 2471 9073...4883
## Planned Maintenance

<table>
<thead>
<tr>
<th>Application</th>
<th>Function</th>
<th>Benefit</th>
<th>Rand Value</th>
</tr>
</thead>
</table>
| Planned maintenance | - In combination with Asset register / management  
                    - Correct identification of asset for maintenance  
                    - Asset maintenance history |  - Costing per asset is more accurate  
                                               - Improved planning and scheduling  
                                               - Correctly identify when equipment has reach economical repair point | Yes        |
<table>
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<th>Application</th>
<th>Function</th>
<th>Benefit</th>
<th>Rand Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset management</td>
<td>- RFID tag positioned on asset&lt;br&gt;- RFID tag number links to asset register in ERP&lt;br&gt;- Tag can contain history of asset and other relevant information</td>
<td>Increase:&lt;br&gt;- Asset register accuracy&lt;br&gt;- Update frequency&lt;br&gt;- Asset control</td>
<td>Yes</td>
</tr>
</tbody>
</table>
# Equipment & Employee Tracking

<table>
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<tr>
<th>Application</th>
<th>Function</th>
<th>Benefit</th>
<th>Rand Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracking relevant equipment and employees</td>
<td>- Multiple tags linked to equipment or employees</td>
<td>Improved employee control</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>- Employees linked to equipment or directly to a tag</td>
<td>Better control of organisation teams</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- One system to track material, rolling stock, men, stope monitoring, pegs</td>
<td>Enabling improved half level costing</td>
<td></td>
</tr>
</tbody>
</table>
## Tyre & Process Waste Management

<table>
<thead>
<tr>
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<th>Function</th>
<th>Benefit</th>
<th>Rand Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tyre and process waste management</strong></td>
<td>■ Tags added to waste at waste chutes&lt;br&gt;■ Waste is tracked to stockpiles&lt;br&gt;■ Process system flags if waste is reprocessed</td>
<td>Reduced processing&lt;br&gt;Accurate recording of contractor production&lt;br&gt;Improved plant efficiency</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Improve tracking of waste materials – improved processing efficiencies**
## Electronic Waybill

<table>
<thead>
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<th>Function</th>
<th>Benefit</th>
<th>Rand Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Waybill system</td>
<td>□ Track equipment to and from repair agents</td>
<td>Improved Audit Trail</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>□ Track Major Spares from Stores to Workplace to Repair Agents</td>
<td>Automatic Surveillance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ LP gas bottle and fire extinguisher tracking</td>
<td>Improved Inventory Control and Turn around Time Management</td>
<td></td>
</tr>
</tbody>
</table>
## Logistics Management

<table>
<thead>
<tr>
<th>Application</th>
<th>Function</th>
<th>Benefit</th>
<th>Rand Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logistics</td>
<td>□ Receiving, Issuing of stock</td>
<td>Improved accuracy of stock receiving and issuing</td>
<td>Yes</td>
</tr>
<tr>
<td>management</td>
<td>□ Stock taking</td>
<td>Reduced stocktaking timeframe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ Material handling with material carts to mining section</td>
<td>Material handling accuracy improvement of 925%</td>
<td></td>
</tr>
</tbody>
</table>