

SIMERA
TRACE

RFID Technology developments within the Mining Industry



Photo by Peabody Energy, Inc.

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1 Development work completed

| Title | Details |
|----------------------------------|--|
| Company Profile | About |
| Comptia RFID+ Certificate | Certification |
| RFID Reference | UHF Training |
| RFID Reference | HF Training |
| Tag in Tyre | Approval |
| RFID Awards | Ore Tracking |
| Case Study | Track and Trace |
| Case Study | Asset Management |
| Case Study SAIMM Presentation | RFID enabled Ore Tracking / Density Tracers |
| Case Study | Ore Tracking |
| Feasibility Study | Asset Tracking - Crates |
| Endorsement | RFID enabled Solution |
| Endorsement | RFID enabled System - Mining |
| Endorsement | RFID enabled Product |
| Development | Collision Avoidance |
| Test and Evaluate | RFID System |
| Design | Sample Track and Trace Specification |
| Design | RFID Standards "Group Blueprint" |
| Design | Lamp Room Management System |
| Design | Multiple RFID Applications within underground mining |
| Feasibility Study | Inbound / Outbound Logistics Benefits Case |
| Design | Real Time Locating System |
| Design | Sample Track and Trace Specification |
| Assessment | Existing RFID systems |
| Feasibility Study | RFID applications within underground mining |
| Design | Ore Tracking and multiple applications |
| | Ore Grade Pilot |
| Summary | RFID developments |

2 Achievements

- 1999 – Vehicle Paint Shop - First to implement an RFID Turnkey solution in SA
- 2001 – First Globally to apply a disposable (low cost) RFID Tag for Vehicle Track and Trace within manufacturing process.
- 2001 – Appointed to identify the Uses and Benefits of RFID technology within the mining Industry
- 2002 – First globally to successfully embed a RFID tag within in Tyre during manufacture
- 2003 – Invited by international tyre company in Germany and major vehicle producer in the USA to test and demonstrate the tag in tyre application.
- 2003 – Mining – Developed the Blast Proof Ore Tracer
- 2003 – First to successfully track ore from pit to plant
- 2006 – Accredited Comptia “Gold Partner” for Africa region to provide RFID + Certification
- 2007 – Nominated for Best Pilot Award – RFID Global Awards – Whitehall, London –
- 2008 - Designed RFID “Blueprint” for one of the largest global mining groups
- 2009 – Appointed by North West University (Chicago, USA) and University Cape Town Biomedical Dept. to partner for Western Cape Department of Health RFID research. (Bill Gates Foundation)
- 2011 – First full rollout globally of Tyre Track and Trace system
- 2012 – Test RFID Technology Component for global mining company
- 2013 – Award of RFID deployment contract – major iron ore mine
- 2014 – Grade Control System GR80 – iron ore mine
- 2014 – Design RFID Tracking solution for tobacco products
- 2015 – Implement Sample Tracking System – iron ore mine
- 2018 – Track and Trace – Telecommunications giant in South Africa

3 Expertise

Our expertise stems from the migration of being a Process Control System Integration Company (established 1989) to providing RFID enabled Solutions since 1999, eventually establishing the RFID Institute SA in 2005. In 2017 the RFID Institute seized operations and the technology was transferred to INNORFID, a private company owned by Kevin O'Neill. In 2023, INNORFID and Simera joined forces to commercialise the RFID applications developed to date under the banner of Simera Trace.

| Certification / Training | Certified By |
|--|------------------------|
| RFID Product Training – HF Technology | EMS USA |
| RFID Product Training – UHF Technology | Alien Technologies USA |
| RFID+ Certification | Comptia Global |

Due to our vast experience and expertise in the RFID industry, vendors had their product and enabled solutions validated and tested for endorsement by the RFID Institute.SA. All our endorsements are in compliance with;

- ICASA (Regulating Authority within South Africa)
- EPC Global (International Standard)

4 Customers

With over 15 years of experience within the RFID industry, we have provided over 100 customers both locally and globally with services ranging from application analysis to deployment and further to help realise the benefits of this technology within their business. We've built and deployed some of the largest volume RFID systems in the world and applied our expertise to many specialised applications, being the first globally to develop and apply specialised RFID enabled solutions within almost all industries.

Further to these services provided, we have serviced over 500 RFID related enquiries since 1999.The table below is a brief summary of our key customers other than mining.

| INDUSTRY | Application |
|--|--|
| Manufacturing Automotive | Vehicle Identification and Tracking – Paint Shop Vehicle Track and Trace – Manufacturing Vehicle Distribution System |
| Manufacturing - Tyres | Development – Tag In Tyre Pilot – Tyre Tracking within manufacturing |
| Retail / Fleet Management Tyres | Tyre Database – Track and Trace Tyre Tracking within Re- tread Factory Tyre Management System (Fleet) |
| Communications | Data Centre - Asset Tracking and Management |
| Communications | Radio Network Asset Tracking and Management (Towers) |
| Retail | Asset Tracking - Food Crates |
| Utility Services | Asset Tracking / Inventory Control |

5 About RFID

RFID (Radio frequency identification) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders (tracers). Utilizing radio frequency waves, an RFID tag can be applied to or incorporated into a product/ material for the purpose of location and identification.

UHF Passive RFID can be read from several meters away and beyond the line of sight of the reader. Most RFID tags contain at least two parts. One is an integrated circuit for storing and processing information, modulating and demodulating a (RF) signal and can also be used for other specialized functions. The second is an antenna for receiving and transmitting the signal.

The RFID tag can be affixed to an object and used to track and manage inventory, assets, people, etc. For example, it can be affixed to vehicles, computer equipment, books, tools, etc. RFID encapsulates the data accuracy advantages inherent in all types of automatic identification technology (AIT). Additionally, RFID is a totally non-intrusive methodology for data capture (requires no human intervention), is non-line of sight technology, and is a technology that possesses both read and write options within the same equipment item.

The use of RFID in mining operations has the potential to provide real benefits in material management, grade control, efficiencies, and interoperability in an end-to-end integrated environment.

RFID Technology facilitates continuous real time measurement of people, process, equipment and materials.

“You can’t manage what you can’t measure!”

6 RFID in Mining

The use of RFID in mining operations has the potential to provide real benefits in material management, efficiencies, and interoperability in an end-to-end integrated environment.

Together with Kumba Resources R&D we embarked on an initiative in 2002, to firstly research the feasibility of using RFID technology, and secondly to identify all the other uses and benefits of RFID technology that the technology would impact on.

This involved intensive site surveys and workshops involving stakeholders from all divisions throughout the group at all the Kumba operations. Due to the harsh environments and many challenges that the mining processes pose and the fact that RFID technology is not a “one size fits all” technology, off the shelf products were not available to facilitate all the required applications and their criteria.

It is therefore that prior to proceeding with a pilot project on any of the identified applications the products had to be developed to meet the application requirements. Many trials and pilot projects have been implemented over the past decade with some of the requirement criteria not being met due to the technology capabilities.

Since 2008 the evolution of UHF RFID technology has provided the capabilities to overcome most of the previous shortfalls and failures that were experienced.

The key improvements being;

- Increased read range from 30 cm to 10 meters
- Tag orientation (specific design antenna)
- High multiple tag read (300 tags per second)

In 2010 three key factors drove a significant increase in RFID usage:

- decreased cost of equipment and tags,
- increased performance to a reliability of 99.9%
- and a stable international standard around UHF passive RFID.

The adoption of these standards were driven by EPC Global, a joint venture between GS1 and GS1 US, which were responsible for driving global adoption of the barcode in the 1970s and 1980s.

7 Mining Applications

All possible applications that RFID technology can provide benefits within the mining industry has been investigated. In doing so we have compiled a common application schedule for both open pit and underground mining.

The utilization of RFID Technology in the mining industry has proven benefits. These include but are not limited to enabling:

- Improved efficiencies
- Safety Compliance
- Improved logistics
- Improved processes
- Improved Quality
- Improved management and utilization of assets
- Ability to simulate processing plant optimization

Customised Products and Solutions have been developed to enable the successful implementation of all the listed Applications.

8 Surface Mining

| OPEN PIT MINING | |
|---------------------|---|
| System | Application |
| Sampling | <ul style="list-style-type: none"> • Exploration Samples • Grade Samples • On line info characteristics • Laboratory Management |
| Blast Block Mapping | <ul style="list-style-type: none"> • Surveyor Drill Stake • 3D Modelling • Blast Movement Analysis |
| Ore Tracking | <ul style="list-style-type: none"> • Hauling Ore / Waste • Pit to Plant • Plant to Customer |
| Ore Management | <ul style="list-style-type: none"> • Process Efficiency Monitoring • Mixing and Blending • Stockpile Management |
| Mining Operations | <ul style="list-style-type: none"> • Drill Instructions • Hauling • Operational Equipment • Inventory Control |
| Safety and Security | <ul style="list-style-type: none"> • Emergency Evacuation • Collision Avoidance • Authentication • Identification |
| Maintenance | <ul style="list-style-type: none"> • Screen Panels • Fleet Management • Asset Tracking and Management • Tyre Management |

9 Underground Mining

| UNDERGROUND MINING | |
|--------------------|---|
| System | Application |
| People Logistics | <ul style="list-style-type: none">• Access Control• Authorisation• Auto Identification• Real Time Location• Resource Management |
| Inbound Logistics | <ul style="list-style-type: none">• Material Tracking• Explosives Tracking• Inventory Control |
| Outbound Logistics | <ul style="list-style-type: none">• Ore Tracking• Cross Trammimg |
| Safety | <ul style="list-style-type: none">• Medical Records• Shaft Clear• Personnel Detection• Emergency Evacuation (Roll Call)• Collision Avoidance• Lamp Room Management (PPE) |
| Maintenance | <ul style="list-style-type: none">• Asset Tracking and Management• Fleet Management• Service History |

10 Mining References

Application and type of work executed

| Application | Service |
|--|---|
| Safety and Logistics in underground mining | Analysis Feasibility Study |
| Ore Tracking Ore Tracking / Multiple Applications | Pilot Analysis |
| Grade Sample Tracking On Line - Sample Tracking | Deployment Deployment |
| Evaluation of Existing RFID installations. Lamp Room Management Systems | Assessment Deployment |
| Ore Tracking – Ocean Bed | Deployment |
| Development of Density Tracers | Analysis |
| DMS Ore Tracking Diamond Tracking - Security | Development POC Analysis |
| Inbound/Outbound Logistics RFID Standards “Blueprint” Inbound/ Outbound & People Tracking Lamp Room Management Collision Avoidance System Real Time Location System Personnel Safety/ID Card | Feasibility Design Design Design/Test/Deploy Design/Test Analysis / Design Design |
| Ore Tracking – Power Station | Pilot |
| Ore Tracking | Pilot |
| LAMP Room Management | Project |
| Density Tracers Sample Tracking | Project Analysis |
| Process Efficiency Monitoring | Project |

| Date | Application |
|-------------|--|
| 2001 | Coke Pusher Position Monitoring |
| 2002 | Investigate Uses and Benefits of RFID within the Mining Industry |
| 2002 | Development of Ore Tracer |
| 2003 | Ore Tracking Pilot |
| 2003 | Development of Density Tracer |
| 2003 | Screen Panel Monitoring |
| 2004 | Plant Efficiency Testing Pilot (DMS) |
| 2004 | Development of Blast Tracer |
| 2005 | Ore Tracking "Pit to Plant " Pilot |
| 2005 | Present RFID Developments |
| 2010 | Pre - Feasibility Study – Grade Control |
| 2011 | RFID Technology Evaluation and Testing. Group Workshop |
| 2012 | Proof of Concept Testing |
| 2014 | GCMS TRIAL |
| 2015 | Mine Management System |
| 2017 | Sample Tracking- Production Sampling QA/QC Process |