

SIMERA  
TRACE

## RFID Technology developments within the Mining Industry

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# 1 Annexures

No.	Title	Details	Company
R01	Company Profile	About	RFID Intitute.SA
R02	Comptia RFID+ Certificate	Certification	Comptia
R03	RFID Reference	UHF Training	Alien Technologies
R04	RFID Reference	HF Training	EMS
R05	Tag in Tyre	Approval	Dunlop SA
R06	RFID Awards	Ore Tracking	Kumba Resources /RFID I
R07	Case Study	Track and Trace	Toyota
R08	Case Study	Asset Management	KWV
R09	Case Study SAIMM Presentation	RFID enabled Ore Tracking / Density Tracers	Kumba Resources
R10	Case Study	Ore Tracking	Mining
R11	Feasibility Study	Asset Tracking - Crates	Woolworths
R12	Endorsement	RFID enabled Solution	Tyre Corporation
R13	Endorsement	RFID enabled System - Mining	Schuenburg
R14	Endorsement	RFID enabled Product	Asset Auditor
R15	Development	Collision Avoidance	Anglo Platinum
R16	Test and Evaluate	RFID System - Modikwe	Anglo Platinum
R17	Design	Sample Track and Trace Specification	Assmang
R18	Design	RFID Standards "Group Blueprint"	Anglo Platinum
R19	Design	Lamp Room Management System	Anglo Platinum
R20	Design	Multiple RFID Applications within underground mining	Anglo Platinum
R21	Feasibility Study	Inbound / Outbound Logistics Benefits Case	Anglo Platinum
R22	Design	Real Time Locating System – Waterval UG2 Concentrator	Anglo Platinum
R23	Design	Sample Track and Trace Specification – Khumani Mine	Assmang
R24	Assessment	Existing RFID systems	Lonmin
R25	Feasibility Study	RFID applications within underground mining – Arrnot Coal Mine	Exxaro
R26	Design	Ore Tracking and multiple applications – Doornkop Gold Mine	Harmony
R27		Ore Grade Pilot	Richards Bay Coal Terminal
R28	Summary	RFID developments	Kumba Resources

## 1.1 Achievements

- 1999 – Toyota Paint Shop - First to implement an RFID Turnkey solution in SA
- 2001 – Toyota SA - First Globally to apply a disposable (low cost) RFID Tag for Vehicle Track and Trace within manufacturing process. Refer Annexure R07
- 2001 – Kumba Resources – Appointed to identify the Uses and Benefits of RFID technology within the mining Industry- Refer Annexure R27
- 2002 – Dunlop Tyres SA – First globally to successfully embed a RFID tag within in Tyre during manufacture – Refer Annexure R05
- 2003 – Invited by Continental Tyres Germany and Ford 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 – Annexure 06 R
- 2008 - Designed RFID “Blueprint” for Anglo Platinum Group
- 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 – Tyre Corporation - First full rollout globally of Tyre Track and Trace system
- 2012 – Test RFID Technology Component. POC – Anglo American
- 2013 – Award of RFID deployment contract - Anglo American Sishen Mine
- 2014 – Grade Control System GR80 – Sishen
- 2014 – British American Tabaco ( BAT ) – Design RFID Tracking
- 2015 – Sample Tracking – Sishen Mine
- 2018 – Track and Trace - VODACOM

## 1.2 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)

## 1.3 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.

Customer	INDUSTRY	Application
<b>Toyota</b>	Manufacturing Automotive	Vehicle Identification and Tracking – Paint Shop Vehicle Track and Trace – Manufacturing Vehicle Distribution System
<b>Dunlop</b>	Manufacturing - Tyres	Development – Tag In Tyre Pilot – Tyre Tracking within manufacturing
<b>Tyre Corporation</b>	Retail / Fleet Management Tyres	Tyre Database – Track and Trace Tyre Tracking within Re- tread Factory Tyre Management System (Fleet)
<b>Internet Solutions</b>	Communications	Data Centre - Asset Tracking and Management
<b>Vodacom</b>	Communications	Radio Network Asset Tracking and Management (Towers)
<b>Woolworths</b>	Retail	Asset Tracking - Food Crates
<b>Ethekwini Municipality</b>	Utility Services	Asset Tracking / Inventory Control

## 2 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!”***

### 3 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.

### 4 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.

## 4.1 Surface Mining

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



## 4.2 Underground Mining

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

## 5 Mining References

### 5.1 Other than Kumba Resources / Kumba Iron Ore

Customer	Application	Service
<b>Exxaro</b> Arnott Mine	Safety and Logistics in underground mining	Analysis Feasibility Study
<b>Harmony Gold</b> Bambonani Shaft Doornkop Shaft	Ore Tracking Ore Tracking / Multiple Applications	Pilot Analysis
<b>Assmang</b> Beeshoek Mine Khumani Mine	Grade Sample Tracking On Line - Sample Tracking	Deployment Deployment
<b>Lonmin</b> Hossy / Saffy Shaft  Hossy Shaft	Evaluation of Existing RFID installations. Lamp Room Management Systems	Assessment  Deployment
<b>Namdeb</b> Oranjemund	Ore Tracking – Ocean Bed	Deployment
<b>Debmarine</b> R&D	Development of Density Tracers	Analysis
<b>De Beers</b> CTP Kimberly CTP Kimberly Kimberly Mines	DMS Ore Tracking Diamond Tracking - Security	Development POC Analysis
<b>Anglo Platinum</b> Group ICT Group ICT Spud Shaft  Spud Shaft R&D Waterval Concentrator Group ICT	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
<b>Eskom</b> Kendal Power Station	Ore Tracking – Power Station	Pilot
<b>Richards Bay Coal Terminal</b> SABS Testing Dept.	Ore Tracking	Pilot
<b>Anglo Gold Ashanti</b> Moab Shaft	LAMP Room Management	Project
<b>Anglo Coal Laboratories</b> Witbank	Density Tracers Sample Tracking	Project Analysis
<b>Letseng Diamond Mine</b>	Process Efficiency Monitoring	Project

## 5.2 History – Anglo Kumba Iron Ore

Date	Application	Location	Responsible
2001	Coke Pusher Position Monitoring	Iscor VD Bijl	
2002	Investigate Uses and Benefits of RFID within the Mining Industry	Pilot Plant Pretoria Sishen Thabazimbi Rosh Pinnah Tshikondeni Grootegeluk Zincor Iscor VD Bijl	Danie Krige Gerhard Jonk Pieter Pieterse
2002	Development of Ore Tracer	R&D Pilot Plant	Pieter Pieterse
2003	Ore Tracking Pilot	Rosh Pinnah	Pieter Pieterse
2003	Development of Density Tracer	R&D Pilot Plant Thabazimbi Thsikondeni	Paul Fouche
2003	Screen Panel Monitoring	Grootegeluk	H.Esterhuisen
2004	Plant Efficiency Testing Pilot (DMS)	Sishen “Larchodem” Leeuwpan	Paul Fouche
2004	Development of Blast Tracer	Sishen CSIR	Jean Smith
2005	Ore Tracking “Pit to Plant “ Pilot	Thabazimbi	Paul Fouche
2005	Present RFID Developments	SAIMM Conference Zambia	Paul Fouche
2010	Pre - Feasibility Study – Grade Control	R&D Head Office, Sishen, Thabazimbi	J.Van Schoor J.Smith Group Representatives
2011	RFID Technology Evaluation and Testing. Group Workshop	R&D Thabazimbi Sishen	Bongi Ntsoelengoe
2012	Proof of Concept Testing	Thabazimbi	Dingaan Skosana
2014	GCMS TRIAL	Plant Trial	Dingaan Skosana
2015	Mine Management System	Sishen Mine	Dingaan Skosana
2017	Sample Tracking- Production Sampling QA/QC Process	Sishen Mine	D.Van Eeden
2018		Sishen Lab	