

READ ON METAL (ROM) TAGGING CHALLENGE

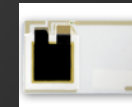
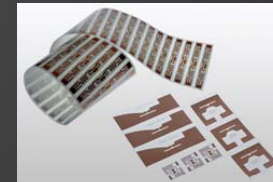
Asset Management for Tool Tracking and IT Assets

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RFID Technologies and Applications

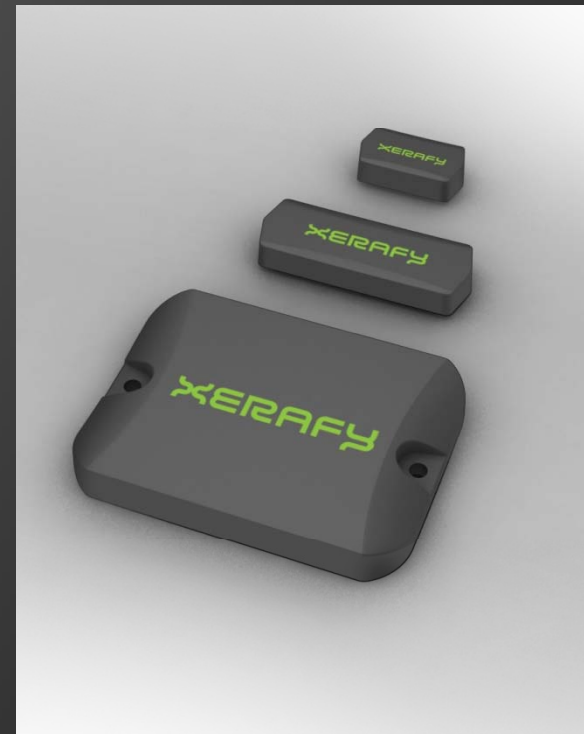
- **Passive (UHF, Gen2 EPC)**
 - Non-metallic assets – boxes, plastic, wood
- **Passive ROM (UHF, Gen2 EPC)**
 - Metallic assets – electronics, tools, ...
- **BAP (Battery Assisted Passive)**
 - Tracking with larger read zones
- **Active (Location tracking)**
 - Proprietary technologies
 - Tracking to room or building areas
 - Wi-Fi – RTLS, resolution within 20'
 - UWB – RTLS, resolution within a few inches
- **GPS (Position tracking)**
 - Outdoors, no reader infrastructure



Why Choose UHF ROM Tags

◎ ROM RFID Tag Features & Functions

- **ASSET MATERIAL** – for RF unfriendly materials
 - Metallic / Liquid
- **SIZE** - Assets have very small areas for tag attachment
- **DURABILITY** - Indoor / Outdoor, harsh conditions
 - UV, moisture, cleaning chemicals, extreme temperatures, vibration, & physical stress
 - Unlimited tag life
 - Re-usable (ROM tags can cost less than paper tags)
- **READ RANGE** – dual usage
 - Assets are read a few inches for inventory audits
 - Assets are read several feet by fixed readers for near real-time tracking / audits
- Manual Audits(10x improvement over barcode scanning)
- Automatic Real-Time Audits (using fixed portal readers at choke points)
- Supports both inventory auditing & asset location tracking

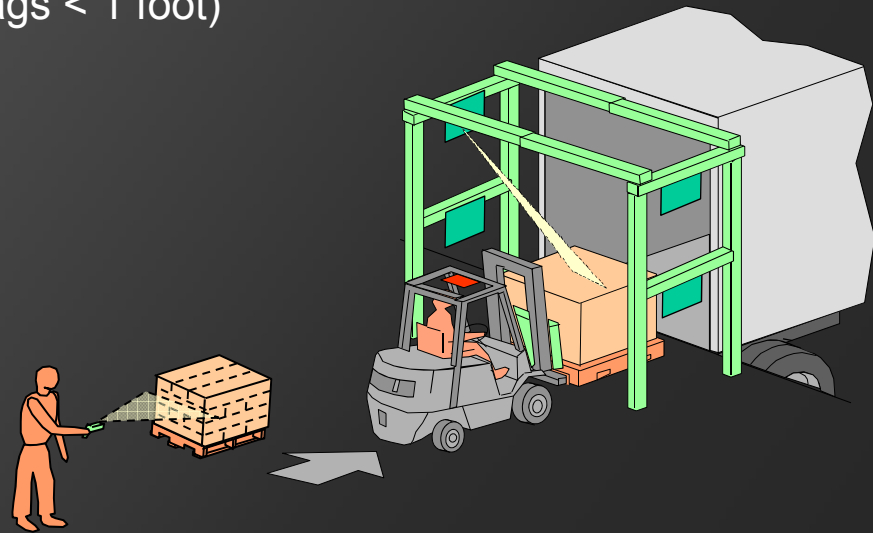


Smart Label paper RFID tags won't work when attached to assets with high metal content

Why Choose UHF ROM Tags (1)

UHF versus HF RFID Technology

- UHF advantage over HF tags
 - Tags are smaller
 - Tags can be attached directly to metal
 - Tag read range > 20 feet (HF tags < 1 foot)
- Item level auditing / tracking
 - Unique serialization
 - Factory (64 bit TID)

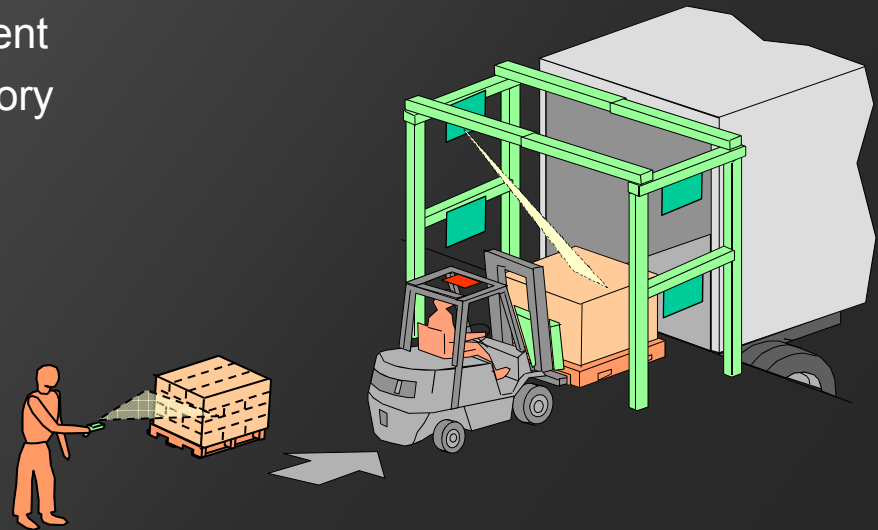


Selecting the right RFID tag for small assets with high metallic content

Why Choose UHF ROM Tags (2)

○ Applications

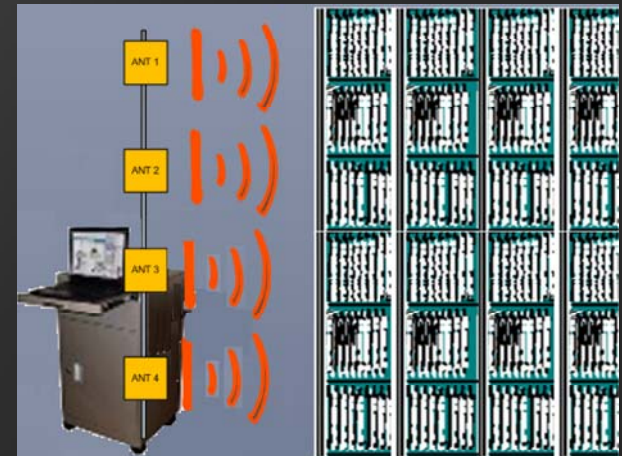
- Telecommunications / Healthcare / Power Plants / Aerospace / Industrial
 - Assembly Verification
 - Anti-Theft / Security
 - Logistics & Inventory Management
 - Asset Tracking / Movement History
 - Product Recall / Return process
 - Anti-Counterfeit
 - Dangerous Material Tracking



IT Asset Management Application (1)

Major Telecommunications Service Provider using barcode inventory management takes 5 years to audit 100M assets and inventory is 5 years out of date

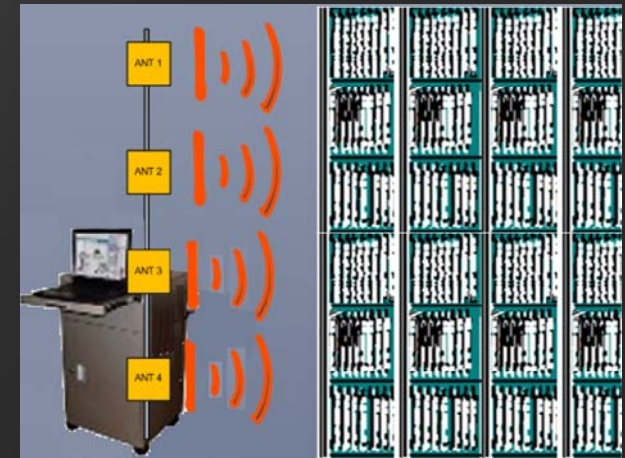
- Current Barcode Inventory Audit Process
 - Assets barcode scanned at receiving
 - Barcode audit processes are slow and labor intensive
 - Barcode scanning requires line of sight
 - Scans only one barcode label at a time
 - Barcode audits accumulate the total number of assets by type
 - Asset leave sites without being logged out



IT Asset Management Application (2)

Major Telecommunications Service Provider using barcode inventory management takes 5 years to audit 100M assets and inventory is 5 years out of date

- RFID Process Improvements
 - Scan multiple assets quickly (over 100 per second)
 - Ability to update inventory database and reconcile discrepancies
 - Locate individual asset by unique tag serial number
 - Portal RFID reader allow automated near real-time inventory updates (check-in / check-out)
 - Accurate inventory details can be shared with other legacy systems
 - Other process improves can be implemented after RFID tags are attached to all assets



Tool Management Application (1)

Coal Power Plants require visual counts for tool inventory audits

- **Current Physical Tracking Process**
 - Tools are stored in tool crib areas with a limited number of spares
 - Extremely large assets are stored in yards (very time consuming to audit)
 - Tools are manually checked-in and checked-out on a hand written log sheet
 - Many tools are large, expensive, and require long lead-times for replacement
 - Barcode labels cannot be attached to some tools
 - Barcode labels are not durable enough for extreme conditions
 - Can't locate individual tools, only the total number of like tools
 - Tools leave cribs without being logged out



Tool Management Application (2)

Coal Power Plants require visual counts for tool inventory audits

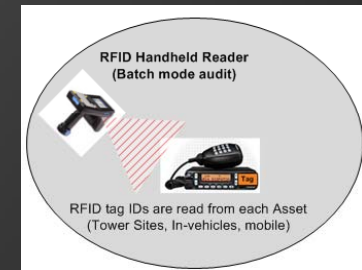
- **RFID Process Improvements**
 - RFID tags - more durable, require small mounting area, and have longer read range
 - Multiple collocated tools are read simultaneously instead of sequentially
 - Reports for lost, damaged, tool usage, and scheduled maintenance
 - Portal RFID readers provide near real-time inventory updates (check-in / check-out)
 - Accurate inventory details can be shared with other legacy systems
 - Other process improves can be implemented after RFID tags are attached to all assets



Real World Challenge for ROM Tags (1)

High Temperature and Pressure

- Autoclaves – Pressurized ovens (90psi at 350F for maximum of 17 hours). Tags attached to aluminum fixtures for fabricating subassemblies.
- Tag must survive high temperature and pressure (Xerafy has a small tag that meets this requirement)



Mobile radios inside vehicles

Cards are in-use 24/7 for over 20 years

Durability

- Telecommunication cards
 - Tag must be very small in order to be attached to metal faceplate. In many cases, the tag will replace the existing barcode label.
 - Tag must function for more than 20 years
- Healthcare instruments and equipment require sterilization after use
 - Tag must survive chemical sterilization process



Telecom Shelf with 16 cards



Medical instruments need to be sterilized

Real World Challenge for ROM Tags (2)

- **Durability (continued)**
 - Tool Cribs have tools where barcodes won't work
 - Small all metal hand tools (have very small "safe" areas to attach an RFID tag)
 - Large tools / spare parts are stored in remote locations (very hard to keep track, they may not be needed for 10 years or more. ROM tags can be read 20 feet away with a mobile reader mounted in a Pickup truck.
 - Tools are exposed to all types of chemicals, water, and cleaning solvents
 - Tools are prone to *mechanical shock and rough handling*



Tools have many unique attachment restrictions – Power Plant Tool Crib

Real World Challenge for ROM Tags (3)

RFID Performance of IT equipment in various Antistatic Packaging

Test	Antistatic Bag Description	Bag Type	Read Range
1	Test performed with card only (no bag or box)	NA	12'
2	Black, grid/checkered, dissipative bag	GRID	11'
3	Brown, dissipative bag, Static Intercept	X-21386	12'
4	Clear plastic, clam shell	PLASTIC	11'
5	Pink Poly, antistatic bag (not recommended for electronics)	Plastic	12'
6	Black, TI version	Black	11'
7	Shiny, metal film, dissipative bag	METALLIC	1'

- Limitations

- Metal film antistatic bags shield the tag
- Other antistatic bags work well (10% reduction in read range)

RFID tags will not read through metal film antistatic bags



Comparison for ROM RFID Tags

Tag Read Range, Size, & Durability Benchmarks

Tag Vendors	Read Range Ranking (on metal)	Size Ranking (inches) 1.1x0.4x0.12 1.3x0.4x0.14 1.5x0.50x0.12 1.5x0.50x0.125	Durability Ranking (for outdoor use)	Attachment Type (adhesive)	RFID Chip Manufacturer	Reads when embedded (tag face visible with back and sides enclosed in metal)
Xerafy	1 (best)	1 (smallest)	1 (best)	1	Alien – H3	Yes
Vendor 2	4 (worst)	2	4 (worst)	1	Alien – H3	TBD
Vendor 3	2	4 (largest)	3	1	Impinj – M3	TBD
Vendor 4	3	3	2	1	Alien – H3	TBD

Chip Manufacturers Tested

- Alien – H3
- Alien – H2
- Impinj - M3
- NXP – G2XM

Future

- Even smaller tags are coming !

RFID Test Readers

- Alien – ALR9800 Fixed Reader
- Motorola – MC9090 Handheld
- ACC Systems (ATID) – Handheld

Tag Vendors

- Xerafy
- Confidex
- Omni ID
- Titan

ROI Analysis

- ⦿ Reduced manpower costs
 - RFID audits are 10x faster than barcode audits
 - Faster and more frequent inventory audits
 - Reduce time searching for assets
 - Smarter processes available
- ⦿ Process Improvements
 - Asset usage history provides end-of-life data for replacement and maintenance
 - Accurate tracking means up to 25% less spares required
 - Better utilization of assets
- ⦿ ROM tags are re-usable

Conclusion

Select the Right Tag for the Right Job



Metal Embeddable Tags
for durability, security,
and performance



Smallest ROM Tags
with best
performance



Questions

Selecting the right RFID tag for small assets with high metallic content