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RFID in Harsh Environments

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RFID JOURNAL VIRTUAL EVENTS RFID for Harsh Environments

Choosing the Right RFID Technology for Harsh Environments

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Agenda

- Characteristics of different RFID systems
- Pick the right technology
 - Passive vs Active
 - Passive LF vs HF vs UHF
- Types of Harsh Conditions
- ATEX certified tags
- IP Ratings



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RFID Characteristics

Column1	Low Frequency (LF)	High Frequency (HF/NFC)	Passive Ultra-High Frequency(UHF)	Active / BLE
Operating Frequency	125/134.2 kHz	13.56 MHz	860 - 960 MHz	2.45 GHz
Read Distance	Less than 3 ft.	Less than 3 ft.	10 to 20 ft.	50 ft. and up
Data Transfer Rate	Slow	Medium	Fast	Fast
Memory Capacity	Low	High	High	High
Maintenance	None	None	None	Battery or tag replacement
Water / Humity	Non-issue	Minor issue	Can cause issues	Can cause issues
Metal	Non-issue	Minor issue	Can cause issues	Can cause issues
Robust tags available	Yes	Yes	Yes	Yes

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Pick the Right RFID Technology

- Passive or active
- Frequency
- Characteristics



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Active vs Passive

Passive:

- Less expensive
- No battery
- Shorter read range
- Can be disposable



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Active vs Passive

Active:

- Much longer read range
- Less influence from water and metal
- High data transfer rate
- Expensive
- Requires maintenance



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Choose the Right Frequency

- LF and HF work well around water
- HF works well around water
- UHF has a longer read range and faster data transfer, but doesn't work as well around water and metal (need special tags)



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Next, Consider the Harsh Conditions

Will the tag be subject to:

- Extreme cold (cryogenic chamber)
- Water or wet conditions
- Vibration
- High impact
- Hazardous chemicals
- High heat



Image: HID Global

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Extreme cold

- HID Global's Piccolino passive HF tags can withstand temperatures as low as
 -321 degrees Fahrenheit (-196 degrees Celsius)
- There is even a reader that can operate at that temperature



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Water or wet conditions

- LF tags work well in water (used on fish)
- HF also works around water
- UHF requires special tags



Image: Unified Information Devices

www.rfidjournal.com

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Vibration

- Tags need to survive vibration when used on machines, items shipped on trucks etc.
- Antenna can break off chip
- IoT devices can monitor vibration



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High Impact

- Gas canisters, oil pipe and other items bang together in transit
- Can be embedded in items
- IK00 Ratings values range from IK00 (not tested) to IK10
- IK10: Drop of 5kg steel object from 15.7 in / 40 cm (20J)



Hazardous Chemicals

- Kegs, uniforms and other items get washed repeatedly with harsh chemicals
- Tag must survive
- Special enclosures



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High Heat

High heat:

- Some auto makers tag items that go into ovens
- Some tags can survive temperatures of 600 degrees
 Fahrenheit (316 degrees) Celsius



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ATEX (NEC/IECEx) Zones

European certification for devices used in hazardous (ATEX short for atmosphères explosibles)

- ATEX Zone 1: high risk gas/vapor
- ATEX Zone 2 (medium risk gas/vapour)
- ATEX Zone 21 (high risk powder/dust)
- ATEX Zone 22 (medium risk powder/dust)



Picture by

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IP Ratings 66, 67, 68, 69K

- **IP65:** Dust tight and protected against water projected from a nozzle
- **IP66:** Dust tight and protected against heavy seas or jets of water
- **IP67:** Dust tight and protected against immersion
- **IP68:** Tag can be submerged under water continuously for a defined duration
- IP69: Dust tight and can withstand high temperature, high pressure water

Additional Issues

- Radiation resistent tags
- Tamper-evident tags
- Seal tags



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Sealing Bags of Ore

- Tamper-evident seal tag used to tag bags of ore
- Helps optimizing logistics workflow
- Proves that bag has not been opened between mine site and refinery



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THANK YOU