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RFID in Harsh and Hazardous Environments 2021

Choosing the Right RFID Technology for Manufacturing and Harsh Environments

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Agenda

- Different types of RFID technology
- How to pick the right technology
  - Passive vs Active
  - Different types of passive tags
  - Different types of active tags
- Characteristics that enable tags to survive different harsh environments

Different Types of RFID

Three main types of RFID technology:

- Active RFID (has a power source)
- Passive RFID (no power source)
- Battery-assisted RFID
  (tag has a battery, but
  not for communication)

Different Types of Active RFID

- Active tags fall into two categories:
  - Tags that wake up when in range of a reader (toll collection systems)
  - Tags that emit a signal every few seconds or minutes (real-time location systems)

Different Types of Active Beacons

- Active RFID (433 MHz) proprietary
- Active RFID (900 MHz) proprietary
- ZigBee (2.45 GHZ) IEEE 802.15.4
- Wi-Fi (2.45 GHZ) IEEE's 802.11b
- Ultra-wideband UWB (6 to 8.5 GHz in the U.S. and EU) proprietary
- Bluetooth Low Energy (2.45 GHz) proprietary

Different Types of Passive RFID

- Low frequency tags (125 Khz or 134 Khz)
- High frequency or NFC (13.56 MHz)
- UHF (856-960 MHz)

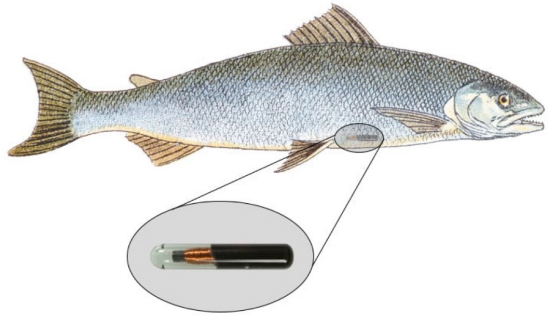


Image: Unified Information Devices

Different Types of BAP Tags

- 13.56 MHz
- UHF (856-960 MHz)
- UHF is most common
- Mainly used to power sensors

CSL BAP ID tag

Pick the Right RFID Technology

- First choose
  - Passive, active or BAP
  - Then choose your frequency
  - Then choose the characteristics to survive your environment

What Do You Want to Track?

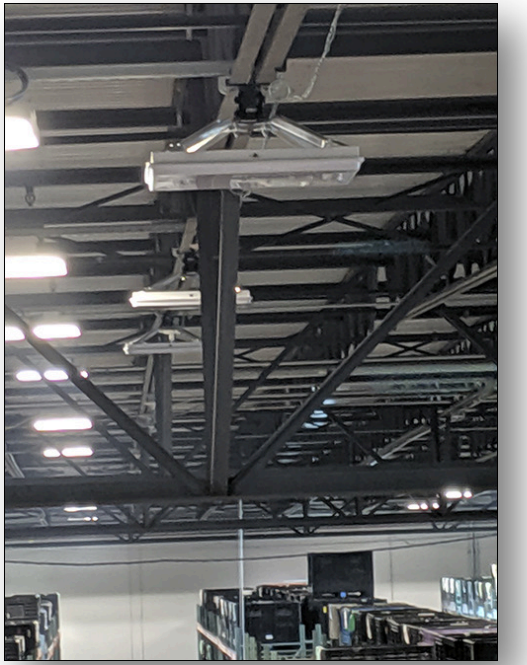
- Make a list, which might include:
  - Spare or replacement parts
  - Oil pipe and other large assets
  - Parts bins and other returnable containers
  - Tools, mobile equipment, safety equipment
  - Finished goods
  - People (for safety)

Group Items Based on Tracking Requirements

- These items need to be tracked as they move through a portal
- These items need to be tracked in real time
- These items need to be tracked to within a few feet
- All we need to know is these items arrived

Things to Consider for Each Group

- Over what distance to you need to track items in each group?
- What location accuracy is required?
- Do you need to know the assets' condition?



Active vs Passive

Active:

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

Active vs Passive

Passive:

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

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)

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

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

High Impact Environments

- Gas canisters, oil pipe and other items can bang into each other in transit
- This can crush the microchip and render the tag inoperable
- Solution: Embed tag in object or use protective housing for the tag

High Heat Exposure

- Normal RFID tags will not survive high temperatures (above 150 degrees Celsius)
- Need tags with special solder that won't melt
- Need to protect the tag and the antenna
- Some passive tags can withstand temperatures of 600 degrees Celsius

Prioritize What You Want to Track

- What are the benefits of tracking and managing the objects, or groups of objects, on your list?
- Which will reduce your capital expenditure?
- Which will save staff the most time/labor?
- Which will improve safety?

Start with the System that . . .

- Delivers the most benefit for the lowest cost
- Is the easiest to deploy
- Add onto the system
- If you need a second type of RFID, deploy that last

Questions?

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THANK YOU

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