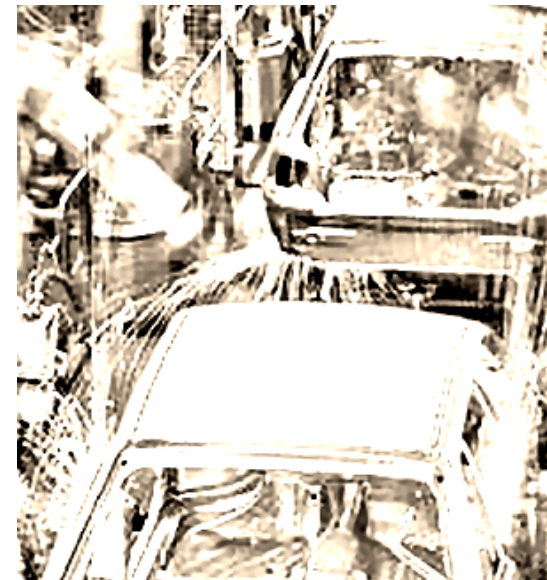# Tracking metal parts with passive UHF RFID
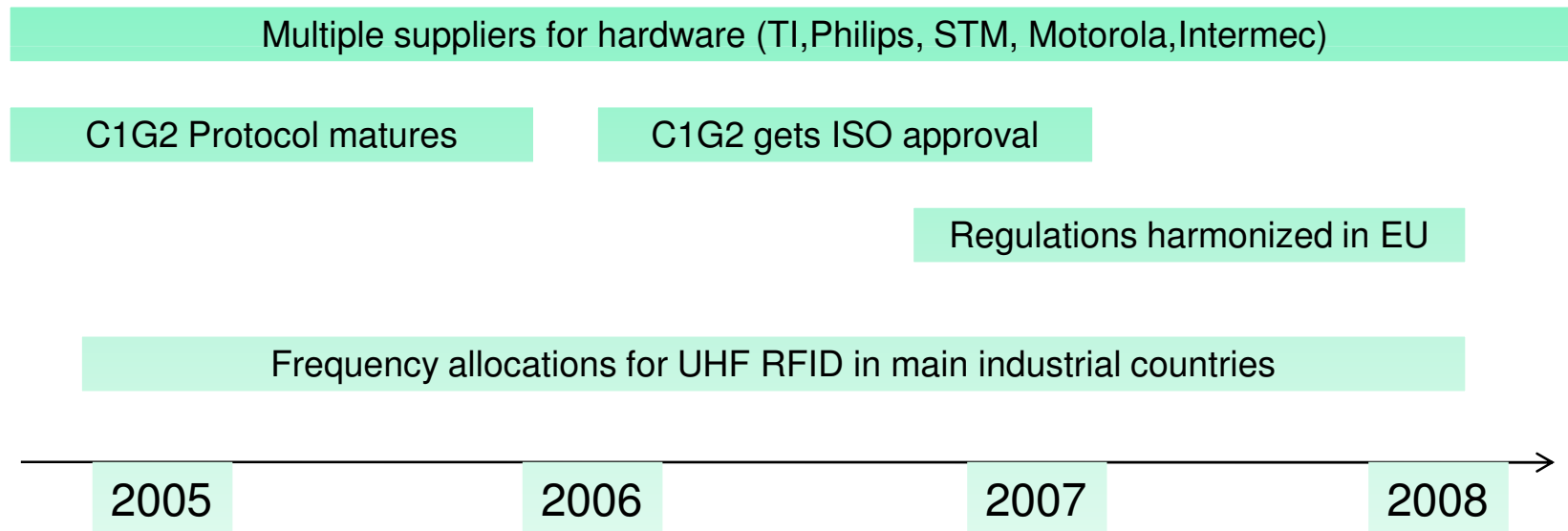
April 2007

Confidex in brief

- Focused in wireless identification, especially on industrial RFID tags on 13,56MHz (HF) and 865-952 MHz (UHF)
- Main business areas in Aerospace & Defence, Automotive, Petrochemical and Retail logistics
  - RFID tag supplier in Boeing RFID Program
  - Industry's first AS5678 compliant UHF RFID Tag
  - Supplier of tags for world's leading petrochemical companies
    - Reliance, India – Jamnagar Oir refinery project with steel pipe tracking
  - In automotive industry ongoing RFID projects in
    - Car manufacturing process
    - Part tracking
    - Tyre manufacturing
    - B-to-B supply chain
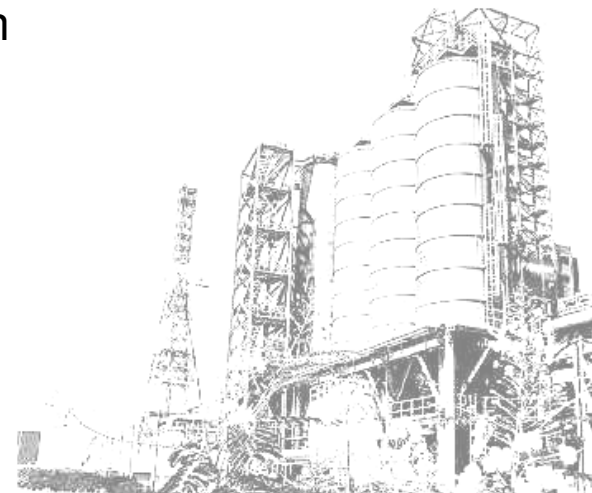
RFID in industrial applications

- Long-range operation is requirement in industrial applications with RFID
- Quantity of assets may be large, so purchase and maintenance costs must be low, especially for tags
- Important milestones in passive UHF RFID for industries

Multiple suppliers for hardware (TI,Philips, STM, Motorola,Intermec)

C1G2 Protocol matures

C1G2 gets ISO approval

Regulations harmonized in EU

Frequency allocations for UHF RFID in main industrial countries

2005   2006   2007   2008

- Significant growth in interest towards passive UHF RFID in closed loop applications, especially in manufacturing processes

RFID in industrial applications

- Principle of passive UHF RFID system
  - Reader transit energy and data to tags in field
  - Tag reflects part of the received energy and that is interpreted to data by the reader again i.e. tags are not sending anything, but 'mirroring' signals
- This creates the challange in the industrial environment for RFID
  - Electromagnetic waves at UHF frequencies are easily effected by the environment (metals, liquids, intereferences etc) in form of reflection, diffraction/absorption or cancellation

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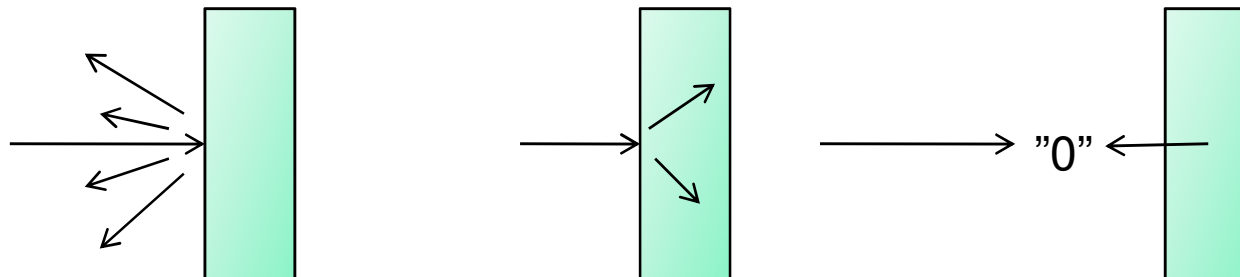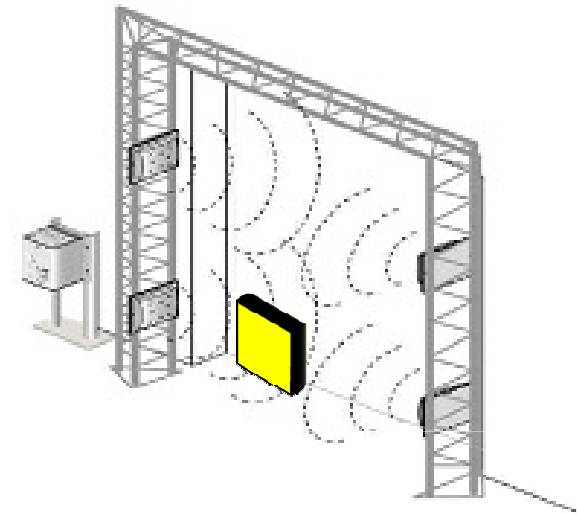
On-metal asset tracking

- Usability of RFID in metal asset tracking
  - Tag selection for metal assets and items:
    - Performance: Reading distance typically 3-4 meters in portals, 1-2 meters with handheld devices
    - Small size: large tags prone to damage, difficult to attach
    - Durability: Temperature and UV resistance over long period of time, vibration, dirt, chemical and water resistance
    - Usually performance is validated according to industry standard
  - Cost of product is cost per use, not cost per unit as RFID needs to solve a problem, where conventional identification systems are not capable

RFID in industrial applications

- RFID can not be a "mandate" but..
- A possibility to adopt new process methods
  - faster responses to changes (signals from distribution network in 'real-time')
  - lowering costs, improving productivity (less monitoring, faster handling)
  - wireless authentication

- Improved automation and Quality of service
  - less errors (e.g. human errors in recording)
  - higher reliability (visual identification prone to problems)
  - Improved visibility (process monitoring, tracking of shipments)

- Any new technology should be an answer to a end user problem

Key success factors

- 'fit-for-purpose' RFID solution many times required to solve the application problem.
    - Re-usable on-metal tags need to be designed for the asset life-time use

- Main factors for succesful RFID implementations in industrial applications
    - Problem identified before the solution is chosen
        - " RFID is not the silver bullet"
    - Single interface for customer
        - Clear objective of the requirements are important new technology implementations
        - Suppliers with references and resources in the special field of expertise
        - Typically undefined roles and responsibilities lead to more educative than operative outcome
    - Standards – validity of the system in the future

Developing a solution

- Define the problem:
  - **Identification**: errors in process (automation or human) create problems in production . Typically with poor line-of-sight to objects, manual recording failures etc
  - **Authentication**: risk of product failure or origination of the component or item. Typically wrong components are assembled due to human mistakes or origin and production history of critical components is not verified
  - **Automation**: insufficient surveillance of production or supply chain creates additional costs. Typically manual work in incoming/outgoing shipment handling and inventory is causing increasing costs if operations are expanding
 - **Others**: yard managment, asset management, work cards (Kanban) etc

Developing a solution

- Create a specification
    - System requirements?
        - Internal (e.g. Inside production facility) where fixed readers could be used, or handhelds with WLAN connectivity
        - External; portable readers/hand helds with GPRS, WLAN connectiviity
        - Amount of devices (tags, readers etc)

    - What are the system connectivities?
        - ERP ←→ middleware ←→ RFID readers ←→ tags

    - Where and how are RFID tags used?
        - Single use or multiple use
        - Where are the attached and how?
            - Metals, liquids..attachement with adhesives or screws etc..

Developing a solution

- Finding the right players for the winning team
    - RFID is automation and IT – select system integrators with reference customers
    - Ask for field engineering references. RFID pilot project references do not necessarily mean that the experience is in-house. Training at customers processes is not acceptable
    - Get a second opinion
    - Typically smaller suppliers are faster and more responsive but upscaling when moving towards software layer becomes challange – define the scale of your implementation well
    - Ask for a 'proof-of-concept' demonstration before contracts
    - Commit to make changes to your current processes
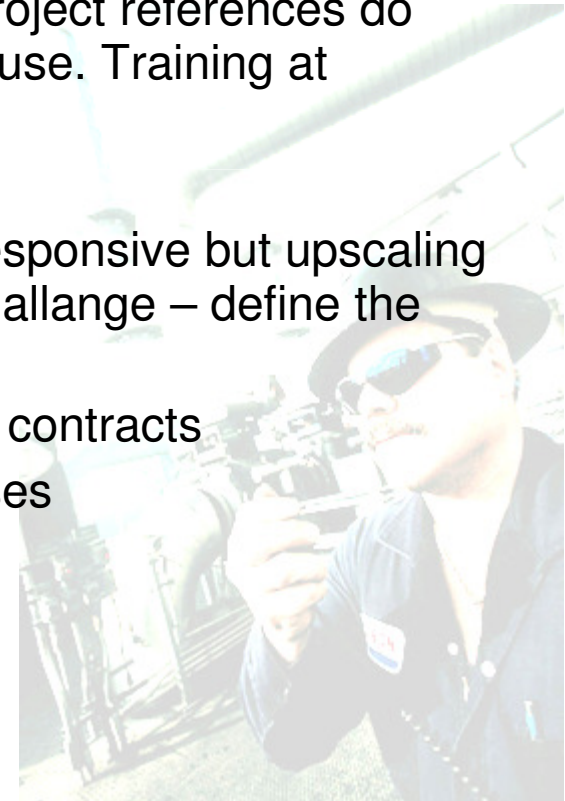
Developing a solution

- Sometimes a customer specific product is required, a RFID tag for a specific product, Reader antenna or even a reader device for a forklift truck, conveyor, handheld etc

- Consult with specialists to calculate the effect of a custom product for your needs – the system needs to be usable for years typically