Wireless Communication in the Oil Industry

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ABB
Wireless - Motivation

- **Reduced Costs**
  - Through the elimination of cables, wireless technology greatly reduces the CAPEX associated with instrumentation.

- **Improved Flexibility**
  - Mobile instruments and hand-held devices (video cameras, PDAs, laptops) allow devices to be positioned, both temporally and spatially, as required.

- **Ease of Scalability**
  - The elimination of cables increases the scalability of the wireless networks: enabling the ease of new device installation on an existing infrastructure.

- **New Applications**
  - Wireless instruments and hand-held devices provide additional solutions that are not possible (physically or financially) with today wired solutions.
"It is possible to achieve up to 10% reduction of construction costs by utilizing wireless instrumentation in new plants and facilities."

Dag Sjong, Automation Leader
StatoilHydro 2007
Limiting factors for industrial adoption

- Not understanding the possible benefits of wireless technology is the largest barrier

Source: Industry Total
The (Perceived) Issues with Wireless...

- **Security**
  - Eavesdropping, Tampering, Malicious attacks...

- **Battery Lifetime**
  - Changing batteries in the field is not acceptable, changing thousands of batteries every year is too time-consuming, battery life too low...

- **Difficult to Install**
  - Tricky to get good coverage, especially in a typical Oil & Gas environment, results vary...

- **Coexistence**
  - Different technologies operating in the same space will interfere with each other

- **No Standards**
  - Forced to use proprietary solutions, don’t want to be locked into a particular vendor...
The Wireless Reality...

• Security?
  – As good as wired

• Battery Lifetime?
  – 5-10 years typical for wireless instrumentation

• Difficult to Install?
  – Mesh networking, Redundancy, Site surveys...

• Coexistence?
  – Standards are ensuring that their technologies are ‘good neighbours’
    – channel blacklisting, frequency hopping, frequency agility...

• No standards?
  – WLAN, WirelessHART, ISA 100...
Main Application Areas for O&G

- Mobile Worker
- Condition & Performance Monitoring
- In-Process Wireless
Case – Tail IO: F3 Wireless (StatoilHydro)

- Evaluate, test and apply new and open standardized communication system architectures that allow handling increased amount of data in a cost-efficient and reliable manner for remote support & operation centres.
- Develop a functional requirement specification for future communications integrated in process control and safety systems.
- Investigate new monitoring and control opportunities brought about by wireless sensors.
- Support condition based maintenance with wireless sensing techniques & communication.
- Coordinate with mobile ICT to keep infrastructure cost at minimum when installed.
Mobile Worker

• Always connected
  – Online access to asset information and documentation.
  – Online reporting
  – Real-time collaboration between operators and engineers in support centres
  – Improved safety through presence monitoring
  – Read/write work notifications, work orders and permits in field
  – Activity planning for modifications / turnarounds
  – Tools for condition monitoring etc.
Mobile Worker: Wireless Video

- Company: StatoilHydro at Åsgard B
- Company: ConocoPhillips at Ekofisk

- Challenge:
  - Relay real-time field video to control room and onshore support centre
  - Maintain field worker mobility

- Solution
  - Mobile video system based on WLAN

- Why Wireless?
  - Mobility is not possible (or is severely reduced) when the worker needs to be attached with a cable

- Outcome
  - Mobile solution allows field workers to relay real-time video data to control room and onshore support centre.
Mobile Worker: Fire & Gas Testing

- Company: StatoilHydro at Snøhvit
- Challenge:
  - To remove the time-consuming interaction between field worker & control room operator
  - Reduce the capacity for human error
- Solution
  - Mobile F&G tester based on WLAN & RFID
  - Connected to ABB’s Safety & Automation System (SAS)
- Why Wireless?
  - Provides the necessary mobility
  - Reduces human errors
  - Reduces the control room operators workload
- Outcome
  - Currently in prototype->pilot phase
Condition & Performance Monitoring

• Monitoring the condition & performance of assets increases lifetime and maintenance interval
• Low-cost solutions, brought by wireless technology, enable monitoring of less-critical equipment
• The mobility of a wireless installation allows for installation in hard to reach areas
• Rotating equipment can be particularly difficult to wire
WiVib – Wireless Vibration Sensor

- Vibration monitoring of LV AC motors
  - Size below 400kW
  - Non-intrusive (very simple installation)
  - Fully autonomous
  - Small, inexpensive, wireless
  - Long battery life (5-10 years)
  - Suitable for EX environment

- WirelessHART compliant

- Available Q2 2009
In-Process Wireless

- Wireless instrumentation,
- Wireless remote I/O,
- Wireless fieldbus.

- Low-cost installation
- Installation in difficult areas
- Ideal for modular processes
- Line-powered / Battery powered
In Process: Wireless Remote IO

- Wireless PROFIBUS between controller and multiple remote IO
- Allows for islands of remote IO units to operate within the scope of a controller without the need for a physical connection
- Mobile process modules
- New process modules where cabling would lead to great installation costs
- Retrofit installations
Key Oil & Gas Wireless Technologies

• Wireless Sensor Networks
  – Monitoring, in-line process measurements, enabling smart instrumentation...

• WLAN
  – real-time plant information, local instrument configuration, work process activation/deactivation...

• RFID
  – Asset Tracking, Personnel Tracking...

• WiMax
  – Long-range communication, Inter-Platform communication...
Next: Wireless intelligent environments

- Intelligent environments
  - Space or environment with embedded systems and information and communication technologies
  - In which information and communication technologies and sensor systems “disappear” as they become embedded into physical objects, infrastructures, and the surroundings
  - Always on, anytime, anyplace, anywhere
  - Context-aware
    - Sense physical environment and adapt behaviour accordingly
      - Where device is
      - What other devices are in range
      - Available resources

*If I'd asked my customers what they wanted, they'd have said a faster horse.* Henry Ford (on inventing the Model T)
Summary

• Market Drivers
  – Health and Safety
  – Execution & Ressources
  – Energy & Sustainability
  – Service & Maintenance

• Technology Drivers
  – Wireless
  – Web technologies
  – Remote operation support
  – Asset Management

Flawless Execution

Product Technologies

Process and Energy

Integrated Operations