Wireless Sensor Networks
Honeywell Businesses

2008 Sales

- Aerospace: $12.6B
- Specialty Materials: $5.3B
- Automation and Control Solutions: $14B
- Transportation Systems: $4.6B

Total = $36.5B
Wireless Sensor Networks at Honeywell

Market Expertise
• 50 million Hom wireless sensors installed
• Industrial wireless products available since 2002
• Over 500 industrial wireless customers
• Applications in Industrial, Buildings, Homes, Structures

Technology Expertise
• Selected by US Department of Energy for Industrial Wireless Research and Solution Development in 2003
• More than 300 wireless patents issued or pending

Standards Expertise
• Charter member of ISA100, WirelessHART and ZigBee

Expanding Wireless Sensor Network Capability across Hom
WSN Reduce Cost & Increase Flexibility

- 80% lower installation cost vs wired
- Simpler and cleaner deployments
- More sensing points, especially in places that cannot be wired
- Potential to integrate with existing control and IT systems to enable more advanced applications such as preventive maintenance
- Intelligent networks where the nodes can act on the parameters that they sense

*Wireless Sensor Networks provide ability to monitor and control assets not previously feasible*
Customer Requirements

- Reliability “as good as a wire”
- Secure communications
- Guaranteed latency
- Support multiple protocols

OneWireless: Universal Mesh Network Supporting Multiple Industrial Protocols
OneWireless Development & Commercialization

Technology Development

Agency: US Department of Energy
Program dates: Sep 2003 – Jun 2009

Key innovations:
• Highly robust radio communications
• Scalable latency-controlled multi-hop mesh network
• Secure wireless communications with convenient key management
• Long battery life

Key accomplishments:
• Unique implementation of redundant wireless communications to enhance reliability without compromising battery life
• State of the art security: privacy, integrity and authentication for protecting end-to-end communications
• Multi-functional architecture to support diverse applications

Patents:
• >30 patent applications and invention disclosures

Commercialization

Product launch: Jun 2007
Current applications:
• Multi-functional industrial wireless network to
  ➢ optimize plant productivity & reliability
  ➢ improve safety & security
  ➢ insure regulatory compliance
• Universal, simple and efficient solution
  ➢ Single plant-wide wireless infrastructure
  ➢ Connects to installed industrial protocols
  ➢ Best integrated industrial security available today
  ➢ Reliable mesh network: field-proven for best uptime
  ➢ Most flexible and upgradeable plant wide wireless system available today

Coming Soon:
• ISA100 (industrial wireless) standard approval
Capture & Create Knowledge Throughout the Plant

One Wireless Network can link all Applications
Steel Mill Case Study

• Nucor Steel in Tuscaloosa, Alabama

• Wireless transmitters were installed on cooling circuits a few feet from the base of the furnace, encased in protective boxes to withstand the extreme heat.

• Better sensor data led to:
  – Improved production efficiency
  – Improved safety
  – Enhanced process reliability
  – Improved decision making
  – Optimized maintenance

“With Honeywell’s wireless solution, we have been able to improve our furnace process. Access to new temperature readings has allowed us to upgrade the furnace and expand production by 15 percent. The return on investment has been significant.”
WSN for Equipment Health Monitoring (EHM)

Diagnostic inputs
- Vibration
- Temperature
- Pressure
- Current

Wireless network
- Multi-hop mesh
- Battery/Mains powered
- Capability for multiple applications

Analysis software
- Programmable alarms
- Remaining useful life
- Easily programmable

Backend Interface
- Scheduling Maintenance
- Performance optimization
- Parts inventory
- Production scheduling

Benefits of EHM: Increased uptime, reduced maintenance, lower energy costs
OneWireless EHM Case Study: Loch Rannoch

- Energy Co. operates a dedicated shuttle crude oil tanker, Loch Rannoch, to transport oil from a storage vessel to an oil-processing terminal in the North Sea.

- Loch Rannoch is a purpose-built double-hull oil tanker with a capacity of 130,000 tons.

- Manual monitoring of rotating equipment could only gather data from each asset once every three months.

- Specific operational goals of this project:
  - Protect employees involved with tanker operations
  - Protect installed assets onboard the vessel
  - Improve the tanker’s ability to operate at full capacity
  - Proactively manage maintenance schedules

- OneWireless System Solution
  - OneWireless provided a scalable wireless infrastructure
  - A highly redundant network design was implemented to cope with the poor RF environment on the ship.
  - Data is collected in a historian database, and analysis is performed to determine equipment health through conditions such as enveloping energy and vibration.
EHM Economic Benefits

• Increased Uptime
  – Rotating equipment failures cause 70% of downtime that results in loss in production in a factory

• Reduced maintenance costs
  – Equipment failures can occur anytime and 90% of them are not be caught by preventative maintenance
  – Results in higher maintenance costs and lower MTBF

• Maintenance practices do not use personnel time efficiently
  – 60% of the time is spent on equipment that is not faulty
  – Only 10% of the time is spent on data analysis - the real value add activity

• Maintenance practices are not optimized for payback
  – Extend equipment life
  – Repair early or run to breakdown based on predetermined criteria

• Provide inputs to optimize machine specifications for production
  – Correlate causes of failure to process parameters

Effective EHM can reduce Maintenance Costs by 25%
Economic Benefits in Multiple Applications

- Motor Systems: 11% - 18% reduction in energy use
  - 23% of all electricity sold in the US (excluding HVAC)
  - 65% of the electricity used by industrial automation

- Compressed Air Systems: 50% reduction in energy use
  - Typically left running when not in use and not monitored for leaks

- Steam Systems
  - 47% of energy used by chemical manufacturing
  - 51% of energy used by petroleum refining

- Water Treatment Plants
  - Much rotating equipment that would benefit from continuous monitoring for preventive maintenance and energy management

*Increased Productivity, Reduced Energy Usage, Improved Maintenance Effectiveness, Increased Safety*
The emerging opportunity for Industrial Wireless Sensor Networks is expected to be $5B in 5 years.

Technology is at the point where issues of interoperability, scalability, security, robustness, cost and coexistence with other networks can be effectively addressed.

ISA 100 is the first industrial wireless network standard to address these issues.

Challenges remain with Battery Life and Compatibility with Legacy Systems.

Adoption will be based on providing solutions to customers that provide economic benefit.

Govt Support of research and appropriate regulation of outcomes; improved energy efficiency, reduction emissions etc. will drive usage of WSN.