

Wireless Device Networking in Process Industry -Challenges and Applications

A White Paper

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1 Introduction

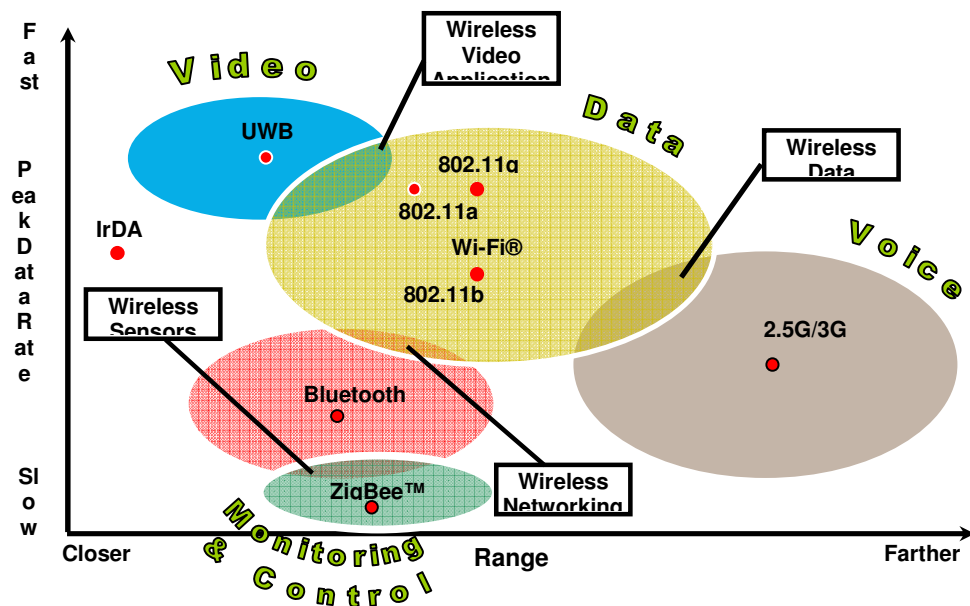
Wireless Sensor networking has huge potential to improve manufacturing and process applications. A major part of realizing that potential requires the development of industrial wireless sensor networks (WSN). Specifically, industrial approach to defining standards is now being pursued by WirelessHART and ISA SP100 group and is focussed on sensor networks for process automation.

Over the past year, end users have rapidly adopted proprietary Point-to-Point and Point-to-Multipoint (star) wireless sensor solutions by several vendors. While robust, these first solutions lack the advantages of mesh networking such as reliability and scalability, creating the demand for wireless solutions by industrial companies.

While standards based industrial WSN is in its early stages with only small nodes per network on average, there have been several successful mesh/hybrid deployments by some vendors like E-Senza. These deployments illustrate the high demand for robustness, receiver sensitivity and range for most industrial applications. As the start-ups like E-Senza continue to illustrate the potential of large-scale networks, there remains some reservation in minds of customer about widespread deployment in industrial applications.

Another challenge that wireless faces is due to the fact that all technologies share a common medium and can be typically used to realise an application. This brings certain amount of fear in minds of user.

- All wireless technologies have common medium!

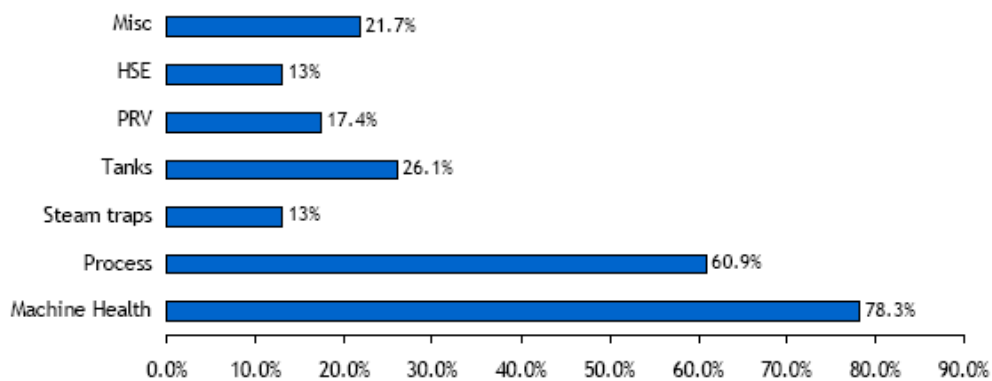


2 Strong Drivers & Large Potential Market

Based on a high return on investment, strong demand for wireless solutions and vendors collaborating with end users on standards, the total potential market size for industrial WSN is enormous. Assuming all major industrial establishments deploy 100 nodes per year on average, this market could be worth annual deployments of 100s of millions of units within the next decade.

Despite increasing customer deployments of wireless sensor solutions, we have seen that the market did not pick up mainly due to the current uncertainty about standards and appropriate technologies for industrial WSN. However, strong end user demand for predictive maintenance and more remote process monitoring are driving this market forward.

Figure 13: Current Industrial WSN Applications



Legend:

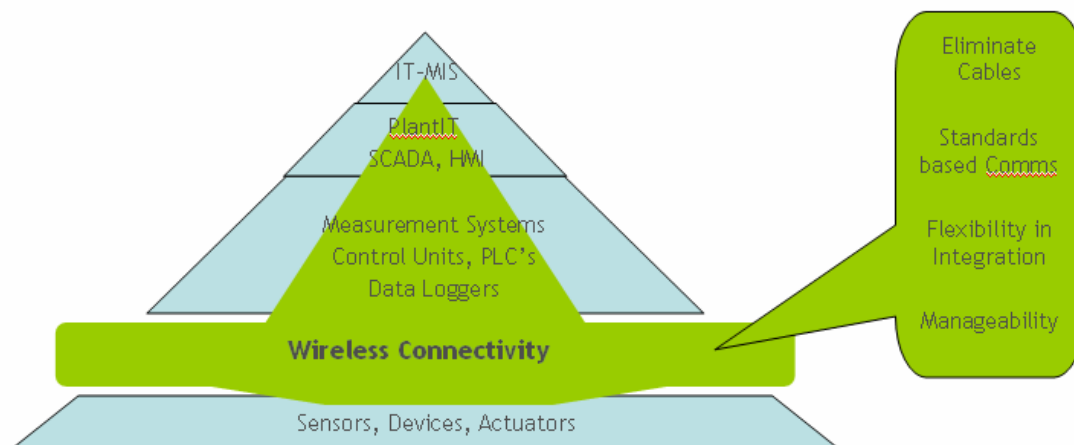
Machine health =	Machine health monitoring for preventive maintenance
Process =	Process monitoring and/or control
Steam =	Steam trap monitoring
Tanks =	Tank level/leak monitoring
PRV =	(Pressure) Relief Valve monitoring
HSE =	Health, Safety & Environmental

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3 The Promise of Industrial Wireless

No development since the Internet has greater potential to advance manufacturing than wireless networking. As with earlier revolutions in manufacturing technology, advances in wireless IT and consumer electronics technology are having impact at all levels of manufacturing. The huge demand for wireless products by IT and consumer markets have made a number of powerful wireless technologies available to manufacturers at very low cost. Globalization of the IT and telecom market has also created global standards for many types of wireless networks. Technologies like Wi-Fi, Bluetooth, and GSM have become global standards, while emerging wireless technologies like WiMAX, Wireless USB, and ZigBee also have the potential to become pervasive globally.

Future manufacturing plants will support not one but many wireless technologies at the same time. Wireless networks will provide voice communication, mobile computing, process and factory automation, process sensors and transmitters, building automation, personnel safety, access control, and security. These applications either are or can communicate to an extent over wireless. In the world of manufacturing there are sensor and field bus networks (that capture sensor and actuator information) automation networks (that control and manage production equipment and human interfaces), and IT / Plant IT level networks that provide services for the whole manufacturing firm and its supply chain partners and customers. The upper level could be wireless already but a great challenge lies in “last meter” of the industrial world, viz between field bus devices and sensors!



4 Challenges in Wireless Sensing

Creating any wireless product for the industrial market requires a balancing act, in order to meet the distinct requirements of manufacturing as opposed to IT and consumer segments. In the case of sensor-level wireless, this challenge is daunting. Sensors used in manufacturing need to be highly reliable. The performance of these sensors often determines the success of the manufacturing operation itself. If the sensors do not perform their mission, production may be lost, sometimes large amounts of valuable production or production time. Wireless sensors need to be designed specifically to address this reliability.

A large number of challenges need to be met for a wireless sensor to perform reliably. Some of these variables are:

- *Standards* : There should be a common language to talk between all sensors!
- *Chips/ Modules* : The customers hate single chip / proprietary solution. They try to avoid single source solutions
- *Integration ability* : Each new product does not mean that they throw the old infrastructure out, they need integration ability with their existing systems!
- *Smaller Footprint* : Smaller is better
- *Reduced Power consumption* : Power sources and Batteries are a headache to process implementers looking for wireless sensor. An efficient power management on wireless sensor would help them in a long way.
- *Networking ability* : The wireless sensors should be networkable, as the range in process applications could be very tough proposition due to rf disturbances.

5 Applications in Wireless Sensing

All these opportunities are driven by application needs in Process Industry for

- Continuous Process Monitoring,
- Predictive Maintenance Programs
- Quality Control Regulations
- Improved Quality of Service Offerings

As users see that the wireless technology matures and that it can work reliably and that it can be standardized, we see a greater acceptance about wireless sensors in process industry and feel that Wireless has started moving and making its mark on the industrial applications!