How Is Wireless Changing Manufacturing?

Andy Ross, B&B Electronics, www.bb-elec.com [1]

M2M communications used to be hobbled by the need to accommodate legacy equipment and timeworn communications protocols. Harsh physical environments and awkward locations imposed additional limitations, as even the newest equipment could be cut off from the network. Industry-hardened device servers and media converters could overcome some of those issues, but no one would have said that factory automation was anywhere near the cutting edge of data communications innovation.

Now, thanks to rapid advances in both the software and hardware, network engineers are able to use wireless to fill in the old communications gaps. They’re extending the network’s edge to include devices of every description, and turning those devices into nodes on modern, intelligent data communications systems. Wireless makes it possible to network-enable just about any device, just about anywhere.

Wireless networking benefits include everything from enhanced efficiency and functionality to savings in equipment purchases and maintenance costs. Infusing legacy devices with modern communications capabilities makes them more valuable and extends their useful lives at the same time. New devices are empowered to make full use of their feature sets, as wireless can link together everything from serial ports to tablets and smart phones. Processes can be controlled and monitored at every step. Predictive maintenance is also being replaced by machine prognostics, as the network can pinpoint exactly which components, in which machine, are likely to fail — and when.

Formerly a networking backwater, factory automation is now being reinvented, with wireless communications as the missing piece in the puzzle. Wireless is empowering automation engineers to blend the old with the new, to explore unprecedented possibilities and to turn entire factories into integrated, intelligent, unified systems.

Daryl R. Miller, VP of Engineering, Lantronix, Inc., www.lantronix.com [2]

In its infancy, wireless networking was ill-suited for the challenges of the industrial environment. Factors such as temperature, humidity, moisture, shock and vibration extremes all posed threats. If that wasn't enough, the shop floor could be a cacophony of radio signals spanning across the Industrial/Scientific/Medical (ISM) radio spectrum so often used for wireless network enablement. Fortunately, manufacturers have risen to the occasion with ruggedized and weather-tolerant wireless hardware along with multi-band, multi-channel (i.e. IEEE802.11abgn), high power radio transmitters and gain antennas. This applies both to infrastructure equipment (access points) and the client devices (device servers, radio modules) that go alongside, or are integrated into, the industrial equipment.

Wireless enablement in the industrial setting can be very beneficial — it allows mobile equipment (forklifts, carts) to be connected to the network infrastructure, and it avoids costly or impossible cable runs necessary for wired Ethernet. By using wireless sensors, it becomes quite feasible to monitor older equipment for a variety of parameters (temperature, vibration, noise) that could evade costly, catastrophic failures. In one example, a CNC machine manufacturer was able to meet the needs of their customers by offering a Wi-Fi device server that was seamlessly integrated with their machine's controller. The advantages are many: with no cables, installation time is reduced and less costly; also the customer is able to relocate the machine as needed without re-cabling. On a day to day basis, the wireless networking capability allows users to closely monitor the machines through a central operations station, thus improving uptime and productivity.

The industrial environment has shaped the design and implementation of wireless networking. With these changes in place, it is now time for the industry to reap the benefits wireless networking has to offer.

Mike Ueland, Telit Wireless Solutions North America, www.telit.com [3]

Wireless machine-to-machine (M2M) technology has its roots in industrial solutions, for years allowing for operational efficiencies and cost savings through applications such as remote utility meter reading and industrial asset monitoring. While these core applications have not necessarily changed, the advancement of wireless technologies have both expanded the monitoring capabilities and enabled even more cost-effective solutions, making cellular M2M an especially viable option that can be simply integrated into existing industrial systems.

The inherent benefit in cellular technology is the existing infrastructure of widespread, ubiquitous cellular networks that allow for reliable connections, even in remote areas. As the M2M market has continued to grow and expand, the hardware costs for monitoring solutions have sharply decreased, as have the data plans offered by cellular service providers. In addition, mobile network operators (MNOs) have hardened cell sites and now offer many advanced security functionalities to their industrial customers. These advances have effectively removed many of the barriers for M2M adoption, and enabled industrial customer from benefiting from M2M through operational efficiency, cost savings and safety.

For industrial sites and assets that require around-the-clock monitoring, M2M applications such as gas line monitoring devices and video surveillance solutions provide real-time information and the ability for immediate response. In fact, the most significant development in wireless industrial applications is the capability of streaming video, enabled by new 3G and 4G network technologies and their higher speeds of data transfer. These remote video surveillance solutions are able to ensure that power facilities, water systems, and gas pipelines, for example, are secure against tampering, theft and vandalism.

Video capabilities provide additional cost savings and security assurance in remotely monitoring sites with a significant environmental impact. Gas lines, oil fields and waste water management facilities, for example, require careful attention and immediate response in the event of an incident. Video-streaming M2M solutions enable immediate response to protect the health of the surrounding environments and human population, and they can also save a company millions in fines for environmental violations.

Maneesh Soni, Texas Instruments, www.ti.com [4]

Industrial wireless networking is attractive to customers in the industrial automation segment for obvious reasons, including cost-effective deployment and operational convenience. In certain scenarios, the hazardous nature of the operating environments makes wireless networking very effective and compliance to intrinsic safety requirements becomes easier.

Along with the advantages to wireless networks come challenges - security being number one. Security can be narrowed down to its main components: authentication, authorization, resilience to over-the-air threats, quality of service and interoperability. Several of these challenges are addressed by the emerging standards in wireless networking such as the IEEE802.11(a/b/g/n). Cellular communications for remote locations, 802.15.4, ZigBee and 6LoWPAN for security, lighting and automation, RFID for identification and asset tracking and WirelessHART for sensing are other technologies gaining acceptance today.

However, the cost of this proliferation is that more features are needed from the electronic components and therefore engineers must find ways to add them without increasing costs. Software is one major way to do this. Low power, flexible new memory technologies like ferroelectric RAM (FRAM) allow manufacturers to add features after deployment by enabling wireless updates of software without impacting battery life. Furthermore, many devices now integrate both the radio and the security features.

With the progress in making wireless networking secure and robust over the years, there are a large number of standards compliant products available today from the leading vendors of automation equipment. Although it is going to stay small compared to wired networking, there will be high growth in the wireless segment for the foreseeable future with more standardization.

Todd Hanson, Honeywell Sensing and Control, http://sensing.honeywell.com/ [5]

Standard data cabling in an industrial environment is subject to a wide range of conditions that greatly shorten its life. This includes repeated movement — often thousands of times a day — that results in copper wires kinking and breaking. Cables and wires are also subject to abrasion and tearing from nearby machinery as well as from contact with mobile equipment, tools and vehicles. Commonly found in industrial environments, caustic and hazardous chemicals, fluids, grease, dirt and gases can also quickly corrode away the connections.

Finding, locating and repairing these cable faults, often inaccessible and hidden

behind equipment or covered in years of dust, dirt and grease is not an easy task.

The managers of assembly plants and campuses are quickly learning that it is much faster, and much more economical, to simply discard the damaged cables and replace them with a wireless network.

Our customers often tell us that the cost of a few hours of downtime to troubleshoot and fix broken cables is more than the cost of installing a wireless network to replace it!

Another outstanding advantage of industrial wireless networks is flexibility for reconfiguration. In plants with ever changing floor plans to accommodate new product cycles, it is simple to move the wireless solution. Rearrange the heavy equipment, attach the wireless sensors and network, plug them in, and you are ready to go. If there is another minor fine tune to the floor plan, there are no cables to re-run or to worry about.

Flexibility and reducing maintenance/repair costs, combined with the recognized reliability and robustness of industrial wireless networks, are the prime basis for this new industrial revolution.

Source URL (retrieved on *12/08/2013 - 9:35pm*):
http://www.chem.info/articles/2012/08/how-wireless-changing-manufacturing

Links:
[1] http://www.bb-elec.com/
[2] http://www.lantronix.com/
[3] http://www.telit.com/
[4] http://www.ti.com/
[5] http://sensing.honeywell.com/