Best Practices for Powering Wireless Devices & Avoiding Interference

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Todd Hansen, Director of Strategic Marketing at Honeywell Sensing & Control, and Paul Richards, CEO of Wireless Sensors, offer best practices for powering wireless devices and avoiding interference.

Chem.Info: What options are available for powering wireless sensors?

Todd Hansen: Local line power could be used to power the sensors but this many times defeats the value of using wireless enabled solutions. There has been much recent press on energy harvesting, which can mean generating energy from light, vibration, temperature change, or friction, for example. While such solutions may work well in non-critical monitoring applications, the reliability has not yet been proven.

The biggest question to verify is, “does it work every time, anywhere?" In many cases, such harvesting means are not universally applicable and may only work in some applications or conditions. For example, what happens with vibration if the frequencies change or with temperature if there isn’t enough of a delta?

Battery power is the most common and reliable source of power and it provides for the full benefits of wireless devices. With recent developments in low power sensors, radios and long life batteries, battery life has been extended to 4 years or greater depending on the refresh rate. In most cases, such devices send a low battery diagnostic signal to allow for scheduled replacement. There’s no need for annual maintenance until a diagnostic signal is received.

There are two options for changing batteries. Option one is to replace the batteries in the field, ensuring that explosive gases are not present via a “sniffer”. Option two

is to remove the wireless device from the field, take it to a safe location and change the batteries.

Paul Richards: Wireless does not mean powerless. Most wireless devices derive their power from batteries and this introduces a new set of operational issues. Select a wireless systems which monitors and alerts it own battery status so there is adequate time to replace batteries before the measurement go “dark.”

Reputable manufactures offer this feature as well as link to link alarming in the event of RF problems. Making sure these alarms are monitored, either through the factory floor control system of via email alerts if a web based data system is implemented ensures reliable operation. At reporting frequencies of one to five minutes, most wireless sensor systems achieve battery duration in excess of one year, but putting a battery change frequency at annual shutdown or at annual calibration time constitutes a best practice approach. If power is readily available in some locations the batteries can be eliminated altogether and still achieve the benefits of eliminating signal wiring. There are many advancements being made in battery technology, electronics power reduction and energy scavenging so look for this to areas of differentiation amongst vendors.

CI: What interference issues are commonly encountered? Are certain wireless transmitters or protocols more likely to interfere with Wi-Fi or other existing wireless infrastructure?

TH: There are very few concerns with interference if the wireless system is properly installed. Line of site is preferred to gain the strongest signal, but it may not be required. While Wi-Fi, Bluetooth, ZigBee and others operate in the same 2.4GHz band, all such standards-based technologies have built-in means for avoiding interference. A little bit of planning before any wireless installation goes a long way in avoiding any un-necessary issues later on.

PR: Anyone who has listened to an AM radio during a thunderstorm is familiar with interference. You’ve probably also noticed that FM stations are far less prone to this interference, so the RF modulation technique matters. Many may also be old

enough to remember the marked improvement to cellular phone call quality when digital replaced analog transmission. State of the art wireless sensors use digital transmission with all the error checking and acknowledgments customary in wired systems. These systems also use modulation techniques to reduce the effects of interference from electrical noise and other RF “traffic” such as Wi-Fi.

Common wireless systems operate with radio transmission standards (IEEE 802.15.4) developed by the same groups responsible for WiFi (IEEE 802.11.X). The standards bodies when to great lengths to ensure compatibility between the two systems, they do however share the same RF space so the technique of frequency hopping means a wireless system is capable of moving away from the channels which may be carrying large amounts of Wi-Fi traffic into open channels to reduce the effects of interference further enhancing the robustness of this technique.

CI: Do you have any other advice for processors that are thinking about switching from wired to wireless sensor systems?

TH: Stay with standards based solutions such as ISA100 which are supported by large, or multiple companies. You should have confidence that the solutions are backward/forward compatible, scalable, and that the firmware will be supported and maintained by the supplier long-term. If supporting plants in multiple countries, make sure that the wireless protocol is globally license free and that the solution has country specific certifications, if required.

Look at solutions that meet present and future needs. Mesh networks may be best for some solutions, and point-to-point may be better for others. Some other considerations:

- The less frequent the refresh rate, the longer the battery life.
- Once a wireless infrastructure or system is installed it becomes very cost effective to add or relocate components throughout the facility.
- With mesh networks, request that the supplier do a site survey and include a layout of the most effective access point count and locations.
- Using a wireless solution frees up resources normally dedicated to monitoring functions, so manual valve checks, for example, can be reallocated to more productive activities.
- Wireless is simply an enabler. The opportunities are limitless.

PR: Process engineers can enjoy the many benefits of wireless sensors systems, but like any technology they are not a panacea and should be selected and deployed carefully. Understand they are not all the same and some systems employ more sophisticated technology, which results in more reliable operation. If you're new to the technology, learn a little about it, ask questions of vendors and try it out. The advantages of a successful installation is worth the price.

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