Converting Ambient Energy to Power the Factory

Energy harvesting wireless technology monitors and controls large-scale industrial plant facilities

By Jim O'Callaghan, President of EnOcean Inc.

Essential factors for the success of a business include production up-time and process machinery efficiency. Real-time monitoring of machinery makes it possible to detect and prevent equipment failure proactively. Many monitoring systems require extensive cabling, which is expensive, cumbersome and unsuitable for hard-to-access places. This is where EnOcean's energy-harvesting wireless technology presents an ideal alternative for monitoring and controlling industrial plant equipment.

Making effective use of surrounding energy

Since 2001 EnOcean has been developing wireless sensor modules that harvest the power they need from locally available sources – such as linear motion, indoor light or small differences in temperature. This ambient energy is converted into usable electrical energy to power the transmission of wireless signals between devices. In terms of real world applications, this self-powered wireless link can be used to report a disturbance in production machinery, for instance. EnOcean-enabled devices operate autonomously, there are no batteries to check or replace, so they are also entirely service-free.

EnOcean wireless solutions are based on the international standard ISO/IEC 14543-3-10. RF signals are transmitted in the 868 MHz or 315 MHz frequency bands, meaning it fits into solutions worldwide. EnOcean radio transmissions are very fast to both conserve energy and to avoid interference. An EnOcean signal is just one millisecond long, which is about one hundred times shorter than the signal of a conventional wireless switch. A

telegram is randomly repeated twice in the space of about 30 milliseconds to enhance system reliability. Transmitting data packets at random intervals makes the probability of collision extremely small. As a result, hundreds of wireless switches and sensors may be co-located with minimal concern for collisions. Each EnOcean RF module comes with a unique 32-bit identification number to exclude any possibility of overlap with other wireless switches. The range of EnOcean wireless sensors is 200 feet in the open and up to 75 feet inside buildings.

Wireless cable harness testing

One example of the use of EnOcean technology in an industrial plant environment, interestingly enough, a tester to verify proper assembly of complex wire harnesses, developed by SEMD, a German-based provider of products and services for electro-technical and medical industries. A cable harness consists of numerous interconnected cables and requires up to one hundred unique connectors. Employing energy harvesting wireless technology, SEMD confirms proper placement and connection when the harness is snapped into the harness panel. This mechanical motion generates electricity to send radio signals to the quality assurance system confirming each connection point was properly connected.

The individual test components can be exchanged speedily and simply without altering the entire support device. The system is integrated in a PC-based network, enabling operation by conventional server technology. Using this wireless testing a cable harness manufacturer can cut production time plus substantially reduce production costs by 35 to 48 percent.

Next generation of energy converter

The SEMD solution is based on the third generation of EnOcean's mechanical energy converters, the ECO 200, which produces a small electrical pulse with each actuation to power the RF transmitter. When combined with the wireless transmitter module PTM 330, they create a complete system that incorporates all the components and functions of wireless technology without batteries. Together, the two products form the basis for realizing customized, energy-autonomous switching solutions. The combination is a robust and reliable industrial switch good for more than a million switching cycles. Other industrial applications include batteryless hand-held transmitters and wireless position switches. With this ready-to-use system, OEMs can implement individual wireless switching solutions based on self-powered wireless technology quickly and easily without a deep knowledge of energy harvesting.

Flexibility made to measure

EnOcean's batteryless wireless technology has established itself in recent years as a wireless standard for sustainable building, and is now gaining in significance for use in industrial plant automation. It enables reliable monitoring of the status of machines and processes plus simplification of their cabling. Information can be detected and retrieved from inaccessible locations. A company is able to respond to business requirements quickly, flexibly and efficiently to make optimum use of existing capacity.

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