Interview

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Upgrade Old Networks with IoT Smart Machines

Please tell us a little bit about yourself and your background with Schneider Electric.

I joined the Square D Company in April 1983, which became part of Schneider Electric in 1991. Over the decades, I have worked in various positions from product management, project engineering, and marketing to business development, including a three-year stint in France. Schneider Electric today is a global specialist in energy management and automation, with 160,000 people in over 100 countries.

Schneider Electric sees the advent of the Industrial Internet of Things (IIoT) as an "evolution," not a "revolution." We invest about 5% of our revenues into R&D annually. We draw on our long history of innovation in open architectures and Ethernet-based technologies to guide our customers through this transformation. The IIoT brings about a world where our smart connected products and subsystems operate as part of larger systems of systems. We see the plant of tomorrow as a smart plant—a truly connected and sustainable ecosystem where plants and machines work together in a secure and collaborative way to put technology at the service of people for greater empowerment and efficiency.

What area of the industry is most affected by the IoT?

Manufacturing is the sector most affected by the Internet of Things (IoT), but data capture in particular. Smart manufacturing is the implementation of IoT for better asset performance and optimization. The goal is to produce a more efficient product line, which means less energy is consumed, better machine-to-machine (M2M) integration, and better use of the supply chain. The IIoT is not about ripping out current automation systems in order to replace them with new ones.

The potential lies in the ability to link automation systems with enterprise planning, scheduling, and product-lifecycle systems. We will see self-organizing machines and assets that enable mass customization and lot sizes of one. In the realm of asset performance, the collection and analysis of data from increasing numbers of cost-effective and intelligent sensors will increase business performance and asset uptime.

A new generation of "augmented" workers will leverage cutting-edge technologies, including mobile devices and augmented reality. With easier access to information across the enterprise, their work becomes simplified and production systems grow more profitable. Some of these changes can be implemented in the short to medium term; others will require a gradual evolution with end users and original equipment manufacturers (OEMs) incrementally adding functionality to their existing legacy systems as new international IIoT standards are established.

What trends do you see occurring with the implementation of IoT?

OEMs and end users can leverage IIoT to better monitor and control machinery. Within today's industrial environments, some devices are connected, but many are not. IIoT applications will include not only M2M communication, but also machine-to-people, people-to-machine, machine-to-objects, and people-to-objects communication. These connections enable the ability to collect data from a broad range of devices and applications. This "big data" can then be accessed via the cloud and analyzed using sophisticated analytics tools.

Use of sensors is increasing on the factory floor. The cost of sensors and the fact that it is getting easier to install sensors with current interfaces allow for more tracking and more data collection. Another growing trend is greater distributed control, moving away from centralized control. For example, imagine a long conveyor system with a centralized PLC for the motors and ac drives. All of the wiring runs through a single centralized panel, which manages all of the motors, starts, stops, and speed controls. New IoT products allow a small, low-cost PLC to be placed on top of an individual conveyor and provide individualized control. One can add different, self-contained PLCs to control different conveyor processes. The Ethernet connections between PLCs also help reduce cost due to decreased usage of copper wire.

This new type of distributed control improves efficiency and flexibility. It also ties into machine optimization. The current concern is that machines need to look externally toward other machines. Communication of data and information to other machines is crucial to IoT systems, requiring a more service-oriented approach around the individual machine.

The new Modicon M580 from Schneider Electric is an Ethernet Programmable Automation Controller (ePAC) that features redundant processors, native Ethernet, and cybersecurity embedded in its core.

Define smart machines and what role they play in IoT systems.

Smart machines are more efficient, flexible, connected, and safer. Some important aspects include their connectivity (i.e., the ease of Ethernet connections), ability to self-monitor and monitor the devices they are connected to, and ability to adapt on-demand. They also offer predictive maintenance. This helps decrease the amount of downtime a system can see due to failures or product-line readjustment.

When it comes to connection to other machines, they can help solve miscommunication between different pieces of equipment. For example, four to five machines each speaking the same language are able to communicate with each other using a new smart machine as a central hub. New communication standards like PACKML for packaging machinery can help to translate different devices speaking different languages. The transition from dedicated fieldbus to industrial Ethernet protocols and the emergence of smart manufacturing initiatives are reflected in the evolution of communications.

What new improvements and security features are available in smart machines, considering their connection to the internet?

Examples of new smart-machine devices are human-machine-interface (HMI) -based PLC controllers. They integrate two different types of tech: display and logic controller in one platform. New PLCs have higher CPU power and dual-core technology: one processor for logic and one dedicated to communication.

In terms of digital mobility, machine operators and factory-floor engineers are embracing in ever-greater numbers the concept of using mobile devices at work. With mobile HMI, the machinist is not tied to the machine and can take the information, with data displayed on mobile devices, anywhere. In terms of security, the devices themselves have built-in security with encryption and firewalls, but also offer biometric security. One example is a biometric pushbutton for access control.

On the safety and cybersecurity front, with security built into their fundamental designs, smart machines will enhance operator safety and minimize the security risk of increased networking. Improvements in machine performance and lifetime cost reductions cannot be offset by reducing the safety or security of the machine or production line.

With regard to safety, machine builders need to offer a broad range of flexible options. This will include dedicated safety components, such as laser scanners and safety cameras, together with automation components that have embedded safety, such as safety PLCs and safety drives. The ability to utilize a mix of safety components and controllers will allow machine builders to fit the solution to specific end-user application requirements, helping to improve overall performance and productivity.

Today, data security is the leading inhibitor of end-user adoption of new networking technologies and work processes. The perceived risk of networking components and machinery in order to achieve production benefits is high.

What problems arise when integrating IoT into older systems?

The problem is usually what kind of investment you want to make—immediate or long term. Both come with different solutions and cost. For immediate solutions, integration into older PLC products is done via software. Software solutions offer the ability to communicate with different kinds of data and hardware. Software is an enabler. It links all of these disparate systems together. Software solutions also enable simulation and prototyping, with the ability to create virtual models of the machines.

A long-term solution is upgrading your automation equipment. New equipment will have the latest tech and many are designed for future-proofing—the ability to use giga-Ethernet speeds, for example—so that the technology is adaptable for years to come.

With smart manufacturing and IIoT, a transition is now underway to replace fieldbus protocols with industrial Ethernet variants. The outlook suggests that adoption of industrial Ethernet will future-proof end-user facilities in terms of industrial communication. Continuing reliance on and adoption of fieldbus, without considering Ethernet-based alternatives, will likely hurt overall production in the long term.

Today, fieldbus protocols still account for about 66% of new node connections, with industrial Ethernet increasing its share by about 1% per year. Currently, the move to Ethernet-based networking is slow, but will likely accelerate as smart manufacturing and IIoT benefits become more substantial and widely recognized.

Perhaps one of the biggest barriers to the adoption of IIoT, smart manufacturing, and smart machines is the creation of suitable standards. New standards must encompass creation of standard semantics that will allow smart devices to connect and "talk" to each other without the need for custom programming (as is the case today). These smart devices will also need to "discover" each other and interact.

The development of open standards will provide structure and guidance to OEMs and end users, helping them to implement new working processes and leverage the benefits of IIoT. These standards will need to focus the overall integration of systems and uniformity across the factory floor. md