machine design

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How Will the Internet of Things Affect Motion Control?

Almost all manufacturing and a wide variety of consumer products depend on motion control—reliably moving a component or assembly from here to there and maybe back again, or perhaps rotating it. And the Internet of Things (IoT) is predicted to be a critical cog in all forms of technology. So how will the IoT change motion control?

To get the answer, we talked with Daniel Repp, business development manager for Lenze Americas in charge of Automation Solutions. Repp has worked at Lenze for more than 16 years, having started in IPC production in Germany, and later serving in various quality-inspection and sales-management roles.

How will IoT affect the motion-control industry?

Speed, flexibility, productivity, and efficiency will remain cornerstones of manufacturing, packaging, and logistics. However, OEMs are undergoing major, fundamental changes with the adoption of digital control, lower-cost sensors, remote monitoring, wireless communications, and other IoT-enabling technologies. They are improving efficiency, performance, and accessibility of built-in machine intelligence. From big-data analytics to smart energy monitoring, machine builders and manufacturers will be on the frontline of IoT adoption in the coming decade.

One of the most important drivers of IoT is the trend toward product customization. Intelligent and connected machines are more flexible and well-equipped to make customized products with the highest degree of productivity, quality, and resource efficiency in small and large quantities. Factories of the future will be fully automated, and we will see more temporary production lines that can be repeatedly reconfigured for increasingly diverse products.

The digital era is yielding unprecedented machine intelligence. Better machines, with self-optimization and the right motor and inverters, will continue making automation more efficient by letting machine builders and operators commission, program, and connect machines faster. From parametric programming to machine visualization, it is already happening and will only accelerate.

How can OEMs manage the complexity of these innovative machines?

Automation gives OEMs the possibility of improving productivity, yet adds layers of complexity in the form of kinematic programming and control systems and integration into the network-, internet-, and cloud-based platforms. Compounding that complexity, most plants operate with at least some legacy systems. Another important factor is the lack of technically skilled employees. In addition, time to market is increasingly important. Today's faster pace and leaner operations do not support protracted programming or steep learning curves.

The best technological innovations simplify work. That is why demand is on the rise for smarter and more intuitive drive technologies. Simplifying complex technologies requires modular motion-control concepts and standardized functional units from the motor to the shaft. Modularized and standardized drives already help make complex technology more manageable. Frequency inverters with advanced functions actively support connectivity for new *and* legacy machines.

Smart motor drives based on parameterized programming expedite machine kinematic programming from concept to deployment. Parameterization makes commissioning easier than traditional programming. Replacing complex programming with uniform machine-configuration software tools significantly reduces engineering time and technical requirements, and eliminates redundancies that drive up costs. Bringing a smart drive online no longer requires special training, thanks to modular components and engineering tools.

When will those effects start to kick in? When would you say the machinery industry will have completely accepted IoT?

The IoT is here to stay, but widespread adoption will be

incremental. The fact that it is here to stay is demonstrated by the extraordinary rate of adoption for automation, with nearly every factory now automated and projections showing the global robotics industry expanding to over $226 billion by 2021. One study (Quest Technomarketing, Germany) reports that already half of all mechanical engineers rely on modular, intelligent machines. The number of these machines will increase twice as quickly over the next few years as generic machines, and will have an 80% market share by 2020.

The IoT represents a logical progression in leveraging IT and communication technologies to turn out goods with improved flexibility, speed, and efficiency, principles Lenze has been committed to for over a decade. Agile and scalable drive technologies lead to efficient data flow, visibility, and control. Motion-centric automation incorporates ergonomics and user-friendly, multi-touch, HMI operating systems for process visualization and easier integration, to support network and IoT-enabled connectivity and control.

Secure data transmission allows real-time decision-making, diagnostics, and maintenance, as well as predictive analytics to improve performance, uptime, and machine operating life. Cloud-based applications make it possible to perform complex control functions, data aggregation, monitoring, and diagnostics—functions once only accessible at the plant level—via smartphones. Machine industries and manufacturers will be on the frontline of future IoT innovation.

What are the major hurdles slowing or preventing motion-control firms from adopting IoT technologies and processes? And how might those hurdles be overcome?

Many companies already use machine intelligence to improve the efficiency and performance of their operations. A recent survey (*Business Insider*) found that over 80% of executives believe that successfully adopting IoT technologies is critical for success in the future. There is no lack of on-ramps for IoT adoption. So, the choice ultimately comes down to leading or lagging behind competitors.

But the IoT is not merely about connecting drives and transmitting data. Equally important is software that supports developing flexible, modular machines. That modular concept is also migrating to software.

With FAST software, for example, my company has developed a toolbox for engineers that turns frequently-used machine functions into standardized technology modules. This means various machine functions no longer need to be programmed the old-fashioned way. They can be created simply by adjusting parameters. The software includes functions for customizing production streams, processing films and other materials, [and] cutting and sealing, as well as more complex pick-and-place robotic applications. Even project-specific functions can be easily integrated into FAST modules.

The FAST toolbox was developed with a specific time standard in mind. The goal, which was met, was for customers to realize 80% of a machine's functions in 20% of the time. Automation and motion control is all about saving time without sacrificing performance.

Should motion-control companies concentrate on getting IoT into their products or on embedding IoT in the processes they use to make motion-control devices? Wouldn't clients be more apt to adopt IoT technology if the company selling it were using it?

Definitely, motion-control companies need to climb the curve in order to better understand the challenges and opportunities of these new technologies. Lenze, for example, sets high standards in operations and practices, and knows firsthand the value of technology for improving manufacturing efficiencies. We use innovative electronic processes and automation, including a large number of robots.

Are Germany and Europe as a whole closer to realizing IoT than the U.S.? Would you explain the difference, if there is one?

Major global companies largely define the state of technology when it comes to production. A few examples include Daimler, Volkswagen, P&G, Nestle, and Kraft Foods. On one hand, they try to create consistent technological standards in their factories, but they purchase machines mainly in the U.S., Europe, and—increasingly—in Asia. So it reasons [that] it would be difficult to identify absolutes or fundamental differences in the implementation of IoT in the U.S. and Europe. Suffice to say, the entire manufacturing sector stands to gain enormous benefits from advances in automation, particularly if stakeholders and leaders pull together when it comes to standardization and best practices.