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The Role of Robotics in Flexible Manufacturing

by Austin Weber

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When most engineers think about “flexibility,” they imagine robots. Because of programmable controls, end-of-arm tooling and machine vision systems, the devices can perform a wide variety of repeatable tasks.

“Robotics is a key component of flexible manufacturing,” claims Ted Wodoslawsky, vice president of marketing at ABB Robotics Inc. (Auburn Hills, MI). “Any applications that involve high-mix, high-volume assembly require flexible automation. Manufacturers need the ability to run different products on the same line. That’s much more difficult to do with hard automation.”

The automotive industry is still considered to be the role model for robotic flexibility. However, Wodoslawsky says many of the lessons learned by automakers and suppliers can easily be applied to other industries and processes.

“Automotive manufacturers are faced with producing a greater mix of vehicles in a shrinking number of plants,” adds Walter Saxe, automotive business development manager at Applied Robotics Inc. (Glenville, NY). “This practice is driving the need for higher payloads, faster tool changeover and greater control of data to achieve maximum flexibility and exacting production details. This in turn is challenging the makers of robots and tools to stay ahead of the ever-increasing market needs by advancing technologies before they are needed.”

For instance, state-of-the-art robots feature force control, which offers an extra degree of flexibility for critical applications such as powertrain assembly. Other new tools and features that make robots more suitable for flexible production applications include open architecture that allows easy integration with commonly used PLC platforms and offline simulation from desktop computers.

“[Manufacturing engineers should ensure their] controls platform has the ability to manage, manipulate and store all the data that is required with flexible implementation schemes,” says David Huffstetler, market manager at Staubli Robotics (Duncan, SC). “It can become a critical issue in places where you least expect it to happen.

According to Huffstetler, networking, continued standardization in protocols, and enhanced predictive maintenance tools, in addition to transparency and openness in software capability, will make future generation of robots even more flexible than they already are. “Having robotic mechanics in place that can be quickly reprogrammed, along with the minimal retooling effort of only product-critical pieces is what flexible automation is all about,” he explains.

However, when it comes to true flexibility, or the ability to move quickly from job to job, robots are still not as flexible as humans. The biggest culprit is ease of programming, claims Efi Lebel, CEO of SmartTCP Inc. (Farmington Hills, MI). “Programming time is typically very long, even for a one-minute operation,” he explains. For instance, to accomplish one hour of robotic welding, Lebel says it usually takes 15 to 20 hours of programming.

“Robots are built to be flexible, but programming is difficult and time-consuming,” adds Lebel, who has developed software that allows robots to be more flexible. “With our product, it can take minutes to hours, rather than hours to days, to program tasks, depending on the application.” The software automates complex and tedious robot programming tasks.

In the past, parts feeding has also limited the flexibility of robots. “However, we’re seeing more flexible parts feeding,” says Mark Handelsman, industrial marketing manager at FANUC Robotics America Inc. (Rochester Hills, MI). “”Flexible feeding and 3D vision systems are become more prevalent, especially in applications where parts have contours or where they vary in dimension.”

Austin Weber
webera@bnpmedia.com
Senior Editor