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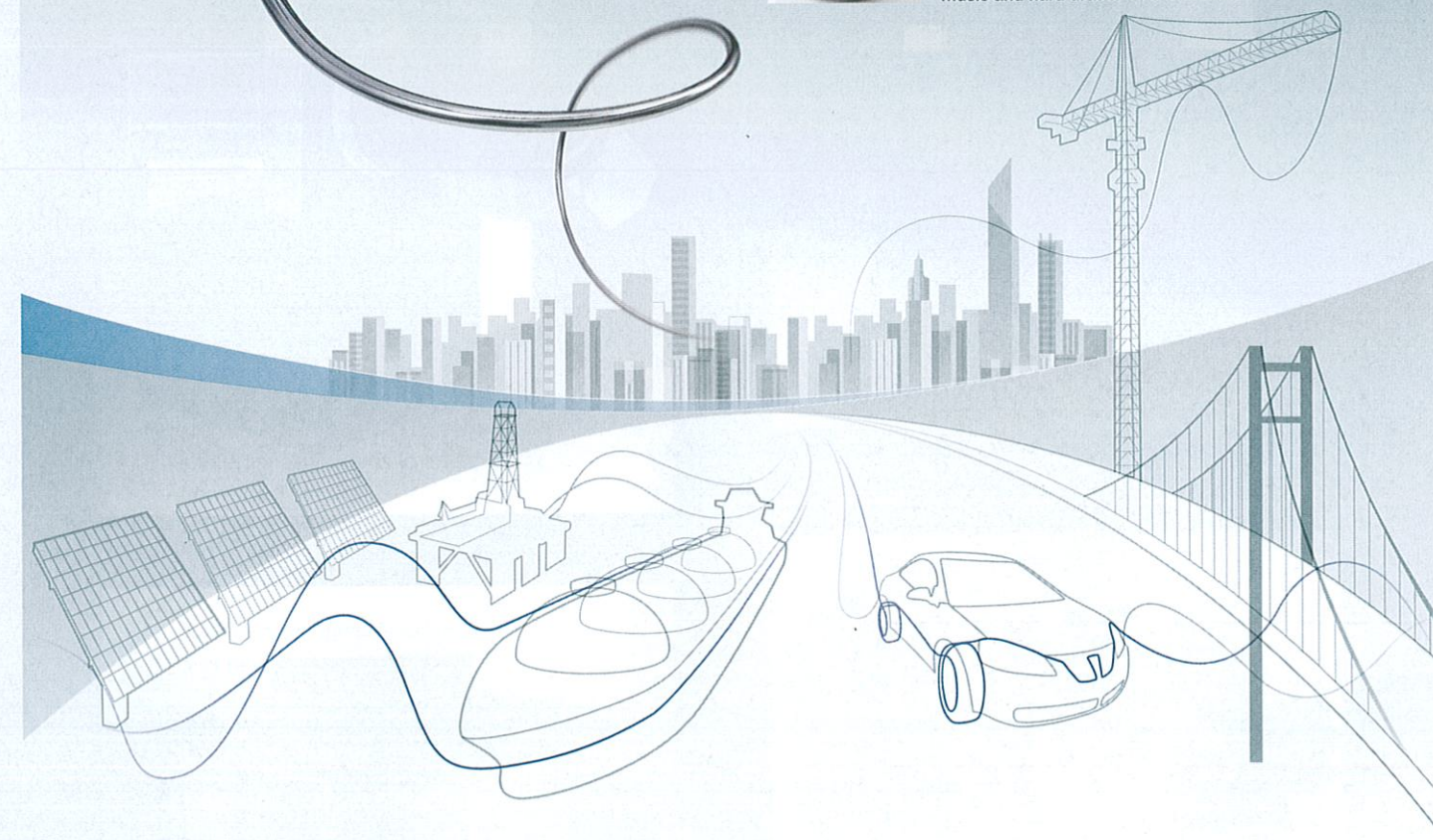


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ROBOTS and the Spring Industry

By Gary McCoy



The term "robot" conjures up a lot of images and ideas. Baby boomers might remember back to the days of Rosie, the household robot in the animated television show "The Jetsons" or HAL (Heuristically programmed ALgorithmic computer) 9000 in "2001: A Space Odyssey." While those types of robots are the lore of science fiction, they bear little resemblance to the ones being used in industrial manufacturing settings such as the spring industry, where wire is coiled to make springs or bent to form wire parts. This article will attempt to take robots from the realm of TV, books and movies into practical applications for manufacturing.

A Fanuc M16 robot using dual Schunk PZN style grippers and ATI Robotic Tool Changer loads a part into the spindle of a Haas SL-20 lathe. The air blow nozzle is used to clear jaws of dirt and swarf prior to load.

Article photos provided courtesy of Productivity, Inc. and are used by permission.

SMI president Steve Moreland, the president of Automatic Spring Products Corporation in Grand Haven, Mich., says the term “robots” is wide and broad and “oftentimes people think of the most sophisticated kind of robots they may have seen on television.”

Robots have been existence for many years and gained popularity in the ‘70s and ‘80s. Moreland says the understanding of robots in the general public is not exactly the same as it was back then.

“They were large, complex and expensive machines,” explained Moreland. “The nice thing about technology today is that robots have come down in cost so they are more affordable for small manufacturers like those in the spring industry. There are many applications in our industry where robots have a place in our factories.”

Moreland says robots in spring industry applications are often simple “pick and place” robots or small motion robots used to automate or semi-automate a manufacturing process. He says the latter type of application is often used for secondary operations, such as an automatic transfer between operations.

While it is true that robots can displace workers and shrink labor costs, they are also seen as an economic tool for competing with low cost countries.

“[The robot] takes a job that once was boring and monotonous,” explained Moreland. “It eliminates that job and we are able to retrain those employees to higher level work and activities, so we both win.”

“We do a lot of automation or semi-automation with robotic applications to reduce labor costs,” admits Moreland. “One of the largest challenges we face right now in North America is the continued force of the low cost country competition – especially for high labor content work. One of the best tools to offset this and keep jobs in America is to use robotic automation.”

Don Engles, manager of the automation group for Productivity, Inc. in Plymouth, Minn., has worked with robotics for nearly 20 years and in precision manufacturing for 35 years. His company’s core business is selling and servicing CNC machine tools, but also has a robotics group that he is in charge of. The company is a distributor and integrator of FANUC robots, one of the largest manufacturers of industrial robots.

Engles says with manufacturing making a renaissance in the U.S., robotics can help the industry stay competitive with low cost countries.

“The robot allows skilled labor to be better utilized by concentrating their skills on those aspects of manufacturing that are critical to keeping quality high,” explained Engles. “The robot kind of replaces the ‘drudge’ work, if you will, of putting and taking, inserting and obtaining parts from machinery especially in a hazardous situation. I think robotics really helps that.”

March of the Machines

An enlightening, yet controversial “60 Minutes” segment called “March of the Machines” aired on January 13, 2013. While accurately portraying technological advances in automation and robotics, the piece implied that robots are costing the American workforce in the elimination of routine, middle-skilled jobs.

Not everyone agrees with that assessment. The Association for Advancing Automation (A3), the global advocate for the automation industry, expressed disappointment in how “60 Minutes” portrayed the industry in a news release.



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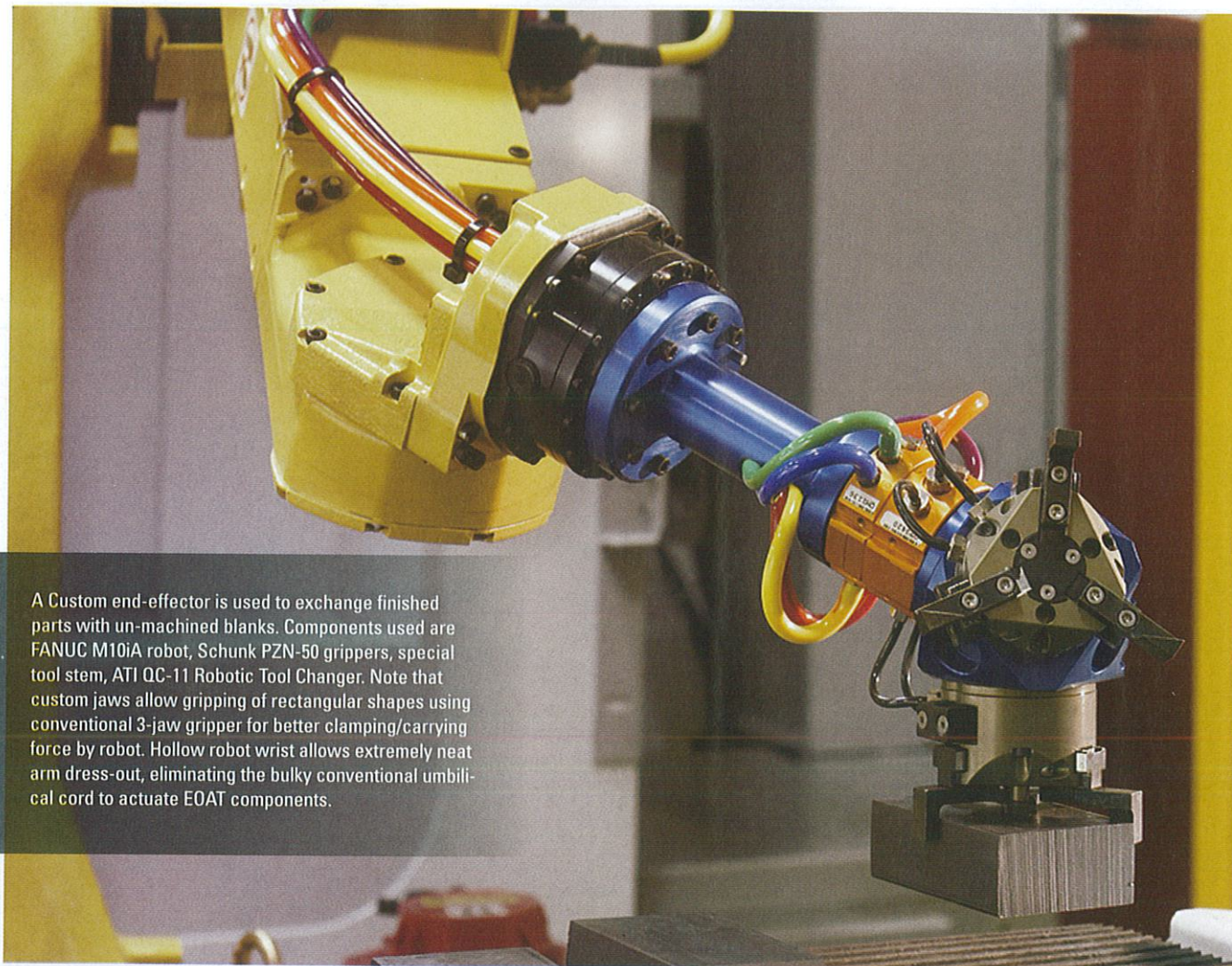
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Human hands putting parts on the shelf after it has gone through a robotic cell.



A Custom end-effector is used to exchange finished parts with un-machined blanks. Components used are FANUC M10iA robot, Schunk PZN-50 grippers, special tool stem, ATI QC-11 Robotic Tool Changer. Note that custom jaws allow gripping of rectangular shapes using conventional 3-jaw gripper for better clamping/carrying force by robot. Hollow robot wrist allows extremely neat arm dress-out, eliminating the bulky conventional umbilical cord to actuate EOAT components.

"While the '60 Minutes' depiction of how technological advances in automation and robotics are revolutionizing the workplace was spot on, their focus on how implementation of these automation technologies eliminates jobs could not be more wrong," said Jeff Burnstein, president of A3, a trade group representing some 650 companies from 32 countries involved in robotics, vision, and motion control technologies.

"We provided '60 Minutes' producers several examples of innovative American companies who have used automation to become stronger global competitors, saving and creating more jobs while producing higher quality and lower cost products, rather than closing up shop or sending jobs overseas. They unfortunately chose not to include these companies in their segment. With respect to MIT Professors Brynjolfsson and McAfee who gave their viewpoint in the piece, they are missing the bigger picture."

"To paint advances in technology as just taking jobs is very one-sided," stated Dr. Henrik Christensen, KUKA chair of robotics and director of robotics, Georgia Institute of Technology. "Studies have shown that 1.3 better, higher paying jobs are created in associated areas for every one job that may be insourced. In fact, the larger issue is that companies are having trouble finding qualified employees

to fill these high tech job openings. We instead should focus on how best to educate our workforce in the United States so that we can remain the leader in automation technologies."

The news release also cited the success of Drew Greenblatt, president and owner of Marlin Steel (past author of articles in *Springs*) and Matt Tyler, president and CEO of Vickers Engineering. Greenblatt and Tyler were featured in a discussion at a 2013 A3 conference on how they successfully implemented automation technologies instead of going out of business or sending manufacturing overseas. They also participated in a separate roundtable on "How Robots Create Jobs."

"Automation creates jobs in the United States," said Greenblatt. "Marlin Steel is hiring people because our robots make us more productive, so we are price competitive with China. Our quality is consistent and superior, and we ship much faster. Our mechanical engineers can design material handling baskets more creatively since we can make more precise parts. Our employees have gone 1,492 days without a safety incident because robots can do the more difficult jobs while our employees can focus on growing the business. American

manufacturing's embrace of robotics will ensure a new manufacturing renaissance in this country."

"Roughly 90 percent of our automated cells are producing parts that were previously made offshore while the other 10 percent were also globally competitive, strictly due to automation," said Tyler. "Automation has not only allowed us to bring more jobs back to the United States due to our 'new' cost structure, but our profit margin has increased. This ultimately allows us to fund additional growth, which in turn creates more stateside jobs."

Environmental Benefits

Moreland says Automatic Spring Products Corporation uses robots in heat treating applications, where the environment is hot and the job is not the most desirable.

"So we have higher functioning robots that work in our heat treating areas which allows us to be more productive and competitive, plus we have a higher level of precision and technology," said Moreland.

"We aren't asking a worker to be in an undesirable work environment," and he says with a laugh, "and the robot doesn't care! The robot is happy to do its work in whatever environment we place it in. And it will do it repetitively and will do it without the labor costs."

Automatic Spring Products Corporation also uses pick and place robots to extract parts out of machines, so wire forms don't tangle. "These kinds of applications are prevalent throughout our manufacturing environment and it takes a job that once was boring and monotonous," explained Moreland. "It eliminates that job and we are able to retrain those employees to higher level work and activities, so we both win."

Dan Sceli, president and CEO of Peterson Spring, says his former company, The Woodbridge Group, where he was a president, used robots at their 64 plants. He said the robots were primarily used for mixing and pouring liquid foam into heated, moving tools in specific patterns for flow. Currently, Peterson Spring is not using robots at their facilities.

Sceli says he doesn't see as many applications in the spring industry for using robots, but is open to the idea where it makes sense. He said areas like packaging could be implemented down the road where the cost/benefits align.

Growth and Cost Considerations

There is no question that the robotics industry has grown dramatically from the last time *Springs* examined robotics in the May 1984 issue (see Flashback on p. 27). According to the Robotics Industries Association (RIA), a total of 5,833 robots valued at \$341.2 million were ordered from North American robotic companies through March 2013, an increase of 14.5 percent in units over the same period in 2012 and 10 percent above the previous first quarter record set in 2005.

"Our quality is consistent and superior, and we ship much faster. Our mechanical engineers can design material handling baskets more creatively since we can make more precise parts. Our employees have gone 1,492 days without a safety incident because robots can do the more difficult jobs while our employees can focus on growing the business."

In a news release issued by The Assembly Show, Jeff Burnstein, president of RIA, said, "It is great to see the record demand for robots continuing into 2013, following our record-breaking year in 2012. While activity continues to be strong with automotive OEMS and tier suppliers, the real story is the resurgence of other industries. Non-automotive orders grew 15 percent over 2012."



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"Most of the people who start thinking about the robot want it busy," explained Engles. "The most common source of financial justification failure for robotic cells that I see happens when the robot is over applied."

Further showing the interest in robotics, The Assembly Show held in October 2013 included many robotic suppliers such as ATI Industrial Automation, Epson Robots, IPR Robotics, Janome Equipment and SCHUNK, Inc.

Engles says the cost of robots has dropped in the 30 years since *Springs* produced its last article on robots. "Robots are cheaper and have much more robust technology. They are much more capable and a defined and engineered core piece of technology."

The average cost of robotic system today is around \$150,000, says Engles. Although the robot is the focal point of a system, he says there are many other things involved in putting together a robotic cell such as fixtures, end of arm tool sets, gripper fingers, conveyors and pallets.

Engles the typical payback period for robotics for a job shop is more in labor reduction than capital investment. He says the two most important areas to measure when looking at robots is labor reduction and efficiency improvement. He says robots are Just in Time (JIT) manufacturing friendly and tend to have more uptime with historic efficiency figures above 90 percent.

Practical Considerations

When considering whether a robotic system is right for your company, Engles suggests three things springmakers should consider: repeatability, process stream and simplicity.

"You have to have a repeatable, sustainable flow of work," advises Engles. "Robotics doesn't lend itself to traditional job shop work, where you only do a job once and then it's gone and you never see it again."

In his experience repeatable set ups are important. "You have to do enough homework...either towards a finite number of parts that go through a particular cell repeatedly with just set up changeovers from time to time, or you have to have a core process flow through a grouping of machines or operations. That's consistent with a family of parts or consistent processes."

A second consideration is mapping out the process stream. "You must address every aspect," explains Engles,



"of how the part gets delivered into the cell, presented to the robot to how they come out."

Finally, the last consideration is important, said Engles, especially for small manufacturers: "Keep it simple in order to keep it manageable." A more complicated cycle doesn't lend itself to being more productive.

"Robotic systems that are simple generally tend to be more versatile, easier to bring new parts into, and ultimately have a higher uptime." As complexity increases, so does change-over time. Changes to the part mix also become more difficult, says Engles.

He says small manufacturers who are considering automation must focus on keeping value-added machinery producing in cycle and not worry so much about keeping their robots busy 100 percent of the time.

"Most of the people who start thinking about the robot want it busy," explained Engles. "The most common source of financial justification failure for robotic cells that I see happens when the robot is over applied."

Engles has witnessed manufacturers who want a robot to manage a lot of machines. "That's a false economy, because if you're a machine shop or a spring manufacturer that's running spring coilers you want to make as many springs as you can. If you want to apply a robot to the

process and the robot sits for 20 percent of the time or even 50 percent of the cycle, so be it.

"Don't worry if the robot is not 100 percent busy," advised Engles, "because your operators aren't either."

Whether you decide it's time to consider robots for your spring operation, robotic integrators such as Productivity Inc. can provide a valuable service, acting as an effective supplier for the necessary planning and implementation process.

Toward the Future

While the adoption rate for robots has gone up, the U.S. is still far behind the rest of the world. Engles points out that China, often made out as the bad guy of foreign competition, uses more robots per year than the U.S. does.

"There's something inherently wrong with that," says Engles. "Robots have been more readily adopted by the rest of the world and America lags behind. America has to do this (implement robots) in order to have a vibrant manufacturing sector again."

The "60 Minutes" segment, referenced earlier, explained the success story of iRobot, started by Rodney Brooks, a pioneer who ran the artificial intelligence lab at MIT. His latest project is a friendly robot named Baxter.

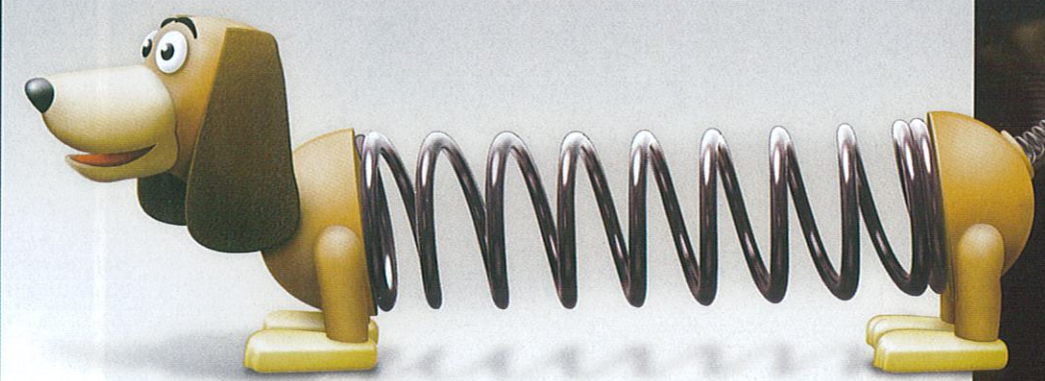
Brooks told the CBS news program, "It's (Baxter) meant to be able to go in a factory where they don't have robots at the moment. And ordinary workers can train it to do simple tasks."

Brooks says Baxter can pick stuff up off a conveyor belt, costs \$22,000 and can be trained to do a new task by a coworker in just a few minutes. "It can also be upgraded like an iPad with new software as new applications are developed."

Brooks and investors in his new startup, Rethink Robotics, see a potential market worth tens of billions of dollars, and believe that Baxter can help small U.S. manufacturers level the playing field against low cost foreign competitors. Visit www.rethinkrobotics.com for more information.

Other companies that show promise for industrial manufacturing are Universal Robots www.universal-robots.com and Adept Technology www.adept.com.

With the cost and operational technology that has improved over the last 30 years, it could be time for springmakers to reconsider their use of robots. If not, you'll want to keep monitoring new robot developments, like Baxter, to see if it's time to bring them to your plant. ■



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