A JOURNAL FOR BUSINESS & INDUSTRY MAY/JUNE 2015

Grayway

LEAD STORY

ON THE FAST TRACK

How Technological Advancements Are Changing Modern Manufacturing

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Stephen Gray
Chief Executive Officer

WELCOME

Remember when almost all manufacturing assembly was done by hand? Remember when there were only a handful of ways to manufacture parts? Today's shop floor has gone through an extreme makeover of sorts, as automation, robotics and alternative manufacturing processes have become more advanced, and more affordable. In this issue of the GrayWay, we review how advanced robotics are being integrated into more manufacturing environments—large and small—and offer expert advice on practical applications of 3D printing as an alternative production tool.

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EMERGING TECHNOLOGIES IN MANUFACTURING

INSIDE THIS ISSUE

ON THE FAST TRACK

Hal Sirkin
senior partner and managing director, Boston Consulting Group

How Technological Advancements Are Changing Modern Manufacturing

Manufacturing in 2015 looks nothing like it did just 20 years ago. Technological advancements in automation and robotics have transformed the shop floor from "dark, dirty and dangerous" to clean, high-tech centers of efficiency offering challenging and highly skilled jobs. With the economy improving, manufacturers are taking advantage of the opportunity to invest more in technologies that have proven to increase throughputs and impact the bottom line.

One technological area experiencing rapid growth is advanced robotics. While robots have been integrated into many large manufacturing environments, new, smaller, more sophisticated robots are proving to be a wise investment for manufacturers of all sizes.

Earlier this year, the Robotics Industries Association (RIA) reported that 2014 was a record-setting year in robot orders and shipments in North America.

According to the RIA, "a total of 27,685 robots valued at $1.6 billion were ordered from North American companies during 2014, an increase of 28 percent in units and 19 percent in dollars over 2013. Robot shipments also set new records, with 25,425 robots valued at $1.5 billion being shipped to North American customers in 2014. Shipments grew 13 percent in units and six percent in dollars over the previous records set in 2013."

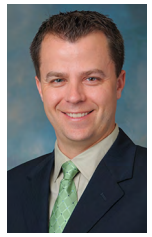
What's behind this unprecedented growth?

Boston Consulting Group's (BCG) Hal Sirkin, who has observed the evolution and integration of robotics into modern manufacturing plants over the past couple of decades, says a big factor is decreasing cost.

The ABB-robot IRB 6640 is optimal for high-production environments, from foundries to clean rooms. | Photo: ABB

"The historical issues were that robotics were basically only used in many heavy manufacturing situations like automotive plants because the economics of the labor costs were pretty high," said Sirkin, senior partner and managing director of BCG. "What's going on now is that the cost to use robotic labor is getting a lot lower than the cost to use human labor, and so we're watching substitution not only on the very large machines that cost a half-million dollars, but on equipment that is much smaller."

While the automotive industry continues to be the primary driver of growth in robotics with orders increasing 45 percent year over year, non-automotive industries are also gaining steam, growing seven percent over 2013. According to the RIA, other industries showing significant growth were plastics and rubber (25%), semiconductor and electronics (21%), and metals (16%). Most often, industrial robots are being used for arc welding, material handling and assembly applications.



Bob Doyle director of communications, RIA

Bob Doyle, director of communications for RIA, says another big reason for the spike in robot orders is due to technological advancements in robotics, like gripping and vision capabilities that allow robots to see and execute "pick-and-place" operations that were previously not possible. One of the hottest types of robots on the market today, he says, are those that work in collaborative environments, side-by-side with humans—a relatively new development in the industry.

"When you think of industrial robots, you think of them behind big fences because they can be dangerous," said Doyle. "But the new, collaborative robots include a lot of advances like being able to work closer to humans. They don't take up as big of a footprint, which makes them easier to deploy in certain operations. They might be able to move from one operation to another, rather than like an industrial robot that's just strictly performing one operation. They are cheaper, certainly, and that makes the return-on-investment faster."

Baxter by Rethink Robotics is one example of a collaborative robot that is getting a lot of attention in the manufacturing world. The robot is relatively inexpensive, with a base price beginning at $25,000 and has been touted as safe, flexible, and easily adaptable, with vision and touch sensors that allow it to adapt to a variety of situations, like when a part is dropped or is missing. Rather than traditional programming, the robot is manually "trainable" by internal staff and can be moved around and retrained to perform a variety of assembly and other production tasks.

Doyle says even the more traditional robotics manufacturers are introducing collaborative robots, like ABB, Kuka, Yaskawa Motoman and Fanuc.

But how is the integration of more robots into manufacturing environments impacting the number of jobs in the industry? RIA charts industrial robotics sales versus the unemployment rate versus the number of employees in manufacturing in the U.S. and has found no observable relationship between the three.

"People are buying more robots than ever and the unemployment rate keeps going down," he said. "We firmly believe that the use of robotics actually grows jobs and creates better jobs, higher-paying jobs—the types of jobs that require training and make employees happier."

As evidence, RIA's website—a3automate.org—features a series of videos called "Why Automate," highlighting small-to-medium-sized manufacturers that are thriving after introducing more automation and robotics into their plants.

Even so, Sirkin says there are still some manufacturing sectors that are not able to integrate robotics into their plant operations at this time, due to the nature of their business or the type of products they manufacture.

"There are some things that robots do better than humans, and there are some things that robots don't do better, and so you have to make the distinction very clearly," he said. "We have some real problems in the apparel area when we try to use robotics. As humans, we've learned how to pick up one very fine piece of cloth or denim, but it's very hard to train robots to do this—they do not yet have the technology to perform that same tactile skill that humans do. This is holding back advances in robotics for the apparel industry."

But, both Sirkin and Doyle agree it's just a matter of time before issues likes these are overcome by innovators in the industry.

"I think the technology will continue to evolve," said Doyle. "These collaborative-type robots that are designed to make manufacturing more efficient in electronics and other similar industries will continue to grow. We're very bullish on the market. We see it continuing to grow as more and more manufacturers realize the benefits of robotics and automation. I think the technology will continue to improve and the prices of sensing technology will continue to go down, which allows more and more manufacturers to purchase automation systems. We see a really bright outlook for robotics and automation."

Baxter is a collaborative robot with compliant arms and force detection that makes it easily adaptable to a variety of manufacturing environments.

TO PRINT, OR NOT TO PRINT

Leading 3D Printing Expert Offers Practical Advice for Manufacturers

3D PRINTING—or additive manufacturing as many in the industry call it—may be a relatively new term to your average American, but has actually been around for quite some time. Manufacturers first began using 3D printers over 20 years ago, primarily for rapid prototyping of new product concepts.

While the technology has yet to become a widely used alternative to traditional injection molding or cast manufacturing techniques, manufacturers willing to think outside the box are using 3D printing in creative ways, especially as printers become more advanced.

Todd Grimm
founder advisor, 3D Printing Association

Todd Grimm is a founding advisor of the 3D Printing Association and is a leading consultant to manufacturers on the pros and cons of integrating the technology into their operations. He says, over the last decade or so, manufacturers have become more serious about using the technology as a production vehicle to make end-use, sellable goods.

"Yes, 3D printing is capable of being a production tool, however it's just emerging now," he said. "We still have years and years—if not decades—of advancement and development and adoption before it becomes a ubiquitous tool for all types of manufacturing."

The U.S. Department of Energy's Oak Ridge National Laboratory (ORNL) is one entity investing money and resources into research and development of the technology. At the 2015 North American International Auto Show this past January, ORNL revealed a Shelby Cobra *(left)*—the nation's only vehicle designated a national monument—almost entirely manufactured by 3D printing. The vehicle weighs about 1,400 pounds and contains 500 pounds of printed parts made of 20 percent carbon fiber. ORNL used the Big Area Additive Manufacturing (BAAM) machine to print the car's components, which they say prints up to 1,000 times faster than other industrial additive machines.

"Our goal is to demonstrate the potential of large-scale additive manufacturing as an innovative and viable manufacturing technology," said Lonnie Love, leader of ORNL's Manufacturing Systems Research group. "We want to improve digital manufacturing solutions for the automotive industry."

But while it's possible to make something as complex as a car out of 3D printed parts, Grimm says current applications remain mostly on the product development side of the manufacturing process.

"If your company has any activity in product development and you're not using the technology, you are behind… way behind," he said.

The body of this Shelby Cobra was made almost entirely by 3D printing technology.

These 3D printed motor pieces are an example of the type of concepts and prototypes being developed by researchers at ORNL to increase efficiency and reduce component weight.

He says some companies are using it in manufacturing production, but on a limited basis.

"As rapid prototyping and the technology gets better and more capable, as materials get better and more capable, we've been extending the reach into tooling and other support devices for manufacturing operations," he said.

Currently, he says manufacturers are using 3D printing for extremely low-volume, high-value components, particularly in the aerospace, defense and medical device industry sectors.

"That's where the odds of success are most likely," he said. "The more you move into higher volume, the more simple, inexpensive pieces, the less likely 3D printing makes sense for you."

Grimm says it's important to avoid making "emotional" decisions when it comes to investing or integrating 3D printing techniques into manufacturing operations.

"I highly recommend for any manufacturer to take a hard look at what it's capable of today and make a decision if it's suitable for the high-end production applications. And then, if it is, go for it. If not, keep it on the agenda to revisit on an annual basis because, some time in the future, it is very likely to be appropriate for an increasing number of manufacturers."

THE NEW FACE OF MANUFACTURING

A Q&A with Marlin Steel's Nathan Myers

Q: Tell us about your position with Marlin Steel.

In my position as a robot technician for Marlin Steel, I set up, program and operate robotic equipment and computer numerical control (CNC) machinery.

Q: What type of training/skill sets are required to do your job successfully?

This position requires strong mathematical and mechanical skills, and the ability to interpret technical information and drawings. Because our manufacturing processes are constantly changing, the job also requires flexibility, strong communication skills, and a willingness to be a team player. Training from the machine manufacturer is also required, which ranges from general to higher-level training, depending on the work being performed. To be successful, you must apply what you know and constantly learn as you go.

Q: What is the most rewarding aspect of working in advanced robotics at a manufacturing company?

The use of robotics contributes greatly to our company's profitability and competitiveness in the global marketplace, and it's highly rewarding knowing the work we do plays a key role in the company's success. It has also been rewarding to witness how the use of robotics has made our company more productive and efficient. What used to take us several weeks to complete can now be done in a week with robotics, and we have been able to do so without losing employees. Learning how to run new equipment and adapting to a continually changing work environment are also enjoyable aspects of my job.

Q: What advice do you have for people interested in entering this line of work?

It is important to enter the workforce with some technical training—either by attending a technical school or some other professional training program—and to never stop learning. Having a good work ethic and a willingness to continuously improve and refine your skills are key to success in this field.

GRAY... WE'RE BUILDING

UNITED STATES TILE, INC. (GRUPPO CONCORDE)

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Gray was selected by United States Tile, Inc.—a subsidiary of Italy-based Gruppo Concorde—to build its first U.S. manufacturing facility in Tennessee. The facility represents an $80 million investment by the company, creating 180 new jobs.

The 650,000 s.f. tile-making facility will be located on 96 acres in Maury County, Tenn. The facility will be operational within the second half of 2016.

Founded in 1968, Gruppo Concorde has grown to become one of the largest producers of high-end ceramic tile in the world, exporting its products to more than 130 countries. The company employs over 2,200 people globally, with operations in Italy, France and Russia.

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