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Top Six Trends in Industrial Robotics

Nick Chambers spends his days researching the robotics market and following the trends of the future. Before joining ABB he was an automotive journalist, with his work appearing regularly in several well-known outlets including The New York Times, Scientific American and Motor Trend.

By Nick Chambers – Global Editorial Manager, ABB Robotics nick.chambers@us.abb.com

Over the last several decades we have seen robots go from incredibly expensive machines with limited functionality to today’s modern industrial robots that can do amazing things and offer a quick return on investment.

It is always hard to look into the future and see exactly what it might bring, but if one thing is certain it is that robots will be an integral part of that future, entering parts of the economy that a few years ago we could only imagine.

Here are six emerging trends in the world of industrial robots that will likely have a big impact on a wide variety of industrial sectors, and provide benefits well beyond what was once imaginable.

1) Increasing ease of use, deployment and maintenance

The automotive industry has had a long history of using robots, but for industries that are relatively new to automation, programming robots can be a challenge. We need to find ways to make robots easier to use so that they do not require such a highly skilled workforce to deploy, operate and maintain. In fact, this question is one of the largest technical challenges the industry is currently grappling with.
As more and more companies find that robots are within their affordability range, it is clear that one of the final barriers to adoption is the perceived complexity of programming and designing robotic systems. At ABB we feel very strongly that a “what you see is what you get” (WYSIWYG) programming interface is one of the main ways to overcome this barrier.

Our PC-based RobotStudio offline programming solution has been around for many years now and continues to make the design and commissioning phase much simpler than in the past. When combined with an increasing number of standardized “off-the-shelf” products for the most popular robotic applications—something we call Function Packages, such as our recently released Flex MT® for machine tending—offline programming can be harnessed for maximum efficiency and provide the fastest time to start of production. RobotStudio is unique in the industry in its ability to truly provide WYSIWYG programming with near perfect accuracy when taking what you’ve created in the virtual world and installing it in the real world.

I also think we will increasingly see robots that can “program themselves.” At present, we mostly have robots that need to be trained and programmed in a unique way for each installation. We will see sensor technologies, such as vision and force-sensing, playing a bigger role in helping robots do this. We will also see robots continue to evolve to meet the needs of non-automotive industries. As new applications of robots emerge in new industry segments, features such as accuracy, stiffness, weight, speed and cost will evolve alongside them—some increasing in importance and some decreasing in importance based on the industry.

2) Human-Robot Collaboration

At ABB we believe that close collaboration between humans and robots, working as colleagues on assembly lines and in other applications, will be a large part of the future of industrial robotics. In fact, there may come a time when the line between what is made by a human and what is made by a robot is blurred to the point of becoming indistinct. This will be especially pronounced during a transition phase in which robots are still incapable of perfectly reproducing human dexterity, but have enough dexterity and ability to work with delicate objects that they can take over some but not all of the jobs that currently require a human touch. The growing need for small parts assembly is a perfect example, with the electronics market leading the charge in this regard.

The industry, working in conjunction with lawmakers, regulators and the insurance industry around the planet, will need to agree on ways to mitigate the inherent risks of human interaction with robots. Specifically, strengthened and new global standards governing this interaction, as well as creative ways of mitigating risk, will be needed.

ABB has recently announced YuMi® - a dual arm collaborative robot slated for market introduction in April 2015 - which is designed to
work on small parts assembly alongside human co-workers. YuMi is designed in such a way that it is inherently safe. It can detect and respond instantly to unexpected impacts; its axes are designed in such a way to eliminate pinch points; it is made of lightweight materials; and it relies on ABB’s decades of software experience governing safety. When all these features are combined, when it comes in contact with a human being it has the most minimal risk of doing any kind of harm, and beyond that we have added padding for an additional safety measure.

Use of such collaborative robots will grow significantly in the future, but safety will be vital for collaborative robot operation since the robots will need to work in close contact with humans.

While YuMi is ABB’s signature collaborative robot, we also believe that there is plenty of opportunity for more types of collaborative robots. By combining our advanced safety software with speed limited motors and force-control and padding on the exterior of the robot, the future of human-robot collaboration is just around the corner.

3) New ways of working with robots

We envision a future in which companies that depend on robots will be able to manage them and the teams that rely on them from any device, anywhere with an Internet connection to simplify all stages of robot interaction (design, sales, installation, commissioning, operation, oversight, and service).

I believe the future of robotics is closely tied to two aspects of connectivity that the entire industry is focusing on. The first relates to the application of connectivity to remotely monitor robots. For instance, the ABB Remote Service solution is being used to monitor robots remotely in real time. The solution helps to proactively identify potential issues so that they do not disrupt normal manufacturing operations as well as help users optimize their processes. For instance, it helps us detect if a robot is in need of service or an upgrade and it can also analyze movements for efficiency. The customer can then choose to have the issue resolved over the phone or by having a technician visit the pro-
duction plant. This helps us better support our customers in running trouble free manufacturing with no loss of production time.

4) Improved robot “senses”
A key piece of the technical challenge puzzle involves the tools that allow robots to interact with the world around them, including advanced sensing and advanced gripping. In order to allow robots to do all the jobs that they are well suited for, they will need to develop more “human-like” abilities to find, identify and manipulate objects.

When combined with powerful processing capability, tools like force control and advanced 2D and 3D vision will create a kind of robotic “independence” and allow the robot to make “decisions” about what to do when it encounters the inevitable hiccups that arise in everyday operation. Already ABB has developed a new generation of Integrated Force Control and Integrated Vision to help make these advanced technologies available to more and more end-users.

And while robots are certainly capable of very precise and repeatable movements, when it comes to things like small parts assembly all that precision is useless without the ability to handle tiny objects with dexterity. In this regard, end of arm tooling is needed that mimics the human hand as much as possible with its touch, flexibility, care and speed.

5) Improved ROI
Over the last several decades we have seen robots go from incredibly expensive machines with limited functionality to today’s modern industrial robots that can do amazing things and offer a quick return on investment.

Robots have also reduced injuries in the workplace, increased the competitiveness of companies in a fierce global market, elevated the quality of affordable products, increased profits for countless businesses, and created a whole new ecosystem of high-paying and rewarding jobs.

Based on a huge body of evidence, experience and common sense, it is clear that the companies that adopt robots realize huge financial benefits. More than any other action businesses can take, integrating robots can increase productivity, reduce overhead, provide flexibility, reduce waste, and increase quality—in some cases improving these metrics by orders of magnitude.

6) Training the robot employees of the future
Industrial robots have created a whole new ecosystem of high-paying and rewarding jobs. Designing, building, marketing, selling, installing, operating and maintaining robots creates jobs that didn’t exist before robots. The jobs this “robot ecosystem” creates are typically high paying, rewarding and come with good levels of benefits.

Robots allow companies to remain cost competitive even
Continued

Top Six Trends in Industrial Robotics

while maintaining production in a high cost country as opposed to moving operations to a low cost country. This preserves jobs in the high cost countries that would otherwise be entirely shifted to the low cost countries. This concept, known as reshoring in the industry, helps to balance out employment around the world.

A February 2013 IFR report touches on some of these topics and highlights the fact that from 2000-2008 the robotics industry created 8-10 million new jobs, either directly or indirectly. That’s more than 1 million jobs globally per year. Although the economic recovery stalled job growth on all fronts, the prediction is that between now and 2020 another 4 million jobs will be created in the “robot ecosystem.”

So while it’s true that the old manufacturing jobs are disappearing, it’s also true that the required manufacturing job skills of the future will be more high tech and demand an understanding of automation. In the US, even though there are more jobs available every day, employers are having a hard time finding qualified candidates. In the high tech world (including that of robots), this is often due to the fact that the needed set of job skills is hard to find. Instead of fighting about the fact that some of the worst jobs on the planet are going extinct, let’s celebrate a future with better jobs. There are many robot-related training facilities around the world—ABB Robotics runs many around the world—and when helping our children pick what to study in school, and even what type of school to go to, let’s let them know what the jobs of the future will be so they can make wise decisions.
Robots support strategy to keep manufacturing in the United States

For Baldor Electric Company, robots are part of a strategy to stay close to their customers and retain good employees by keeping manufacturing in the US and taking humans out of harm’s way.

In 1920, Edwin Ballman and Emil Doerr had a vision of a future world that depended on electric motors for nearly every aspect of daily life. In that world energy would be limited and efficiency would be paramount. Together, the two men built Baldor Electric Company to meet these dual needs of reliability and efficiency.

That forethought continues to pay off today as the world becomes more and more dependent on electric motors. From the smallest 1/50th horsepower motor to large 15,000 horsepower motors and beyond, Baldor delivers solutions for every need. Over the years the company has built itself into one of the most recognizable electrical equipment brands in the world and the largest motor and mechanical power transmission company in North America.

“Mr. Ballman was an electrical engineer and Mr. Doerr was a machinist, and their intent was to build a better motor,” says Ryan Fitts, Baldor Assistant Plant Manager for the 210 Motor Facility. “By that I mean a more efficient motor—and that’s still our goal today.”

Over time the company has grown from a small workshop to over 7,000 employees in North America and recently became a member of the ABB Group. Now, rather than competing with ABB for business, the two organizations operate as one and have mutually extended their global reach. Together, ABB and Baldor provide customers with the broadest range of industrial motors, drives and mechanical power transmission available—primarily for original equipment manufacturers and distributors.

“We’re a customer focused company,” says Fitts. “We want to build the kinds of products our customers want to buy, not the kinds of products we want to sell.”
Simultaneously investing in US manufacturing and keeping humans safe

Given that the majority of Baldor’s customers are located in North America, their strategy has always been to invest in the facilities closest to their customers so they can provide faster deliveries and local customer support. Rather than choosing to manufacture their products overseas to save on costs, Baldor has intentionally improved productivity in their US factories with a combination of automation and introducing more efficient methods of manufacturing. One important extra benefit of this automation is that they have also created an extremely safe environment for their employees, as evident by the sign that hangs proudly above their factory floor proclaiming 8,000,000 man hours worked without a significant injury on the job.

For many years now, adding robots to their operations has been a key part of the strategy to keep manufacturing close to their customers. At their home base in Fort Smith, Arkansas, Baldor started using ABB robots in 2000 as part of the Southwestern Die Casting facility—which is tasked with producing all the aluminum castings for Baldor’s motors. Foundry work like this is dirty and dangerous, which lends itself well to robotic automation. Over time Southwestern Die has grown from one robot to a full complement of nine robots, including an ABB IRB 6640, IRB 6600, IRB 4600 and IRB 4400.

“One of those nine robots is still the original robot from the first installation,” says Jed Reinhard, Manager of Engineering and Maintenance for Southwestern Die. “The rest of them have provided many years of service—between five and seven years, depending on how difficult the application is.”

“The robots have enabled us to run...
more and more multiple cavity dies at a high rate,” says Mike Gipson, Baldor Die Casting Production Supervisor. “They are extremely reliable and don’t take breaks. Also with the size of the multiple cavity castings that come out of our robotic cells, they can get pretty heavy and could wear out humans who handle them. The robots never fatigue or get injuries from these activities.”

While this sort of repetitive stress injury is a hazard for any individual who handles heavy parts on a regular basis, the specifics of foundry work also lend themselves to other kinds of hazards.

“We have a lot of other atmospheric conditions in this plant that make it a pretty harsh environment,” says Gipson. “There’s a lot of heat, aluminum dust and lubricants in the air. For a human that can present problems, but the ABB Foundry Plus protection on these robots ensures they keep running even under the harsh conditions. In general once we get a robot installed and programmed there’s not much we have to do to keep it running. We can get several years of life out of a robot before we start having any kinds of issues due to wear and tear.”

“In this hot and dirty environment with lubricants in the air, being able to have a robot inside the cell versus a person is a much better situation for us,” says Reinhard. “The operators can run multiple machines and don’t have to handle a lot of heavy materials. We’ve been very happy with the performance of the robots; their uptime and long service life has really been an asset for us.”

Die casting with aluminum is an inherently tricky process conducted under amazing pressures and temperatures. When the piece is cooling, it shrinks substantially and sometimes it’s just a matter of a fraction of a millimeter position change on robot movements that makes the difference between easy release and sticking when the cast is being ejected after trimming.

“With the new programming and the latest features in our robotic cells we can make changes on the fly,” says Gipson. “We don’t have to shut the cell down to dial the process in after we change dies and we can solve any small issues easily and quickly. The robots themselves are also quite easy to take care of given how interchangeable their parts are.”

Just down the road from Southwestern Die in Fort Smith, Baldor’s newest winding facility is being expanded from the ground up with robots playing a key role in the winding of copper wire within their motors. This so called “210 Facility” represents what Baldor sees as the future of motor manufacturing. From the movement of materials so that they never have to be lifted by humans to the incredible flexibility of the facility (it can produce thousands of different variants of motors on one line) the clean, white walls of the 210 Facility stand in stark contrast to the dirty environment of the foundry.

“One of Baldor’s strategies has always been to stay in the United States,” says Steve Morse, Engineering Manager for Baldor, “in order to
Robots support strategy to keep manufacturing in the United States

do that you have to keep your costs down as much as possible. As we deliver more and more complex and customizable solutions we have to add processes to the assembly of our product and the only way we can alleviate the cost that comes along with that is through robotics and automation.”

At the 210 Facility robots come into play during the incredibly intricate and complex step of winding copper coils. The number and length of coils varies for every run and customer, so the robots allow for a high degree of flexibility in this process. In addition, the motor parts are incredibly heavy and having the robots move them from one winding station to another saves employees from fatigue and injury. This philosophy of preventing injuries runs throughout the 210 Facility in the form of ergonomically designed shuttles and well-positioned overhead lifts.

Currently the 210 Facility has two robotic winding cells with one ABB IRB 7600 robot per cell, but once it is fully expanded over the course of the next year it will have four cells, something that Fitts is looking forward to. “Right now we’re still in the build out phase,” he says. “Once we are fully up and running this facility is going to be what all Baldor factories are modeled after in the future. It’s a very efficient process and there’s no way we could do it without automation and robots. ABB’s support in this regard has been spectacular.”

“Some people might think that because ABB and Baldor are the same company now we get special treatment,” says Reinhard. “But the reality is that we were using ABB robots long before the acquisition and we are buying more today for the same reasons we always have: they are reliable and ABB provides great customer service—something we also value as a core mission at Baldor.”

Click here to learn more.

Offline programming is the best way to maximize return on investment for robot systems. ABB’s simulation and offline programming software, RobotStudio, allows robot programming to be done on a PC in the office without shutting down production. RobotStudio provides the tools to increase the profitability of your robot system by letting you perform tasks such as training, programming, and optimization without disturbing production. Quicker start-up, shorter change-over, increased productivity.

Click here to learn more.
Aye, Robot! Meat Processor Welcomes Automation

A deli meat and cheese producer finds that a robotic case packer is not so costly and complex after all, and it can handle automated inspection.

By Anne Marie Mohan, Automation World Contributing Writer

For Dietz & Watson, the first time was the charm when it came to installing a robot at its Philadelphia headquarters and production facility. Dietz & Watson is a 75-year-old, family-owned company that produces more than 400 varieties of deli meat and cheese products sold around the U.S. and the world. Until recently the company had not considered using robotics in any of its four U.S. packaging facilities. But the successful installation of a robotic case packer at its Philadelphia plant has given the company a new perspective on the potential for automation in its operations.

“This is our first robotics installation,” says John Schoenfellinger, vice president of engineering. “We have not implemented robotics in other areas because of the diversity of our product mix. Costs and complexity are always a consideration. [But] this installation has proven that the complexity is no different than with any other production equipment, and the costs are justified by the reduced labor required and the increase in productivity.”

Case packing has been done manually on Dietz & Watson’s sliced deli-meat packaging lines. But when the company invested in a new, 144 pack per minute horizontal form/fill/seal vacuum packaging machine, the VisionPak from CP Packaging, it realized that it would not be possible to position enough people at the end of the machine in the space available to keep up with the VisionPak’s high speed. So the company chose an Osprey Case Packing System from JLS Automation equipped with two IRB 360 FlexPicker robots from ABB (ABB, http://www.abb.com).

One drawback to using an automated system in this application, however, was the degree of inspection required for each pack: On existing lines, operators check for leaking packages, and to ensure labels are printed with barcodes and date codes, before packs are placed into a case.
High Speed Picking for Heavier Items

The 8 kg IRB 360 FlexPicker provides a robust solution for handling larger individual products, and in multi-product pick applications, more products can be handled per cycle. The FlexPicker portfolio now includes a complete range of high speed picking robots. For specific applications, such as picking and placing flow wrapped products into cartons, the IRB 360 8 kg version has the ability to handle up to 500 products per minute.

Click here to learn more.

Continued
Aye, Robot! Meat Processor Welcomes Automation

To address this need, JLS implemented—for the first time—its proprietary Package Integrity Validation Technology (PIVT). It integrates vacuum, vision and several other sensor technologies to detect seal contamination, leaks, pinholes and other issues that lead to loss of package integrity.

“The Osprey case packer they bought was intended to be downstream of their vacuum packaging machine,” says Craig Souser, JLS president/CEO. “So we set up the system to deal with the uneven flow of product [from the intermittent-motion machine] and orientation. That’s inherent with vision-guided robotics. But what really enabled this application was PIVT, because without that package inspection, automated case packing wasn’t viable.”

Installed in late March 2014, the Osprey handles 50 SKUs, featuring four different package weights, packed in four different case sizes. The case-packing machine is surrounded by stainless-steel guarding that, unlike Lexan material, can withstand the cleaning detergent used during washdown operations without discoloring.

Packing in action

Use of a vision-guided robot eliminates all product contact, product orientation and product manipulation, as well as case indexing functions, from the standard case packing system.

During operation, packages exit the intermittent-motion vacuum packaging machine in groups of nine and are spread out for picking on a gapping conveyor. After inspection by the Osprey, the packs are dynamically loaded into the case. Since the case does not stop, but is instead tracked through the system, only one adjustment to the side guide is required during changeover.

As far as changeover for package size, “it only requires recipe selection on the control screen,” Schoenfellinger says. The delta robot’s end-of-arm tooling (EOAT) comprises vacuum cups designed to be flexible enough so that they do not damage the packages.

Since installation, Dietz & Watson has accomplished all of its goals for the new system, says Schoenfellinger. In terms of speed, the system is running at 15-16 machine cycles per minute vs. the 10-12 cycles per minute achieved with...
manual case packing. This is a 30 percent increase in productivity with just one-third the labor, he says. In terms of accuracy, the machine provides 100 percent repeatability, and Dietz & Watson is seeing consistent quality through package leak detection and label, barcode and code-date detection.

“The system has been much easier to integrate into production lines than we had originally imagined,” Schoenfellinger admits—so much so that Dietz & Watson has purchased a second Osprey for installation on an existing vacuum packaging line. The company also plans investments in automation for other production areas, as well as for a $50 million expansion of its Philadelphia facility, announced in June 2014.
A classic tale of “Made in America” manufacturing, with a modern robotic twist

Bad Boy Mowers has hit the big time, riding a surge of American manufacturing innovation aided by robotic welding technology from ABB.

The “can-do” spirit is a deeply held defining ideal of the American tale; the country’s history is strewn with stories of garage tinkerers building the next big thing.

While this legacy is something Americans are quite proud of, the realities of the modern world sometimes seem to have relegated this kind of “can-do” success to software innovators such as the Facebooks and Apple Computers of the world—with recent examples in manufacturing being hard to find. Yet a resurgence in home-grown American manufacturing is now taking root in the country, largely driven by advanced technology.

Through a combination of determination, solid management, and robotic technology from ABB, Bad Boy Mowers, based in Batesville, Arkansas, is one such example of this kind of resurgent manufacturing success.

Founded in 1998, the company has always had the goal of building the best and highest quality zero turn lawn mowers on the planet. They commenced their first mower sales in 2002, and each and every year since they’ve doubled their production and built a new building to meet demand.

“We have hundreds of thousands of mowers out there right now,” says Jeff Mynatt, Director of Operations for Bad Boy Mowers. “From where we started to where we are now, in such a short period of time, is pretty amazing—especially given that the zero point turn mower market is very competitive.”

“Made in the USA” means everything to Bad Boy

Walking through the 800,000 square feet of production space that Bad Boy currently occupies, it’s clear that the company has a family atmosphere. There’s a palpable pride in the fact that Bad Boy strives to keep as much of the manufacturing in-house, and in the USA, as possible.

“We try to do as much as we can do on our own machines—from getting in the metal, to fabricating it, to welding, to cutting it out and...
painting it—we try to limit what we have to purchase overseas,” says Mynatt. “We do purchase a little bit from overseas suppliers, but very small amounts. Most of our parts on the mower are bought or made here in the US.”

Indeed, Bad Boy fabricates its own mower decks in house; they also build their own frames and most of the smaller associated parts. “A lot of our competitors use a stamped deck, but we do not,” says Mynatt. “Bad Boy lawn mowers are welded up and are very strong. We use heavier metal than most of our competitors do, everything is hand fabricated and we weld in extra reinforcement, which results in a unique machine. Our mowers are built to last.”

And that kind of quality is apparent when you get up close to a Bad Boy lawn mower. They have a certain presence—a heaviness and weight that instantly tells you this is a product that you can use for a lifetime and beyond.

“Being ‘Made in the USA’ is everything to Bad Boy Mowers,” says Landon Russell, who is part of the Bad Boy Marketing and Communications team. “We believe, and we have proven, that you can build a product right here in America that is just like they used to build them. Throughout the years we’ve noticed that a lot of the other manufacturers in the industry have moved their production overseas, but not us. We’re proud to build a product that supports American jobs and that our customers are proud to own.”

**Remote Service and the Internet of Things**

Connecting ABB’s deep experience in customer service with the power of the Internet, it is now a reality for our customers to change from a “break then fix” conventional approach, into a predictive, proactive, and immediate support mindset. This is accomplished by merging our Remote Service platform with the burgeoning explosion of the Internet of Things. Remote Service monitors the health of robotic systems 24/7/365 through a wireless connection to the Internet.

**Remote Service**

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**Click here to watch video.**
realized they didn’t need a robot at that time, but I gave them some justification figures to help them determine when a good time to deploy robotics might be. It was only a matter of months and they called back and said they were up to 10 mowers a week and had met the justification targets.”

Now the company is building 300 mowers a day during peak season and has eight ABB FlexArc robotic welding cells running on two shifts. “As we’ve grown and expanded, we realized very quickly that we couldn’t keep up with demand on manual labor alone,” says Mynatt. “The robots can weld things up better, faster and more efficiently all day long. Once you get the initial programming done, the robotic welders always weld a good bead. With manual welding there is more variation.”

Mynatt points to Bad Boy’s tightly controlled vertical integration as one of its keys to successfully keeping production in the USA. They control everything from receiving to production, and now they have their own trucking company that ships completely assembled mowers to their network of dealers.

“The more of the production that we can do in-house, and the faster it can be produced and the better quality that we can deliver, it does limit our need to outsource manufacturing—whether that outsourcing is here in the US or in other countries—and the robots are part of that,” says Mynatt. “At the same time, we’ve increased our number of welding employees from the two we had in 2002, to the 90 we have today in just our fabrication facility alone—and that’s a huge increase in such a short period of time.”

On top of these benefits of robotic production, Mynatt points out one other important aspect. “Our employees do a great job, and are committed to the Bad Boy product,” he says. “There’s a feeling around town that if you work at Bad Boy that’s something to be really proud of. For us, here locally, those kinds of employees are important for our success. By having the robots work on the larger things, we can keep our valuable employees from having to lift heavy parts, and when the robot is welding it’s in a confined area that is separate from our workers so that prevents injuries due to sparking—together these things keep our employees safer.”
Standardization on robotic welding cells keeps costs down

Over the past 10 years, Bad Boy has bought a new robotic welding cell from ABB virtually every year. In particular, they’ve standardized on ABB’s FlexArc K cell because it gives them the capability of handling the mower decks and frames, as well as the small parts that go along with it.

“FlexArcs come in a variety of designs, but the K Cell that Bad Boy has standardized on has a ferris wheel index which minimizes the footprint on the floor,” says Luster. “It gives them the capability to be loading on one station while the robot’s busy welding on the other. It has a very wide work envelope and it’s able to rotate a very large part.”

The FlexArc cells have a many options for what robots can be put in them, but Bad Boy has used robots with longer reach arms because they work on larger parts—namely the company uses the ABB IRB 2400L and IRB 2600 series robots.

“As a standard item, we can drop ship the FlexArc cells directly into Bad Boy,” says Luster. “We come in and spend a couple of days to make sure everything’s okay, and their guys take over from there. The platform is the same every time so it doesn’t take a lot of effort at this point to get a new cell running properly. Initially we did a week of training with two of their guys at ABB training facilities in Auburn Hills, Michigan. Now they’re perfectly capable of taking the robot when it hits the floor and programming their parts.”

The turn key solution provided by ABB has been a key part of keeping Bad Boy on track to double production every year.

“In my opinion, ABB builds the best robotic system on the market,” says Luster. “We do sell other brands, but my reason for believing that is they reinvest heavily in technology every
year. It gives us a time-saving advantage to offer to our customers, and ABB’s technical support is staffed 24 hours a day, 7 days a week. So if there is an issue, normally you can get in touch with somebody and get it resolved rather quickly. We’ve actually got ABB robots out there with other customers that are 20-plus years old and are still supported and still run production on a daily basis.”

The longevity and ease-of-use of ABB’s robotic products should come in handy for a company that has its eyes set on the future. “We are wanting to be the best zero turn manufacturer out there,” says Mynatt. “That doesn’t mean we’ll sell the most units, but we want to be the best.”

View the video accompaniment to this story.

Key benefits of FlexArc cells for Bad Boy Mowers:
- Plug-and-play standardized solution minimizes startup time
- Keep costs down and maintain production in the USA
- Can increase production on an “as-needed” basis
- Standardizing makes training and service easier
- Increase quality of finished products
- Reduce risk for employee injuries
After 5,000 years, automation finds its way into the “lost wax process”

With home-grown innovation and ABB robots, MPI, Inc. has discovered the secret to incredible increases in productivity and quality for today’s most competitive foundries.

For everything from the most advanced surgical implants and single crystal jet engine turbine blades, to NBA championship rings, the investment casting industry rules the roost. Also known as lost wax casting, the technology has been around for thousands of years and has played a huge role in the industrialization of the world.

The process begins by creating an identical wax pattern to the product you want to create. Dozens of these wax patterns are then attached to a runner that is subsequently dipped in a ceramic slurry. Once the ceramic dries, the wax is melted and removed leaving perfect molds of the product. These ceramic molds are then filled with a molten metal. Finally, after the metal hardens the ceramic shell is removed, leaving perfect metal copies of the original wax pattern.

Although investment casting has been around for eons, its fundamentals haven’t changed all that much—and neither has the certainty that a quality metal casting is heavily dependent on creating the best possible wax pattern and runner assembly. Over its 41-year history, the family-owned MPI, Inc., based in Poughkeepsie, New York, has made it a priority to create innovative wax room equipment that accomplishes just that.
Continued
After 5,000 years, automation finds its way into the “lost wax process”

“At MPI we’re constantly looking for ways to make our products and our processes better so that our customers have a higher quality product,” says Jeffrey Rich, VP and General Manager of MPI, Inc. “We’re looking to help them solve their problems for the last time.”

Eye on the future— with robots
Traditionally the industry has been extremely labor intensive due to the detailed nature of wax runner assembly. Although the shell room—where the wax assemblies get dipped in a slurry of ceramic—has been automated with robots for quite some time, the idea that the intricate work of placing each pattern on an assembly using robotics is a relatively new concept. With manual human assembly, there are errors and inconsistencies which result in inconsistent assemblies and increased scrap. “The future of MPI is really the future of the wax room,” says Rich. “One of the biggest challenges is getting our customers to see the value that automation can provide. There is some pushback due to the perceived complexity of robotic systems and the fact that many of these shops handle very low volume jobs. They believe that the investment in robotic tooling is just too high to ever see a return on investment. However, what our customers have found is that the value of standardization through automation far outweighs the cost of the investment.”

The goal: “total automation”
MPI has long been the worldwide leader in wax room equipment and innovation. In order to realize the ultimate goal of a fully automated wax room that would result in higher productivity, lower waste and unparalleled levels of quality, MPI knew it would have to turn to robotics. Initially, MPI collaborated with Rensselaer Polytechnic Institute and the New York State Energy Research and Development Authority (NYSERDA) to create a system based on 3-axis Cartesian robots. However, the restrictions of those robots eventually limited the creativity of MPI’s engineers and they decided to search elsewhere for new solutions.
MPI’s goal was to create a next generation pattern assembly prototype using robotics. An exhaustive search for a robotics partner led MPI to ABB due to its well-known robot reliability, global reach, and technical know-how. In addition, MPI found that ABB was ready and willing to help solve even the toughest problems. As a result, MPI quickly became a fully authorized integrator of ABB.

“ABB has given MPI the support we need, and our engineers find working with ABB’s robots to be very user friendly,” says Bruce Phipps the President, Owner and founder of MPI, Inc. “We’ve worked closely with ABB to develop unique programming that allows us to accomplish wax welds that were previously unattainable—something that has led directly to incredible successes with major customers in the aerospace industry. In fact, ABB engineers have sometimes worked through the weekend to help us meet deadlines, which is the kind of dedication we’re truly appreciative of.”

Research and development paves the way

For customers who are not yet able to automate their facilities or are running out of capacity to handle their current production demands, MPI offers in-house contract pattern production and assembly services. Not only has this created an additional revenue stream, but MPI has found that providing in-house production provides a unique opportunity to further their research and development efforts. It also allows customers to experience first-hand the undeniable benefits of automation.

“This industry is 5,000 years old and is very entrenched,” says Rich. “You can still find foundries that are truly using antiquated equipment and techniques. We’ve set up systems right here in our own facility where we can show them the value of automating. There is nothing better than real-world experience to prove that automation is extremely cost effective—not to mention we are able to conduct very valuable R&D in the process.”

Benefits far outweigh investment costs

It was this direct and highly involved experience that led to the creation of the new MPI Model 20-14 Automated Pattern Assembly

Continued
After 5,000 years, automation finds its way into the “lost wax process”
System (APAS). Based on two ABB IRB 2400 6-axis robots instead of the three axis Cartesian system of the Model 20-10 it replaces, the 20-14 can weld 25% larger wax assemblies, is capable of multi-plane welding for advanced products such as single crystal turbine blades, and increases casting yields by 10-30% depending on application.

“The value that’s gained through automation in decreased scrap is way underestimated,” says Rich. “A lot of times an investment casting foundry is going to focus on other parts of the process than the wax room, but it’s very important to understand that the entire process starts in the wax room. If you don’t get a high quality pattern on a high quality runner you’re almost asking for failure throughout the rest of the process.”

Compared to manual wax pattern assembly, the 20-14 creates incredibly high quality fusion welds that are perfect 100% of the time. It is able to accomplish this all at a rate approximately 2 to 5 times faster than manual assembly allowing for high throughput on deliverable products. The 20-14 is also much more flexible than conventional assembly due to its quick change tooling with less than 1 minute changeovers. Whether the requirements are high volume or low volume, or a combination of both, it can easily be drop-integrated into a fully automated wax room.

Robotic automation also solves the traditional problem of finding employees with the necessary skills and abilities to create good quality welds for wax runner assembly. Once a recipe is programmed into the MPI-designed user interface, it is easy for an operator to choose the appropriate recipe for a given wax assembly. In fact, an individual can be trained how to operate the machine in less than one day—an amazing accomplishment in-and-of-itsel.

In order to remain competitive in the modern investment casting industry, it seems clear wax rooms will need to be automated. With MPI’s innovative plug-and-play systems that change is less daunting.

View the video accompaniment to the story.

Key Benefits of MPI’s APAS:
- 10-30% higher yields
- 2 to 5 times higher throughput
- Perfect welds every time
- Increased casting uniformity
- Reduced waste
- Reduced labor costs and training
- Less than 1 minute changeovers
Robotic palletizer handles two paint-filling lines

At Dunn-Edwards’ new paint plant, this vacuum-gripper end effector carries a 220-lb payload, and the articulating robot can palletize 5-gal paint buckets at 44/min.

By Pat Reynolds, VP Editor, Packaging World

Robotic palletizing of 5-gal plastic buckets of paint is just one of the highlights of four new packaging lines in the brand new Phoenix plant of Los Angeles-based Dunn-Edwards Paints. Built by ABB and installed and integrated by Systems Automated, the robot’s vacuum-gripper end effector picks up four buckets weighing a total of 220 lb with each cycle and places them on pallets at speeds to 44 buckets/min. The system’s speed and flexibility, the weight of the load being palletized, and the dexterity of the end effector all add up to a pretty impressive example of what robotic technology can bring to the packaging space.

Dunn-Edwards is the leading manufacturer and supplier of architectural and industrial coatings in the Southwest. It recently consolidated all of its water-based manufacturing and distribution operations in its new Phoenix facility. The firm sells most of its paint through its own stores, all 109 of which are located in the Southwest.

Because the robotic palletizer is capable of such high speeds, Dunn-Edwards is able to feed two identical filling lines into it. Each of these lines begins with automatic denesting of the high-density polyethylene buckets, performed by a machine from Heisler Industries. An operator takes a stack of 20 nested buckets and places it on an infeed conveyor. The denester does the rest. The stack is tipped on its side so that buckets can be mechanically separated from the stack and fed—at being uprighted again—to the labeler.

Application of a cold-glue-applied paper label is done by a Heisler Industries machine. Once labels have been applied, a pneumatic pusher divides the single lane of buckets into two so that the buckets can file into the two lanes of the inline, four-head AB netweigher from PASE Group. Two buckets are filled at a time. While the two in the left lane are being filled, the two on the right are discharged and two empty ones take their place.

The filler features pressure-over-product filling. Rather than a more
conventional approach involving a manifold and a pump pushing product through modulating valves that then steer the product to each filling nozzle, the filler relies on a blanket of low-pressure air over the product in the tank. It’s the air pressure in the tank that pushes product out of the nozzles. When the net weigh scale determines the proper target weight has been reached, the nozzles close and the bucket is discharged. Accuracy, says PASE Group, is plus-or-minus a quarter of a percent.

“What we like especially about pressure-over-product filling is that you don’t get surges in paint flow,” says Clay Fenstermaker, director of engineering at Dunn-Edwards. “Those surges are what make accurate filling more difficult.”

The filler also includes four cylinders through which 6 oz of “topping solution” are added to each bucket so that the latex paint won’t form a skin on the top.

Lidding and inspection
A short distance from the PASE filler is another Heisler machine, a continuous-motion roller lid press that compression presses HDPE lids onto buckets. Then the buckets pass through an inspection device from Heisler to ensure all lids are firmly seated. A second inspection camera, from ifm, makes sure none of the lids is missing its tint plug. (This is a rubber stopper that the store personnel remove in order to add the tint that gives the base paint the final color desired by the home-owner or contractor buying the paint. The plug is then replaced and the bucket is shaken to disperse the tint.)

Following the imprinting of SKU and batch number on the lid, which is done by a Domino Amjet (www.domino-printing.com) ink-jet system, the buckets are ready for palletizing in a three-layer pattern with 12 buckets per layer. The ABB IRB 660 robot sits between the two conveyor sections on which filled buckets reach the palletizing cell. The vacuum-gripper end effector picks buckets from the left conveyor and puts them on a left pallet or from the right conveyor for placement on the right. Each side has a magazine of empty pallets so that a fresh pallet can be fed in automatically whenever it’s needed. Systems Automated engineered and integrated the pallet dispenser and the zero-pressure zoned accumulation conveyor that indexes buckets into the palletizing cell.

“The big driver on this part of the line was rate capability,” says Fenstermaker. “Originally we were thinking about an overhead gantry robot solution because we were unsure about one articulating robot being able to handle both lines. But as part of the initial engineering contract, the integrator used some ABB software to do a nice simulation showing the full robot movement in real time and a good computer model showing us this robot packing at the rate we needed. Also at issue was the vacuum-cup end effector’s ability to hold four.
of these heavy buckets. But the integrator sent us a video of a similar installation where the same kind of end effector was successfully whipping a similar payload all over the place. In the end we were convinced this was the way to go.”

Tint plug issue

One other area of special concern revolved around the tint plugs in the lids, says Fenstermaker. “The concern was that the lid vendor might fail to insert a plug in every single lid and the end effector would suck paint out through the plug-less hole. But the inspection system from ifm takes care of that possibility, unlikely though it is. The other worry was that the vacuum exerted by the robotic end effector could suck the tint plug out. But this hasn’t been a problem, either, partly because the end effector has a thick foam pad that both disperses vacuum pressure over the entire lid and makes the system relatively insensitive to minor height variations in the buckets.” Also contributing is a Venturi Vacuum system that carefully regulates vacuum pressure so that it’s strong enough and evenly dispersed enough to grip the buckets without dislodging the tint plug.

The final pieces of equipment on each line are a stretch wrapper from Wulftec and a thermal-transfer print-and-apply pallet labeler from Videojet. “We’ve had some previous experience with Wulftec and we liked their equipment and their pricing,” says Fenstermaker.

As for the printing on the pallet label, it represents a step forward in inventory management for Dunn-Edwards.

“Each label includes a unique transfer request number that’s printed as a linear bar code,” says Fenstermaker. “This ties into our ERP [Enterprise Resource Planning] system. When the forklift driver scans that bar code, he automatically knows exactly which pallet location in the warehouse that pallet belongs in. That information is also sent automatically to our inventory management system, so we know automatically, without having to keep track with paper and pencil, where each pallet from each batch is located. It’s a big help in managing first-in/first out inventory and in bringing a new level of accuracy and efficiency to picking for shipments along with our overall inventory management.”

Like the robotic palletizing cell, it’s one of the reasons Fenstermaker believes that this might be the most sophisticated 5-gal paint bucket packaging line in the world.

To View the related video please click here.