Meet YOUR NEW EMPLOYEE

Do you have manufacturing positions within your plant that remain unfilled because you have been unable to find the right employee? Have you hired someone with less skills or experience than you'd like in order to fill a short term demand? If so, read on.

by B Kyle, Don Engles, Lynn Swanson and Dave Ackland

Photo courtesy of Productivity Inc. and Greg Thoen Photography.

Today's reality of manufacturing drives continued pressure to reduce costs and improve efficiency. We must compete with a reduced workforce and under increased regulatory and financial pressure. Of great concern, then, is the looming shortage of skilled machinists and machine operators as we anticipate baby-boomers retiring, coupled with a demographic trend away from factory work.

Enter the industrial robot as your next employee.

Currently, only about 14 percent of nonautomotive manufacturers have implemented robotic automation, according to a March 2011 article written for the Gas and Welding Distributors Association.[1]

And yet, the tide is turning. Manufacturers are automating out of necessity. Certainly, the shortage of skilled workers is a factor driving automation, as is the drive for repeatability and quality in terms of exactly reproducible parts (the topic of *Precision Manufacturing's* January/February 2011 cover story on quality).

From a price perspective, automation can cut costs and even beat low-wage countries like China. There is an excellent analysis of this in a 2005 issue of *Manufacturing Engineering* magazine, "Robotic Automation Can Cut Costs," by Rick Schneider.[2]

Contributors to the following article are seasoned experts in the field of automation. At the conclusion is a comprehensive list of MPMA member companies that are potential partners in the automation process.

Why Consider Automation?

Don Engles, Productivity Inc.

Purely from a cost perspective, robotics is an option worth considering. Indeed, automation of any kind in your manufacturing process provides a competitive advantage in world-wide markets. It allows you to utilize your skilled trades over a broader range of processes, and reduces the indirect costs of recruiting and retaining skilled machine operators. As the need to do more with less continues, many manufacturers find robotics to be cost effective when compared to the high cost of labor and benefit packages.

Labor undeniably is a significant cost of doing business. Beyond direct payroll are the difficult-to-quantify costs of recruitment, retention and absenteeism.

Consider a typical CNC machine operator who makes $18 per hour plus benefits. Added to the base annual cost of $37,440 is about $7,063 for tax liabilities. If your company offers benefits, you can add an additional $13,700 for family health care, dental plan, STD/LTD, and matching contributions to a 401K plan. The real cost to your business is not $37,440, but rather $58,200!

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Job performance is another area of unplanned cost, particularly as it relates to absenteeism and resulting machine downtime. When someone is absent, there is an interruption in productivity. Someone else must be inserted into this position on short notice, often without adequate training.

Machine Load / Unload

If you are considering adding robotic automation into your manufacturing facility, you first must do some careful planning to ensure a successful installation. Generally speaking, robotic machine tending requires jobs with repeat set-ups, although the old idea that you need automotive level volumes no longer is true of robotic automation systems.

Using a robot for machine tending will provide your company with consistent, reliable operation with high uptime and equipment effectiveness. Productivity Inc. offers several pre-engineered machine tending packages available at justifiable costs and quick deliveries.

A well-planned system allows for many different parts to be run on a single production cell. Fast, easy changeovers are accomplished using components that are available commercially from robotic supply vendors. Once your robotic machine cell is installed and has the first part running, it is easy to add additional parts to the cell. You also will find that new parts are pretty simple to introduce: make a new set of gripper fingers, teach a few point modifications, save the robot program, and then you can run a different part as needed.

In the planning stage of a robotic work cell, you will identify a machine tool or two, plan a sequence of operations, and choose a part infeed and exit device (part conveyors, bowl feeder, etc.). When this is complete you will schedule work across this cell that matches the part process flow of the cell. An example might be a simple 2-axis lathe and a small drill tap machine that allows round parts with simple hole patterns. Or it could be as complex as a multi-machine system that washes, dries, inspects, and marks your work process. In either case, you will want to select a machine process that allows you to maximize the cell uptime with work that fits your requirements.

Although not all that common, a robotic cell can be redeployed if your strategy changes. Redeployment generally will involve some electrical integration up front, along with door actuators and workholding integration to allow for robotic operation.

As you decide on your first cell, keep in mind that since your uptime will be high you need to use machine tools that are in good shape and are reliable. Also keep in mind that old machines with mechanical gear shifters and levers generally do not allow successful robotic integration.

A fairly common first-time thought is to over-complicate the cell. It is important to keep in mind that your main benefit will come from keeping your machines "in-cycle," not from keeping the robot busy. The more tasks that you expect the robot to do, the more complex your cell will become. Especially with your first cell, you want to keep this as simple as possible. Doing so will keep your investment down and

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your reliability up—both good traits to have in your first system.

Following these recommendations will guide you in implementing robotics successfully. You still will need the skilled knowledge and experience of your employees on the floor; however, having a robot to handle the part exchanges will allow this skill set to be multiplied over a greater number of machines, while allowing for improvement in operating efficiency. This will lower your own manufacturing costs by spreading your skilled labor over a greater number of processes, making you more competitive in today's new manufacturing reality.

Robotic Automated Welding Solutions

Lynn Swanson, PRI Robotics

After a few long years of low-level manufacturing investment in robotics (flexible automation), there is now a pent-up demand driving new investment. This likely will be the case for years to come. Our customers and prospects tell us that the incentive to invest in robotic welding automation is threefold:

- **Shortage of skilled welders** – many of our seasoned welders are retiring and fewer young welders are entering the workforce.
- **Productivity improvements** – automated welding provides productivity improvements of 200 to 300 percent most often over manual welders.
- **Consistent weld quality** – extremely consistent torch positioning and more controlled amps, volts, weld size and location.

Fabrication companies, whether OEMs or job shops, are reacting to today's increased manufacturing demands with a renewed push for automation. In the past few years, demand was low while their workforce was over staffed. During this period, many robotic welding systems were underutilized; thus, investing in additional automation was minimal. Many of these companies were forced to downsize their workforce in order to survive.

Today, as manufacturing opportunities again are increasing, management is considering the above

PRI custom-built FANUC / Lincoln turn-key system

incentives and looking to automation to provide additional capacity, with its accompanying improved quality, rather than adding more workers. Even though manufacturing seems to be a positive factor, as the country comes out of the recession, I believe unemployment will continue to be relatively high.

Many of the robotic welding systems in the field are 10 to 20 years old and equipment must be upgraded. These systems have a fabulous return on investment (ROI). Many ROIs are 1 to 2 years, depending on their utilization—some are even less than 1 year. These productivity improvements can give U.S. companies the ability to beat their overseas competition and win the order. In the past, the time to market with respect to the automation selling process was easily 2 months to 4 years or so. Today, the selling process can be as short as 2 weeks.

The introduction of pre-engineered machine packages, perhaps a decade ago, has driven down the price and lead time of many popular style robotic welding systems. PRI Robotics (PRI) offers these pre-engineered systems built by both Lincoln Electric, utilizing FANUC robots, and Miller Electric Mfg., which recently acquired the robotic division of Panasonic to form a strategic partnership.

Along with offering these pre-engineered systems, PRI focuses their integration capabilities on custom robotic systems for welding, machine tending, and pick-and-place applications. Many of these projects are turn-keyed with sophisticated fixturing, end-of-arm tooling, and custom robotic programming. Providing local service and support is why most customers prefer to purchase automation from a servicing integrator.

It's encouraging to hear our customers talk about how their investment in robotic welding has provided their welders with a better tool to work with in order to be more productive. Most automated welding systems consist of two workstations so the operator can perform the load/unload operations in one workstation, simultaneous to the robot performing the actual welding requirements in the other station. Robots don't get bored welding the same parts over and over again. And robots often can be operated by a lesser skilled welder, leaving the more meticulous and perhaps lower volume welding to the experienced worker.

Due to the improved capabilities and technologies, robotic welding is now applicable to more demanding requirements than they would have been only a few years ago. There are technology improvements in aluminum welding, TIG welding, and laser welding. Utilization of simulation software, off-line programming and vision systems also can help in the evaluation and implementation of tougher applications.

On the Shop Floor

Dave Ackland, Digital Tool and Automation

For us, automation has been more elementary than creating cells or connecting multiple machines together. It has been about maximizing the efficiencies of the machines themselves and how we manage our jobs.

I'm continually trying to apply advanced processing, fixturing and workholding tricks, and writing better programs to maximize my machines' efficiencies. I also work to establish multiple work locations for parts, so that a machine has more run time before it needs an operator to touch it.

As part of that maximization, we make very good use of the automation features within a machine. Truly, these machines are robots in themselves. For example, one of my machines, a Haas

The MPMA membership includes several strong companies that provide robotics/automation equipment.

Agility Machine Tool, Inc., Blaine, Minn.
see www.agilitymachine.com for more information

All Tech Machinery and Supply, Maple Grove, Minn.
see www.atms.us.com for more information

Baillie Sales and Engineering, Inc., Minneapolis, Minn.
see www.bailliesales.com for more information

Concept Machine Tool Sales, Inc., Plymouth, Minn.
see pages 5 and 20 or www.conceptmachine.com for more information

Ellison Technologies, Plymouth, Minn.
see pages 30 and 31 or www.ellisontechnologies.com for more information

Hales Machine Tool, Inc., Minneapolis, Minn.
see page 44 or www.halesmachinetool.com for more information

Hegman Machine Tool, Inc., Maple Grove, Minn.
see page 16 or www.hegmanmachine.com for more information

Industrial Tool, Inc., Minneapolis, Minn.
see www.industrial-tool.com for more information

John Henry Foster Company, Eagan, Minn.
see www.jhfoster.com for more information

Northwest Machine Technologies, Rogers, Minn.
see www.nwmtec.com for more information

Productivity Inc., Plymouth, Minn.
see pages 2, 21-24, 27 and 34 or visit www.productivity.com for more information

SCHUNK, Inc., Morrisville, N.C.
see www.schunk.com for more information

Stone Machinery, Inc., Saint Paul Minn.
see page 32 or www.stonemachinery.com for more information

Technology Reps, New Brighton, Minn.
see page 41 for more information

EC400 Pallet Pool, has an internal robot that loads and unloads pallets. That HMC can handle a 22" diameter cylinder, with a 20" Z-axis and 20" Y-axis.

We also take advantage of touch probes for both part and tool probing. We can use this feature for placement and verification and part pick-up, and also for a certain amount of part quality checking after the cuts. Without automated tool pick-up, for example, my machine would be grossly underperforming.

On my Haas EC400 I run a series of specialized mold cavities. We can get 18 1/2 hours of solid machining, nonstop, without the machine coming out of the program run. We added remote cameras to monitor part process.

How has that translated in terms of man hours? That isn't always easy to quantify, of course, but I can get 4 to 5 hours of run time after people leave and we turn the lights out. I've had as high as 7 to 8 hours of run time when I have the right sequence of work, where we leave the machine running into the night—past the night shift.

The Haas EC400 Pallet Pool has an internal robot that loads and unloads pallets.

In my experience, HMCs are almost twice as effective as my verticals. My VMCs, by comparison, are shut down within 1 to 2 hours of shift end. Most HMCs by design, even the simplest ones, are at least semi-robotic in that they have an external pallet that can be loaded while the machine is cutting another part. We take advantage of that as much as possible.

If you've got an efficient programmer, you can have nearly 100 percent machine utilization as far as cutting time. Pallet switch takes maybe 10 to 15 seconds, and the machine can begin again. With my VMCs, changing parts is done only while the machine is not in process. During setup, which can be 10 to 15 minutes or more, cut time is lost. It's true that not every job is suited for an HMC, but I sure can tell the difference. If I can fit a part onto my HMC, I win.

From my perspective, it is worthwhile to implement even the most fundamental of automation options. Use all of the features of existing equipment, then enhance with external robots and part loaders and gantries, etc.

I am certain that our efforts in automation and innovation have saved the business. Our efforts with extended run time, palletized work, and some multi-station work have given us the margins we needed to manage our costs—particularly labor costs.

I know of some shops that have gone out of business because their labor costs ate them alive—they didn't automate, kept throwing labor at new challenges. And they hit a breaking point. PM

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For the complete bibliography, please contact the MPMA office.