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Paladin shifts gears

Paladin Industries revs up for robotic sanding

By Brooke Baldwin Wisdom

When Paladin Industries was first presented with the opportunity to manufacture automobile shift knobs, the Kentwood, Mich.-based company looked at machining hardwood blanks as a fairly new challenge. That's because since 1985, Paladin specializes in precision 3- and 5-axis CNC machining, membrane pressing and casegoods assembly. But since the company prides itself in being on the cutting edge in craftsmanship and taking on projects others say can't be done, the decision to accept the job was an easy one. Perfecting the process down the line, however, required quite a bit of innovation and the implementation of a steel-collared worker.

"Part of the uniqueness of our company and what sets us apart from the competition is 23-plus years of experience in CNC machining and programming, and over those years, we have done so many different types of projects," says Larry Bell, CEO of Paladin Industries. "We strive to deliver quality and value, but also peace of mind. Those years have given us a lot of knowledge and expertise on fixturing, holding parts while they are being machined. In addition, we've always been willing as a company to spend the capital to acquire new technology. These factors are what allowed us to successfully take on manufacturing the shift knobs."

"When we first saw the shape of the part, we could pretty well grasp what could be done," says Alan Applegate, vice president of business and development for Paladin. "In the early stages, the initial challenge was trying to identify what would be the most efficient way to produce the shape with the equipment we had. We quickly came to grips with how to do the fixturing, because again, that's our expertise."

But when it came to the sanding phase of the knob, the Paladin team realized it was time to call upon some of the lean manufacturing techniques it had learned four years earlier when grant money from the state of Michigan paid for a consultant to come in and help identify methods to better produce parts throughout the plant. "It became apparent pretty quickly that something needed to be done when it came to sanding the knobs," says Craig Bell, president of Paladin Industries. "There was inconsistency in the sanding, and we were having problems training people. Not everyone is suited to standing there and hand-sanding a shift knob all day long. Some would leave and some were better at it than others, so we always had to wade through some people to find the right person. By then we'd fall behind."

Seeing the labor input required in making the knob, Paladin drew from those lean manufacturing concepts and decided to implement a work cell. To make the entire operation as efficient as possible, capital would first have to be spent on a custom boring machine to do some of the pre-CNC machine operations. Then Thad Bell, vice president at Paladin, and Steve Swanson, plant manager, suggested the idea of a robot to do the biggest portion of the sanding of the knobs. Discussions were held among the Paladin team, along with input from Stiles Machinery.

"We've all seen robots work at trade shows, but it has always been in material handling," says Applegate. "I've

How it all works

✣ Three flap sanders are mounted one above the other in a framework, which is at one end of an enclosed safety cage. The bottom flap sander is loaded with 100-grit sandpaper, the center flap sander is loaded with 120-grit and the top sander is loaded with 150-grit sandpaper.

✣ At the opposite end of the safety cage, an operator loads two machined shift knobs onto the robot arm, which then moves to the lower flap sander with the coarse grit sandpaper.

✣ The main or master program then moves the knobs to engage the flap sander on the path of the contours of the knob while rotating it 360 degrees. This program is the same for all three sanding stations.

✣ What is unique is that the sanding cycles are tracked, and at the start of each sanding cycle, Paladin has an automatic indexing or off-setting of the knobs into the sanding flaps by .0002 of an inch, which compensates for wear of the sandpaper.

✣ In addition, there are sub-routine programs for each of the three sanding stages where the operator can simply change the off-setting to change the sanding pressure being applied to the knob, or change the speed to increase or decrease the actual sanding time.

These sub-routines allow the operator to get the required finish in a time-efficient manner, while not allowing the operator to have access to the master program.

never seen one within the woodworking industry doing a process. It was a different challenge for us to look at programming a robot to do some pretty intricate moves including, rotating and adjusting the amount of pressure being applied to the sanding media. Procuring the Fanuc robot was not a leap of faith, however. We felt pretty confident as to the final outcome. We felt very confident about our programming ability. Another member of our team has been able to learn enough of the program to fine tune the movements of the robot even more, removing excess movements from the initial program. That has made the operation even faster."

Recouping the investment

The Fanuc robot, along with lean manufacturing initiatives, brought the total number of employees involved in the shift knob work cell from eight to four. "Our output has always been pegged at around 300 parts a day," says Jeff Bouwens, project manager. "What's really changed or fluctuated is the number of man hours, our shift time and the number of people working during the shift to get that 300 out."

An unexpected benefit has been the increased longevity of the sandpaper. Paladin found that it could program the robot to make use of the full width of the sandpaper as opposed to people who would just tend to sand in the center of the sandpaper. "We actually saved a small amount of money just on the sandpaper," says Applegate. "Best of all though, we achieved consistency, which has made our customer very happy. The robot does 90 percent of the sanding. We still do some touch up work and quality inspection such as weighing the shift knob out for density purposes. All in all it turned out to be a very good investment for Paladin to make. I think that by the time we include the safety cage and all of the other steps we made, we were probably looking at a $180,000 investment. We have more than recouped that by now."

Do Paladin's 35 employees feel threatened by their fellow robotic worker? Not at all, says Larry Bell. During its lean manufacturing training, Paladin instituted a profit sharing plan on a quarterly basis. He believes his employees have bought into the fact that

Paladin needs to keep increasing the amount of sales dollars per employee. Due to increased business, no one was laid off due to the robot. "Since our employees have bought into the whole profit sharing idea and increased output per employee, they have readily embraced this. We definitely will use robots in other applications," says Larry Bell. "There's obvious application for material handling and we also have a couple of people who see this as a potential for processing other parts. That's in the back of our mind as a possibility."

The lean journey continues

Applegate says the results of Paladin's lean manufacturing journey continue to be good, despite its being a very tough project to undertake for a 54,000-sq.-ft. woodworking plant that is not running its own product line. "We're a true job shop, so nothing ever stays the same," he says. "We're always running something a little bit different from run to run. But we performed exercises and gained a much better understanding on how to approach some of our projects in terms of setting up work cells and what it really means in terms of being lean within that cell. We're seeing our employees embracing lean manufacturing more enthusiastically than they ever have before, and we're seeing results

Paladin's Fanuc robot does 90 percent of the sanding on each knob, bringing quality and consistency.

in our bottom line and more throughput through the plant, which gives us opportunities to pursue other opportunities more aggressively."

Paladin identifies a certain project that has a high enough volume for any particular part that can be seen as its own entity and then sees how it can effectively set up to run that single part and all its processes. Paladin also sees that it has different processes and capabilities that would allow it to run a variety of parts in terms of CNC machining, membrane pressing, case goods assembly and packaging. A whole variety of shapes and colors could run through all of those steps, so Paladin looks at each one of those processes and tries to identify some commonality and then produces a work cell or work flow that is lean around those work centers versus a particular part.

Although Paladin feels that purchasing the Fanuc robot was not an exercise in risk taking, does it ever speculate on purchasing equipment? "We just did," says Larry Bell. "We have just placed an order for a Wemhöner press line. It had a bit over $1.1 million price tag, and that's only part of the total expenditures, which will require moving machinery and laying out a conveyor system, etc., to make our whole membrane pressing operation into one large work cell. Currently we can keep up with our production with the equipment we have, but if we're going to grow we need to add more capacity. Technology changes, too. We look at equipment like this new Wemhöner line versus our current press equipment and see a drastic change in throughput in terms of increased pieces per day, per week or per hour with a substantial labor reduction. That takes us back to more throughput and more production per employee."

Paladin Industries has been on a gradual shift over the years to change its focus from contract CNC machining to becoming more of a supplier of components for office systems furniture, display and store fixtures manufacturers. "The more we get into this the more complexity we find with some of these parts and some of the programs because our customer base is also focusing on becoming lean," says Applegate. "When they want to outsource a part, they want to outsource as many aspects of that part as they can take off their plate. That often involves subassemblies, packaging, putting wiring harnesses inside the package, trim grommets and things that we never would have gotten involved in before. We're finding we have to add value. It's worth it for us to do it, but it's becoming a more and more complex proposition."

For more information, circle #350 for Stiles Machinery and #351 for Fanuc on the Reader Service Card.