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On the cover: Photo courtesy of Paladin Industries.

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Robotic cell solves production problem

Technology and lean manufacturing open up automotive market for Paladin Industries.

By Kathleen McLaughlin, Managing Editor
kmclaughlin@wattnet.net

Paladin Industries isn't interested in the status quo. Investment and innovation coupled with lean manufacturing principles is changing how the woodworking company produces machined components for the office/institutional furniture, store fixture and automotive industries.

By pushing the possibilities and embracing lean manufacturing, Paladin is tapping the automotive industry, a revenue stream not traditionally associ-



Panels are sprayed with a heat-activated adhesive. From there, they move via conveyor to the membrane presses.



After adding a Fanuc robot to automate its shift knob sanding operation, Paladin was able to reduce its labor by half.

ated with the woodworking industry, and producing components on a just-in-time basis. Paladin's commitment to technology was recently recognized by the Woodworking Machinery Industry Association with the Innovator of the Year award.

Automated sanding

The company's commitment to lean was tested more than two years ago when it started manufacturing solid hardwood maple and walnut shift knobs for an automotive supplier. Paladin had to produce a certain number of parts per day. Because the sanding was initially done by hand, the process required eight people to produce more than 300 knobs per day. If production fell behind, more labor had to be added to meet its daily quota.

"No one sanded the knobs the same and the size and shape is dictated by the customer and each one had to be checked with a gauge," says Larry Bell, CEO of Paladin Industries. "We had some inconsistency, and if a knob was sanded too hard or if the shape wasn't

right it was a reject."

Because of fluctuating labor costs and consistency issues, the production team researched options to streamline the sanding process. After consulting with Stiles Machinery Inc., the team decided to add a Fanuc robot to automate the sanding operation. "The robot was a leap for us," says Bell.

To maximize the investment, the team developed a lean work cell, which included moving the four-spindle CNC router and clustering the robot and custom boring machine. "Physically there's very little movement of the part between operations and final packaging," says Bell.

A hardwood blank goes from the custom boring machine and is sent to a CNC router. From there, it's transferred to the robot that sands the shift knob with three grits of sandpaper. The shift knob is then given a quick touch up and is inspected for quality.

"The operation went from eight or more people to four people," says Bell. "Approximately 90 percent of the sand-



Approximately 90 percent of the sanding is done by the robot. Shift knobs are given quick touch ups and are inspected for quality.

ing is now done by the robot."

Reject rates remained consistent because most of them occurred from defects in the wood. "The robot gave our customers something they never anticipated asking for because the shift knobs were hand sanded," says Alan Applegate, vice president of business and development. "We now can provide a consistent product."

In-house innovation

The robot's initial programming was provided by Stiles, but it required a few internal tweaks. The production team had to figure out how much pressure to apply when the shift knob is flap sanded, how long to leave it there and how much it should be rotated as it's going through the sanding operation.

"We incorporated a carbide sleeve on the bottom of the knob that protected it from being over sanded, which was an initial problem," says Jeff Bouwens, project manager at Paladin Industries. "Now, we can sand two shift knobs at a time by adding an addition-

al axis and servomotor on the end-of-arm tooling."

The longest cycle time to produce two shift knobs is one-and-a-half minutes compared to five to six minutes of hand sanding. "We are producing more than 300 shift knobs per day and have the capacity to increase production to 400, if needed," says Bouwens. "In the past, we adjusted the cycle time by adding labor, now we're producing more with fewer people."

The robot's sanding program was modified to accommodate maple and walnut parts. "The amount of pressure is different for the maple because it's a harder wood than walnut," says Craig Bell, president of Paladin Industries.

The robot's router tooling is removable and interchangeable and if an insert needs to be sharpened it can be easily replaced.

Making other processes lean

Paladin's next lean initiative is to streamline its membrane pressing operation.

Before the lean makeover, parts were machined in three different areas in the front of the 54,000-square-foot plant. A caseloads assembly area and a separate membrane pressing area were located in the back.

"We would approach these contract jobs as a batch process run from 25 to 200 or 400 as a batch, and send these parts into the pressroom as a batch," says Applegate. "We now have two dedicated routers outside the press room. They are easy to set up so everything that goes through the press room is machined on the routers."

The goal is to set up and machine one piece or 50 pieces as quickly and efficiently as possible. "We have more volume, but we're running smaller and smaller batches of product orders every day," says Applegate.

Paladin recently invested in a new Wemhoener membrane press to reduce labor and set-up times. "It's more automated than our current presses, and we'll be able to increase capacity by 100 percent," says Applegate.

Membrane pressing is also going to be turned into a large work cell. "We've purchased two Weeke CNC machines and they'll be located near the membrane pressing work cell," says

Applegate. "All the component parts will be machined on the Weekes and they will pass via conveyor to a panel cleaning device directly into a spray booth."

The panels are now machined MDF components and are sprayed with a heat-activated adhesive. From there, they will move via conveyor to the membrane presses.

According to Bell, the company's shift from CNC contract machining to producing finished components is moving the company forward and positioning it as a strategic partner for its customers. ●



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For more info

Stiles Machinery Inc.
Wemhoener membrane press, Weeke CNC
machining centers
616.698.7500 www.stilesmachinery.com
Fanuc, Robot
248.377.7000 www.fanucrobotics.com
Or visit fdmonline.com