

December 2018

FFJournal[®]

The magazine for today's metal fabricating & forming technologies

www.ffjournal.net

A TREND Publication

PUSH BUTTON

OEM TAKES THE
PLUNGE TO INTRODUCE
Automation TO ITS
PRESS ROOM

TUBE & PIPE

Achieve better-looking bends

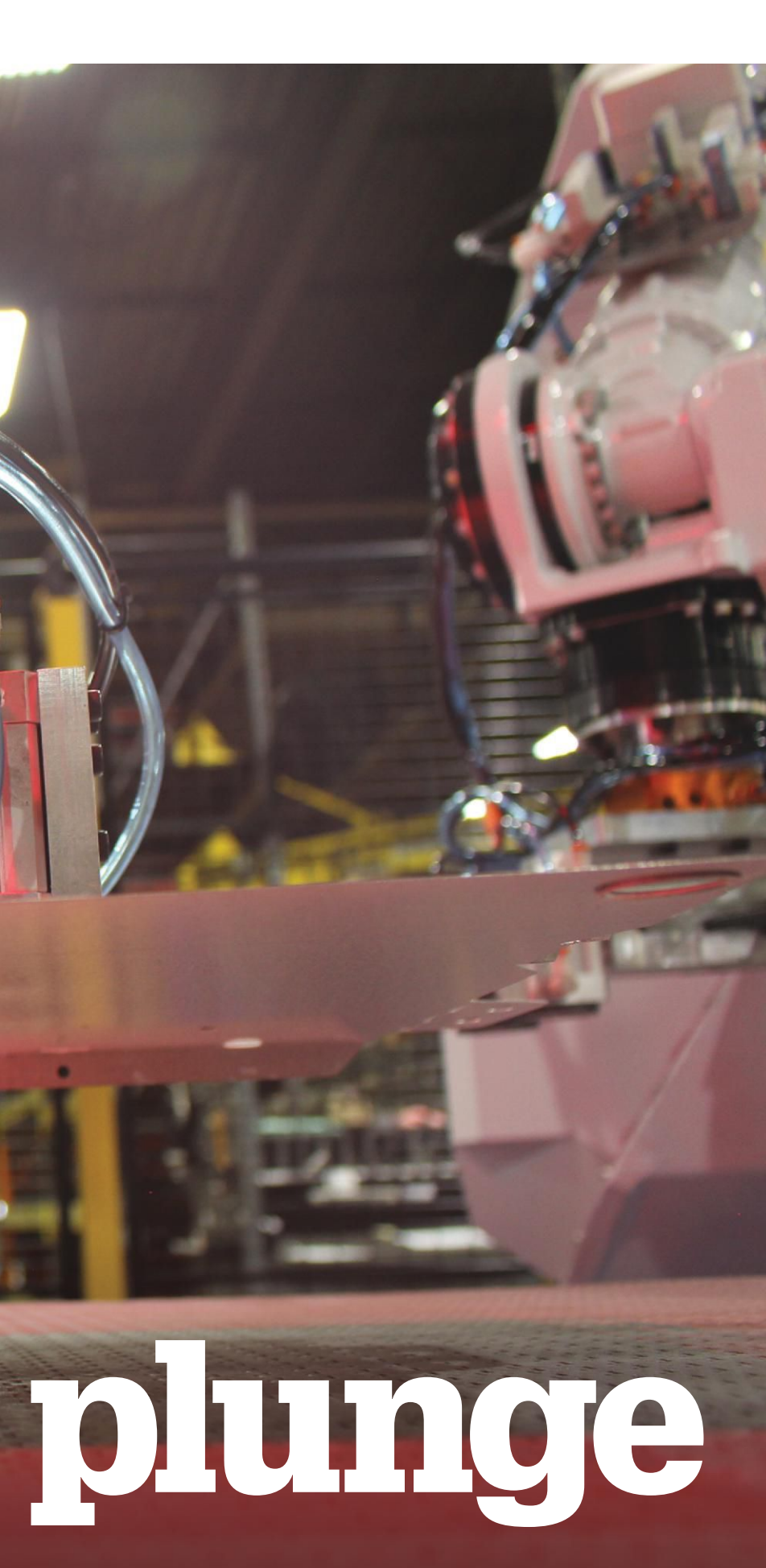
PUNCHING

Tapping tool eliminates
downstream processes





Taking the



Automation

BY LYNN STANLEY, SENIOR EDITOR

In face-off against labor shortage, OEM dives deep to bring automation to its press room

Toes gripping the edge of a 10-meter-tall diving platform, Olympic athletes use physics to cram four-and-a-half flips into 1.5 seconds of fall time before hitting the water at almost 35 miles per hour. Diving is also a mental game. One coach tells his clients to “feel the fear and dive anyhow.”

It’s a strategy Vince Petruzzini, senior manufacturing engineer for Broan-Nu-Tone LLC, can relate to. He says the company’s decision to introduce automation to its press room was akin to “taking a leap from a high dive for the first time.”

The integration of automation in manufacturing spaces has largely been incremental over the last few decades. The Industrial Internet of Things (IIoT) and factors like reshoring and the lack of skilled labor has accelerated its adoption. But when it comes to taking on projects like Broan’s—a stamping line automated from its coil feed to material handling for downstream operations—the press room remained a holdout.

With manufacturing, marketing and sales locations in California, Ohio, Canada, Chile, China and Mexico, Broan designs and manufactures residential ventilation products, customized climate, communications and home automation solutions. The OEM is no stranger to controlling and monitoring production with minimal human interaction.

In 1992 Broan first incorporated automation into the stamping, weld and assembly of its range hood line. Units go from coiled sheet metal cutting to box with just three to five people touching them. “Since then, we’ve introduced pockets of automation to different sections of our sup-

Automation

ply chain,” says Petruzzini. “Last year we established a committee to launch IIoT companywide. Our goal is to have a central dashboard that connects all our equipment and can update personnel at any given moment about what’s happening at each stage of the manufacturing process.”

Trajectory

However, this is the first time Broan attempted to bring automation to its press room, he continues. “It’s not an evolutionary step though. It’s a revolution. You can’t be afraid. You have to jump in with both feet. But you need an integrator that is willing to do that with you.”

The concept for the line was a spin-off from Broan’s IIoT committee sessions and the brain child of Petruzzini. He contacted five machine/process integration experts to explore and validate the idea. An engineering study confirmed that an automated stamping line could form parts at 50 strokes per minute (spm) but dictated Broan change its packaging.

“We use 40 in.-by-40 in. boxes to pack our parts for downstream processes,” Petruzzini says. “They wanted us to change our box size. That was a major issue for us because our factories’ racking, material handling and assembly areas are dedicated to this size.”

That’s when Broan turned to BDC Machinery. The Nekoosa, Wisconsin, distributor provides metalforming and stamping presses, full systems integration, installation, training, service and support. “We went to Rick [Wenzel],” Petruzzini says of BDC Machinery’s president. “We have a history with his company. Any manufacturer entering into this type of venture has to have people they can trust. Management has to commit and be behind you. But you also need someone on the outside, like Rick, who has the knowledge to put it all together.”

The journey, which began in 2016, took 18 months to complete. A Seyi 330-ton SLG straightside link motion crank press was installed in January 2018. The line’s automation component arrived this September.

“Vince asked me if I had a formula,” recalls Wenzel. “I said, ‘Yes. It’s called in-depth analysis.’”



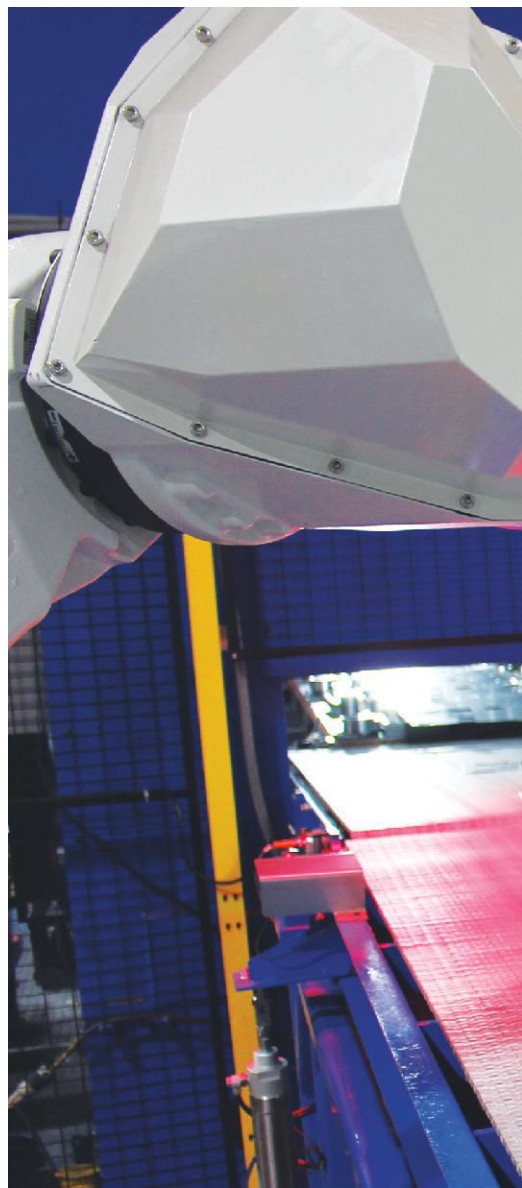
To help bring Petruzzini’s concept to life, BDC collected existing tooling data that included tonnage, physical tool size and minimum stroke length requirements. The distributor also looked at future parts production related to tool design. “Understanding existing tooling and required part volume is critical,” says Wenzel. “Looking to what is next, such as new product designs, also affects tooling and press specifications. Material widths and thicknesses; associated tonnage for each die; forward and reverse load and energy needs contribute intel to press requirements and coil handling and feeding equipment.”

Mechanical and servo-mechanical press manufacturer Seyi-America Inc. built the SLG according to the road map established by BDC Machinery’s analysis. “A servo mechanical press could have worked in this situation but the cost justification was not there,” says Scott Braitto, director of sales for Seyi. “We look at fit, form and function for each customer.”

“We initially considered a servo mechanical press because of its full control slide,” adds Petruzzini, “but found that link motion better suited our needs.”

Momentum

Link motion improves metal flow by modifying slide motion during the working portion of the stroke. “We’re producing components for bathroom and ventilation





The press line gives Broan complete automation from coil to parts bin with the push of a button.

“It’s not an evolutionary step. It’s a revolution. You have to jump in with both feet. But you need an integrator willing to do that with you.”

Vince Petruzzini,
Broan-NuTone LLC



A camera locates parts and feeds the information to two robots that pick and place them in patterns.

fans and range hoods from cold-rolled and galvanized steel in thicknesses ranging from 0.024 in. to 0.03 in.,” Broan’s manager of manufacturing and operations, Jason Rodriguez, explains. “It’s fairly light metal. Forming exerts a lot of tension on these steel plates. Link motion slows the slide at the bottom of the stroke, allowing the metal to relax and avoid [a] tendency to twist. Some parts have flanges that must be bent up. Link motion is perfect for that process.”

In this case, says Wenzel, Broan was able to use the dollars saved by purchasing a traditional link motion press over a servo press and invest it in automation.

Seyi-America worked on the project with EAS Mold & Die Change Systems Inc., Menomonee Falls, Wisconsin, and Dallas Industries, Troy, Michigan.

“We haven’t done a stamping line as integrated and automated as this before,” says Jimmy Pilaczynski, a senior regional sales manager for Seyi.

“Frequent tool changes pointed us in the direction of a quick die-change product,” says Cliff Drake, president of EAS North America. An FD100 magnetic clamping system was installed on the press. It clamps dies in place but also includes pneumatic die lifters and pre-rollers mounted on the bolster to roll the dies in and out of the press. Conventional methods call for loading dies with forklifts and hydraulically, pneumatically or mechanically clamping the perimeter of the die in place.

Air gap sensors and die subplates ensure the magnetic system is in contact with the die when the system is magnetized and that holding pressure is both quick and uniform. “This is not an electromagnet though,” says Drake. “It doesn’t rely on power to maintain magnetization. If power is lost, the die won’t fall.”

Tool loading, material feed

Pre-rollers on the SLG press were set up for Broan’s five-ton dies. “Once the system’s pre-rollers move the die onto the die lifters, the pre-rollers retract, bring the slide down and magnetically clamp the tool into place,” says Drake. “Loading, unloading and clamping the die takes about 2 seconds versus the five or 10 minutes it

Continued on page 28

Automation

Continued from page 25

can take to bolt a die into place. If an operator doesn't have the right tool or bolts, it can take even longer. It's surprising how quickly the minutes add up. We eliminate all that with this type of system."

Wenzel says the subplates, added to Broan's existing tooling, accommodates the magnetic system.

Dallas Industries' ProfileSelect feed control system and powered straightener saved Broan additional production time. The system allows the user to select the best strip motion profile for the specific feed requirement.

"What's different about the Dallas feed-line is that this entire system is automated to the point that passline height, feed roll pressure, entry vertical guides, straightener roll depth settings and brake tension are pre-programmed and recalled by the push of a button," Wenzel notes.

Traditional servo feeds index in a trapezoidal motion profile, based on operator entry of feed length, speed and acceleration. This results in feed speeds that are typically higher than necessary. As a result, feed lengths are completed in less time than the feed window allows. This mismatch results in abrupt strip movement at a higher speed than the application requires. The Profile-Select synchronizes material indexing with the press to use the full available feed window. This smooth or sinusoidal profile minimizes material surface stress.

"We're a slave to the press," says David Laws, Dallas Industries feed sales manager. "It's our master. The width, length and speed of the press dictate changes to our parameters. Job changes can be done in minutes where as before, it might take a good setup guy 15 to 20 minutes to perform the same tasks. If a company has one skilled setup guy, that person can set all the feed-line parameters for the line. Then, all the operator has to do is input the job number and push 'go.' We're seeing a lot more of these purchases because once a job is programmed and run correctly, any operator with basic training can call up the recipe."

Robotics

With an automated feedline and link motion press equipped with magnetic die clamping anchoring the line, C&D Au-

tomated Systems, Allenton, Wisconsin, was called on to automate the material handling component. The automated conveyor system and robotic assembly builder evaluated the line's requirements before constructing a tailored system for the unique application.

Acting as an "eye," a camera finds parts flowing single file at 50 strokes per minute from the press and feeds the information to two robots. One robot takes two parts and places them in a pattern. The other takes two more. The packing robot at the end of the line takes the pattern of parts and layers them in a box.

The different parts the Broan line runs make different patterns. Some with 90-degree flanges. This meant the robots had to be programmed per part run to maximize the efficiency of the operation.

"It's not just about finding skilled labor," says C&D Automated Systems President Cory Passineau. "Very few people can run 100 percent eight hours a day." The line reduces employee safety risks while adhering to quality control measures by picking and packing parts the same way every time.

"Changeover time had to be minimal so end-of-arm tooling didn't change," he continues. "The challenge was enabling the vision system to see each of the parts the line runs. The camera sees parts in pixels. A [grade] 430 stainless part has a different surface from a steel part. Lubricant on a part can make it light up like a ball of fire. You have to compensate for all of those variables so that the camera sees all the parts consistently."

The two robots picking and placing parts were designed to lift 110 lbs. "This may seem like a large robot for parts that only weigh a few pounds each but we needed the robot's reach to be large enough to fill an entire pattern," Passineau says. "The packing robot was equipped to handle a 150 lbs. based on reach requirements, product weight and end of arm tooling."

Broan found the robots could easily accommodate 14 parts from 7 in. by 32 in. to 12 in. by 36 in. without requiring a tool change.

Broan is prepared to incorporate more automation down the road. "We can't find enough people to work in the press room,"





The third robot at the end of the line takes the pattern of parts and layers them in a gaylord bin for downstream operations.



Depending on parts, the line can eat 12,000 lbs. of material in two to four hours and just needs a material handler to remove full boxes and replace them with empty ones.

says Petruzzini. “We had to find a way around that. Our entire business community is starved for employees. Driving past an industrial park on the way home, you see hiring signs posted outside for every company.”

He says that initially, employees were nervous. “There is a fear of automation taking jobs but they have come to understand that our workload is growing. Jason [Rodriguez] has actually added employees and no one has been laid off.”

Broan’s goal is to load up the machine at the end of the second shift. Lack of workers caused the OEM to shut down its third shift. “The line runs faster,” says Rodriguez. “If I need more machining hours I can run this operation lights out until the coil is consumed. Depending on parts, the line can eat 12,000 lbs. of material in two to four hours. The only thing we need is material handling to remove the full boxes and replace them with four empty gaylords [corrugated boxes].”

If Broan decides to add parts to the line it can invest in additional end-of-arm tooling. The line is running at 50 spm. “We were running at 30 spm prior to installation of this operation,” Petruzzini says.

The commissioning phase is allowing Broan to make adjustments. “We have some old habits to break,” he says. “For example, inching the ram down during die setting has been the tried-and-true method for the last 100 years. Now we’re asking die setters to trust magnetic die holding, which eliminates the need for inching because the ram knows where the top of the die is from the last time it ran.

“I see us going further with automation,” he adds. “We’re growing and without automation, I don’t know how we would keep up.”

Broan could be a poster child for manufacturers looking to delve deeper into automation. “Complete automation from coil to parts bin helps manufacturers compensate for the lack of skilled labor available to our workforce, but few shops are taking the plunge,” notes Wenzel. “We see what manufacturers want, what they need—but you see the doubt in their eyes,” observes Pilaczynski. “Is it really going to pay off? The answer is an unequivocal ‘yes.’”

FFJ