Automation in the Forging Industry Speeds Production and Increases Safety

Hazards are ever-present in the steel plant environment, and a heightened awareness and emphasis on safety is a necessary priority for our industry. This monthly column, coordinated by members of the AIST Safety & Health Technology Committee, focuses on procedures and practices to promote a safe working environment for everyone.

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Comments are welcome. If you have questions about this topic or other safety issues, please contact safetyfirst@aist.org. Please include your full name, company name, mailing address and email in all correspondence.

The industrialization of economies around the world owes a debt to forging and the men and women who operate forging equipment. Without the ability to forge steel and other metals over the past century and a half, we would not have had the parts needed to manufacture cars, build aircraft, drill for oil, mine for minerals or lay down rail tracks.

However, as with any process involving manual labor, automation is changing the game. Despite lagging behind many other industries, the forging industry is now increasingly requiring significant automation upgrades for both new equipment and remanufactured/rebuilt models of everything from horizontal forging machines and vertical presses to hammers and solid ball die forgers.

In doing so, tasks that were once performed manually — such as moving heavy steel rods, pipe, and other stock in and out of equipment — are now automated to improve worker safety. Gone are the days when three men would lift a heavy steel rod with a glowing end into, and out of, a horizontal upset forging press.

Today, many of these manual tasks are instead being replaced with the mechanical "hand" of a robot or by integrating servos that can lift, insert and deposit materials. Even tasks such as automated tooling changes can be completed with the push of a button.

Not only does this create a safer environment for forging operators, but productivity is increased. By automating forging operations to perform some of the tasks of a human operator, productivity can increase from several hundred pieces per hour to up to 3,000, depending on the type of products being forged.

According to Ken Copeland, president of Ajax-CECO, the vast majority of project requests today involve some aspect of automation.

"About 90% of the time we talk to customers today, they want equipment that has an automation component," says Copeland.

Ajax-CECO is one of the oldest manufacturers of forging equipment, having begun operations in 1875. In its more than 140 years of history, the company has built and put into production more than 6,000 horizontal and vertical forging presses. In 2005, the company purchased the intellectual property of the Chambersburg Engineering Co. and now manufactures and supports both brands of equipment.

According to Copeland, most of the automation requests from his customers are for control consoles or some type of material handling and conveying equipment to bring the steel into the machine, move it around as needed for heating and forging, then finally deposit the finished item into a bin when completed.

In the most advanced examples, entire forging line "cells" can be created that include sophisticated communications that report production rates and machine performance back to company networks.

This demand, Copeland adds, applies to both new and existing forging equipment.

"It is not uncommon for a customer that has, or acquires, an older model of equipment to send it to us to be rebuilt or remanufactured while adding automation upgrades to it," says Copeland.

Modern Forge Tennessee is one such company. A hot steel forging company that makes motorcycle parts, Modern Forge uses die forgers that date back to the 1980s and weigh

between 20 and 50 tons. The company has more than 7,000 dies in its inventory.

To continue to leverage their investment in their existing equipment, Modern Forge decided to update and upgrade the consoles on its drop hammers to improve performance, given that they run their equipment hard and at very tight tolerances.

"We had some very good hammer units with some very outdated controls," said Wade Ferguson, maintenance manager at Modern Forge. "We knew that if any of the parts in the consoles went down, we would be off-line for a while."

According to Ferguson, Modern Forge of Tennessee will also possibly be installing a robot on its trim press later in 2019 to handle production delays that were impacting the quality of the trim removal.

After observing operators to determine how long it took to trim each part, Modern Forge was able to determine that when operators got tired, the work would slow considerably and they would get behind schedule. When too much time passed between parts, the platters would cool off enough to making trimming difficult.

Now, after the hammer operator completes the forging, the robot will pick up the item and trim it consistently each time.

"Forging companies like us are increasingly considering how we automate our presses to help our operators," says Ferguson. "There is only so much an operator can do. With automation, robots and other motorized devices can move the part through the various stages of the process with more speed, safety and accuracy."

At the Eaton Corp. forging operation in Kearney, Neb., USA, the company operates 26 100- to 1,300-ton forging presses. Eaton produces engine valves and precision gears for the North American automotive industry. The Kearney facility also manufactures precision-forged parts for agriculture, marine, ATVs, automotive and heavy duty.

As part of a two-stage process for creating its engine valves, a round steel slug is formed into an "onion-head" shape using a forging die press. The item is then transferred to a re-strike die where it is formed into the final product.

For many years, the transfer from the first to the second stage of the process was performed manually by an operator at the machine.

Approximately four years ago, Eaton undertook a project to automate so that the operator only needs to push a button and a robotic arm completes the transfer. The upgrade was applied to 15 of the presses that were used specifically to produce the engine valves.

The primary driver for automation was worker safety, according to Randy Kreutzer, lead maintenance manager at Eaton.

"You have a person sitting in front of a press who theoretically could be injured if something went wrong," explains Kreutzer. "Now, we have them out of that scenario. They're still there, but they are behind protective shields and only there in case adjustments need to made."

Kreutzer adds that there was a benefit in increased productivity as well, because it allowed Eaton to run two presses instead of just one.

"We are constantly updating our equipment," says Kreutzer. "The industry is moving past the mentality of having a man or a woman do all the manual labor and instead letting technology take over. That's the drive in the industry right now." ✦

Did You Know?

Material Sciences Corp. Wins PACE Award for MSC Smart Steel®

Material Sciences Corp. (MSC) was named a 2019 *Automotive News* PACE Award winner at an awards ceremony held 8 April 2019 in Detroit, Mich., USA. The award recognizes automotive suppliers for superior innovation, technological advancement and business performance.

MSC was recognized for its MSC Smart Steel®, a new multi-layer steel laminate engineered as a direct substitute for low-carbon steel stamped vehicle body parts. Offering up to a 35% mass save compared with same-thickness standard steel, MSC Smart Steel is produced as a coil, stamped in conventional dies, spot welded with existing equipment and processed through standard electro-coat and paint systems — essentially compatible with existing manufacturing systems. This is the first ever spot-weldable, low-density composite laminate to be used in a body application.

"MSC is proud to be one of the elite thirteen 2019 PACE Award winners," said Matt Murphy, MSC vice president, engineered solutions. "...Smart Steel will make its first appearance in the automotive industry as roof bows on the 2019 Lincoln Aviator. This is a perfect example of how innovative designs and lightweight materials are playing a significant role in delivering competitive vehicles that do not compromise performance."

The 25th annual PACE Awards were presented by *Automotive News* and the Automotive Parts Manufacturers' Association (APMA). Material Sciences Corp. earned a PACE Award following an extensive review by an independent panel of judges including a comprehensive written application and a site visit.