TRANSFORMING AGING FORGING PRESSES INTO HIGH-PERFORMANCE ASSETS

Today's automations improve consistency and increase productivity while reducing operator fatigue and safety risks. (Courtesy: Ajax-CECO-Erie Press)

Strategic upgrades to controls, hydraulics, automation, and monitoring systems enhance productivity, improve reliability, and enable older forging presses to perform with capabilities comparable to newer equipment.

By ETHAN ELLIOTT

Demand for new or modernized forging equipment is rising globally as requirements surge for the forged parts needed to replace depleted stockpiles of items such as artillery shells, tanks, aircraft parts, and other military equipment.

According to the Forging Industry Association, "Forged components are found in virtually every defense implement, from rifle triggers to nuclear submarine drive shafts. Heavy tanks, missiles, armored personnel carriers, shells, and other heavy artillery are common defense-related applications of forged components."

Additional applications in modern military systems include rifle bolts, naval propulsion parts, and structural and engine components used in rockets and aircraft.

To meet this demand, forgers are modernizing existing equipment that in many cases is several decades old.

Modernizing a forging press often involves removing major machine components and repairing or replacing them with OEM parts to restore the equipment to its original manufacturer specifications.

Because the heavy-duty steel frames of many older forging presses remain structurally intact and continue to function after decades of service, modernization of a forging press is a relatively low-cost alternative to purchasing a completely new piece of equipment.

The ability to quickly move into production with upgrades is a major advantage, as opposed to purchasing a brand-new forging press, as the delivery and commissioning of a new press may take up to a year or longer. In addition, many modernization projects can be completed while the forging press remains stationary on site, reducing disruption.

Another benefit of upgrading an existing forging press is increasing its lifespan, enabling the machine to run dependably for many more years. A typical refurbishment will extend the production life of the forging press by 20 to 30 years.

In many cases, modernization can also result in performance improvements nearly equivalent to those obtained with a new machine. Modern digital controls, improved sensors, enhanced automation features, and modern hydraulic systems enable an older forging press to achieve better precision, greater efficiency, and higher reliability than the older configuration.

AUTOMATION AND MATERIAL HANDLING

Automation is now one of the most common features in modernized forging lines. Many older presses relied heavily on manual handling of billets and forged parts, which limits production speed and exposes workers to high-temperature materials.

Today's systems, like ones offered by Ajax-CECO-Erie Press, include automated manipulation systems, robotic billet and part handling systems, and transfer mechanisms that move parts between furnaces and presses. These automations improve consistency and increase productivity while reducing operator fatigue and safety risks.

By automating forging operations to perform some of the tasks of a human operator, productivity can increase from several hundred pieces per hour up to 3,000, depending on the type of products being forged.

MODERN CONTROL SYSTEMS (PLCS AND HMIS)

Another area of modernization for these forging machines is the control system. Many of the older forging presses were manufactured using relay logic or early electronic control systems that are no longer in service.

Control systems now typically include programmable logic controllers (PLCs) and digital operator interfaces that provide diagnostics and alarm reporting to alert operators when problems occur, enabling faster troubleshooting and reducing downtime.

Modern Human-Machine Interfaces (HMIs) provide operators with a graphical control system for monitoring and managing forging equipment. Displayed on touchscreen or computer terminals, HMIs present real-time machine status, alarms, and operating parameters that allow operators to control the press and quickly diagnose problems. Forging presses with advanced HMI capabilities can help operators see equipment performance.

This is accomplished with dynamic animated models and schematics, live trending, and diagrams. For example, operators can quickly "drill down" from a top-level animated schematic to review the performance of specific components, such as valves and pumps, and to locate information on part numbers and wiring schemes.

Even less experienced personnel can look at a well-designed HMI screen, watch the press run, and then learn how it functions. Operators can monitor live press positional and force data as the machine transitions through the production cycle.

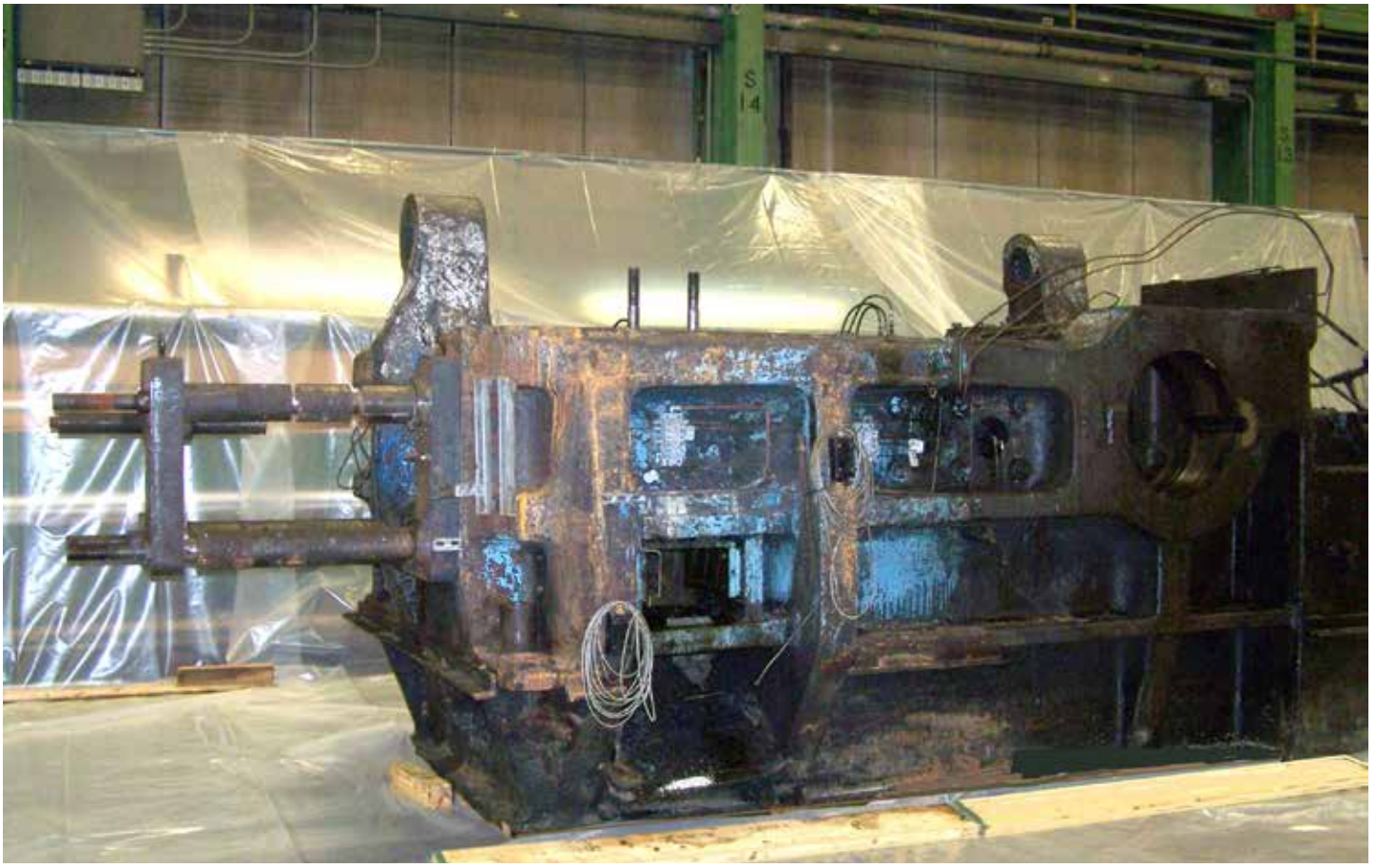
When something is out of sequence or stops abruptly mid-cycle, they can quickly troubleshoot because the HMI provides a graphical window into the machine control system and its processes, identifying problem areas.

With the HMI, operators get access to a library of data sheets that include electrical schematics, hydraulic schematics, and mechanical assembly drawings.

The data sheets are in PDF format, which enables keyword searching within the document. Instead of spending days trying to locate the right technical documentation and reading through data sheets or wiring schematics that can be 100 pages long, the data is searchable and immediately available to operators.

REBUILDING HYDRAULIC SYSTEMS

Typically, a modernization project includes a new pump, servo valves, filters, and a new cooling system. This will provide more precise con-



With rising demand for forged components, manufacturers are looking at what they can do to optimize their existing forging equipment. (Courtesy: Ajax-CECO-Erie Press)

Instead of waiting months for delivery on new high-tonnage presses, many forgers are opting for modernization programs to restore and improve performance of their existing machines. (Courtesy: Ajax-CECO-Erie Press)

trol over hydraulic pressures needed for forging and reduces heat buildup. The servo-hydraulic system can be added to an existing forging press as electronic motion control that regulates hydraulic flow to the cylinder. The closed-loop system allows precise regulation of ram speed, position, and pressure during the stroke, improving performance and reducing wear.

REFURBISHMENT OF RAM AND MECHANICAL COMPONENTS

When a forging press is modernized, its mechanical components are often repaired or rebuilt at the same time because the ram, guide systems, and wear surfaces are subjected to extremely heavy loads during operation. This process may involve reboring the ram guides, replacing wear plates and gibs, repairing structural components, and installing improved lubrication systems.

Sourcing parts from the original OEM can offer advantages compared with having components reverse-engineered and produced by independent machine shops.

Machine shops often do not have access to critical specifications about high wear parts, including the material grade of the steel, the heat-treating process used, and tolerances — all of which were engineered specifically for that piece of equipment.

ADDING SENSORS AND MONITORING EQUIPMENT

Sensors and machine monitoring equipment are also often added as part of forging press upgrades. Sensors that measure hydraulic pres-

Modernizing a forging press often involves removing major machine components and repairing or replacing them with OEM parts to restore the equipment to its original manufacturer specifications. (Courtesy: Ajax-CECO-Erie Press)

sure, oil condition, vibration levels, temperature, and ram position permit the operators and maintenance personnel to continuously monitor the machine from any location.

Using this type of system provides the opportunity for predictive maintenance, giving forgers the ability to detect emerging issues before they result in unplanned downtime.

UPGRADING SAFETY SYSTEMS

A major area of consideration in modernizing forging equipment is safety. Many modernized systems include safety-rated control circuitry, interlock guard systems, emergency stops, and safety sensors such as light curtains or laser scanners to ensure that forging operations meet all current regulatory standards and minimize the risk of injury to employees.

IMPROVING ENERGY EFFICIENCY

There are also opportunities to improve the efficiency of forging equipment, particularly with older hydraulic systems, which tend to be less efficient than newer versions.

Newer forging equipment is often installed with variable frequency drive technology, improved hydraulic pump design, and advanced cooling systems. Together, these technologies result in significant energy savings and enhanced operating efficiency for the machine.

Strategic upgrades to controls, hydraulics, automation, and monitoring systems enhance productivity, improve reliability, and modernize capabilities. (Courtesy: Ajax-CECO-Erie Press)

MODERNIZATION AS THE NEXT STEP FOR FORGING OPERATIONS

With rising demand for forged components from the aerospace and defense industries, and other heavy industry sectors, manufacturers are looking at what they can do to optimize their existing forging equipment.

Instead of waiting months for delivery on new high-tonnage presses, many forgers are opting for modernization programs to restore performance of their existing machines while incorporating the same level of control, monitoring, and reliability that is now standard in most manufacturing environments.

ABOUT THE AUTHOR

Ethan Elliott is a Torrance, California-based technical writer who specializes in industrial technologies. Ajax-CECO-Erie Press is one of the largest forging equipment suppliers in North America. Founded in 1875, and after several acquisitions, Ajax-CECO-Erie Press offers a range of standard mechanical presses along with individually engineered hydraulic presses for nearly any application. These include closed-die and open-die forging, ring preforming, metal forming, cold and carbon extrusion, isothermal forging, composite pressing, and stretch forming. For more information on modernizing forging equipment, go to www.AjaxErie.com.