Metal Forming and Stamping Presses

Improve productivity and safety in forming and stamping applications

This paper takes a closer look at the automation and information solutions available for metal forming and stamping press systems.
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Executive Summary

Press line production runs today are smaller and changeovers are numerous. Manufacturers are demanding flexible systems that help increase productivity and safety. Flexible, agile and smart automation systems are becoming critical differentiators in today’s challenging market.

Machines need to be built to acceptable standards and easily integrate with other equipment in the production line. They also need to reduce energy consumption and increase line efficiency to help meet manufacturers’ sustainability objectives.

Rockwell Automation solutions deliver improved press production capabilities and reduced total cost of ownership for your customers. Whether measured from a business, commercial or technical perspective, Rockwell Automation can improve your performance with solutions and services to lower the Total Cost to Design, Develop, and Deliver™ metal forming and stamping systems to meet your customers’ requirements.

What may start out as an “order-by-order” relationship, can eventually develop into a mutually beneficial business partnership because we strive for a holistic approach that focuses on your machine and business performance. Rockwell Automation will work with you to develop solutions that will give you a competitive advantage throughout your machine’s life cycle.
Introduction

Sheet metal forming remains a strong global industry with significant growth in emerging economies. Growth in the automotive market will drive demand for metal forming equipment. Many existing automotive assembly plant press rooms are due for equipment replacement. Demand will also increase at Tier 1 and Tier 2 automotive suppliers. Electric “servo” stamping press use is increasing versus the traditional mechanical “flywheel” press.

Sheet metal use has slowed in the US and Europe due to a global shift in manufacturing to emerging markets. There has been a dramatic expansion in these markets, with China and India nearing double digit growth for sheet metal material and process equipment. Both countries represent tremendous potential buying power as lifestyles improve. At the same time, Asia region sheet metal feed and stamping press OEMs are becoming global leaders.

Sheet Metal Panels for a Car Body

Sheet metal is a major part of an automobile. There are 40 to 50 major panels required for a typical vehicle and are most often produced by the car manufacturer because they define the geometry and quality of the vehicle.

It takes 150 to 250 die sets to produce these major body panels.

Smaller sheet metal components used in an automobile are typically produced by suppliers.
Stamping Press

A stamping press is a metal working machine tool used to shape or cut metal by deforming it with a die. Some of the key stamping press types are mechanically-driven presses, hydraulically-driven presses and servo-driven presses.

Stamping presses are typically used with auxiliary equipment such as coil stations, straighteners, transfer systems, stackers/de-stackers and slug/chip conveyors. Typically, presses are electronically linked with a controller to an automatic feeder which feeds metal raw material through the die. The raw material is fed into the automatic feeder after it has been unrolled from a coil and put through a straightener.
Mechanically-driven presses are powered by a motor that runs the machine's large flywheel. The press's flywheel works by storing kinetic energy, which is then transferred through the gearing into the press slide. Mechanical presses consist of:

- Motor
- Fly wheel
- Clutch/brake system
- Helical gears
- Connecting rods
- Slide (ram)
- Bolster plate
- Counterbalance system
Challenges

For **the machine builder:**

- Balancing machine performance, safety requirements, and machine cost
- Machines can be shipped anywhere in the world and in any kind of working conditions, so it is critical to provide reliable machines that can be supported globally
- Precise tension control, safe and efficient stamping, reliable press automation
- Machines are built to accepted standards and easily integrate with other equipment
- Machines with easy changeovers and shorter down times that drive a more profitable stamping press operation. Productivity considerations with safety solutions are also critical.
- Repeatability even with variations in material characteristics, with minimized scrap
- Machines that reduce downtime, reduce line inefficiencies and reduce energy consumption to help meet manufacturers’ sustainability objectives
For **the manufacturer**:  

- Quick setup and changeover times - Press lines today have smaller production runs so die and equipment setup and changeover times must be reduced  
- Information-enabled machines that seamlessly integrate with the production line and provide actionable production information for improved decision making (e.g. OEE)  
- Repeatability even with variations in material characteristics, with minimized scrap  
- Quality product and global support - Uptime is the most critical need of press line and ancillary equipment; reliable machines and ability to support with plant personnel is required  
- Consistent control standards and program/drawing revision control  
- Increased equipment utilization and reduced unplanned downtime.  
- Safe machines with maximum productivity  
- Ever increasing production rates and sustainable production  

**Why metal forming automation is so critical**  
With safety standards constantly evolving, manufacturers have a dire need to stay compliant. Increasing productivity, while at the same time providing the best machine safety for the protection of personnel and production equipment, is imperative in today’s global economy.
Proposed Solutions

Rockwell Automation Integrated Architecture™ with Compact GuardLogix™ PAC

Rockwell Automation Integrated Architecture is a powerful system that combines control, motion, networking, visualization, and motor control technologies. The Logix control platform offers scalable, flexible, programmable automation controllers (PACs) with a common control engine and development environment. The Allen-Bradley® Kinetix® servo drives and PowerFlex® AC drives deliver high-performance integrated motion and motor control on EtherNet/IP™, the world’s leading industrial Ethernet network. EtherNet/IP simplifies the integration of the entire system including HMI, PAC, I/O and motion.

Rockwell Automation is the industry leader for integrated safety products and solutions to help improve operator and machine safety. These scaleable safety solutions can control single presses, tandem lines or complete press systems. Ranging from simple relays to integrated safety systems, Rockwell Automotion safety solutions offer maximum control and flexibility to meet business and safety needs.
Pre-engineered Systems
Rockwell Automation offers press control systems, bundled packages, and kits meeting safety-related control standards for clutch/brake mechanical stamping presses. These off-the-shelf solutions include PressGuard™ and Compact PressMaster™ pre-engineered press control systems; ClutchGuard™ solution for clutch brake control; FeederPro™ packages for press feed or cut-to-length applications and STFPro™ for servo transfer press feed systems.

PressGuard Press Control System
- Protected controller memory to meet ANSI/OSHA and CSA safety guidelines.
- Top stop overrun detection, anti-repeat protection, and stop time monitoring.
- Air pressure monitoring and perimeter guard / light curtain monitoring.
- Recipe Management System
- Configurable clutch-brake control with Off, Inch, Single Stroke, and Continuous modes.
- Software for control of lubrication systems, reversing main motor and manual slide adjust.

Development Tools
- Design productivity tools reduce engineering time – Standard and reusable software modules, Add-on-Instructions (AOIs), Motion Analyzer, Sistema Safety Tool, Safety Automation Builder and Safety Functions
- Modular code and HMI screens compliant with industry accepted standards
- Integrated Architecture offers a scalable, multi-discipline Logix platform in a single programming environment
- Engineering expertise and support to help decrease time-to-market
Metal forming Instruction Suite

These instructions assist you in designing a flexible and custom safety system for your equipment. Leverage the Logix technology to scale to the performance demands of your specific press application and production needs. You can use a single GuardLogix® controller or combine with additional Logix processors, 1756 I/O or distributed I/O to meet a wide range of press applications.

These instructions support customizing the following press safety functions:

- Comprehensive mechanical press clutch/brake safety control, accommodating various mechanical and hydraulic clutches
- Perimeter and point of operation safety monitoring and hazard control
- Light curtain muting and muting lamp monitoring
- Die safety gate monitoring and locking control
- Die safety block monitoring
- Enable switch monitoring
- Run station, E-stop, light curtain, and mode selection monitoring and control
- Support for Run Time operation and maintenance functions
- Press feed, loading/unloading, and material handling equipment
- Scrap chute door monitoring and control

10 BG Certified Mechanical Press Application Instructions

- Crankshaft Position Monitor
- Clutch Brake Inch Mode
- Clutch Brake Single Stroke Mode
- Clutch Brake Continuous Mode
- Camshaft Monitor
- Main Valve Control
- Auxiliary Valve Control
- Manual Maintenance Valve Control
- Two Hand Run Station
- 8 Position Mode Selector
Benefits

The Rockwell Automation Integrated Architecture system offers single-source buying to ease design, development and maintenance. With a fully integrated control and information platform that seamlessly connects power and control components to enterprise information systems; the Integrated Architecture system provides actionable, real-time data for improved decision making.

The scalable, multi-discipline Logix platform provides stamping press control with integrated safety that meets global standards. The flexibility of the Logix controllers allow for easy setup and changeover times for stamping press optimization. The Kinetix integrated motion offers improved safety and precise tension control for press automation systems.

With the industry's widest portfolio of integrated safety solutions and products, Rockwell Automation is well positioned to improve operator safety and press machine safety while also improving productivity.
Summary

Rockwell Automation solutions deliver improved production capabilities and reduced total cost of ownership for manufacturers by providing unparalleled functionality, flexibility and scalability. OEMs can respond more quickly to customer or market demands, reduce maintenance costs and downtime and allow their customers to easily access actionable plant and production information for improved management and decision making.

Consider Rockwell Automation for your metal forming applications including:

- Stamping, forging, powder metal compacting, die casting
- Mechanical and hydraulic press controls
- Blanking, straight side, progressive die, and transfer presses
- Fully automated tandem lines
- Motion control for feeders, servo transfers and flying cut-off systems
- Coil feed and blanking lines
- Feeder controls
- Transfer press automation
- Flat metal lines/cut-to-length
- Interpress automation, destackers and stackers
- Perimeter guarding, safety systems and robotic automation

Rockwell Automation OEM Team: Experience at Work

Program / Project Managers

- Experienced project managers
- Co-Manage customer projects
- Develop tools for OEM success

OEM Engagement Team

- Global OEM Technical Consultants (GOTC)
- Senior engineers with extensive field experience
- Focus on machine innovation & technical support
- Training, examples, side-by-side engineering

Segment Business Team

- Industry liaison for your business
- Coordinate among international teams
- Develop strategies for key accounts

Technical Resources Team

- Develop & maintain application library modules for code development
- Facilitate sharing of best practices
- Ensure global consistency of delivery
Customer Case Study

SIMPAC – Solutions In Action

SIMPAC is as one of the leading manufacturers and suppliers of press automotive, electronics, and semiconductor industries in Korea. It ensures quality throughout the entire process that includes press design to fulfill the specifications, soldering, processing, assembly, packaging, delivery, installation and trial-run of the equipment.

SIMPAC’S Double Crank Press MC2 Series is the best equipment designed to increase productivity. This is achieved through various optional devices for operator convenience and an electrical system for safety and operating convenience. To reduce time and costs needed for design, development and delivery of the equipment that meets our customer's needs, SIMPAC selected Rockwell Automation as it's automation partner.

The Rockwell Automation solution includes PowerFlex® 755 Inverter (AC Drive) and ControlLogix® PAC for synchronization feature where EtherNet/IP supports the fast synchronization.

Results of Implementing a Rockwell Automation Solution

Simpler Implementation Of The Transfer Press Function

This is achieved by using PowerFlex® 755 Inverter that uses the Common Industrial Protocol (CIP) which supports main functionality for synchronization among presses through EtherNet/IP.

Increased Productivity And Speed Efficiency For The Entire Press Line

ControlLogix PAC controls the press slide position and speed as well as the entire press line using the PID function block diagram that is included in the basic Option and support synchronization between the presses.

The transfer press line drastically increases productivity in comparison with a conventional non-synchronized press line. Since it reduces the manufacturing labor hours, it helps to increase the profitability of a manufacturer who has press equipment in its production line.
Resources

Call a Rockwell Automation sales office or an authorized distributor today or visit us online at: www.rockwellautomation/solutions/oem