



THE NEXT LEVEL OF PLASTICS PRODUCTION

Blow molding solutions

MOTION CONTROL SOLUTIONS FOR MACHINE PRODUCTIVITY AND PERFORMANCE

Across the globe, blow molding machines are being called upon to manufacture an increasingly complex array of industrial products. To offset rising production costs stemming from these demanding applications, manufacturers turn toward machines that can deliver higher accuracy, greater cost efficiencies and maximum flexibility. In fact, there has never been a greater need to deliver improved performance and reliability in blow molding machine design.

For decades, Moog has been at the forefront of high performance motion control technologies for hydraulic blow molding machines.

Today, as technology shifts toward electric motion control, Moog engineers help machine builders solve the trade-off between force requirements and axis velocity on high-tonnage machines, as well as reducing noise, delivering a cleaner operation, lowering energy costs, maximizing clamp force and minimizing required floor space.

Our deep expertise in motion control solutions, familiarity with specialized blow molding applications and worldwide presence make us the ideal partner to solve your toughest challenges in this demanding industry.

HIGH PERFORMANCE SOLUTIONS AND BLOW MOLDING EXPERTISE FOR YOUR KEY CHALLENGES

Throughout the plastics industry, Moog experts work proactively with customers who demand high performance hydraulic and electric solutions for their machines. We understand the challenges you face in today's competitive business environment and can help you increase productivity and improve reliability for large blow molding machines.

Here are a few ways Moog motion control solutions can benefit your machines:

Improve performance

The key to productivity is the development of high-speed machines that run reliably and provide maximum power. For example, Moog developed an innovative electric non-linear drive mechanism that allowed the mold carriage to move faster (up to 600 ms per 550 mm [21.65 in] stroke) for substantially higher output.

Reduce operating costs

Smarter engineering and high performance operation helps reduce maintenance expenses and lower operating costs.

Meet stringent requirements for cleaner, quieter operation

As regulations become increasingly restrictive, our solutions help your machines meet the new rules. And our electric-based solutions deliver environmentally superior operation with no oil contamination—ideal for pharmaceutical and food packaging industries.

Reduce energy consumption

Moog's electric solutions, for example, help machines consume up to 30% less energy than competitive hydraulic machines.

Produce higher quality, more repeatable parts

Today, end users are continually searching for the edge in product quality, from plastic bottles that utilize 30% less material to complex package designs. Moog high precision motion control ensures uniform wall thickness and guarantees all parts meet quality specifications.

Save valuable floor space

The compact design of our electric solutions means customers can increase the number of machines at work at any given time.

Ensure safe operation

Built-in safety features including failsafe and slow set-up mode reduce unplanned downtime and foster operator safety.

Facilitate future blow molding machine technologies

High performance engineering means you'll always be ready for the next advance in machine technology.

Moog is committed to helping you exceed your performance expectations and take your machine designs to a higher level of productivity.

RAISING PRODUCTIVITY, LOWERING COSTS

A leading machine builder's blow molding machines are used to make everything from vessels to toys to car gasoline tanks. To offset rising production costs from ever-more demanding applications, its customers need blow molding machines of even higher accuracy, efficiency and flexibility.

The request

More accurate parison thickness control for highest product quality and lower production cost, plus new ways to solve the challenge of accurate positioning under high-speed motion.

The solution

Moog's complete system of high-response servo valves, the machine controller and an advanced man machine interface (MMI) overcame the technical challenges. The highly accurate multi-axial control system yields faster and more stable closed-



loop mold movement speed. The hardware/software design of the machine controller provides control of cover wall thickness, weight, temperature, motion and other measured values. To address upgrading requirements, the controller integrates intelligent temperature control, closed-loop motion control, a dedicated wall thickness control and a servo valve current drive.

The result

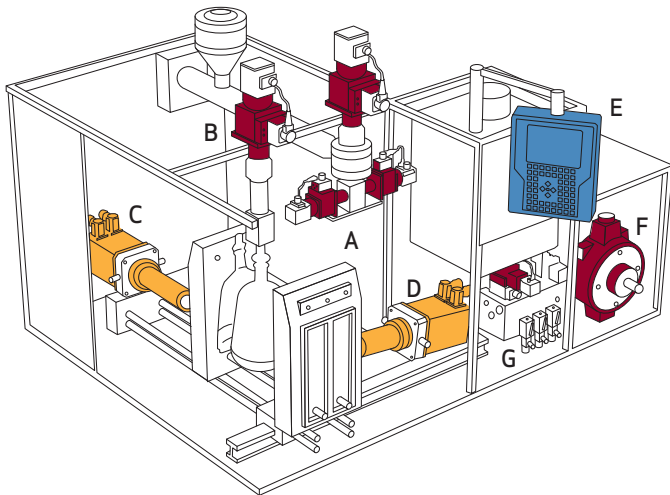
Moog's solution raises productivity and quality, while reducing raw material consumption and labor cost. Even at high speeds, it enables accurate closed-loop operations for all movements. This greatly enhances product molding accuracy and stability, shortens the required cooling time, and raises productivity.

SPECIALIZED MOTION CONTROL SOLUTIONS FOR ELECTRIC AND HYDRAULIC MACHINES

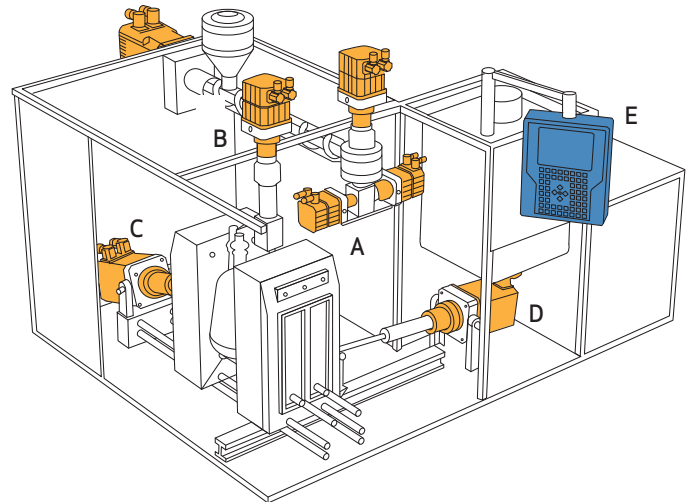
Moog is known globally as a market leader in advanced motion control for blow molding applications, providing a wide array of world-class hydraulic and electric products and systems for your most challenging blow molding applications. Our hydraulic servo and proportional valves and actuators,

parison controllers and motion controllers are specially adapted to the needs of high performance blow molding machines. But we also provide something more: Collaborative expertise that is focused on delivering a unique solution precisely tailored to your needs.

HYDRAULIC SYSTEMS



ELECTRIC SYSTEMS



- Motion Control Systems
- Hydraulic Motion Systems
- Electric Motion Systems

- A Wall thickness control
- B Blowpin
- C Mold closing
- D Carriage
- E Machine controller
- F Radial piston pump
- G Hydraulic manifolds

- A Wall thickness control
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- E Machine controller

As a longtime leader in hydraulic blow molding technology, Moog offers high performance motion control solutions designed for demanding applications including large machines, high tool cavitations and high-speed packaging. Our focus is on reliability, compliance with high quality standards, and reduction of manufacturing and process costs.

Moog's hydraulic products include actuators, servo valves, proportional valves, radial piston pumps and machine controllers designed for machine functions such as parison control, blowpin, mold closing and carriage.

Moog is on the forefront of rapidly-emerging electric design and technologies. Our electric systems include actuators, servo motors and servo drives, and machine controllers. These components are used for parison control, blowpin, mold closing and carriage functions. We also have dedicated engineering resources focused specifically on developing new and better building blocks for electric solutions.

Our extensive application expertise and ability to tailor solutions to specific technical requirements are the keys to a successful transition to electric technology. Energy savings, high reliability, cleaner operation and lower maintenance costs are just a few of the benefits of this transition.

Below is an overview of the products and solutions that Moog provides for the various functions of blow molding machines.

| MACHINE FUNCTION | MOOG PRODUCT/SOLUTION OFFERING |
|----------------------|---|
| Machine control | Machine controllers |
| Shuttle | Electric actuators, servo valves |
| Clamping | Electric actuators, servo valves |
| Extruder (nodding) | Servo motors, servo drives, servo valves |
| Parison control | Modular parison controllers, electric actuators, servo motors, servo drives |
| Blow pin | Electric actuators, servo motors, servo drives |
| Hydraulic power pack | Radial piston pumps (RKP) |

ACTUATORS

Moog offers both hydraulic and electric actuator designs for parison control and other blow molding machine functions.

Our electric actuators are a reliable, compact and energy efficient solution that offers flexibility for your unique requirements. Moog's Flexible Electric Linear Servo Actuator design offers the convenience of a variety of configurations (ball and roller screw), versions (in-line and foldback), mounting options and performance dynamics (strokes and peak forces).



Moog Hydraulic Actuators are compact, rugged and highly dynamic for precise control of position, velocity or force. All actuators can be fitted with different types of transducers and/or servo valves. Our solution has an anti-rotation feature that allows it to be used with non-circular dies and die plates to ensure their relative position remains unchanged.



MACHINE CONTROLLERS

Moog Parison Blow Molding Machine Controller Package

Moog's Parison Controller provides improved part quality, higher production rates and increased profits. In addition, the 4 Channel 400 Point Modular Parison Controller offers control for multiple heads and more points, with reduced material consumption and scrap. The controller's modular concept, and customizable software and hardware architecture make it simple to install and operate.



Machine Controller (MC600)

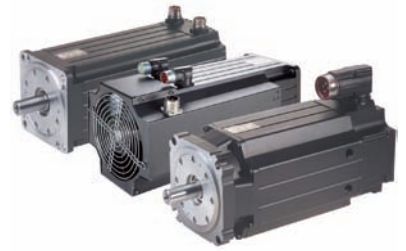
The MC Series 600 series includes a CPU, I/O and communications modules, as well as local and PC-based HMI units. The multitasking Linux-based real-time operating system offers fast reaction and reduced cycle times for efficiency

and productivity. The hardware is complemented by the Moog Application Software Suite, a powerful yet easy-to-use tool for developing application programs based on CoDeSys, the proven IEC 61131-3 compliant programming system. Analog 16 bit I/O resolution offers greater precision positioning and higher accuracy. Combining flexibility with ease of use, these modular controllers are simple to configure and perfectly adapt to applications of all sizes.



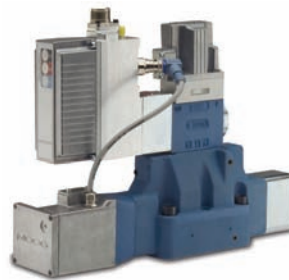
SERVO MOTORS

Moog Servo Motors are built to provide the exact torque, speed and power your application requires. Our products deliver the highest dynamics and reliability, smooth low-speed performance, simple installation, and characteristics matched to optimize the performance of your machine.



SERVO VALVES AND PROPORTIONAL VALVES

When Bill Moog invented the first commercially viable servo valve, his name became synonymous with high performance, versatility and reliability. A critical component in advanced motion control, Moog Servo Valves are optimized for blow molding applications. The technology converts electrical command signals to directional power, enabling movements measured in a millionth of an inch.



RADIAL PISTON PUMPS

Moog Radial Piston Pumps, or RKP, are high performance variable displacement pumps for diverse applications. The RKP is the ideal solution for applications requiring robust performance, low noise, contamination-resistant design and unsurpassed reliability. They are available in various sizes, single and multiple configurations, and a wide array of control options and mounting flanges. Designed to meet the needs of performance-driven machine builders, Moog's RKP units combine innovative technologies with functionality suited to demanding applications.



MODULAR MULTI-AXIS PROGRAMMABLE MOTION CONTROL SERVO DRIVE (MSD)

The Moog Modular Multi-Axis Programmable Motion Control Servo Drive, also known as MSD, is a new generation of servo drives that provides the highest levels of dynamic response, smooth performance and application versatility. MSD includes modular servo drives powered by a shared power supply and a motion controller to coordinate motion across multiple axes. It reduces cycle times, provides precise motion control for higher accuracy and is available with optional algorithms for mold protection and field weakening to extend motor performance.



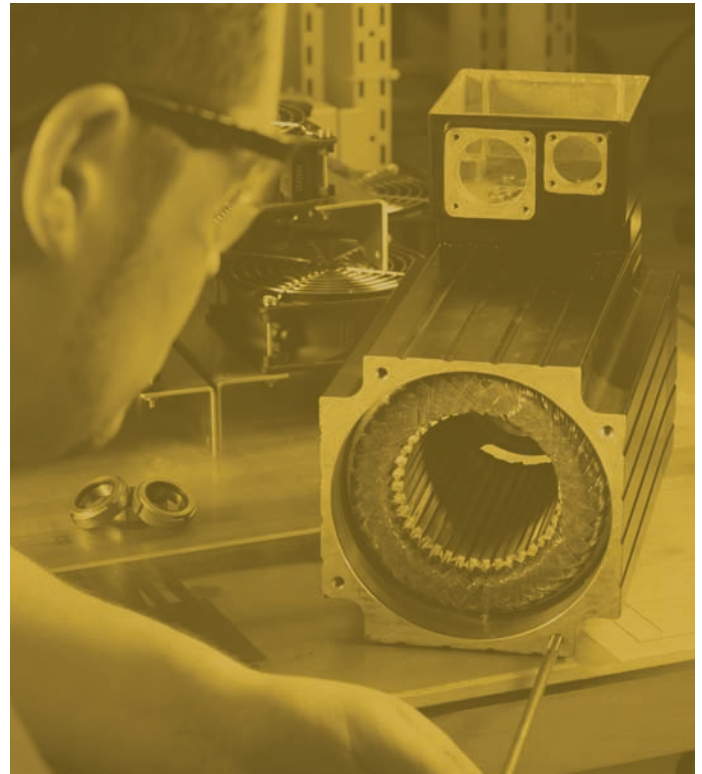
TOTAL SUPPORT FOR YOUR CRITICAL MACHINE NEEDS

Whether you are developing a new generation machine or need ideas and support for a retrofit, Moog is here to help you find the best electric or hydraulic solution.

Our trained engineers, based in more than 25 countries around the world, bring a dynamic and collaborative approach to helping you solve your engineering challenges. Rather than starting with a product, we start with a thorough understanding of your application, your technical needs, and your overall objectives. By focusing on your specific requirements, we are able to provide high performance solutions that realize your machine's potential.

Our commitment to you goes beyond the initial collaboration. In fact, Moog Global Support™ is as reliable and flexible as our products. Our service technicians worldwide ensure timely and precise repair of your Moog components should service be required. And we can tailor a maintenance program that is ideal for your particular needs.

Contact your nearest Moog representative to see how our world-class solutions, technical expertise and proactive support can help you design and deliver better machines today.



POWER, SPEED AND PERFORMANCE IN ONE MACHINE

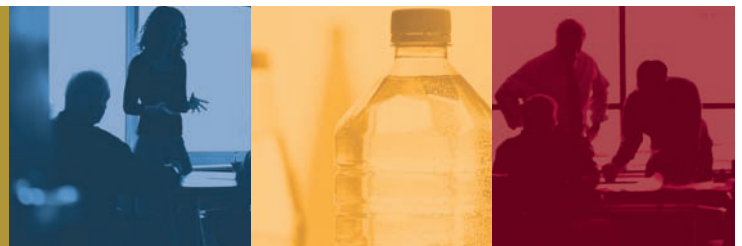
When a leading European machine builder wanted to offer larger blow molding machines capable of high speed and high power, Moog stepped forward with key suggestions for improving performance.

The request

Achieving the required forces and axis velocities on a high tonnage machine demanded a high performance electric solution with low noise, reduced energy cost, high reliability, clean operation, maximum clamp force and a small footprint.

The solution

Moog developed a solution featuring customized electric actuators with nonlinear drive mechanism, enabling carriage speeds up to 600 ms per 550 mm (21.65 in) stroke and clamping



force up to 30 tons. The application-specific actuators deliver precise and dynamic blow pin and parison control. Integrated software provides drive intelligence to improve machine precision and output. A Moog Servo Drive with high processing power and customized system software ensures safety, speed and precision at all stages. Plus, the flexible Moog Machine Controller with integrated user display station affords easy and quick adjustments of settings during installation and operation.

The result

Thanks to Moog's solutions that enable power and speed, electric blow molding machines for more than 30 tons are now a reality.

TAKE A CLOSER LOOK.

Moog solutions for blow molding are only a click away. Visit our worldwide Web site for more information and the Moog facility nearest you.

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