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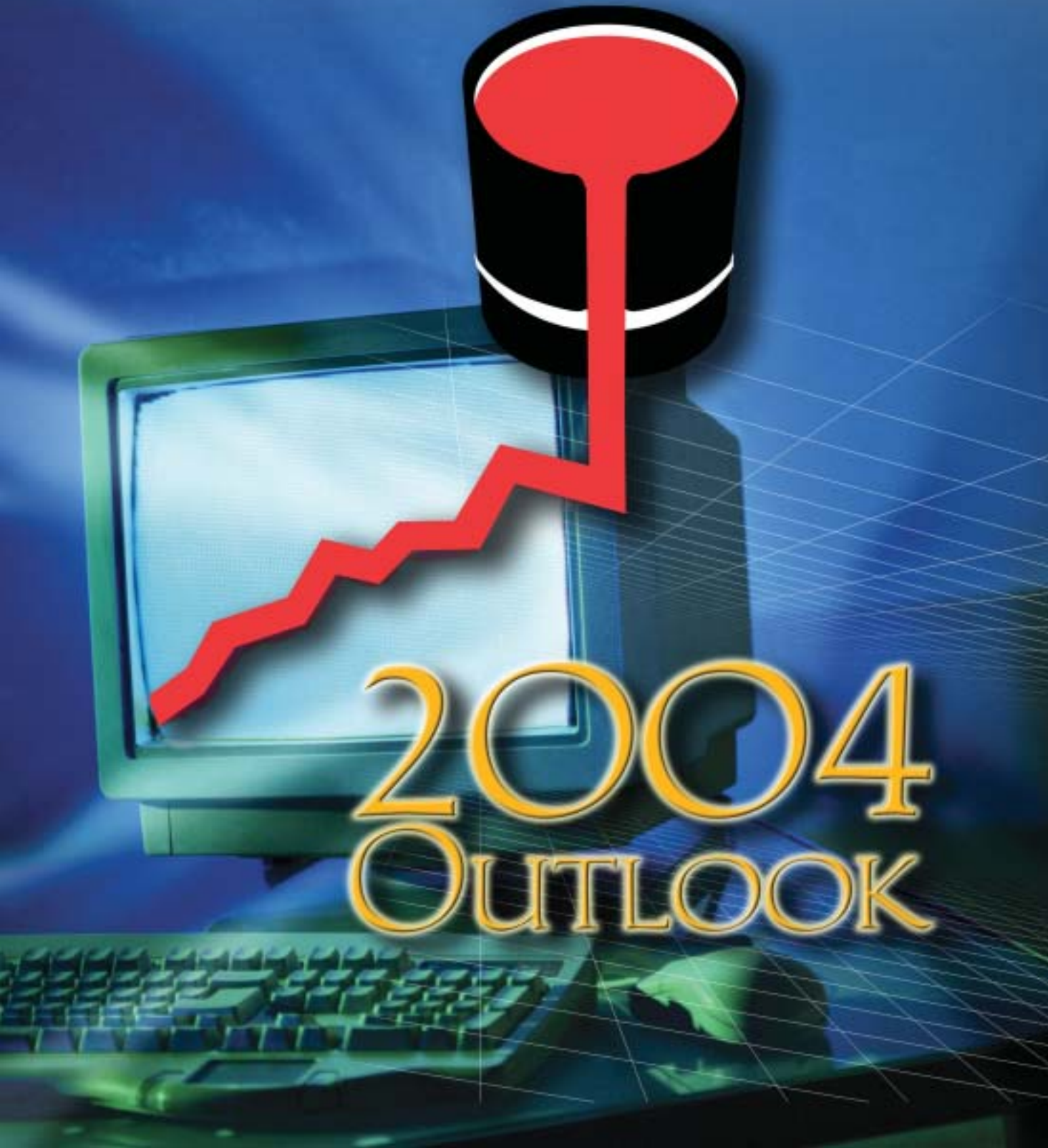
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DECEMBER 2003

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2004 OUTLOOK

Hydraulics Improve Molding Machine Productivity

How a custom-designed hydraulic system added to the second generation design of a B&P Matchblomatic machine helped a Pennsylvania foundry produce up to 180 molds per hour.

In June 2003, a Pennsylvania foundry became the first to install a BSM2016G Series Matchblomatic, an automatic matchplate molding machine manufactured by Beardsley & Piper, LLC, which produces ready-to-pour flaskless green sand molds.

The foundry is a full-service, ISO 9002-certified medium- to high-volume facility that produces ferrous and nonferrous castings. Castings range from ½ lb. to 100 lbs. and are produced by using automatic molding and core-making operations. Some of the industries the foundry supplies include railroad, automotive, agricultural, mining, electrical,



B&P's matchplate molding machine produces flaskless green sand molds that are ready to pour. The matchplate machine uses a blow-squeeze molding method to make uniform molds.

hardware, tools, fittings and couplings, ornamental, material handling, machinery parts and valve bodies.

The first generation Matchblomatic used a blow squeeze molding to produce molds. Now, the second generation BSM2016G, using more sophisticated hydraulics and controls, has gotten faster. It produces up to 180 precision molds per hour.

Employing a simplified design developed through the efforts of Flodyne/Hydradyne, Inc. and the Industrial Hydraulics business unit of Bosch Rexroth Corporation, the machine reportedly offers the productivity of three to five jolt-squeeze molders and requires little more space than a single jolt-squeeze machine.

Flodyne/Hydradyne, Hanover Park, IL, is a Rexroth hydraulic system distributor, designer, and integrator that had worked with B&P before. According to Boris Shiller, B&P's engineering manager, "Flodyne/Hydradyne has been the biggest contributor to the success of the new model in terms of the hydraulics implementation. This, coupled with the Rexroth products, offered the solutions to meet our requirements.

Hydraulic Package Includes Custom Power Unit

According to Shiller, the new molding machine series features a semi-enclosed design, independently variable cope and drag height, an updated Rexroth proportional control system, quick-change pattern features, automatically adjustable blow pressure, larger volume sand magazine, a butterfly valve sand gate, an automatic spray pattern, and a fully updated control and operator interface scheme.

The 80-gallon hydraulic package, designed and built by Flodyne/Hydradyne, includes a custom hydraulic power unit that incorporates a Rexroth 42 gpm maximum horsepower-limiting pump driven by a 30 hp electric motor. The high-pressure portion of the duty cycle is 3000 psi.

"The horsepower limiter greatly reduced the size of the electric motor, while also allowing for a low-pressure standby mode for the machine," says Mike



The matchplate molding machine features an 80 gallon hydraulic package with a custom hydraulic power unit. This unit incorporates a Rexroth 42 gpm maximum high-performance, horsepower-limiting pump driven by a 30 hp electric motor.

Gluchman of Flodyne/Hydradyne Inc. "This pump was selected for its high efficiency, low noise, and reliability."

Also included were three loose valve assemblies, which incorporated Rexroth proportional valves. The selection of these components was based on the recommendations of Flodyne/Hydradyne and Bosch Rexroth, which thoroughly reviewed B&P's design and performance requirements.

Controls and Programmability

By incorporating a Rexroth HNC 100 Series 2X digital servo drive, B&P was able to rapidly, precisely, and smoothly synchronize position, while at the same time smoothly transition to the force control mode on the cope and table actuators during the squeeze portion of the cycle. The HNC 100 is a programmable, bus-capable NC control for electromechanical and electrohydraulic drives.

TABLE — BSM2016G Specifications

BSM-2016G2	U.S.	Metric
Max. mold size at parting*	20 in. x 16 in.	508 mm x 406 mm
Cope mold height - variable	Minimum 5 in. Maximum 8 in.	127 mm 203 mm
Drag mold height - variable	Minimum 5 in. Maximum 8 in.	127 mm 203 mm
Flask taper	4°	4°
Squeeze force - maximum	120 psi	8.437 kg/cm2
Approx. overall height	11 ft.	3,353 mm
Approx. overall width	9 ft. 6 in.	2,895 mm
Approx. overall depth	7 ft. 1 in.	2,159 mm
Mold discharge height**	3 ft. 9 in.	1,143 mm
Approx. weight	18,000 lbs.	8,165 kg
Cycle time without core setting***	20 sec.	20 sec.

* Flaskless mold. ** Floor to tabletop. *** With core setting, add time required to set cores.

Due to open- and closed-loop control algorithms specifically tailored to the special characteristics of hydraulics, optimum performance of electrohydraulic drives can be achieved. The customer can program the sequence via a PC. The NC programming provides greater flexibility of the HNC, and it can complement existing user know-how with its common platform.

As a standard, each HNC 100 features a local CAN-bus, which can be used to link the individual drives for general data ex-


change or for implementing synchronization controls, resulting in a scalable automation concept using modular principles. The system can also communicate with higher-level controls via Profibus-DP, INTERBUS-S, and CANopen field-buses, and is available with a SERCOS interface, the most common communication system for electric drives.

Decreased Cycle Time

The implementation of the HNC 100 also produces a significantly faster, more controlled squeeze, which decreases the cycle time of the machine and increases its output. It also eliminates mold pattern breakout by closely matching both cope and table squeeze forces and providing a menu-based automatic adjustment of pressures, forces, and hydraulic actuator velocities and positions for various patterns. This automatic setup com-

pletely eliminated the need for the operator to manually adjust the machine, resulting in a quicker, more repeatable parameter changeover.

The B&P machines also use Rexroth's DMX-1X digital servo drive on the drag flask, which provides exceptionally fine control of position, while also allowing a bumpless force override on the position of the drag flask hydraulic actuator during squeeze. The DMX-1X optimizes the hydraulic axis for analog position, pressure, or force

control. All card settings can be accessed with the onboard pushbuttons and a digital display, and the end user can perform application configuration and commissioning. This includes the correct mechanical, hydraulic, and electrical installation. 

Throwing Sand

In 1914, Elmer Beardsley and Walter Piper conceived the idea of mechanically throwing sand - an idea that revolutionized the foundry industry. In the years that followed, Beardsley and Piper became the inventors and eventual builders of Sandslingers, which helped change large mold making from a laborious, backbreaking operation into an efficient mechanized process.

Today, Beardsley and Piper is a part of the Simpson Group owned by the Simpson Technologies Corporation, Aurora, IL. Traditionally fierce competitors, Simpson technologies and B&P, have combined their resources to promote innovation and technological change within the foundry industry.



A rear view of the machine.