

Issue 6, December 2004

[Unique Hybrid Solution](#) | [Did You Know?](#) | [Hot Websites](#) | [Product Spotlight](#) | [Ask the Expert](#)

Newsletter and Website Update

Moog is pleased to announce some new efforts to make our newsletter easier for customers to read and use. Copies of the newsletter are now available at the [Industrial News Archive](#) in Adobe Acrobat (.pdf) format for easy downloading and printing.

In addition, the Moog newsletter will now be available in Chinese, Japanese, and Korean languages. Please visit our website to [sign up](#), contact your Moog representative or e-mail marketing.industrial@moog.com to receive copies in your preferred language. Please be sure to designate which language you prefer.

To make it easier to navigate our website, we have created a [new homepage](#) and some exciting new features. Our homepage, dealing with all industrial products, applications and news can now be found at www.moog.com/industrial.

We also have created a new portion of the website where our literature (e.g. brochures, manuals, installation instructions) can be found in multiple languages. Visit www.moog.com/literature often, as our website is the central place for our most up-to-date product, application, and technical information. Also available is a new CD-ROM that contains multilingual literature for current products. Contact your local Moog representative to obtain copies or visit www.moog.com/worldwide to find the location nearest you.

Unique Hybrid Solution For Injection Molding

Feature Article

A Unique Hybrid Solution

Moog is participating in a landmark project with Ube Machinery Corporation to develop an injection molding machine, which incorporates Moog's new PowerShot™ Injection System technology. The PowerShot Injection System is a sealed, closed-loop actuator that combines electrical and hydraulic technology in an energy efficient assembly, which requires no external power unit. This unit is ideal for demanding injection control applications that require high speed and/or high forces on medium and large tonnage plastic machinery, while providing superior closed-loop injection control. It provides the best of both hydraulic and electric technologies by offering the high power, high speed, and accuracy commonly found with hydraulic technology, as well as the low energy consumption, clean environment, low maintenance costs, and modular flexibility of electric technology. As the PowerShot is a new, revolutionary design, the close collaboration between Moog and Ube was critical to the successful implementation of this innovation.

Background of the Ube Machinery Corporation

The Ube Machinery Corporation, based in Ube City in Yamaguchi prefecture, is one of the leading machinery manufacturers in Japan. Ube is a global leader in the manufacture of large injection molding machines, which are greater than 1,000 tons, and use both hydraulic and electric technologies. Ube has made some of the largest injection molding machines in the world, and has been a customer of Moog for a number of years for high performance servovalves.

The Customer's Requirement

Ube is always working in the forefront of technology by working with new customers and advanced materials to continue to make larger, faster, and more efficient machines. About three years ago a global engineering company based in Japan came to Ube with a request for a new machine. This machine was to use a new kind of plastic that had very different properties from conventional plastics and required a performance level that was not possible using a machine based on all-electric technology. The machine needed to be much faster and much more compact than conventional hydraulic machines. For example, the machine needed to reach injection velocities of 800 mm/sec, [31.5 in/sec] and a torque of 3000 N-m [2212 lb-ft].

When Ube came to Moog with this requirement our engineers introduced them to the newly patented, revolutionary technology called the PowerShot Injection System. The PowerShot is a hybrid technology combining the best features and advantages of hydraulic and electric technologies that is ideally designed for large injection molding machines that need high power and energy efficiency. Ube understood that this technology was unique, and it was almost the only way to meet the demanding specifications given to them by the customer.

The PowerShot™ Injection System

Over the past two years, Moog has worked very closely in partnership with Ube to design and manufacture the machine that has incorporated the PowerShot technology. The system was installed on the machine, and tested in a confidential test bed at Ube before it was shipped to the customer.

The PowerShot system has helped Ube to reduce power consumption, noise level, oil volume, maintenance requirements and reduce the machine footprint, while meeting extremely difficult operating conditions. This project is the first project of its kind in the world.

Moog is one of the few companies in the world that has the capability to take on these challenges from customers like Ube. A team from Moog recently visited Ube to continue these discussions. Ube is also considering incorporating Moog's PowerShift Actuator System technology into their machines which have 2,500-4,000 tons of clamping force, which will give them further advantages by improving machine cycle time and energy efficiency.



PowerShot™ Injection System

See Appendix A, page 3.

Appendix A

What is the PowerShot™ Injection System?



PowerShot™ on a typical injection molding machine

Applications

Medium and High Tonnage Injection and Blow Molding Machines

Brief Description

The PowerShot Injection System uses a Moog Servo Controller (MSC), combined with a Moog Servovalve to offer superior closed-loop velocity, pressure, and position control due to the high accuracy of analog in- and outputs, fast digital and sensor interface, and high valve dynamics. The software is easily configured, giving the customer superior shot-to-shot repeatability. The system is accumulator driven, and therefore, capable of high injection rates.

An RKP Radial Piston Pump is combined with a Servo-Proportional Control Valve to ensure precise closed-loop control of backpressure, while recharging the accumulators for the next cycle. This system is capable of backpressure control down to very low pressures. This compact package is installed with just a few connections to the customer's machine, offering plug and play convenience.

Integrated Moog Components

The PowerShot integrated solution uses Moog-designed and built electric and hydraulic components such as Servo-Proportional Valves, servomotors, servocartridge valves, control systems, integrated hydraulic manifold systems and the RKP radial piston pump. The PowerShot System uses the MSC (Moog Servo Controller) System to interface with the customer's controller through a fieldbus.

Technical Objectives of PowerShot Development

- Develop a high-power, high-speed sealed closed-loop system for injection control.
- Combine electric and hydraulic technologies in an energy-efficient package.
- Create a system that is compact, modular, and scalable to a wide variety of machine sizes.
- Easy installation with few connection points to the machine.
- Ease of operation and field maintenance.
- Maintain or improve upon the existing machine performance.
 - Better machine repeatability
 - Improved process control
- Reduce fabrication and assembly time of the injection portion of the machine as compared to an all-hydraulic injection unit.
- Smaller machine footprint due to elimination of large hydraulic power unit and reservoir to provide additional space for auxiliary equipment
- Cost savings and greater productivity for customers
 - Savings on energy
 - Shorter cycle time
 - Higher part quality and lower scrap loss
 - Parallel movement vs. sequential
 - Easy and time-saving user installation
 - Reduced direct material cost due to smaller screw diameter for same shot size
 - Lower audible noise eliminates need for costly noise reduction package
 - Lower annual fluid replacement cost
 - Longer service life with lower maintenance costs and more uptime

About the Authors:

David Geiger is a mechanical engineer who holds four patents in Plastic Machinery and Hybrid Actuation. He has 12 years experience as an Engineer/Engineering Manager in the plastics machinery industry with Husky and Engel and has an added 5 years experience with Moog as Systems Engineering Manager in the motion control industry.

Kenneth Kauppila is a mechanical engineer, who has over 13 years experience as an Engineer in the plastics machinery industry with companies such as Engel machinery. He has an added 3-1/2 years experience with Moog as a Senior Project Engineer in the Industrial Systems group.

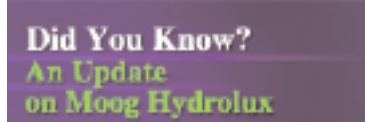
See Also:

- [PowerShot Injection Sytem](#)
- [Literature Download](#)
- [Plastics Applications](#)
- [Published Articles](#)

Did You Know?

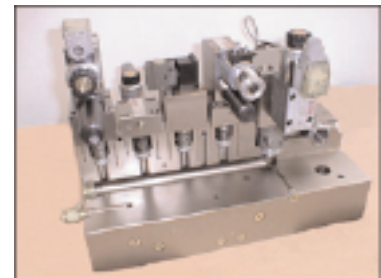
Moog Hydrolux: Moog Site in the Heart of Luxembourg

Specializing in Applications, Integrated Hydraulic Manifold Systems, Cartridge Valve Technology, and Pilot Valves



With 35 years of history in the field, cartridge valves (also known as 2/2-way logic valves, or slip-in elements) have a proven role in hydraulic applications. Some advantages commonly recognized over other technological solutions are compact design, quick response and tight sealing. Compared to subplate-mounted valves, cartridge valves are available in bigger sizes having much greater flow capacities.

Moog Hydrolux has developed vast experience with this product line, helping customers to find solutions on a variety of applications. Innovations have continued to improve this product and offer even greater functionality. For example, the open/close functionality is today state-of-the-art. Through creativity, excellence in design and manufacturing, and extensive field experience, Moog has developed a product range of cartridge families that incorporate the most modern control techniques.



Moog Integrated Hydraulic Manifold Systems

Moog acquired the well-known company Hydrolux in 1998, to provide even better hydraulic motion control expertise to customers. Cartridge valve technology continues to be a focus of product development and process optimization. By combining Moog's high performance servo and proportional valve products with integrated hydraulic manifold systems it is possible to provide leading OEM's worldwide with the best control solutions from components to systems. In addition, a range of products is available from small to large power.

Cartridge Valve Technology

Today, Moog Hydrolux provides cartridge technology with many related components such as covers and pilot valves (e.g. directional, check, and pressure functions). The product range includes:

- Standard Cartridge Valves (DIN)*
- High Flow Cartridge Valves (DIN) with 35% to 50% more flow than Standard Cartridge at the same pressure drop
- Active Cartridge Valves (DIN)
- Monitored Cartridge Valves (DIN) for Press Safety
- Servocartridge Valves (DIN and Hydrolux standard)

**DIN designates a 2/2-way cartridge valve according to DIN 24342 or ISO7368.*

Cartridge Valve Family of Products

Sizes for all of these products range from NG10 to NG160 with flow ranges at 5 bar [72 psi] pressure drop from 70 lpm [18.5 gpm] NG10 up to 20,000 lpm [5,300 gpm] NG160. The hydraulic valve program is one of the most complete worldwide in terms of functionality, variety, and nominal size.

Advantages:

- High flow capability, far above the "subplate valves"
- Insensitivity to high pressure drops
- Same cavity for all functions simplifies manufacturing
- Low flow resistance
- Compact installation - multi function, sized to match the flow path
- Multi-function - same device can control direction, pressure and flow



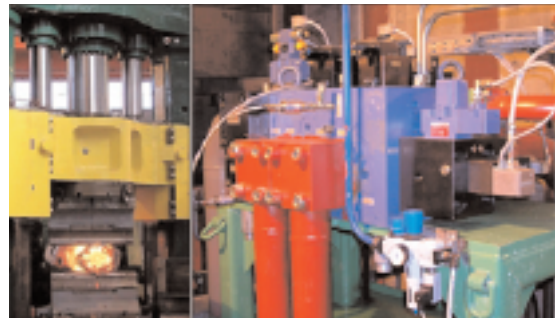
Cartridge Valve Family of Products

Integrated Hydraulic Manifold Systems

Another important capability of Moog Hydrolux is the design of hydraulic manifold blocks based on vast experience in many applications. Manifold systems up to a weight of 6500 kg (14,346 lb) can be manufactured onsite or subcontracted to other facilities.

Sample of Applications Experience

- Injection Molding Machines
- Blow Molding Machines
- Die Casting Machines
- Presses
- Metal Forming Machines
- Heavy Industry Machines
- Paper Machines
- Scrap Shear and Presses
- Windmills



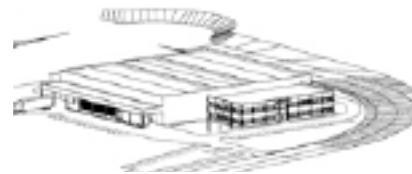
Press Application Examples

The Future

We are pleased to announce that in 2005 Moog Hydrolux will leave its present location in the heart of Luxembourg City and move to new building in Luxembourg Bettembourg in order to take advantage of the ability to expand and develop more efficient operations. As always, Moog is focused on the evolution of our technology and sharing our know-how with customers to find the best solution to their problems.

For more information about our products, please visit:

- [Cartridge Valves](#)
- [Integrated Hydraulic Manifold Systems](#)
- [Published Articles](#)
- [Literature Download](#)



Artist Rendering of Planned Moog Hydrolux Facility

About the Author:

Karl Tratberger is a Chief Staff Engineer and his job responsibilities include project engineering, design of hydraulic systems, technical customer support, and sales support. He started as engineer in 1984 with Hydrolux, and advanced to Chief Staff Engineer with Moog-Hydrolux in 1999. He studied Mechanical Engineering at "Fachhochschule Niederrhein Krefeld" with a specialty in hydraulics (with Prof. Dr.-Ing. K.-H. Post).

Hot Websites

Google Scholar and iCrank

[Google Scholar \(www.scholar.google.com\)](http://www.scholar.google.com)

Google Scholar enables you to search specifically for scholarly literature, including peer-reviewed papers, theses, books, preprints, abstracts and technical reports from all broad areas of research. Use Google Scholar to find articles from a wide variety of academic publishers, professional societies, preprint repositories and universities, as well as scholarly articles available across the Web.

[iCrank.com \(www.icrank.com\)](http://www.icrank.com)

iCrank.com is described as being the perfect starting page for a Mechanical Engineer. It has been assembled by Mechanical Engineers for Mechanical Engineers and will be continually enhanced. It is organized into four main sections: Vendors, Design Tools, Knowledge Center, and Computing.



Product Spotlight

Moog's Servocartridge Valves Offer High Dynamics and Flow Capabilities



Moog offers several high dynamic closed-loop cartridge valve products that allow machine builders to make compact integrated systems with exceptional performance. Available in two-way (DSHR) and three-way valves (SE 3), this product line offers high flow rates and rapid step response.

Moog's servocartridge valves feature a poppet and sleeve design (DSHR, 2/2-Way) in sizes NG 40, 50, 63, 80, 100, 125, 160 and a spool and bushing design (SE 3, 3/3-Way) in sizes NG 30, 50, and 63. The SE3 servocartridge valve has a frequency response of 95 Hz at -3dB and a 12 ms step response time at 100% stroke. The DSHR servocartridge has flow rates up to 20,550 l/min [5,430 gpm] (@ 5 bar [72.5 psi] pressure drop) and a 12 ms (NG40) step response time at 100% stroke. Closed-loop control is through a ServoJet pilot valve with a feedback device on the mainstage. On board electronics is a standard.

Applications such as die casting, high-speed injection molding, press applications and testing equipment benefit from the performance advantage offered by these new servocartridge products.

Special Solutions

Moog also provides special servocartridge solutions in Japan including a high flow and high-pressure sleeve-type cartridge valve (J833 series) with a high response voice coil Direct Drive Pilot Valve (J821 series). The sleeve-type design (2/2-Way) improves flow characteristics around the null position compared to the poppet type. The result is high response and stability with a rugged, long-life design. The flow rates range from 3,000 lpm [790 gpm] to 14,000 lpm [3,700 gpm] @ 35 bar [508 psi] pressure drop and a 15 ms step response at 100% stroke. Separate electronics are standard. This solution used frequently for die casting and high-speed injection molding applications.

Also available are 3-way and 4-way control servocartridge spool and bushing designs (J790 series). The ServoJet valve piloted 3-way valve has a flow rate up to 24,000 lpm [6,340 gpm] @ 100 bar [1,450 psi] pressure drop per land and a 20 ms step response at 100% stroke. The mini DDV piloted 4-way valve has a flow rate up to 1,650 lpm [430 gpm] @ 70 bar [1000 psi] pressure drop. On board electronics are standard. These are ideal solutions for large die casting applications and others requiring very high flow rates.

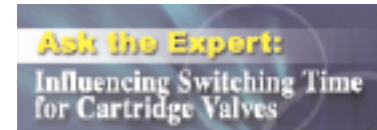
Our line of closed-loop cartridge valves will ensure that Moog products, known for quality and technical superiority, are available to meet the highest performance requirements of our customers

For more information, visit [Servocartridge Valves](#).



Ask the Expert

How Can You Influence the Switching Time of a 2-way Cartridge Valve?



The switching time (either opening or closing) of 2-way cartridge valve can be influenced by installing orifices in the pilot lines. The orifices restrict the flow rate of pilot flow to and from the pilot area of the cartridge valves.

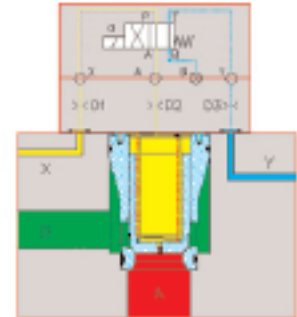
Orifice (Nozzle) in D1: The pilot oil in port X can be throttled by the use of an orifice D1. This will influence only the closing time.

Orifice (Nozzle) in D2: The pilot oil is flowing in both directions, to and from the spring chamber through the orifice D2 and will influence both, the opening and closing time.

Orifice (Nozzle) in D3: The pilot oil flow from the spring chamber is throttled by D3 and will only influence the opening time. Care should be taken to verify Tank Port Pressure ratings in the directional control valve.

The size of the orifice required depends upon the volume of the spring chamber, the required switching time, and the pressure drop across each orifice.

For information on cartridge valve sizing, please refer to the documentation available on our website on [cartridge valves](#).



About the Author:

Robert Roithner has been with Moog since 1996. His career started as a hydraulic engineer in 1964 and he is one of the fathers of the modern hydraulic cartridge technology. He has experience in many different engineering and management functions involving hydraulic systems in Europe and USA. Currently he is working for the Systems Group Moog GmbH.

Upcoming Events

Please visit the Moog booth at:

- Hannover Industriemesse, Hannover, Germany (April 11-15, 2005)
- ITEC 2005 Defense/Training/Simulation, Amsterdam RAI International Exhibition & Conference Centre, The Netherlands (April 26-28, 2005)

For more information, click on [Exhibits and Trade Shows](#).

Moog Training Sessions

For the latest information, click on [Training Opportunities](#).

Other Moog News

- Published article: [Digital Pump Appeals to Machine Makers](#) in Design News magazine, September 2004
- Published article: [It's Time to Start Innovating](#) in Design News magazine, September 2004.
- Published article: [Digital Hydraulics Extended to High-Flow Products](#) in Design News magazine, September 2004.

Contact Us

To find the location or distributor nearest you visit [worldwide locations](#).

E-mail Newsletter

To receive an email version of future editions of this newsletter, click on [signup form](#).

© Moog Inc. 2004 All Rights Reserved.



CONTACT INFORMATION

Argentina	tel: +54 (11) 4326 5916	fax: +54 (11) 4326 5916	sales.argentina@moog.com
Australia	tel: +61 3 9561 6044	fax: +61 3 9562 0246	sales.australia@moog.com
Austria	tel: +43 1 688 1384	fax: +43 1 688 1384	rlange@moog.de
Brazil	tel: +55 11 5523 80 11	fax: +55 11 5524 21 86	sales@br.moog.com
China	tel: +86 21 5854 1411	fax: +86 21-5854 1417	sales@moog.com.cn
Finland	tel: +358 9 2517 2730	fax: +358 9 2517 2739	sales.finland@moog.com
France	tel: +33 (0)1 45 60 70 00	fax: +33 (0)1 45 60 70 01	sales.france@moog.com
Germany	tel: +49 07031-622-0	fax: +49 07031-622-100	sales@moog.de
India	tel: +91 80 2668 9947	fax: +91 80 2668 9963	sales.india@moog.com
Ireland	tel: +353 21 4519000	fax: +353 21 4519001	sales.ireland@moog.com
Italy	tel: +39 0332 421111	fax: +39 0332 429233	sales.italy@moog.com
Japan	tel: +81 463 55 3615	fax: +81 463 54 4709	sales@moog.co.jp
Korea	tel: +82 031 764 6711	fax: +82 031 764 0929	sales@moogkorea.co.kr
Luxembourg	tel: +352 40 46 40-1	fax: +352 40 46 40 909	sales.luxembourg@moog.com
Norway	tel: +47 22 43 29 27	fax: +47 22 43 29 01	contact@moog.no
Russia	tel: +007 83171 31811	fax: +007 83171 31813	sales.russia@moog.com
Singapore	tel: +65 6773 6238	fax: +65 6777 7627	sales@moog.com.sg
South Africa	tel: +27 11 655 7030	fax: +27 11 655 7131	southafrica@moog.de
Spain	tel: +34 902 133 240	fax: +34 902 133 180	ventas@moog.es
Sweden	tel: +46 31 680060	fax: +46 31 287532	contact@moog.se
United Kingdom	tel: +44 1684 296600	fax: +44 1684 296760	sales@moog.co.uk
USA	tel: +1 716 652 2000	fax: +1 716 687 7910	sales.icd_hyd@moog.com sales.icd_elec@moog.com

MOOG

Moog Inc., Industrial Controls

USA: +1-716-652-2000

Germany: +49-7031-622-0

Japan: +81-463-55-3615

For the location nearest you, contact www.moog.com/worldwide.