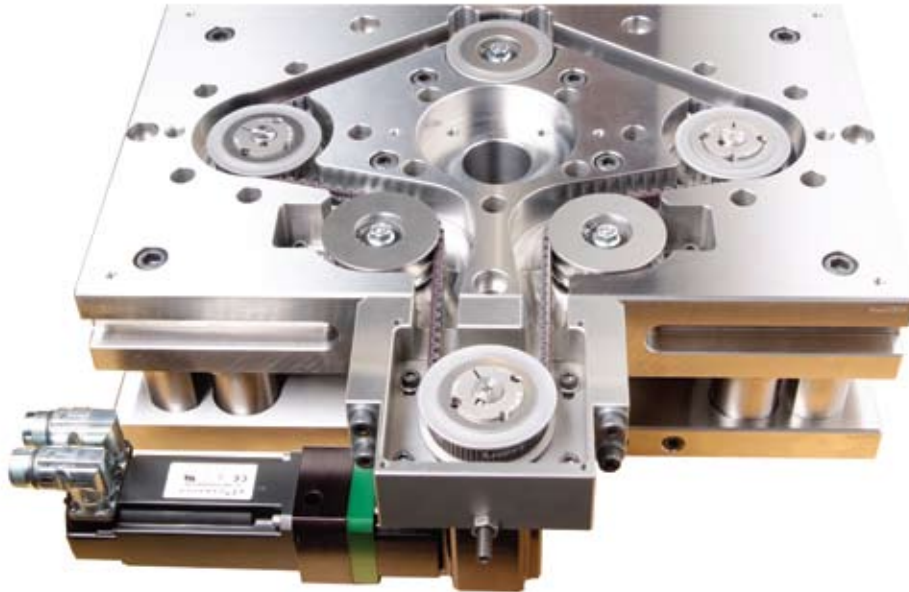

POWERFUL, PRECISE AND CLEAN



THE E-DRIVE SYSTEM PROVIDES UNMATCHED PERFORMANCE WHEN COMPARED TO TRADITIONAL PNEUMATIC AND HYDRAULIC PLATE ACTUATION SYSTEMS.

Hot Runner valve gate systems with electromechanical movement are necessary in an increasing number of applications to assure that the valve pin can operate in an oil free environment. This requirement is not only needed in the pharmaceutical industry. To avoid oil leaks with hydraulically actuated valve pins and to guarantee consistent part quality and operation, Vossloh-Schwabe of Germany chose for the production of electric-technical and electronic components – a hot runner valve gate system with electromechanical movements. The advantage of these systems is that they have the strength of a hydraulic unit and operate clean like a pneumatic driven system.

For the oil free production of plastic parts, pneumatically operated hot runner systems with six to eight bar air pressure are typical in the industry today. Because numerous systems cannot provide the necessary force to move the valve pins, it is necessary to equip the molding machine with an air accumulator to achieve 12 to

14 bar air pressure at an average cost of £ 5,000 Euros. The other solution is to increase the piston diameters of the pneumatic units to get more projected area of the piston which in turn will increase the pitch between the cavities and will restrict the layout of the mold.

Optional second compressors with a suitable interface to the machine are used to compensate for problems in the manufacturing process or to eliminate them. However, the differences caused by the single activation of the valves are difficult to get under control. Stable manufacturing processes and continuous part quality are not possible on this basis. An immediate process control is necessary to service today's high quality standards and to guarantee a comprehensive process security.

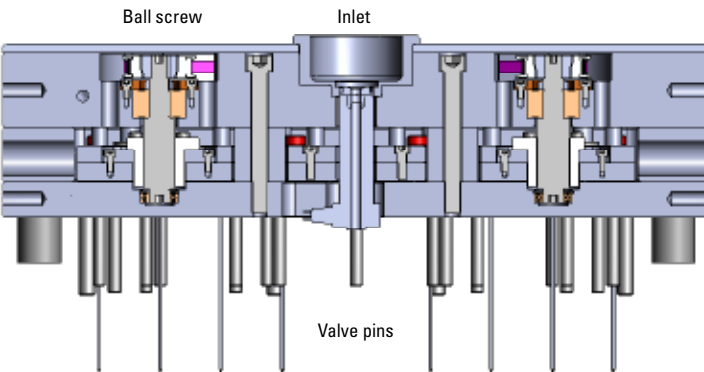
At Vossloh-Schwabe Germany in Lüdenscheid, the hydraulic movements of the components caused numerous imperfections in their parts (oil build up on the parts due to small oil leaks in

the hydraulic system for example). Cleaning the molded parts was not ideal so a move towards pneumatics was logical.

The first switch-over to pneumatics was particularly promising and manufacturing without the use of oil was welcomed by both Vassloh's employees and their quality assurance team. It was soon clear however, that the pneumatic movement of the pin was not secure. Initially, it could not be determined if the pin moved to its final closing position or stopped a few tenths short in the cavity due to material inclusions or the low force of the cylinder. Random control checks also resulted in finding faulty parts.

MOLD-MASTERS INTRODUCES E-DRIVE IN 2007

At the 2007 K-Show in Germany, Mold-Masters introduced E-Drive for the first time. The valve gate system combined the advantages of a powerful hydraulic movement with clean pneumatic force. With very short opening and closing speeds of less than 0.1 seconds and an easily adjustable pin stroke of up to 10mm, the overall installation size allows broader application possibilities in different industrial areas. The advantage of this energy-efficient, robust, powerful and clean movement for up to 128 cavities is also the simple installation and easy operation.



▲ Section view

E-DRIVE BENEFITS FOR VOSSLOH-SCHWABE

Vossloh-Schwabe Germany uses a valve gate system with electromechanical movement. This system works as clean as pneumatic and is as powerful as a hydraulic unit. The closing and opening speeds are less than 0.1 seconds and the maximum stroke is 10mm. The solid guiding of the pin and the complete closing of it results in very low pin wear. The integrated needle position control with an accuracy of 0.01mm guarantees a constant process and part quality.



▲ The production of covers for florescent lamp manufacturing puts high requirements on the valve gate system (a weight of 2.5 grams and wall thickness in some areas of just under 0.6mm).

TECHNICAL SPECIFICATIONS

It was important for Vossloh to work with a partner to find the right solution for their application. The hot runner system was based on a Mold-Masters Pico system pneumatically operated. An injection pressure of 2,200 bar was planned for the PC material to be processed. A processing temperature of 280°C and a tool temperature of 60°C were the processing conditions. The cover, which had to be molded, had wall sections down to 0.6mm, a weight of 2.5 grams, and a size of 27.5 x 25 x 8mm. The high precision and tolerances of $\pm 0.05\text{mm}$ had to be maintained to ensure the installation of a metal 'feather' into the cover. Another condition for the conversion was inconsistently falling parts. On the basis of process delays between 1 to 2 seconds no withdrawal device would be used.

The electric component manufacturer provided the DXF/STP files for the planned tools so the first draft could be compiled. The subsequent meetings resulted in a solid start and guaranteed quick conversion.

By the end of November 2007, the new design ideas from Mold-Masters were submitted, and in early December were approved. Revised drawings for the final version of the system were provided in early 2008 to guarantee a timely conversion.

"Through the precise valve pin positioning, we were able to achieve a good, constant quality."

Thomas Wipperman, Vossloh-Schwabe Deutschland

TROUBLE-FREE PRODUCTION

To gain experience, the new, 16-cavity system was tested immediately for eight weeks and reached 70,000 cycles. The results after this first test indicated early, trouble-free production. A first maintenance date at the end of May 2008 proved the capability of the system. With 244,000 shots and a total of 3.9 million molded parts since the early April, the system had run trouble free and all parts were of the highest quality.

An examination of the system, including the poly chain belt, showed no wear on the belt and helped to determine the service intervals. The plan was developed on terms of 60-day servicing intervals – and extension of 30 days over conventional system service intervals.

IMPROVED PROCESS QUALITY

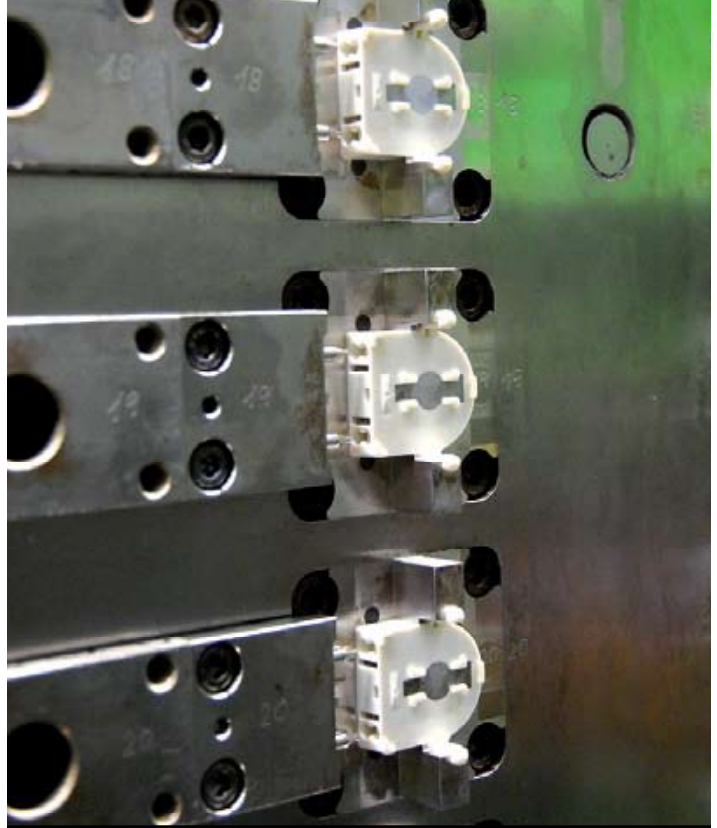
The E-Drive system has been referred to as “clean hydraulics”. Its solid valve pin guidance and consistent, complete closing showed low pin wear compared to hydraulics and pneumatics. Furthermore, a uniform load on the whole system is guaranteed. There are no side forces or any tilting influencing the moving parts on the system. This results in much lower system wear and therefore lower maintenance costs.

The improved process integrity and control are the result of the power and precision within the system. Even with high injection pressure, the entire material displacement occurs in the gate area – especially with small gate diameters. The poly chain belt controls closing of the pins which cannot be guaranteed with pneumatically actuated movements. In addition, the integrated valve pin positioning tolerance of 0.01mm guarantees a consistent process and part quality.



“The molding process with this application was never so easy to control. With the exact pin positioning, we achieved good and constant quality on all of the parts.”

Thomas Wipperman, Vossloh-Schwabe Deutschland



▲ View at the movable ejector side of the 16-cavity injection mold.

LOWER COSTS FOR THE SYSTEM RUNNING TIME

Vossloh’s experience with the E-Drive system extends the service intervals and therefore the cost to maintain. The part change carried out at the servicing maintenance schedules showed that with the E-Drive system only half of the maintenance is required compared to hydraulic or pneumatic systems. With this system, the maintenance cycle is extendable to about 6 million parts – versus the standard 3 million parts – which amounts to a maintenance costs savings of at least 50%.

The cost calculation for the life of the whole project showed that there are immense savings attainable. Vossloh-Schwabe has recognized this advantage and they have already ordered their second E-Drive system. At the end of 2008, molding PBT covers will go into production at the company.



▲ The compact and user friendly control is equipped with a touch screen.

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