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Spotlighting whole-life costs

Bucher Hydraulics develops non-return valves with 50 percent higher flow rating for the same pressure differential

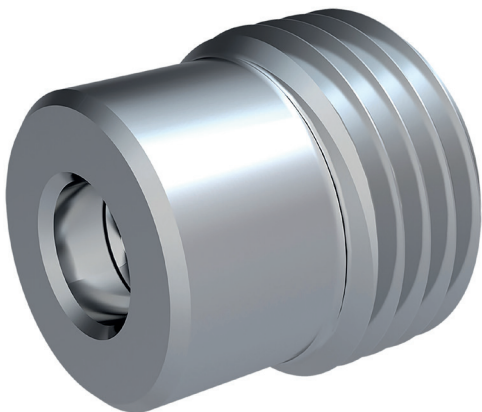
„The whole is greater than the sum of its parts,“ emphasised Aristotle in his writings on metaphysics. All the more reason then, that globalised competition and high cost pressures have also raised our expectations where components are concerned. They are no longer viewed as just individual components that only have to meet the technical requirements. Instead, their impact on the cost effectiveness, availability and energy efficiency of the entire machine moves into the foreground. For this reason, it pays to look at the total cost of ownership of even the smallest elements of the system such as a non-return valve: It needs to work continuously and reliably over a long period and to combine compact design with high performance. And quality pays big dividends here.

Non-return valves, more commonly known as check valves, allow flow in only one direction and prevent return flow in the opposite direction. What sounds so easy – a „one-way street principle“ – is actually a sophisticated technology that has been refined again and again over time. In developing the new series of check valves, the specialists at Bucher Hydraulics had clear objectives: to increase the performance without changing the pressure differential, and cost optimisation.



Many years of in-house application expertise was crucial for creating a new design of screw-in check valve based of the previous RKVE series. Focussing on customer requirements, the specialists undertook an in-depth exploration of the technical possibilities in the check valve for producing improved usability, better performance and increased availability of the complete machine. An equally important aspect was the energy efficiency, which is firmly anchored in Bucher Hydraulics' company philosophy in coherence with the term "ECOdraulics".

Usually incorporated into hydraulic control blocks, check valves are used in both industrial and mobile applications. From excavators to injection moulding machines – all application requirements today are characterised by comparatives such as smaller, more economical, more powerful. For this reason, it is a distinct advantage for system integrators and end-users if they can incorporate smaller valves with a higher performance. The new check valves score here: more flow volume with unaltered dimensions.



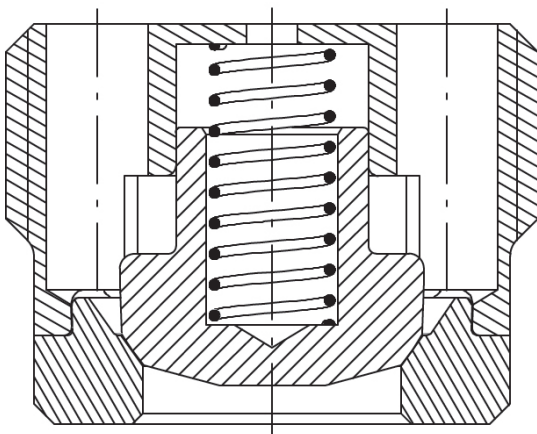
Compared with the previous series, the new generation of hydraulic check valves from Bucher Hydraulics offers 50 percent higher flow rates for the same pressure differential. The user saves energy and, depending on the application, can use smaller valves.

Small changes – big impact

The developers at Bucher Hydraulics put the previous series on the test stand and questioned its cross-sections, its stroke and the design and manufacture of the valve poppet. In poppet check valves of this type, the valve poppet is pressed against the valve seat with help of a spring and thus prevents flow of the medium. To obtain a larger outflow area and thus a higher flow rate, the designers initially reduced the diameter of the valve poppet. At the same time the stroke was increased, which ensures optimum Delta P values in the valve.

The result of attacking the design on this broad front: compared with the previous series, the new generation of hydraulic check valves offers up to 50 percent higher flow rates for the same pressure differential. The larger flow rate saves energy and in many cases allows a smaller valve to be used, which in turn has a positive effect on costs and installation space.

Specific safety aspects were at the centre of another technical innovation in the detail. Although a broken spring occurs only under extreme application conditions, the consequent risk is now significantly reduced: All Bucher Hydraulics new check valves with spring-loaded valve poppets now feature enclosed springs, so that even in the event of breakage the spring remains within the valve.



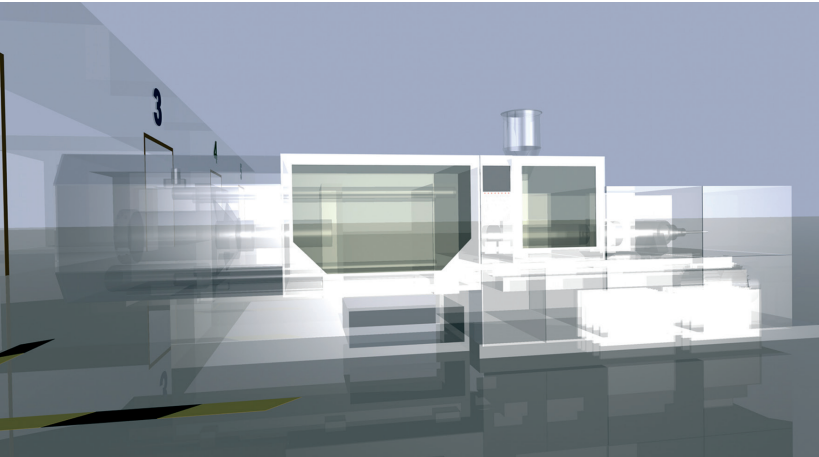
The new check valve is distinguished by its guided valve poppet with internal spring. The stroke was increased to optimise the valve's Delta P values. The body and seat are press-fitted together and, like the poppet, are hardened.

Broader application range, lower manufacturing costs

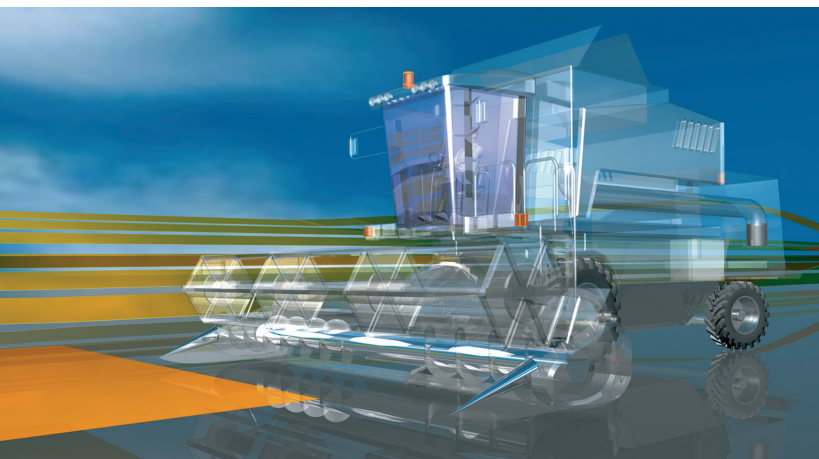
In raising the standard, the designers also included the sealing technology. In the smaller check valves from nominal sizes 04 to 16, the valves have a screw-in design and a cutting edge for metal-to-metal sealing. The soft seals previously used had to be carefully selected to suit the temperature and type of medium, and sometimes required special solutions, but soft seals have now been completely eliminated in the smaller sizes. This therefore widens the spectrum of possible applications, allowing users of the standard version of the new check valves to employ them at temperatures ranging from -30 °C to +120 °C. The inherent metal-to-metal sealing also minimises the risk of valve failure, as there is no possibility of selecting the wrong sealing material.

Based on positive experience with the check valves in sizes 04 to 16 (12 to 120 l/min), Bucher Hydraulics is now complementing the range with valves in nominal sizes 25 to 40 with flow rates from 210 to 540 litres per minute.

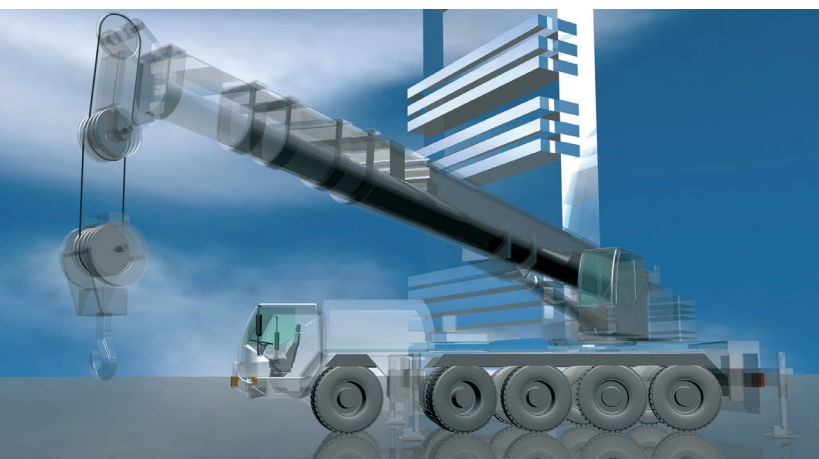
The new generation with thread sizes from G1/8" to G3/4" can be fitted in 118° cavities; with thread sizes from G1" to G1½", the valves can be fitted in 180° cavities. All corresponding previous series can therefore be completely exchanged. By using the same installation cavity for valves that open in the screw-in direction (RKVG valve series) and, conversely, for valves that close in the screw-in direction, users need only one tool, which in turn reduces tool costs.



Plastic injection moulding machines are a classic industrial application for check valves. Their uninterrupted operation demands the highest availability from all components. In applications such as this, the new check valves from Bucher Hydraulics are marked out by their long service life without maintenance.



Low leakage is an absolute must for self-propelled harvesters. Dependable check valves with optimum sealing are therefore needed in this case. The well thought-out sealing concept in the new Bucher Hydraulics check valves raises machine availability.



Construction machines such as mobile cranes have to operate smoothly under circumstances that are often very adverse. Check valves with a spring-loaded poppet/seat are robust, reliable and insensitive to contamination and are therefore suitable for these harsh environments.

Shut off smartly, increase availability

Rugged design, operational reliability and insensitivity to contamination are important criteria for check valves. Although this small component is only a tiny proportion of a control block, it is continuously and highly stressed. The availability of equipment and vehicles is therefore directly dependent on the reliability of the check valve that is used. In this context, a high quality standard ensures long life and minimises expensive and time-consuming repairs in points in the system that are usually difficult to access. In terms of Total Cost of Ownership, high-quality check valves pay dividends for block manufacturers and end users alike.

During the development stage, Bucher Hydraulics places each series on the test stand and tests at maximum pressure, i.e. the valves are put through an endurance test with 1.5 times the flow rating at a pressure of 350 bar. They must withstand 2 million cycles with an in-circuit accumulator before they are released. These tests on the test stand also lead to further insights regarding materials or material combinations. In addition, Bucher Hydraulics carries out 100-percent checks for leak-tightness before valves leave the factory.

This new range of check valves, where thought has been given to every detail, is based on the extensive product and application knowledge that has made Bucher Hydraulics a reliable partner for check valves for many decades. Specialising in applications with exacting technical requirements, the company offers solutions for the widest possible range of demands on check valves. In addition to innovative standard versions, there are also application-optimised valves where specific solutions, tailored to the particular operating situation, are developed in close cooperation with the customer. The support options extend right through to commissioning and tuning the machine together with the customer – always supported by the worldwide sales and service organisation of the Bucher Group.

Bucher Hydraulics in Dachau, Germany

The Dachau location is part of a Bucher Hydraulics global Competence Center with its own design and production facilities. With a primary focus on check valves, the site manufactures standard ranges, and also application-specific special designs – developed closely with customers – for use in industrial and mobile systems. Built on extensive application and technology know-how, the product spectrum covers check valves in cartridge design, to which the new series belongs, as well as flange-mounting check valves in SAE design. Other products include application-oriented system solutions, in which several check valves are incorporated, ready for use, in a body that will eventually be used in power units, municipal vehicles as well as agricultural and construction equipment.



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