

Technical article

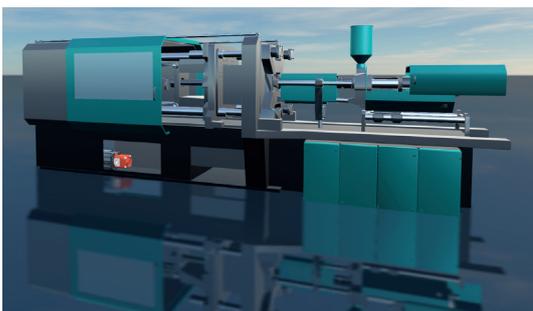
Cutting Costs by Downsizing

New QXEHX internal gear pump from Bucher Hydraulics improves the efficiency of injection molding machines and provides opportunities for downsizing the drive train

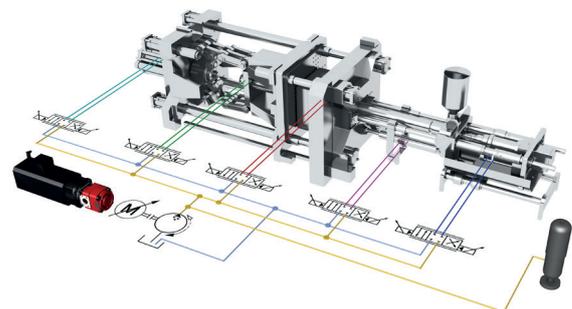
The innovative spirit is one of the great strengths of the plastics industry. Hardly any other industrial sector is investigating new drive concepts quite so intensively in the effort to get a head start in shaping tomorrow's trends. Manufacturers of injection molding machines in particular are therefore concentrating on downsizing the drive train in order to save costs and energy. With this objective in mind, the specialists from Bucher Hydraulics developed the new QXEHX internal gear pump. Lower drive torques resulting from lower displacements coupled with higher speeds, a reliable reverse mode, high energy efficiency, and a continuous-monitoring option by using Condition Monitoring make the unit a future-proof solution.

Using new technologies to consolidate a market position has been an important subject in plastic injection molding machines for many years. The non-continuous, or lot-based production of directly usable plastic parts from granulate material or laminar plastics presents enormous challenges for the machines: performance, costs, energy consumption, noise – all these aspects must be perfectly matched with one other with a view to achieving the highest possible system availability and thus profitability. Irrespective of whether the machines being used are fully hydraulic ones, or electrical machines with individual hydraulic axes for high forces in specific tasks, power must be tailored to demand, individual efficiencies improved and off-load losses and noise levels minimized.

To save costs and energy, manufacturers of plastic injection molding machines in particular are concentrating on downsizing the drive train. The new QXEHX series of internal gear pumps from Bucher Hydraulics is the ideal platform for this.



The centralized supply system of an injection molding machine needs the pump to provide power on demand, a high individual efficiency, minimized off-load losses and low noise levels. The new QXEHX from Bucher Hydraulics covers all these points with its key features, which users can put to work in fully hydraulic machines as well as electrical machines with individual hydraulic axes for high forces in specific tasks.

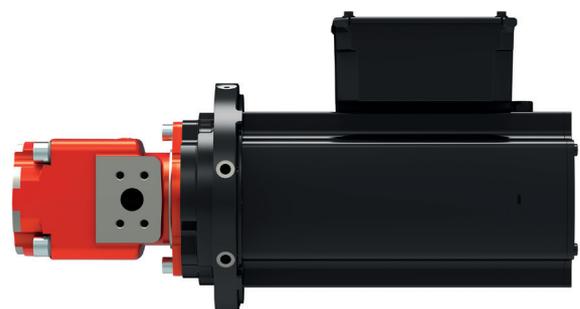


To meet these exacting requirements, Bucher Hydraulics developed the new QXEHX series using its in-depth know-how in the plastics technology sector. The internal gear pump very effectively targets the technical relationships that are found in a drive train. Thanks to the higher pump speeds, the displacements – and thus the drive torques – can be reduced while maintaining the same flow rate. Consequently, smaller electric motors and inverters can be used. The hydraulic power that is created, the product of flow rate and pressure, remains the same. Depending on its size, the pump operates at up to 4,600 revolutions per minute, which is an increase in maximum speed of around 20 percent compared to the previous model. The QXEHX is thus the platform for a successful downsizing of the entire drive system, enabling the operators of injection molding machines to reduce initial acquisition costs as well as ongoing energy costs.

The key technical refinements include optimization measures within the pump housing as well as the tried and tested flooding of the ring gear from both sides. Whereas only three displacements per frame size were previously available, users of the QXEHX can now benefit from larger displacements in smaller and also lighter frame sizes. As an example, for applications requiring a pump with a displacement of 40 cm³/rev at a continuous operating pressure of 210 bar at the pump outlet, customers can now select a size 4 unit instead of the size 5 that would have been necessary before. This saves about 30 percent of the weight of the pump and reduces costs.

Depending on size, the QXEHX internal gear pump operates at up to 4,600 revolutions per minute. Bucher Hydraulics has thus been able to raise the maximum speed by a further 20 percent compared to the QXEH.

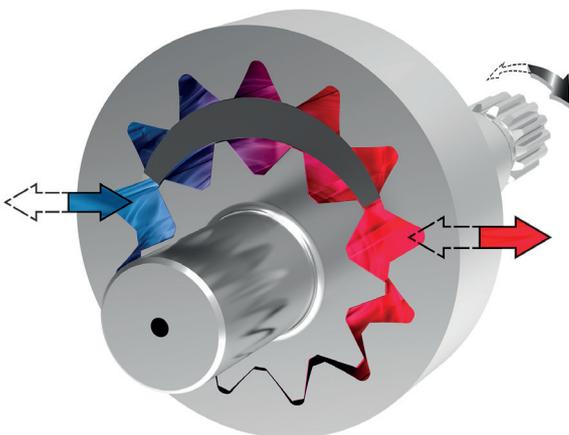
The new internal gear pump very effectively targets the technical relationships that are found in a drive train. Higher pump speeds enable the same flow rate to be produced with lower drive torques, allowing users to employ smaller electric motors and inverters.



Reliable reverse mode

The design of the new, series QXEHX internal gear pumps is completely geared towards delivering significant customer benefits. Its advantages become particularly evident in difficult environments with high cyclic loading. When combined with highly dynamic servo and reluctance motors, the rugged design ensures a very high level of reliability over an extremely long service life. To relieve pressure in the hydraulic system of an injection molding machine, the pump can be operated in full reverse mode almost without restriction several times per work cycle. There is no requirement for a defined preload pressure at the normal pump outlet, so it delivers completely stable and reliable operation even when reversed with very low pressures at the outlet.

These performance 'plus points' are the result of several enhancements to the pump design, which is characterized by its long pressure build-up region along the entire symmetrically arranged crescent. Because this uncompensated system uses no sealing or compensating components to seal the pressure zone, the mechanical friction usually associated with them is eliminated. In addition, the suction and pressure galleries are specially designed for low flow turbulence. Compared with the compensated technology of other pumps and the sealing elements they necessarily contain, the QXEHX guarantees the reverse mode even under difficult conditions.

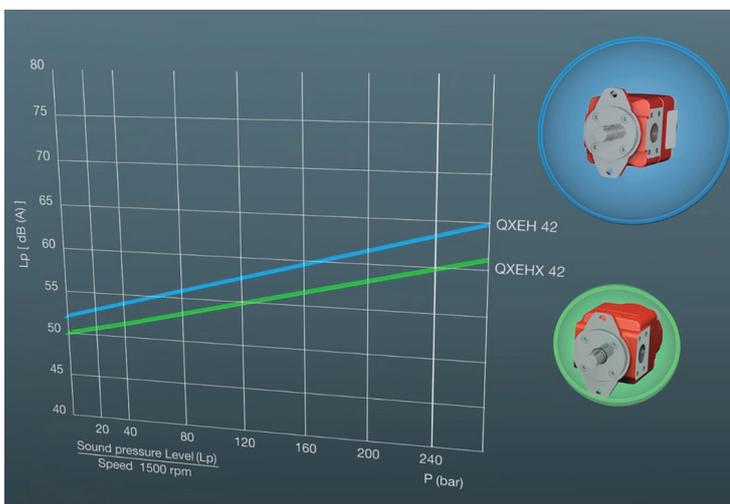


Low noise emission is one of the main features of the non-compensated QXEHX. The basis for this is the smooth pressure build-up along the crescent (with a very long pressure build-up region), the pinion-shaft technology featuring a free-running gear set in precisely manufactured chambers, and the completely symmetrical suction and pressure zones.

Energy-saving and quiet

Precisely these same design features also ensure higher energy efficiency and a more favorable cost balance. Long pressure-holding times, high operational reliability over the entire, highly dynamic speed range, and maintaining the set output flow rate can all be achieved without an extensive system of valves. In reverse mode, the auxiliary valves that normally have to be used to protect other pumps from an outage are no longer needed. This minimizes pressure losses and the associated heat inputs to the system. In consequence, smaller quantities of oil and smaller tanks are sufficient, oil-change intervals can be longer and cooling requirements are lower. All of this reduces system costs.

Another advantage of the QXEHX is its low noise level, despite the higher rpm. The reasons for this lie in the revised contours of the suction and pressure galleries as well as in the other optimized flow paths. These measures have enabled Bucher Hydraulics to reduce the noise level by an average of 3 dB(A) compared to its predecessor. As well as that, the low noise level in the upper speed range remains almost constant. The application therefore needs fewer sound-insulation measures, which saves costs for machine manufacturers and end users.



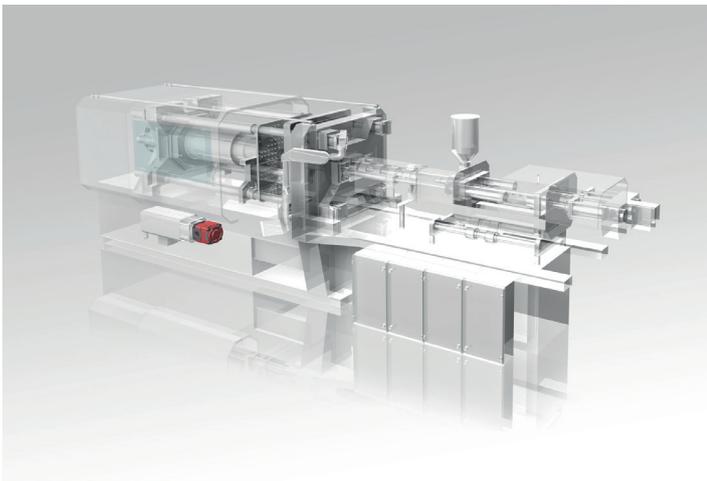
Another advantage of the QXEHX is its low noise level, despite the higher rpm. Improvements have enabled Bucher Hydraulics to reduce the noise level by an average of a further 3 dB(A) compared to its QXEH predecessor.

Increased availability through Condition Monitoring

With this new family of internal gear pumps, injection molding machine manufacturers can proceed directly to the Internet of Things (IoT). This applies in particular to maintenance and servicing concepts, which can make use of Condition Monitoring to ensure high plant availability and cost reductions at the same time.

The underlying concept of the QXEHX pump, enhanced with instrumentation and advanced sensors, offers the ideal conditions for supplying all the data required for continuous monitoring. Thanks to Condition Monitoring and the consistent insight into the current operating conditions that it provides, the potential service life of the pump can be fully utilized. At the same time, users can already retrieve pump data via the cloud, regardless of where the injection molding machines are being used.

Bucher Hydraulics offers the new internal gear pumps with overlapping displacements in sizes 3 to 6 (10 to 160 cm³), which cover all typical applications with open, highly dynamic circuits such as those found in injection molding machines. All in all, the innovative pump concept of the QXEHX increases the productivity of injection molding machines and already meets the growing demands in the plastics industry for products that ensure competitiveness.



Manufacturers of plastic injection molding machines can proceed directly to the Internet of Things with the new QXEHX. This applies in particular to maintenance and servicing concepts, which can make use of Condition Monitoring to ensure high plant availability and cost reductions at the same time.

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