Innovative Results

TECHNOLOGY NEWS recognizes the unique advantages of the Repeater™ Valve

INJECTION MOLDING

As seen in TECHNOLOGY NEWS

Innovative Check Valve Solves Repeatability & Wear Problems

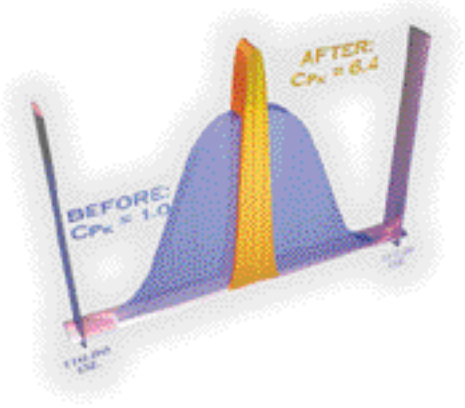
The first major rethinking in decades of the humble injection molding nonreturn or check valve looks like it can eliminate one of the most important sources of shot-size variability, says the inventor of the Repeater Valve.

First published details on the Repeater Valve appeared in Injection Molding and Plastics Technology magazines. Here are more details, as well as the first look at the valve's novel principle of operation.

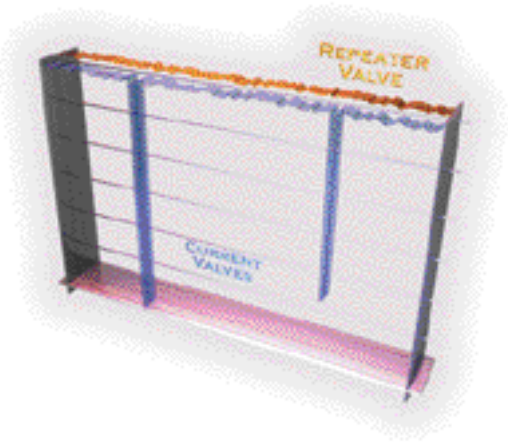
NO MORE INCONSISTENT LEAKAGE

Today's ball-and ring-type check valves all depend on some degree of backflow to actuate valve closing at the start of injection. This undesired backflow produces a pressure drop, causing a force on the moving member (ball or ring) that moves it to the closed position. The trouble is that the amount of this backflow while the valve is closing is inconsistent. And this inconsistency of melt "leakage" back over the screw increases with wear on the valve, especially with sliding-ring types.

According to consultant Jack Stroup of Cuyahoga Falls, Ohio (formerly an executive with Van Dorn Plastic Machinery), who has been working with the inventor to develop the new valve, typical nonreturn valves require excess pullback beyond that which is needed to prevent drool into an open mold. That is done to provide sufficient flow over the valve at the start of injection to ensure the valve closes. But even this is not sufficient to avoid inconsistent closing. Stroup adds that designing ring valves with greater contact area to reduce wear results in even poorer consistency of operation.



Actual case studies show that the Repeater™ Valve from U.S.Valves can increase CPK as much as six times!

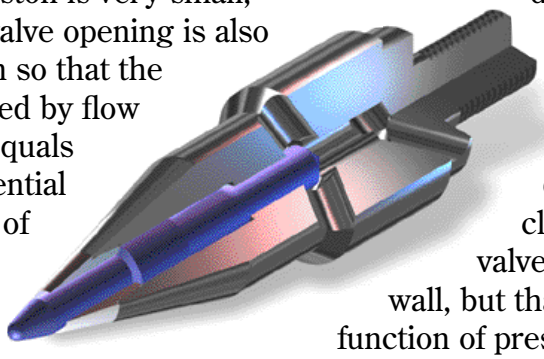


Every flyer runs the risk of losing an important customer. Avoid the worry by using the patented Repeater™ Valve.

Enter the Repeater, which is actuated solely by a pressure differential on either side of a piston, not by melt flow. As shown in the accompanying schematics, the valve has a center piston that slides back and forth, alternately blocking and unblocking a number of melt passages from the center of the valve body to the outside of the nozzle cone. The piston is designed with a

larger surface area on the downstream end than on the upstream end. This means that an equal melt pressure on both ends will result in a net force (pressure x area) driving the piston backward and closing off flow through the valve.

The valve opens to permit flow only when there is a sufficiently higher melt pressure on the smaller (upstream) end of the piston. This happens when pressure is applied by screw rotation. The movement of the piston is very small, and the degree of valve opening is also small—just enough so that the pressure drop caused by flow through the valve equals the pressure differential between both ends of the piston.



At the start of injection, the valve will close quickly and completely as soon as the screw begins to move forward, producing higher force on the forward end of the piston. This requires no flow of melt and only slight screw movement.

Unique to this valve is the ability to preclose it before the actual start of injection. This is done by maintaining hydraulic backpressure on the melt pool ahead of the screw for a short time after screw rotation ceases (normally they are cut off simultaneously). In such a circumstance, higher force immediately develops on the forward end of the piston, driving it closed with no movement of the melt or screw. Stroup expects that preclosing will further enhance the shot repeatability afforded by the valve, but this remains to be proven.

The degree of over-travel of the piston in closing is reportedly sufficient to keep it closed during initial screw pull-back. Likewise, any slight erosion of the rear end of the piston due to wear would not compromise valve action, Stroup says. Because the piston slides over the melt-discharge channel at right angles, there is no possibility of incomplete closing due to build-up of foreign matter on the seat, as can happen with other valves.

The key point about the Repeater Valve, he emphasizes, is not that it doesn't leak at all—it does—but that it leaks only a small amount and very consistently. Some slight leakage does occur through the clearance between the valve body and the barrel wall, but that leakage is strictly a function of pressure, not mechanical action, and should be the same from shot to shot.

INITIAL RESULTS PROMISING

The Repeater valve has been tested extensively in the labs of three major injection machine manufacturers, and three valves have been in 24-hour-a-day production in what the inventor describes as the number-two housewares molder in the country. The valves were simply substituted for existing ring and ball valves on one 300-ton and two 700-ton HPM machines. Nine different parts, weighing up to 747 grams were molded with at most about 1g variation from shot to shot, says the inventor.

The Repeater Valve is patented. U.S. Valves may be reached toll-free at 800·944·6662.

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