



Cylinder Myths, Part 2

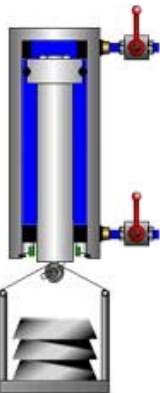
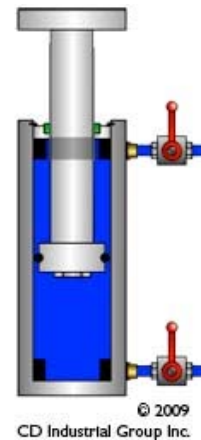
May 1, 2008
Posted in Hydraulic

In this issue we'll conclude the lesson regarding cylinders that are mounted vertically or are subjected to load under the influence of gravity.

Grab a coffee! This one's long!



Last time we looked at single rod cylinders that are oriented with their extending rod pointed upwards. We found that with the directional valve closed to both cylinder ports, the only way for the cylinder to creep downward is to allow for the loss of fluid to the outside of the cylinder. We found that the rod and piston cannot otherwise creep down because a cylinder full of fluid has no additional room for the volume of steel that is the rod.



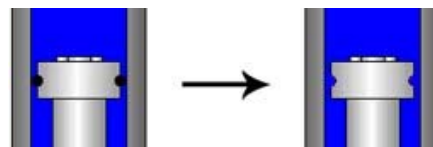
Lets finish up this week with a look at cylinders that are mounted in the inverted position. The rod of such a cylinder extends downward.

Again, it is a fairly common misconception that a worn piston seal will allow fluid to pass from the rod side of the piston to the barrel side, thereby allowing the rod to creep downward.

We'll start with the directional valve closed (we'll put closed ball valves on each cylinder port just to make it very clear), and the rod fully retracted. Let's also assume that the cylinder is full of hydraulic fluid.



If the piston seal is absent and we have a load on the cylinder, will the rod creep downward?



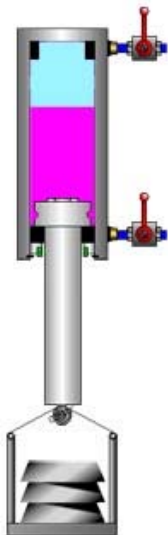
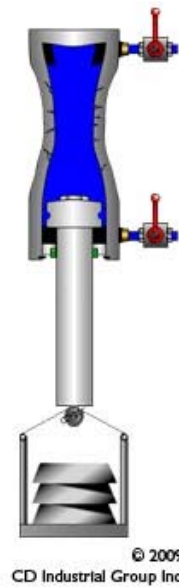
If the cylinder was full of steel (the piston and rod) and liquid (a largely non-compressible fluid), then what would happen if the rod did creep downward into extension?

If the rod extends fully, the full and sealed cylinder will lose that amount of occupying volume as a consequence. What fills the void that is created inside the cylinder?

A large force (heavy load) pulling on the end of the rod could cause some extension, but the total movement would be very small. This is because the vacuum value would become very great within a tiny fraction of an inch.



In order for any noticeable movement to take place, a make-up volume of fluid (shown below in light blue) would have to replace the volume of cylinder rod steel that has moved out into the atmosphere. Remember that the cylinder ports are closed by ball valves. This is the same as if a directional valve's 'A' and 'B' work ports are closed.



A damaged or missing piston seal on its own cannot be blamed for a creeping cylinder rod; the rod end gland seal must also be damaged and leaky at the same time.

If the gland seal is damaged, then as the rod creeps downward under gravity and a heavy load, make up fluid can be sucked in to the void being created as the rod leaves the cylinder and moves into the open atmosphere. It is the presence of this make-up fluid that allows creep. Without it, the settling rod would create a vacuum that would hold it in place.

In this case, the make-up fluid is air. Air is, in fact, a perfectly useful fluid (not a liquid) for use in cylinders, especially if you don't mind spongy, non-positive motion, and you don't need to work with high pressures.



Whether the rod is pointing up or down, we've learned that a missing piston seal on a single rod cylinder with blocked fluid ports will not allow cylinder drift or creeping unless the gland seal is also compromised.

If you know that your cylinder is in fact creeping when the ports are apparently closed at the directional valve, and yet the rod end gland seal is not allowing leakage, where do you look for the real cause?

The directional valve itself is most often the cause. It may not be closing the 'A' and 'B' cylinder work ports completely. The valve may be worn or it may be failing to return to its center closed position. The cause of valve problems will be covered in future newsletters.

