

Seal Characteristics

The Cornell seal system consists of two mechanical seals mounted back to back. The inboard seal prevents escape of refrigerant from the pump casing; while the outboard seal acts as a fail-safe or backup, and provides containment of a system compatible barrier fluid. The system includes a pressurized barrier fluid reservoir, fluid level indicator and a limit switch. This configuration allows unattended monitoring of fluid level, and a safety shut down feature.

Low viscosity refrigeration machinery oil is contained on one side of the piston in the reservoir. This oil is circulated to the seal box by means of a “pumping ring” attached to the rotating mechanical seal. The oil provides lubrication and cooling to the seal faces. A tube from the discharge nozzle of the pump transmits pump discharge pressure to the backside of the reservoir. This pressure is augmented by a spring bearing against the back of the piston. Consequently, the barrier fluid is always at a higher pressure than pump discharge. The pressure difference between the barrier oil and the pumpage, ensures that there is always a minute barrier film between the seal faces. This feature also prevents refrigerant from entering the barrier system.

As the barrier oil is slowly depleted, the indicator rod moves out, providing a constant indication of barrier oil consumption rate and level. At a user-determined set point, the indicator rod makes contact with the arm of the limit switch. The reservoir indicator rod and limit switch will warn that the oil reservoir requires a normal interval refill, or the process side seal has failed. The switch can be wired to trigger an audible or visual alarm, or to shut down the pump before the barrier oil level gets too low. In the event of process side seal failure, the barrier seal will contain the refrigerant until maintenance can be performed.

This type of sealing system has a distinct advantage in predicting seal life. By design, as either seal begins to deteriorate over time and the barrier fluid passes across the seal faces, the oil reservoir rod extends. This advises the operator of a service requirement. Since the barrier fluid is always at a higher pressure than the pumpage (even when pump is off), escape of refrigerant to the atmosphere is avoided.

Since the seals are oil lubricated, they do not rely on the presence of pumpage for lubrication or cooling. It is common with many systems that severe pressure transients in the receiver can cause the pump to lose prime due to vapor locking. With the double mechanical sealing system, the pump can continue to run until the system stabilizes and the pump reprimed itself.