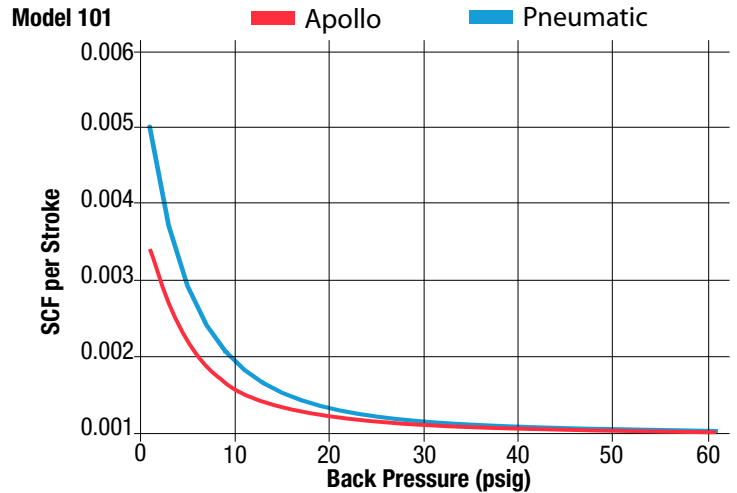


# What Happens When a Piston Pump Runs Dry

## PNEUMATIC AIR CANNOT ENTER WELL

- A piston pump will continue to operate until shutoff, even if there is no liquid at intake.
- Low speed and low heat generation mean there is no damage to the pump or well/sump.
- Pneumatics are designed so that no compressed air can enter the well/sump; air is not used to eject liquid.
- There is no connection between air input and liquid discharge.
- All pneumatic air enters and vents outside/above the well/sump.
- Apollo pumps operate only with solar or AC electric power.

## Pumping Gas vs Back Pressure SCF per stroke chart

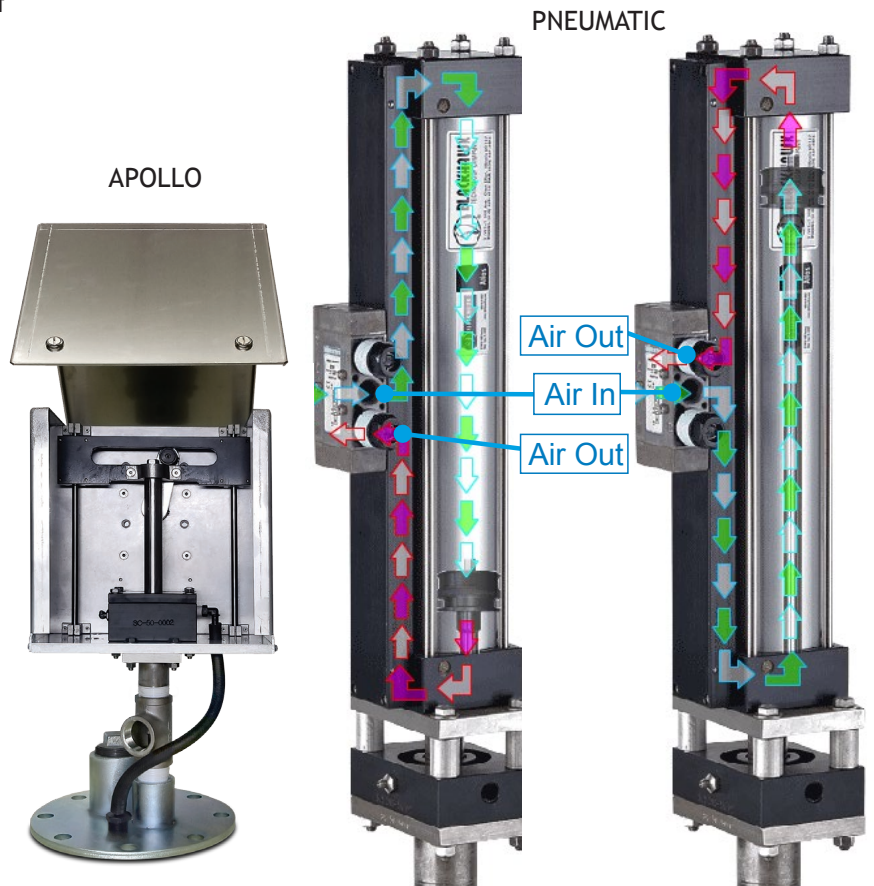


## SMALL AMOUNT OF GAS

- A dry-running piston pump will pump a small amount of gas at shallower depths (graph).
- Gas pumping decreases significantly as fluid pressure grows above the downhole drive-piston check valve.
- SCF is zero at 60 psig.

## FLUID IS ALWAYS IN DOWNHOLE PUMP

- There is always a column of fluid in the pump and riser pipe to the surface discharge tee.
- Fluid is pumped out when replacement fluid is drawn in.
- The column of fluid in the pump and riser pipe restricts gas being pumped.
- In dry-run operation, the non-compressible fluid weighs down the downhole drive piston check ball, restricting its ability to open (drawings on back).
- The increased weight of the fluid compresses the gas to halt its flow.

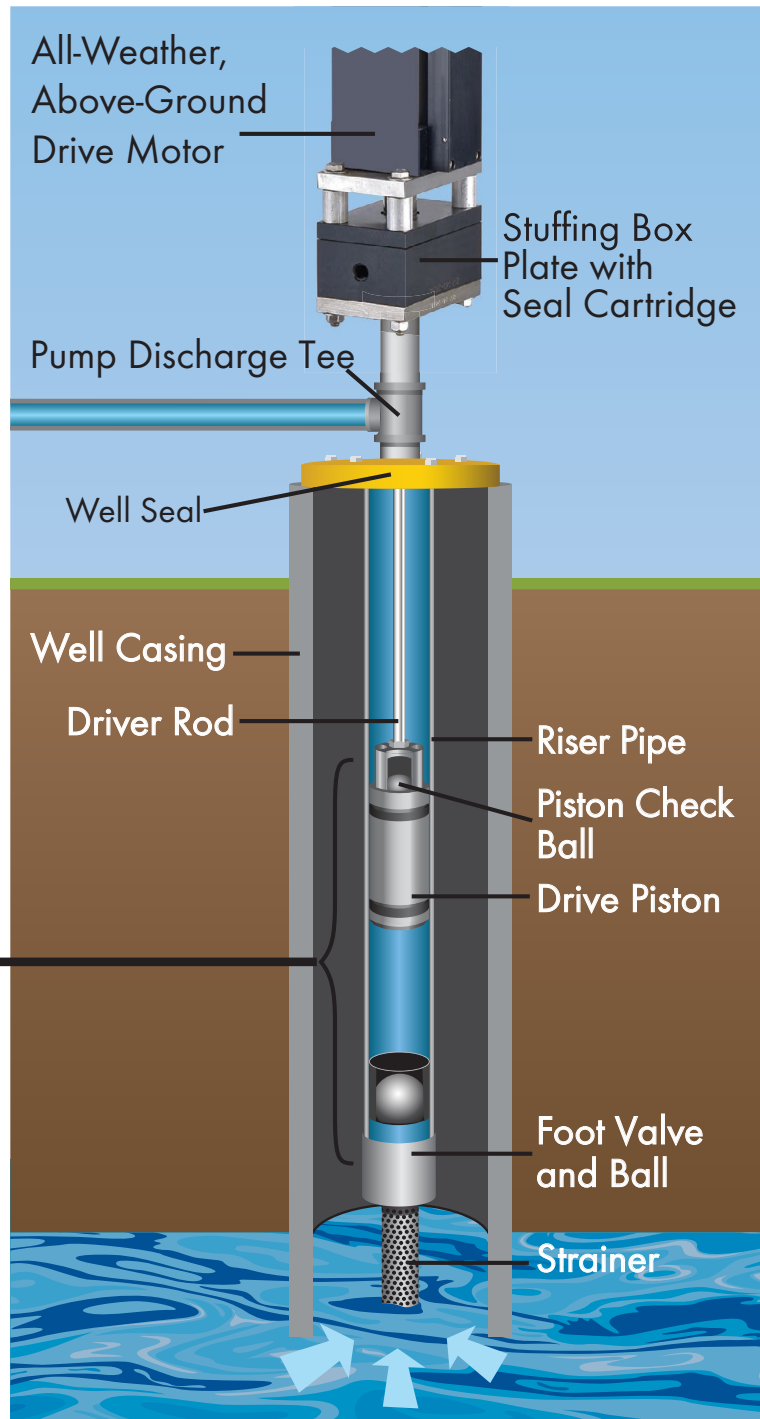
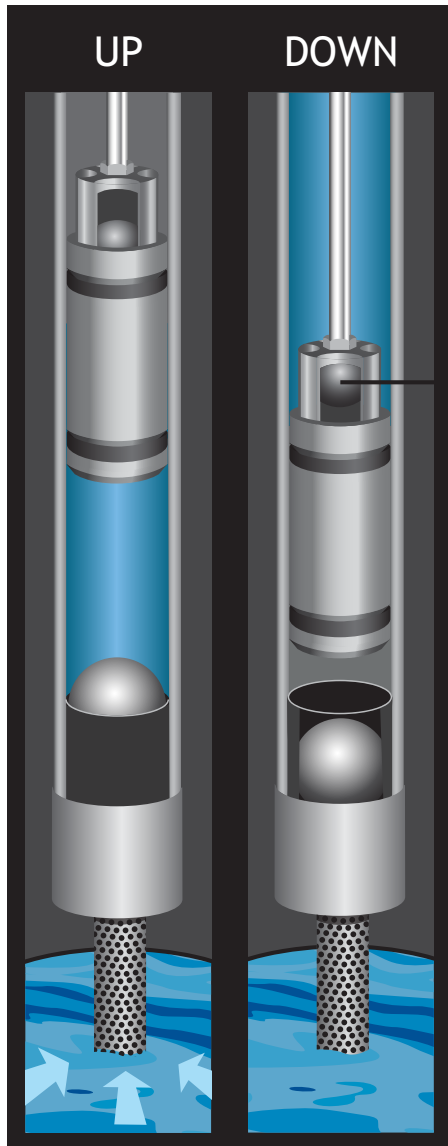


Maximize your investment in Blackhawk Pumps

Fact Sheet #23

# What Happens When a Piston Pump Runs Dry

## DOWNHOLE PUMP OPERATION



The best-performing environmental pump in the business

