Underground Pump Control Valve System

When centrifugal pumps feed into pipelines, these pipelines may be empty or only partially full. Under these conditions, the pumps will produce a high flow to fill the pipeline until the pressure has increased sufficiently to operate at its duty point. However, before that is achieved, the pump may damage the balance disc or tripout due to excessive power demand.

The Pump Control Valve (PCV) serves to maintain sufficient back-pressure on the pump to prevent pump overload and flow surging in the pipeline during filling.

When centrifugal pumps are switched off the water in the pipeline rapidly slows down and may reverse. This will cause pressure surges (water hammer) in the line and on occasions pipe failures have occurred. This valve minimizes pressure surges on closing by throttling the flow rate to a low value a few seconds before cutting power to the motor. (The PCV however, will not eliminate the unavoidable pressure surges due to sudden loss of power—this has to be minimized by installing sufficient Surge Relief Valve capacity).

DESCRIPTION

The PCV consists of an isolation valve with a manual handwheel and a two stage opening/closing pilot control pistons. The pre-opening piston opens the valve fractionally to ensure that the valve will sustain upstream pressure by throttling the flow. The second stage opens the valve fully from the pre-opening position. This valve is a standard two stage pilot controlled (WIP type) isolation valve. A system incorporating solenoid valve, a downstream pressure sensing valve together with strainers, hoses, check valves, ball isolation valves and a sub-plate, a controls the main isolation valve.

PURPOSE

The purpose of the Pump Control Valve is to minimize pressure surges (water hammer) on pump columns by slowly increasing or decreasing the velocity of the water in the column. It achieves this by throttling the flow and slowly opening or closing the valve. It thus protects the pump from possible damage due to any low downstream pressure condition. The pre-opening function allows the pump to fill the column without risk of damage to the pump. The PCV therefore maintains safe operating conditions on centrifugal pumps.

FEATURES

- Designed to conform with ANSI B16.34
- Available in straight through (Y-body) or 90 degree angle pattern body.
- Cast steel body to ANSI class 1500 or 25 MPa working pressure
- Flanges or taper hub and clamp connections
- All working parts stainless steel
- Proven erosion resistant labyrinth long seal poppet and seat
- Robust, well guided poppet and cage design

The valve performs the following:

- Isolates in the operating direction,
- Throttles in the operating direction,
- Throttles and maintains the pump pressure when the downstream column is empty or partially full,
- Opens fully when the downstream column is full,
- Throttles the pump outlet when the pump is to be stopped to prevent water hammer,
- Functions gently without impulses for all the above operations,
- Operates with only one electrical signal to the valve—no PLC or auxiliary compressed air is required,
- Electrically allows selection of one line "operating" and the other line "isolated",
- The electrical signal must be on whilst the pump is operational,
- Closes to the pre-open position which will reduce flow, but not damage the pump if the electrical signal is lost,
- Resorts to the safe operating condition if installed from new,
- Self primes if started full of air, and
- Manual ball valve to over-ride automatic operation of solenoid valve.

Pump Control Valves therefore fulfills all the requirements of pump control in starting and stopping, and in addition, offers protection against pipeline failure and the run-away conditions associated therewith. All this is done with a single electrical signal.

TECHNICAL SPECIFICATIONS

Solenoid voltage - 24VAC (other voltages may be specified, but DC is not acceptable)
Pre-opening - 6mm (Max 8mm; Min 5mm)
Pressure drop - Dependant on size of valve & flow
Flange & operating pressure - Customer to specify
Body & NRV - Straight (Y body) or Angle Pattern
Surge relief protection - Site specific

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