

Frequently Asked Questions

System and Valve Basics:

1. **Q:** What is good cooling coil performance?

A: The temperature range is controlled within $\pm 0.5^{\circ}\text{F}$ (0.28°C) off the cooling coil at set point or below. Also, the coil delta T exceeds design, even at part load.

2. **Q:** What is “delta T” and why is it important?

A: Delta T is the difference between the water return and supply temperature through a heating or cooling coil. All HVAC hydronics systems have a design delta T; however, this objective is rarely achieved at part load. Delta T is the single most effective indicator of system performance. The higher delta T, the less flow required to serve the load.

3. **Q:** How fast will the leaving air temperature change when the coil flow rate varies?

A: Typically, it changes a lot faster than a conventional valve can respond to. However, there is a delay between the flow change and the LAT (leaving air temperature) change. Stabilizing the flow rate through the coils leads to higher ΔT and better energy performance by stabilizing the flow through the coil, which leads to a more stable LAT.

4. **Q:** What causes cooling coil performance to decline?

A: Hunting valves that cause flow fluctuations, high chilled water supply temperature, dirty coils (air or water side), and improper piping.

5. **Q:** What makes a good control valve?

A: An ideal control valve would be able to precisely match the flow with the load at all conditions. This will yield optimum delta T Performance. The valve needs to have high turndown (100:1 minimum), be pressure-independent, sufficient shutoff, and operate over a wide range of differential pressure. Lastly, it needs to be show repeatable performance with a way to verify flow, pressure independence, and proper operation.

6. **Q:** How much pressure does a control valve consume?

A: It consumes whatever it takes to control the flow. DeltaPValves typically have an operating range of 5-70 psid (0.34 to 4.83 bar) or 10-90 psid (0.69 to 6.20 bar).

7. **Q:** In operation, where does the excess flow go if coil delta T is less than design?

A: Excess flow must be processed at the central plant or through a decoupled bypass when delta T is below design. This wastes a large amount of pump and chiller energy.

8. **Q:** If delta T performance is poor, why can't a facility simply reduce the pump speed to raise it?

A: *The system is asking for the flow it requires. Reducing the flow rate will simply starve the coil of the flow that it needs at a given load condition.*

9. **Q:** What is the Cv of a valve?

A: *The Cv is the amount of flow a valve will pass with 1 psi differential (0.07 bar).*

10. **Q:** What is a "modulating pressure independent" control valve?

A: *A modulating pressure independent control valve does not allow a change in flow rate when the pressure differential across the valve changes. Flow only changes with a change in valve position.*

11. **Q:** Why do I need to control flow below 40-50%?

A: *In most climates, a heating or cooling coil, properly sized, should flow less than 40-50% for the majority of the time. Refer to the theoretical cooling coil performance. Since the flow through coils is in this range almost 90% of the time it is crucial to have a valve that will be able to control at low flows. Most conventional valves with poor turndown do not modulate in those flow ranges. Rather they operate as on/off valves at low flow. This results in poor control and wasted energy.*

12. **Q:** What is the difference between valve rangeability and system turndown?

A: *Rangeability: The ratio of the largest flow to the smallest flow within which the deviation from the specified flow does not exceed the stated limits. A control valve that still has good control when flow increases to 100 times the minimum controllable flow has a rangeability of 100:1. Rangeability can also be expressed as the ratio of the maximum to minimum controllable flow rates. Turndown: A term used to describe the ratio between the minimum and maximum flow conditions seen in a particular system. Example: a 100:1 rangeability valve that is sized in the system so that it will only use 30% of its available resources causes the system (coil & valve) to have 30:1 turndown.*

13. **Q:** How is the flow through a DeltaPValve® typically controlled?

A: *In most applications, actuators installed with DeltaPValves modulate to maintain the supply air or room temperature. Flow is not dictated by variations in system pressure. The flow changes only when necessary, to meet the load.*

14. **Q:** Does an actuated DeltaPValve® modulate the Cv to change the flow?

A: *Yes. Just like pressure dependent valves, but with a 90° rotating stem. The difference with pressure-independent control valves is that the pressure differential across the Cv section is held constant while pressures in the system fluctuate.*

15. **Q:** What is the pressure drop across the valve?

A: The system sets the pressure across the valve. A minimum pressure drop, typically 5 psid (0.34 bar), is required across the DeltaPValve® for pressure independent performance. The flow remains constant at any flow setting from 0-100%.

16. Q: If a balancing valve is working, is delta T greater than, equal to, or less than design?

A: A balancing valve clips flow at 100% and there is always a margin put on the coil design. Therefore, the operating point is always to the right of the design delta T line on the ARI coil curve and delta T is low. Balancing valves are just flow limiters.

17. Q: What determines the actuator size?

A: The torque requirements for the DeltaPValve® at shutoff. (The pump design head serving that piping loop)

18. Q: Why do you install pressure/temperature (P/T) ports on the DeltaPValve®?

A: The three P/T ports that come standard on every DeltaPValve® are used for field flow verification and troubleshooting and, in some cases, for pump speed control. Without knowing the intermediate pressure, it is impossible to determine if the valve is functioning as it should.

Pressure Dependent vs. Pressure Independent:

1. Q: Are DeltaPValves selected the same way as pressure dependent valves?

A: No. Pressure dependent valves are selected by Cv and pressure. The DeltaPValve® is selected by the maximum flow rate. Selecting most conventional valves with the Cv and pressure differential can result in conventional valves being oversized. This further limits its ability to control flows at low loads.

2. Q: How do you calculate the Cv of a DeltaPValve®?

A: The Cv for each valve is given in the O&M manual for the given valve position.

3. Q: Why do I need the DeltaPValve®?

A: DeltaPValves provide stable flow independent of pressure fluctuations in the system. This leads to optimal heat transfer, minimum flow, and high delta T. Achieving design delta T or greater minimizes energy consumption, and allows the full installed capacity of the energy plant to be delivered.

4. Q: Can't I set my controls to use pressure and position to establish proper flow through a pressure dependent valve?

A: Software will not solve hardware problems. We have seen this method used to improve delta T performance but only in conjunction with high turndown industrial quality valves. For better performance, thermostat control is far simpler, direct, and accurate when employed with pressure independent DeltaPValves.

5. **Q:** Can a conventional commercial quality 2-way control valve deliver the same performance as a DeltaPValve®?

A: No. The flow through pressure dependent control valves used in the HVAC industry varies with pressure. Most conventional valves modulate poorly under low flow conditions (<40-50%) and against high pressure differential. Unsteady flow, especially at part load, leads to poor heat transfer, excess flow, and low delta T. Every DeltaPValve® is industrial quality and pressure independent.

Applications:

1. **Q:** What happens to system pressure when my facility expands?

A: The system pressure lowers proportionally and may fluctuate more.

2. **Q:** If we use VFDs why would we need DeltaPValves?

A: FCI recommends VFD control in most applications. In part load conditions, DeltaPValves minimize the flow needed at the heating or cooling coil, taking full advantage of VFD control. At design conditions, the pressure drop across the DeltaPValve® is the same for constant and variable speed pumping systems.

3. **Q:** Where is the DeltaPValve® typically installed?

A: On the return side of heating and cooling coils.

4. **Q:** In a variable Primary system, how do you control a variable speed pump with DeltaPValves?

A: The pump is controlled to maintain a 5 psid (0.34 bar) minimum differential across the most hydraulically remote control valve. This ensures all of the DeltaPValves in the system have adequate differential pressure to deliver the exact design flow.

5. **Q:** Can the DeltaPValve® be oriented in any direction?

A: Yes. However, it is recommended that the actuators be positioned so that they do not collect condensation.

6. **Q:** How many pipe diameters are required before or after DeltaPValves®?

A: DeltaPValves® may be installed directly upstream or downstream of a 90° elbow with no adverse impact on performance.

7. **Q:** Does the DeltaPValve® require additional hangers or support?

A: DeltaPValves 3" (80 mm) and larger are heavy, therefore a hanger is recommended on the piping on each side of the DeltaPValve®.

8. Q: Are balancing valves required when using DeltaPValves?

A: *No. DeltaPValves dynamically balance the system at all flow and loads.*

9. Q: Are DeltaPValves tested at the factory?

A: *Yes. Every DeltaPValve® is tested and tagged with actual flow rates for that valve.*

10. Q: Will the required 5 PSI differential (0.34 bar) across the DeltaPValve® increase my pump energy consumption?

A: *No. The amount of pump energy consumed is a function of both head pressure and flow rate. With a conventional valve you may be able to design for a pressure differential of 3 psi (0.2 bar); however you will consistently get below design delta T and pump more flow than is needed for the required load. With a DeltaPValve® you design for a minimum of 5 psi differential (0.34 bar). This is guaranteed to deliver design delta T or better at all load conditions. This means that with slightly more pressure and a lot less flow, you can significantly reduce your pump energy while meeting your load.*

11. Q: What sort of delta T should I expect in systems designed with DeltaPValves?

A: *Design delta T or higher at full load and 1.25-1.50 times design delta T at part load.*

12. Q: Can we confidently design for high delta T using DeltaPValves?

A: *Yes. DeltaPValves control to supply only the flow required to address the heating or cooling load so there is no danger of running out of water.*

13. Q: What is the upside and downside of chilled water reset strategies?

A: *Rising CHWST makes the chiller appear to be more efficient, but in effect reduces coil capacity and lowers delta T. Should only let CHWST rise when only one chiller is running.*

14. Q: Why should I use the DeltaPValve® over other pressure independent control valves?

A: *The DeltaPValve® is the only control valve that has guaranteed delta T performance at the coil. This is possible because every DeltaPValve® is Industrial quality with high turndown, small flow variation, wide pressure and flow ranges, longevity and serviceability, large tolerance for varying water conditions and quality, and 3 P/T ports as standard with actual valve flow rates tagged.*

15. Q: Will FCI review schematics and provide recommendations, energy and investment analysis?

A: *Yes.*

Installation, Startup, and Commissioning:

1. Q: What do DeltaPValves cost?

A: High performance DeltaPValves are larger and have more components to provide pressure independent control. First cost of systems designed with the DeltaPValve® is dramatically less, but the control valve cost is initially higher. Considering the energy wasted with low delta T, the life cycle cost of DeltaPValves is far less than conventional control valves. Full capacities of installed boiler, chiller and thermal storage are available with DeltaPValve® systems.

2. Q: Can you verify the flow through DeltaPValves with a differential pressure gauge and stem position?

A: Yes. The DeltaPValve® O&M manual illustrates flow at each stem position for every DeltaPValve®.

3. Q: When using DeltaPValves®, do I have to balance a new system or rebalance when expanding my facility?

A: No. DeltaPValve® systems are balanced automatically upon installation. Systems using DeltaPValves may be expanded without rebalancing provided that the minimum differential pressure, typically 5 psi (0.34 bar) across the hydraulically most remote valve is maintained.

4. Q: Do you set design flows for each DeltaPValve® at the factory?

A: We set the end stroke for pneumatically actuated valves. The stroke of electrically actuated DeltaPValves® may be set with a DDC control system by limiting the signal to the valve or the span on the actuator.

Service:

1. Q: Must the DeltaPValve® be removed for maintenance or service?

A: If service is required, rarely would the DeltaPValve® need to be removed. Troubleshooting typically starts by measuring pressure using the P/T ports provided and verifying the flow vs. stem position. The only recommended maintenance is seal replacement projected to be required after 10 years.

2. Q: Do DeltaPValves have an integral Strainer or do they require a strainer installed upstream of the valve?

A: No. DeltaPValves have large flow passages and a large piston area which allow it to be very resilient to poor water quality.

3. Q: What is the expected life for DeltaPValves?

A: DeltaPValves can be expected to last 20-30 years in typical systems. Internal components are high quality and should never have to be replaced.

4. **Q:** Can the maximum flow rates be changed if the flow requirements change?

A: *In many cases, with DDC controls, the flow rate through the valve can be increased to its maximum without leaving the computer terminal. This is a significant advantage in systems undergoing modification. Increasing DeltaPValve® capability to the next higher maximum flow may be easily done in line with replacement of a single part.*