AUTOMATIC & STATIC BALANCING

VALVE FEATURES AND APPLICATIONS

Most hydronic systems these days are designed as variable flow systems to reduce the cost of ownership, utilising pressure independent or electronic control valves. However, static and automatic balancing valves still have a role to play. Before looking into Balancing Valve options and their applications, let us firstly recap why Hydronic systems have to be balanced.

Water naturally takes the path of least resistance through the system. Terminal units such as radiators, fan coils, air handling units, chilled beams and radiant panels that are closest to the pump would receive excess water flow whereas units further away from the pump would receive insufficient flow. When balancing a system, flow distribution is influenced by effectively changing the system resistance, providing all circuits with the required flow. When the system is balanced water flow can be delivered at design requirements to all parts of the circuit, resulting in the required ambient temperature and greater occupant comfort. Unnecessary energy consumption is prevented. Pumps are operating with sufficient flow and the heat loss from the piping system, especially in uninhabited areas of the building such as basements and staircases, is minimised. Noise generation is avoided. Balancing valves help achieve design operating conditions by managing the flow of water through the system, ensuring each part of the system is supplied with the correct amount of water. Balancing helps overcome a wide range of system conditions where pipe sizing and pipe configurations alone cannot achieve design requirements.

Static (Manual) Balancing Valve Options and Applications

There are 3 different manual balancing valve types, which, once set, remain in that position. These 3 balancing valve types are designed differently.

1. **Double regulating valve (DRV)**
These valves can isolate and regulate an application. Consider that this balancing valve doesn't provide flow measurement.

2. **Variable orifice double regulating valve (VODRV)**
Where manual control is considered appropriate for the degree of flow management required, the VODRV is designed to allow flow measurement by measuring the differential pressure across the seat of the valve. The Kvs value changes each time the setting is altered. The variable orifice double regulating valve can be identified by the position of the test plugs, which are situated on either side of the regulating disc to measure flow across the valve. The measurement accuracy may be adversely affected by this principle by plus or minus 15%, dependent on the opening position. The valve is unidirectional and the direction of the flow arrow on the valve body must be respected. The setting procedure is a time-consuming process at the balancing stage.

3. **Fixed orifice double regulating valve (FODRV)**
Fixed orifice double regulating valves can be identified by a fixed orifice measuring device cast into the internal body of the valve. The Kvs value of these valves is fixed. The pressure differential is referred to as a measurement signal. The flow rate is calculated from the measurement signal. The accuracy of this type of valve is typically plus or minus 5%, dependent on the opening position. The valve needs upstream and downstream straight pipe lengths to measure accurately. The valve must be installed respecting the flow direction indicated on the body. The setting procedure is quick, easy and accurate. The flow can be read from an electronic flow meter with the correct Kvs value for all valves installed in the system. Another type of fixed orifice flow balancing is through a venturi. A venturi fixed orifice double regulating valve uses a venturi profile instead of a flat plate orifice. It provides less turbulence and significantly reduces loss of pressure and improves signal strength.

The VODRV and FODRV effectively replaces an isolation valve and metering station. Considering that all manually balanced installations require extra large, expensive partner valves to avoid re-adjustments, which sit on branches, risers and mains and that the commissioning of manually balanced systems is time consuming and labour intensive and can only start once all valves are installed and the system is filled with water, systems nowadays are mostly designed for pressure independent and electronic control.

Manual balancing valves can be installed:
(1) Within PICV-controlled zones. Each terminal unit within the PICV-controlled zone is fitted with a static balancing valve so that water is distributed proportionally to all terminal units within the zone.
(2) In the mains off the riser to distribute flow in Chilled Beam or particularly in Radiator systems, where the system is designed with particularly low pump head.

Dynamic Balancing Valve Options and Applications

Today it is quite common to specify dynamic balancing valves, such as an automatic balancing valve or constant flow regulator, to be used in conjunction with 3 or 4 port valves or in PICV controlled systems for an End of Line application.

In a 3 or 4 port valve-controlled system the dynamic balancing valve automatically balances and provides constant flow control in full or by-pass flow, irrespective of fluctuating system pressure conditions. The dynamic balancing valve adjusts itself within a wide differential pressure range (the valve's control area) to automatically limit the flow to design maximum, generating energy savings (in comparison with a traditional manually balanced system). The flow balance accuracy is high, plus or minus 5%. The spring-loaded differential pressure regulator in the dynamic balancing valve absorbs pressure fluctuations that occur due to load variation, maintaining the design flow rate.

At the end of a branch, a correctly sized By-Pass Valve should be fitted. It is recommended that this should be a form of dynamic balancing valve, which is ideal for this application. An installation of PICVs on the terminal units provide flow, temperature and pressure control in variable flow systems. Combined with a dynamic balancing valve as the end of line by–pass, it is ensured that the necessary flow passes through the system avoiding dead legs and a good temperature response. A correctly sized and located dynamic balancing valve will provide sufficient flow through the branch to maintain branch temperature when all the terminal unit valves have closed.

Select a dynamic balancing valve with an adjustable and removable control element (insert/cartridge) to enable trouble free flushing and maintenance.

Learn about the benefits of the PICV valve, its applications and variable flow system design, please get in touch with FloControl Ltd and request a CPD presentation.

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