Full-stroke vs limited-stroke

PICVs where the control and flow setting functions are separated within the valve (Figure 1a) are known as “full stroke” control valves because the full stroke of the control valve is available for control. This type of valve can be fitted with a programmable actuator which can be set to provide an equal percentage characteristic. The actuator always operates over the full stroke of the valve so it never needs to modify its programmed characteristic. The main benefit a full stroke valve offers is that the actuator can be driven through its full range which is of particular importance on valves where the stroke is quite short (e.g. in the 15-25mm size range). Where the control and regulation elements of the valve are separated there is a risk that the control characteristic may change as the valve is regulated although this can be mitigated by the control element having an intrinsic equal percentage characteristic and by proper selection of the actuator.

PICVs where the control valve and flow setting devices are combined in a single component are known as “stroke limited” control valves (Figure 1b). This is because part of the control valve’s stroke will be used up in regulating the flow to its required setting. In stroke limited valves a significant proportion of the valve stroke may be taken up during flow regulation. This limitation of stroke is most apparent with linear characteristic valves, since in order to regulate a valve to 50% of its maximum flow, 50% of the control stroke is also lost. It is therefore essential that stroke limited valves have an intrinsic equal percentage characteristic; if an equal percentage valve is similarly regulated to 50% of its maximum flow rate then only around 18% of the stroke of the valve will be lost.

Stroke limited valves can be of the lift and lay type, multi-turn type or characterized ball type. Lift and lay types have a rising stem which the actuator pushes against to close the valve. Multi-turn or characterized ball types have a rotating stem which the actuator must turn to close the valve.

In the case of lift and lay valves an actuator which can compensate for the lost stroke as the valve is mechanically regulated must be supplied otherwise the control characteristic of the valve will be adversely affected. Multi-turn valves are usually supplied with a matched actuator so this problem is avoided. In the case of rotary type valves, where the control and regulation device is a characterized slot in a ball valve, the valve can be driven to the regulated position by scaling the output from the controller to the actuator. There are also special actuators available that can be used where the scaling cannot be accomplished by the controller.

Author: Amir R. Mahmoudi – BSc Mechanical Eng.