Amsterdam, Noord-Holland State

Two identical rooms in an a office building in Amsterdam were used as a test to determine efficiency of the AB-QM valve over a conventional system with manual balancing valves and logarithmic motorized control valves. In order to compare performance, two identical rooms were equipped with temperature sensors.

In room 1 an AB-QM valve with a modulating thermal actuator (ABNM) was installed. In room 2, the original system was kept with the conventional logarithmic valve with modulating, gear type actuator.

All the valves on the chilled water side had kvs of 1,6 with nominal flow of 0.081 l/s. Both rooms had one sensor installed to measure the room temperature, and another sensor was installed to measure the air temperature exiting from the FCU. The average of both sensors is calculated as an average temperature as if someone was in the rooms. Temperature was monitored for half a year;

from March to August on a 24 hour basis. Throughout the test, standard deviation of the measured temperature was calculated. The two rooms were occupied at different times, therefore "comparable" days were used to perform the evaluation.

From the temperature deviation we can

Measured results over a 6 month period

Temperature deviation (2 x Standard deviation) in °F	Room sensor	Discharge air	Results
AB-QM	±0,7	±3,6	±1,8
Conventional solution	±1,1	±9,4	±4,0

AB-QM valve installation

conclude that the room equipped with the AB-QM has better temperature control. The cause of the low performance of logarithmic is a limited range ability and too low authority of the conventional control valve. These problems are worsened by increased pressure due to low demand in the rest of the installation. These problems typically causes the valve to operate in ON/OFF mode.

The available pressure was changing most of the time due to heterogeneous demand in the system, resulting in a different available pressure than the one in which the valve was calculated and quite different from the differential pressure set with the manual balancing valves at nominal flow.

To achieve temperature comfort in variable flow systems, the control valves should be exposed to minimal changes in available pressure – therefore the usage of pressure controllers are needed. A logarithmic characteristic of the control valve is not an advantage when controlling small flows, because range-ability then plays a pre-dominant role. Pressure-independent linear valves are the optimal solution in that situation.

In addition to the inadequate effect of manual balancing valves, simplified sizing of the control valves adds a secondary reason for the lower performance as all valves were sized the same, regardless of position towards the pump and usage of that particular room. If sizing would be done more thoroughly some of the performance could be improved, however more engineering time will be needed and the office space will lose flexibility to change.

Position of temperature sensors