

CASE STUDY:

The AB-QM Pressure Independent Balancing & Control Valve: Continuously Optimising HVAC Systems Towards Greater Efficiency.



Product: The AB-QM Pressure Independent Balancing & Control Valve
Test case location: University of Technology, Sydney (UTS)

INTRODUCTION:

Despite all the innovations in the field of HVAC efficiencies, it is still challenging to optimise HVAC systems so that they are consistently able to operate at their optimum efficiency. The *Danfoss AB-QM pressure independent balancing and control valve (PIBCV)* enables HVAC systems to stay automatically optimised delivering significant energy savings. The AB-QM valve also makes system commissioning quick and easy for the installer and helps reduce the overall capital cost of a new HVAC system.

THE FACILITY:

Founded in 1981, the UTS is located in the heart of the city of Sydney and has been long-standing for over three decades attracting both local and international students.

A test case was conducted by Devex Systems & Danfoss comparing two rooms positioned side by side to each other.

Room C1.11 and Room C1.13 in Building 5 (Business School) on the Ultimo Campus. The two rooms were identical in size and heat load. Each room was serviced with its own (identical) fan coil unit located above the ceiling space in the adjoining corridor.

The AB-QM valve was applied to room C1.11 while the Classic control (control valve plus manual balancing valve) already operating in room C1.13, remained untouched.

SYSTEM OVERVIEW:

- A primary secondary system with conventional chillers using air-cooled condensers
- Primary chilled water system
- Series of 12 air handling & 190 fan coil units
- Chilled water supply temperature was 6 degrees
- 2 high load demand chillers and 2 low load demand chillers

A central air handling unit provided pre-cooled fresh air and the space above the suspended ceiling was used for air distribution from the central air handling unit to the fan coil units.

Fan coil units in rooms C1.11 and C1.13:

- Air supply capacity of 520l/s
- Blend return air from room (340l/s) with fresh air from hallway (180l/s)
- Estimated design cooling load is around 6.86kW

TEST CASE RESULTS:

The test results were logged using a Hydronic Analyser (Danfoss CCR2/CCR3)



that was connected to 10 temperature sensors. The sensors measured the following for each room:

- room air temperature
- supply chilled water temperature
- return chilled water temperature
- supply air temperature
- return air temperature.

The data was recorded in 5 minute intervals and stored on an SD card which was later analysed with a tool developed specifically for the Hydronic Analyser.

The AB-QM DN32 valve was used in Room C1.11:

- Capacity (Q_{max}) = 0.89L/S
- Setting was 40% = 0.36L/S

The data comparing the two rooms was gathered over a period of 2 weeks in March 2012. From the data collected, the following observations were made:

- The AB-QM achieved a narrower range of room temperature of 2°C while the Classic control oscillated within a 4.5°C range over a typical day.
- At observed capacity, the AB-QM potentially saves 45% pumping power!
- The AB-QM achieved a chilled water temperature differential (ΔT_{cw}) of 50% higher than the Classic control.

ESTIMATED SAVINGS:

Estimated savings per annum combining chiller, control and pumping costs is in excess of **\$95,000** with an **estimated payback of less than 3 years** on a conservative capital investment to retrofit.



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ESTIMATED SAVINGS: SUPPORTING EVIDENCE

The estimated savings the AB-QM valve offers for the Building 5 on the Ultimo Campus at UTS (per annum) is as follows:

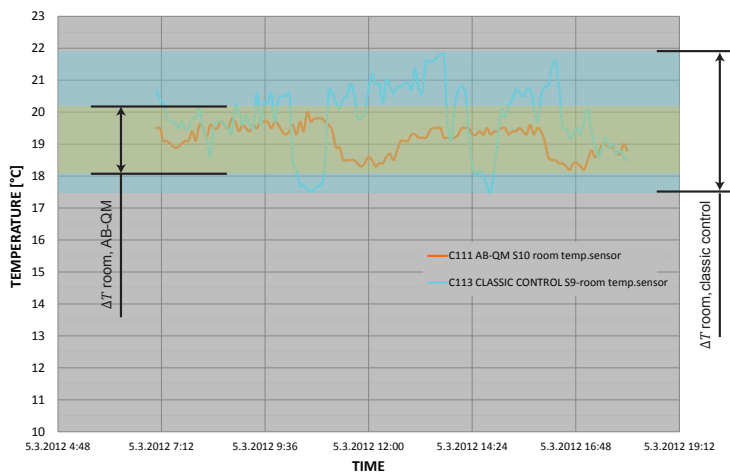
✓ Chiller Savings	145	\$29,023	9%
✓ Control Savings	349	\$57,692	21%
✓ Pump Savings	42	\$ 8,458	34%
✓ TOTAL Savings	536	\$95,174	25%

Estimated payback less than 3 years!

The AB-QM achieved a narrower range of room temperature at 2°C while Classic control oscillated within a 4.5°C range.

- Both valves have modulating actuators
- Both rooms set to the same set temperature
- FCUs are cooling rooms where heat gains are not constant

For equivalent comfort levels, the room with the AB-QM could be set 1.5 °C higher than the classic control. This translates to a 21% estimated saving in the overall running costs if applied across the entire installation.



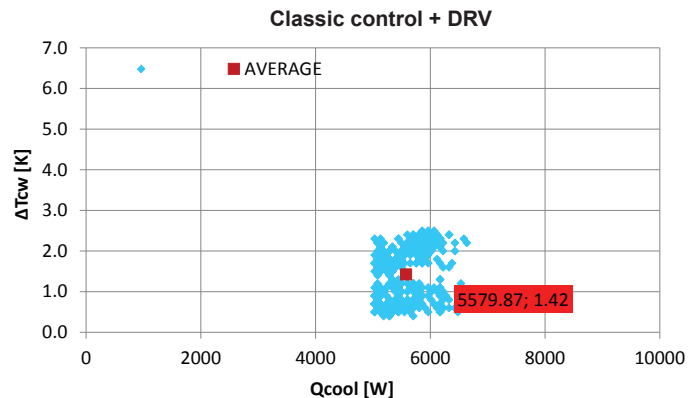
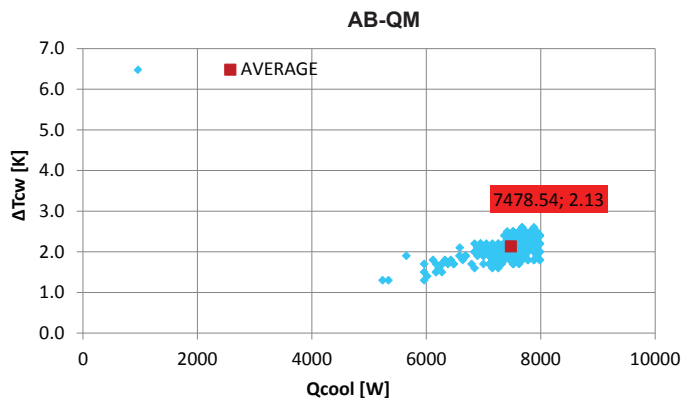
The AB-QM achieved a chilled water temperature differential (ΔT_{cw}) of 50% higher than the Classic control

A higher chilled water temperature differential (ΔT_{cw}) means that energy transported with water is better used.

ΔT_{cw} , AB-QM = 2.13°C

ΔT_{cw} , Classic control = 1.42°C

This translates to a 9% estimated efficiency improvement for the chillers

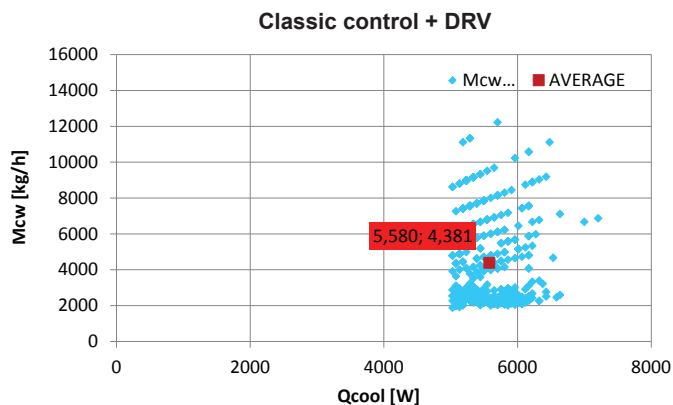
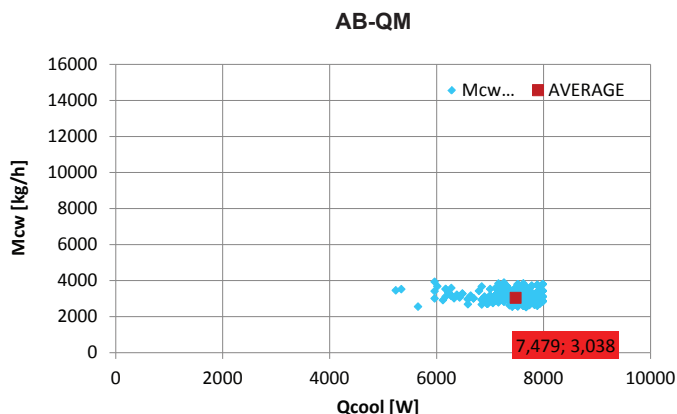


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At observed capacity, the AB-QM saves 45% pumping power!

Because of higher chilled water temperature differential (ΔT_{cw}), the AB-QM is able to keep lower flow and deliver superior performance compared with the Classic control average cooling water flow of 4380 kg/hr (vs 3038 kg/hr for the ABQM). This translates to an estimated savings in pumping power costs of 34%.



CONCLUSION:

The AB-QM showed superior performance over the Classic control and offers significant running cost savings with a very short payback period.



Devex Systems specialises in heating, cooling and insulation solutions for new and existing buildings in residential, commercial and industrial environments.

For more information on any of our product lines, please contact us at:
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