

ABQM Case story

Hydronic Analyzer tests proof: **significant savings on energy costs**

Renovation of the Sunway Resort Hotel in Kuala Lumpur, Malaysia.

61% savings
on pumping energy
achieved through
pressure independent
balancing valves
installed on fan coil
units.



Clear differences between conventional and new AB-QM solution

In 2007 the Sunway Resort Hotel & Spa had a wish to renovate all their hotel rooms. Although the owners of the hotel were already positive about the use of Danfoss AB-QM pressure independent balancing and control valves, they wanted to have some additional proof for the possible energy savings and benefits. Tests with a Danfoss data logger, the Hydronic Analyzer, that were conducted between 2007 and 2011 proved the clear differences between the conventional and new solution.

Danfoss has developed a tool, the Hydronic Analyzer, which is used to analyze the efficiency of a heating or cooling system and determine energy saving potentials. The hydronic analyzer is a set of sensors that is being placed in the pipes and airside of a terminal unit to measure the supply and return temperature of both air and water. Measurements are made first with conventional solution and secondly after replacement with Danfoss AB-QM pressure independent balancing valves. After a certain period of measuring, both tests are being compared by using advanced software and the result is precise information about significant energy consumption.



The Sunway Resort Hotel & Spa is a five star hotel located within the integrated Sunway Lagoon Resort in Kuala Lumpur. The 800 acre outstanding landmark consists of hotels, conference and convention centres, a spa, a theme park, shopping and entertainment mall, medical centre, educational facilities and a multitude of distinctive convention, business and leisure facilities.

Two different setups to prove the case

The hotel has about 500 fan coil units that were originally equipped with a conventional solution, a 2-way control valve and a manual balancing valve. When the first phase of the hotel renovation was finished, one third of the hotel rooms were equipped with about 150 pieces of AB-QM. At that time Danfoss offered the hotel owner to test

the system with the Hydronic Analyzer comparing the two solutions: conventional and the AB-QM. The results of the analysis showed significant energy saving potential, both on the energy for pumping and the efficiency of the chiller. Upgrading of all 500 fan coil units with AB-QM valves would improve the efficiency of the chiller and also save on pumping, about 60% on the overall energy bill.

The tests were conducted in two similar hotel rooms with a different hydraulic setup:

- One conventional, with the use of manual balancing valves and control valves.
- One energy saving proposal, with the use of pressure independent balancing and control valves.



With this Danfoss solution in the hotel we were able to reduce the energy consumption of the chillers. On top of that the fast commissioning time of the AB-QM pressure independent valve was a great advantage, which meant we managed to finish the whole project in time.

Mr. Chin,
Chief Engineer



Measurements made clear

Figure 1a shows the relation between the ΔT and the cooling capacity measured at the fan coil unit. This graph represents the result of measurements on the fan coil units with a traditional control valve and manual balancing valve. Figure 1b represents a fan coil units equipped with AB-QM.

Results:

In the left graph the average ΔT is 2K, the cooling capacity is 7507 Btu(2.2 kW) and in the right graph the average ΔT is 5K, and the cooling capacity is 7165 Btu(2.1 kW). We can therefore conclude that with the AB-QM the cooling capacity is practically the same while the ΔT increases significantly. This will substantially increase the efficiency of the chiller as can be seen in figure 3.

Figure 2 shows graphically the relation between the heat exchangers relative emission and the relative flow. The AB-QM provides exactly the designed emission at a 100% flow, while the traditional control valve and manual balancing valve produce an overflow of 150% (250-100%) with only 10% more emission.

Figure 3 shows graphically the relation between the co-efficiency of the performance (COP) and the chiller load percentage. Overflow through the fan coils causes inefficient chiller operation due to the so-called low ΔT syndrome. Furthermore, because less water needs to be pumped for a similar capacity, the pump speed can be more than halved resulting in substantial energy saving on pumping energy.

The solution comprises:

- AB-QM valves, size: DN25
- Actuators TWA-Z NC, 230 VAC
- Tests were conducted with CCR2 controllers, performing as data loggers

Advantages of the renovation solution:

- No extra installations needed
- High energy efficiency
- Low maintenance costs
- Shorter start up time
- Good control characteristics
- Increased room comfort

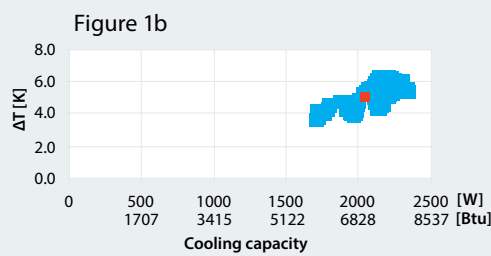
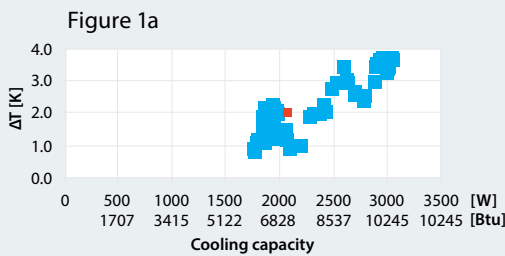


Figure 1a/1b

- ΔT
- Average ΔT

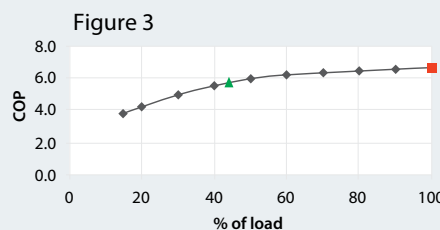
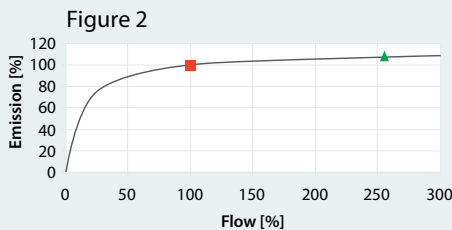


Figure 2

- AB-QM
- ▲ Traditional valve

Figure 3

- AB-QM
- ▲ Traditional valve

About Sunway Resort Hotel & Spa:

- 441 rooms and suites
- 5 restaurants
- 108,000 sq. ft. (10,000 m.) of function space
- Owner:
Sunway International Hotels & Resort
- Testing period:
2007 – 2011

Beneficial results

Calculations of this particular case show that the average flow rate has decreased from 4.6 to 1.8 GPM. This reduces the pump speed with an impressive 61%.

Overall the installation of pressure independent balancing and control valves clearly showed substantial benefits for the Sunway Lagoon Hotel. Not only did it increase the comfort in the rooms, but it also maximized the chiller efficiency which lowered the energy bills. With simplified calculations now being possible, the estimated payback time on the new solution was significantly shorter. The fast and smooth commissioning of the AB-QM valves also saved a great amount of time and did not interrupt the daily business at the resort.



3 good reasons to choose Danfoss

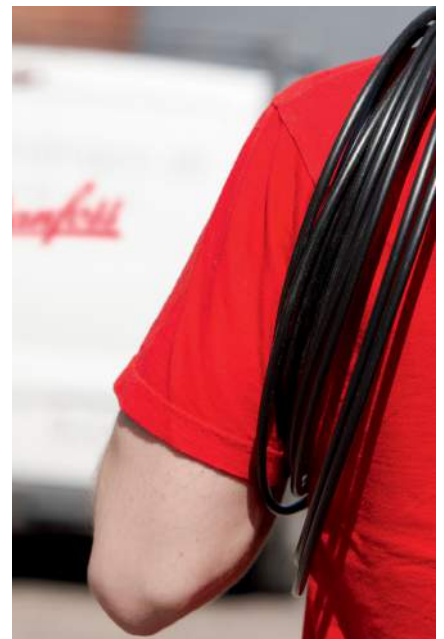
Danfoss is more than a wide range supplier of premium solutions. Our customer insight and technical expertise also make us a strong partner for your business.



1 Broad application know-how and customer understanding



2 Supplier of solutions with a wide product range



3 A strong and dedicated business partner

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