

“Saving Energy in a City Hotel”



Project background

Sheraton on the Park, renowned for being the benchmark of classic hotels in Sydney, is situated in the heart of the city, right across the magnificent Hyde Park with 557 rooms and suites, several award-winning dining venues, a Spa with heated indoor swimming pool and 18 multifunctional meeting rooms are a perfect place to learn more about energy consumption and how to implement new features to support green initiatives and sustainability goals, keeping in regard to Starwood global environmental commitments.

In 2011 Aus Industry extended their Green Building Fund to include the hotel industry. The program was initiated to assist accommodation service providers to reduce their environmental footprint, energy consumption and improve their overall energy efficiency.

Enman, a team of professional engineers and technologists specializing in energy efficiency improvements, carbon pollution reduction and energy supply contracts, conducted an audit at Sheraton on the Park to identify the key energy saving projects which provide substantial energy savings and carbon reduction. As these energy saving projects are in line with their future plans, Enman conducted business case studies for each of the recommended energy

saving projects, so that these project benefits and investments can be in compliance with the investment guideline of the hotel.

Subsequently approved by Aus Industry due to its merit, Enman has been engaged to engineer and manage the implementation of various projects and deliver measurable savings at the end.

Challenges

The greatest challenge in the execution was to implement projects which can save energy and at the same time consider the costs that the business case would develop.

Enman developed a technical specification and called tender for each project. The tenderers were selected based on their merits which are primarily project cost, delivery of the energy saving and ongoing maintenance costs. These projects have been planned to execute the projects at a time line committed to in the Green Building Fund.

Projects

There are a number of projects involved in this energy efficiency upgrade.

1. Chiller Upgrade
2. Control System Upgrade
 - a) Building Management System
 - b) Variable Speed Drive
3. Energy management control system
4. HVAC Upgrade
5. Lighting system

1. Chiller upgrade

The existing chillers at Sheraton on the Park are primarily made by Trane. The chiller plant is on the 23rd Floor, which actually creates the big challenge of lifting the chillers this high, especially in a high traffic zone. Dalkia Technical Services was appointed to replace one of the larger chillers with their state-of-the-art Trane centrifugal chillers with variable speed drives. The chiller has high performance at a part load condition and can operate as low as 10% of the capacity. The peak co-efficient performance is around 11 compared to the current peak COP of 6.4. The chilled water pump has also been replaced for reliability as well as for energy efficiency improvement.

2. Control system upgrade

Energy saving through advanced and optimal control is a more recent trend in the hotel industry. As part of this energy efficiency upgrade, the plan is to improve the overall control system of the hotel. This requires the following upgrade;

a) Building Management System (BMS)

The hotel had a very old Barber Coleman BMS which is not supported anymore. This BMS is now being replaced by Schneiders' latest Struxeware BMS to be accommodated as a platform for the implementation of the energy management control system.

b) Variable Speed Drive

A large number of variable speed drives are being implemented as part of the energy management control system. Variable speed drives are now becoming a standard in energy saving for all major drives, especially in pumps, fans, chillers etc. Variable speed drives are ideally suitable for drives where the load varies as part of the process. At part load condition it reduces throttling which is an irreversible process and wastes energy. VSDs are also used to match the drive load by controlling speed instead of start and stop.

The energy saving from VSDs very much depends upon a control algorithm used to control the speed so as to match the process demand. Areas the VSDs are being applied to are:

- Condenser water pumps
- Chilled water pumps
- Cooling tower fans
- Air handling unit fans
- Kitchen exhaust fans
- Car park and loading dock fans

VSDs are being supplied and installed by Schneider Electric.

3. Hotel energy management control system (HEMS)

An energy management control system has been installed as well. It will provide advanced and optimal control along with a demand management system. This system will be managing the advanced control strategy, energy and performance monitoring and reporting, which is called 'ENERTROL'. The new hotel energy management system or HEMS were supplied by Enman Pty Ltd, which is the third generation of Enman's energy management control system. This HEMS is integrated with the new BMS, working as a "brain" for advanced and optimal control. It is also interfaced with the electricity meters for demand management and energy reporting. The HEMS is based upon Tridum JACE controller, a Niagara based system communicating with the BMS through BAC Net.

The function of the energy management control system is as follows;

- ❖ Chiller optimal control
 - Optimising selection of chiller to run

- Chiller optimal load allocation. This is a unique load control optimisation technique especially warranted when the modern VSD based chillers operate in conjunction with conventional and old chillers
- Optimal chilled temperature reset
- Optimal condenser water temperature control
- ❖ Optimal Speed Control of VSD
Model based speed control algorithms are used to squeeze the energy saving to its maximum. These are:
 - Optimal speed control for all fans including AHU/FCU, exhaust and car park ventilation fans. This uses a supervisory feed forward complied with feedback control algorithm
 - Chiller and condenser water pump speed control. Unlike conventional VSD control it is a variable volume control with supervisory feedback control to provide extra energy savings from the conventional VSD speed control.
- ❖ Optimal HVAC control. Optimal economy cycle with CO₂ control. Enthalpy based economy cycle geared with CO₂ based fresh air intake algorithm is used to provide more interactive energy saving control.
- ❖ Demand management system
 - Demand control through chiller loading and AHU fan speed control. This is to control demand so as to reach its target, reducing the demand cost of the electricity supply.
- ❖ Monitoring and reporting functions
 - It provides chiller performance monitoring in order to run the chiller at the highest possible energy performance
 - Energy and demand reporting

The HEMS is supplied and implemented by Enman Pty Ltd.

4. HVAC Upgrade

To improve HVAC control, all the dampers have been tuned and stroked properly to provide high energy efficiency at all times. The fan exhausting system is being modified to provide better energy saving through an economy cycle. The local HVAC maintenance contractor called CAMS (commercial air conditioning mechanical service) is modifying the HVAC system.

5. Lighting system

Lighting is one of the major energy users of the hotel. The lighting technology has recently been replaced with LED technology. Sheraton on the Park has already replaced a large number of dichroic down lamps with LED lamps. The LED lamps not only have a potential energy saving of up to 80%, but also provide a life of around 50,000 hours

compared to the few thousand hours of life of dichroic lamps. Additionally, they enable the hotel to customize their meeting rooms with any color they wish. The LED lamps used are supplied by OCTALEX Green Lighting Pty Ltd and Optiled by Pega Australasia.

Predicted energy saving

As a part of the business model, energy saving has been estimated. The predicted energy saving has been listed in table 1.

Project	Scope	Saving kWh/year	Carbon Emission Kg CO₂-e/year
Chiller system upgrade	Replace the main chiller with energy efficient chiller including VSDs	1,119,000	1,197,330
Control system upgrade	Energy management control system (HEMS) with BMS and VSD upgrade	1,140,667	1,220,513
Down light/lamp replacement	Replace Dichro lamps with LED lamps	92,707	99,196
Total		2,352,374	2,517,039

Table 1: Energy and carbon emission reduction summary

Conclusion

Investing in energy saving projects is not normally a high priority for a luxury hotel such as Sheraton on the Park. In many cases, investments primarily focus on renovations and maintaining the services required to operate the hotel. However, the incoming carbon tax and the government subsidies are supporting energy saving efforts and cause efficiency projects to reach fruition – an initiative which has been prioritized by the hotel management at Sheraton on the Park and will cause energy savings of approximately 22% in total.

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