Improving Energy Efficiency in a Business Hotel

A case study

1. Introduction

Many hotels are becoming increasingly aware of their environmental footprint, energy consumption and the energy efficiency of their facilities. Park Hyatt Melbourne, a five star, luxury appointed hotel in the heart of Melbourne's CBD applied for government funding through the Green Building Fund (GBF). This program is aimed at encouraging business owners to reduce Greenhouse Gas emissions by investing in energy efficient projects. This study describes the expected achievements of the Park Hyatt Melbourne in reducing their energy consumption and environmental impact through innovative project implementation.

A feasibility study on the Park Hyatt Melbourne was carried out by Enman Pty Ltd in 2011. Possible energy saving opportunities were identified for the hotel and cost-benefit analysis conducted for each opportunity. Enman then developed a business case for the selected opportunities to apply for government funding through the Green Building Fund. Business cases were conducted on projects deemed to provide maximum energy savings and those that were the most economically viable. These projects are to provide a platform for further energy efficiency improvement of the hotel.

The Green Building Fund was awarded to Park Hyatt Melbourne by AusIndustry based on the merit of the projects outlined in the Business cases. Enman Pty Ltd was then appointed to provide the turn-key supply of the project to deliver the energy savings predicted in the Green Building fund application at the estimated project costing. The project is currently under implementation and will increase the present NABERS rating by 1.5 to 2 stars.

2. Projects

2.1.Room management system

The electronic room management system is the recent trend in hotel energy management and is regarded as one of the major potential energy saving projects identified during the feasibility study. Rooms are usually unoccupied for a substantial amount of time, however, the air conditioning and lights are normally left 'on' by guests.

To reduce energy consumption Park Hyatt Melbourne elected to implement a room management system. The Energy eye room management system has been selected to manage their guest rooms. The control system uses the existing Siemens room controller, monitored by the Siemens BMS to control the utility services of the guest rooms such as air conditioning and lighting. The room controller detects occupants via a door switch and motion detectors. When the room is unoccupied the system resets the room temperature to a pre-defined set point around 26°C in summer and 18°C in the winter, It will also turn off room lighting.

A number of rooms have been tested with this room controller at Park Hyatt Melbourne. After observation by the hotel management for a period of time the energy eye room controller has been accepted for implementation.

It appears that around 30 - 40% of the time rooms are unoccupied, providing a potential for a reduction in energy consumption of 20 - 30%.

2.2.Energy Management System

An energy management system is being installed at Park Hyatt Melbourne in a bid to reduce energy consumption and encourage efficient use of energy through advanced optimal control of the chiller plant and comprehensive energy and performance monitoring and reporting functions. These functions are:

- Chiller optimal control:
    - Optimal chilled water temperature control
    - Optimal condenser water temperature control
    - Optimal chiller selection
- Variable speed drive optimal control:
    - To provide advanced optimal control of variable speed drives on chiller pumps and fans to provide maximum savings in using VSDs
- Demand management and housekeeping:
    - To monitor electricity demand and will control chiller loading if the demand exceeds the target. The control uses a load prediction algorithm to manage demand. This process is expected to reduce demand of the hotel by 5 - 10%
    - Providing comprehensive energy monitoring and reporting functions to improve housekeeping which is expected to improve energy efficiency of the hotel by another 2%

Energy management is expected to reduce the chiller energy consumption by 30%, and run hours by 20%.

The energy management system is to be provided by Enman. The system is called 'ENTEROL' energy management control, specifically designed to manage and optimise energy consumption of the hotel. This is based on the Tridium JACE controller communicating with the Siemens BMS by BACNet.

2.3.Variable Speed Drives

Variable speed drives are being installed in the chiller plant to reduce energy consumption. This reduces the throttling of pumps to achieve flow and more precise control if cooling tower water temperature by varying fan speed. The ABB variable speed drives have been selected and installed at Park Hyatt Melbourne for the chilled water pumps, condenser water pumps, hot water pumps and the cooling tower fans. The energy management system controls the speed of the pumps and fans through an optimal speed control algorithm which goes beyond the conventional VSD control, realising increased energy savings. Expected energy savings for pumps with VSDs are around 35%.

2.4.Lighting Upgrade

As a part of this energy efficiency initiative a large number of dichroic down lamps and fluorescent lamps are being replaced by cutting edge LED lamps. A large number of different types of LED lamps with different colour and appearances have been trialled to match the aesthetic requirements of the hotel. The LED lamps provide much lower wattage consumption and therefore provide a much more energy efficient lighting option to Park Hyatt Melbourne. The LED lamps have been tested and results suggest the down lights energy consumption will be reduce by 75% and fluorescent lamp energy consumption will reduce by 60%. The other advantage of these LED lamps include increased life expectancy from 2,000 -10,000 hours to 50,000 hours

3. Predicted Savings

There have been many energy saving projects identified at the hotel. Table 1. Shows these identified projects together with their expected savings.

Project	Scope	Saving	Carbon Emission savings
1. BMS UPGRADE WITH VSD INSTALLATION AND ENERGY MANAGEMENT CONTROL	Install VSDS on chiller plant pumps and cooling tower fans	Approximately 35% pump load, 30% chiller load, 30% cooling tower load, 200kW saving from demand management, 2% saving of hotel electricity use from improved housekeeping	1,407,386.15 kg CO2-e/kWh
	Upgrade BMS and Implement energy management control functions including: Optimal chiller control, optimal speed control for VSDs, demand management and energy reporting		

2. Guest room management system	Install room management system for 240 rooms, including: door switch, motion detector, FCU control	Approximately 21% of total chiller load, 40% in room FCU fan load and 40% of heating load of FCUs	676,565.17 kg CO2-e/kWh
3. Fluorescent Lamp replacement – Option 2	Replace 500 off 36W T8 Fluorescent tubes with 18W LED strip lamps	60% of lamp load	195,200 kg CO2-e/kWh
4. Down Light Lamp replacement	Replace 1000 off dichroic down lights with LED down lights	80% of lamp load	694,044.74 kg CO2-e/kWh

Table 1. Predicted savings and project details

4. Conclusion

This project demonstrates how a government grant program, such as the Green Building Fund, encourages building owners to invest in energy efficiency projects. This case study also illustrates the obvious and viable energy saving projects available for a business hotel and the benefits of such activities for the organisation.

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