



Alexander Library Building Case Study

Various energy efficiency measures implemented at the Alexander Library building complex were expected to provide an annual \$73,465 saving on energy costs and achieve a return on investment within three years. The project included an upgrade to the heating ventilation and air conditioning system, improvements to the chiller plant, the installation of light dimming devices in the atrium and measures to reduce humidity levels in the archive stack area. It is believed that these initiatives will not only reduce the building's energy consumption rate but also contribute to enhanced working conditions and increase the reliability of the energy systems.

Introduction

A vast amount of energy is consumed by the Alexander Library building due to the site's considerable extended hours of operation. A seven-level office building, the Alexander Library is approximately eighteen years old and has a net occupied air conditioned area of 25,700m². The building houses the State Library facilities, the State Records Office, a privately operated café and a privately operated staff canteen. When a project was proposed to upgrade the security system at the site, it was decided that various energy efficiency initiatives should also be implemented. An energy audit was conducted and consultants identified several major energy consuming components and areas in the building and made various recommendations. Initiatives included installing Direct Digital Controls to various energy systems, replacing the Inlet Guide Vanes on the air conditioning system with Variable Speed Drives, reassessing the lighting load in the atrium and installing partitioning in the archives stack area.

Upgrades to the HVAC and chiller plant

The pneumatic control systems for the chilled water, heating, hot water and the air handling plants were replaced with direct digital controls. The direct digital controls will provide the manager with greater control of various parts of the systems via the Building Management and Control System and hence more effective and efficient performance. It allows for the monitoring of energy consumption, adjusting temperature set points to facilitate a quick response to problems. The cost of installing the direct digital controls to the chilled water, heating and hot water plants was \$50,000, providing an estimated energy saving of 180,000 kWh/year, equating to an annual saving of \$19,231 and a payback period of 2.6 years. An additional investment of \$120,000 was required to install direct digital controls to the air handling plant and the energy savings were expected to be 365,000 kWh/year, providing a \$38,710 annual cost saving and allowing for payback within 3.1 years.

Improving the control of the supply of air volume

Variable speed drives were used to replace the inlet guide vanes on air conditioners 1 and 2, as part of the works associated with tuning the building's air conditioning system. In terms of improving the control of supply air volumes, it was necessary to replace the inlet guide vanes as these are high maintenance items which display significant operating inefficiencies when positioned to provide lower supply air quantities. Energy savings of 5% are expected. The cost of installing the variable speed drives was \$15,000 and they were expected to generate a \$8,824 reduction in energy costs per annum. This equalled a 80,000 kWh/year energy saving and costs were expected to be recouped within 1.7 years.

Conserving energy in the atrium

Lighting within the atrium in the Alexander Library building is achieved using sky lighting and an extensive number of fluorescent lamp fittings (four lamps per fitting). During the energy audit, it was established that lighting levels were much higher than levels required by the Australian standard. In order to reduce energy consumption, it was recommended that a dimming system be installed and an appropriately located photo electric sensing cell be used to exploit the high levels of ambient lighting during the daylight hours. The photo electric cell senses light levels and switches off lights when not needed. Investment in the atrium retrofit was \$15,000 and estimated energy savings were set at 40,000 kWh/year, suggesting a \$4,286 saving per annum with a payback period of 3.5 years.

Reducing humidity levels in the archive stack area

An issue of particular concern in the library is the maintenance of correct relative humidity levels within the archive stack area. Recommendations were made to segregate the archive stack from the general office space in order to maintain the high quality conditioned air in this area. Partitioning would enable better control of the climate and ensure optimum air quality. The cost of the partitioning was \$10,000, with energy savings estimated at 22,000 kWh/year, translating to a \$2,414 cost savings and a payback period of 4.1 years.

Summary

Building managers at the Alexander Library building complex believe the energy efficient upgrades will result in an estimated 687,000 kWh/year reduction in electricity consumption, equating to annual savings of \$73,465.

Further information

Further information on this project can be obtained by contacting the Sustainable Energy Development Office, (08) 9420 5600, or via email at sedo@energy.wa.gov.au