EnergyManagement
Association of New Zealand

Continuous commissioning saves energy in a creative environment

Client: The Dowse Art Museum
EnergyMaster: Andrew Forest, ECOsystems
Challenge: Reduce energy use and waste while maintaining an ideal environment for both artwork and occupants at The Dowse Art Museum.
Solution: An energy audit was carried out by ECOsystems in 2011. Issues with the Building Management System (BMS) were identified, and the BMS was reprogrammed. In 2012 a retrofit project included installing variable speed drives in the HVAC fans, CO_2 sensor improvements, fixing leaking valves and replacing inefficient boilers.

In brief: ECOsystems carried out an energy audit of The Dowse in 2011 that led to:

- Identifying BMS issues and reprogramming of the BMS to overcome these.
- A major retrofit project involving the fitting of variable speed drives in all fans in the HVAC system, calibrating CO_2 sensors and installing new ones to moderate the air conditioning, replacing leaking control valves, and installing new gas condensing boilers.
- Installing barrier doors to separate the museum and cafe spaces.
- Monthly energy savings of $3,340 ($40,000 savings per annum) with a simple payback (with EECA funding) of 2 years.
- Energy savings of 39% after 12 months compared with the baseline year prior to the retrofit.
- CO_2 emissions reduced by 70 tonnes per year.
- Reduced maintenance costs with continuous commissioning.
- Ongoing monitoring of energy use and equipment operation to ensure continued energy efficiency.

The project

In line with its vision as "... a connected art place that explores meaningful new ideas and initiatives for our many communities" The Dowse is committed to operating sustainably.

The Dowse is constantly seeking new ways to conduct its business in a more environmentally friendly manner and to foster conversation around issues of sustainability. To do this, The Dowse wanted to investigate how it could be more energy efficient and make more use of renewable energy.

The solution

ECOsystems completed an energy audit of The Dowse in 2011, and found issues with the Building Management System (BMS) resulting in the building's HVAC system running inefficiently. Small changes made to the controls over time meant that the boilers and the chiller were often operating all year (and sometimes at the same time in the same museum space) with a resulting waste in energy. ECOsystems reprogrammed the BMS, while working with the maintenance team to keep the equipment in good working condition, to help ensure the system was operating as efficiently as possible. This initial reprogramming and maintenance work resulted in significant energy savings.

"We take an holistic approach, checking that every system is working properly and then undertake the work required to improve its effectiveness," said Andrew Forest, Energy Efficiency Engineer at ECOsystems.

"Improving the building controls and HVAC equipment not only reduced the energy bills, but made it easier to keep the building comfortable."

The Dowse management team were encouraged by the impact of the BMS tune-up and maintenance improvements on energy use, and confidently undertook a retrofit of aspects of the museum's HVAC system.

Variable Speed Drives (VSDs) were installed across all of the HVAC fans, which meant that the fans could operate at low (and high) speeds when necessary. This resulted in a more responsive and energy efficient system.

The existing CO_2 sensors were recalibrated, and new sensors were installed, to more accurately measure the level of CO_2 in the air and ensure the air conditioning delivered the best air quality for visitor comfort. Also, leaking heating control valves were identified and replaced, further improving the system's efficiency.

The two old, inefficient boilers were replaced with one new gas-condensing boiler. Now, the gas powered boiler resets the hot water temperature based on demand, rather than operating continuously. This replacement has significantly reduced the amount of gas energy used for heating.

A further structural change was made to the space, when doors between the café and museum were installed. Once installed, the reduction in airflow and heating/cooling loss between the two spaces was significant.

Following the retrofit improvements, ECOsystems implemented its "Continuous Energy Optimisation (CEO)" process to ensure the BMS and the related HVAC system is continuously commissioned resulting in maximum efficiency. Continual monitoring and fine tuning for at least two years after the retrofit ensures ongoing savings.

The company

ECOsystems has been saving energy and our environment in New Zealand since 1995 and has offices in Wellington, Auckland and Christchurch. They are energy savings specialists who not only deliver substantial energy savings, but guarantee the results.

ECOsystems' vision is to reduce energy use in commercial buildings by 50% – a vision they are realising in their projects.

"Energy savings are very valuable in a time when we're being encouraged to do more with less. The Dowse has a reputation for being innovative and involved with our local community – values that mesh well with this energy efficiency project.

"The main improvements are reduced costs and better environmental control, which is essential in caring for our collection. Our priority is to provide an appropriate environment for works loaned to us by artists, collectors and institutions.

"Energy efficiency has become a high priority for museums and galleries internationally. In Britain, the Collections Trust recently organised an 'Energy Efficiency for Museums' workshop. A major conclusion was that effective energy management depends on there being sufficient staff to monitor energy use, take appropriate action and collect evidence of the long-term impact. That's the approach we've taken – this is a long-term project with ongoing monitoring and adjustment."

Courtney Johnston, Director, Hutt City Museums