

Automatic monitoring targeting real energy savings & benchmarks

While it is becoming common to analyse the energy consumption in a building and invest in energy efficient technologies, HVAC systems are lagging behind. Their energy consumption disappears in the general electricity bill with separate meters seldom installed. The iSERVcmb Project is designed to shed more light onto this subject, as well as to encourage monitoring and establish energy benchmarks for HVAC systems.

"Cardiff University's involvement with both the IEE HARMONAC and iSERVcmb projects has meant we now can pay much closer attention to the detailed operation, maintenance and control of the University's HVAC systems than we would have done in the past. The savings achieved in McKenzie House over the time span of these two projects has demonstrated to us that there are significant energy and cost savings to be had in many of our buildings. This makes the initial time spent in understanding our systems, through describing the buildings physical assets using the iSERVcmb spreadsheet, a worthwhile and cost effective investment."

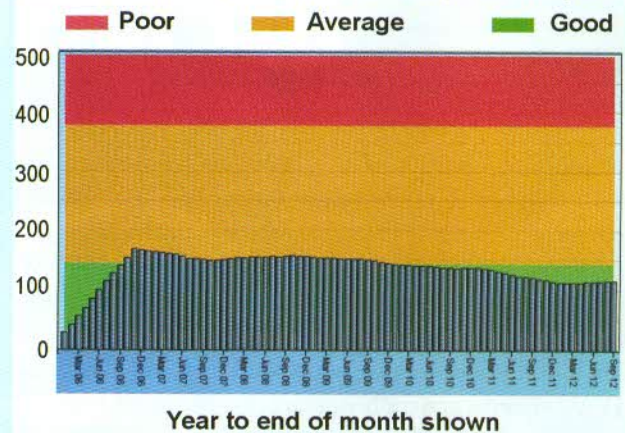
Keith Sims - Maintenance Engineer at Cardiff University

The iSERVcmb project has been discussed in previous REHVA Journals (August '11, January '12). This update on the project's progress shows the level of electrical energy savings being achieved at a whole building level from implementation of the iSERV process in a UK building over a period of 5 years. This is therefore the first building to be demonstrating results within the project period.

These first results show that the savings being achieved are significant: a reduction of 25% of the total build-



Average Annual Electricity Consumption kWh per m²



Currently, 89 buildings, 351 HVAC systems and 1,653 HVAC components have been loaded into HERO. Interested end users are invited to contact the iSERVcmb project partners for more information on benefits. Go to the project website to join the 130 companies and buildings already providing data to iSERV, and see how much money and energy you could save in your building services.

ing electrical energy consumption, worth around EUR 66,000 per year, has been realised in the case study building as a result of using the iSERV methodology. This has been achieved at a total cost of less than EUR 7,000 invested to understand the HVAC systems fully through cataloguing via plant visits and resetting controls via the BEMS. The savings therefore pay back the costs of achieving them nearly 10 times over every year.

The case study building, McKenzie House, is an office block of 8,435 m² conditioned gross internal area arranged over 11 stories, in Cardiff, UK. Floors 4 to 11 of the building are served by a VAV system with heating, cooling, and filtration. The Ground to 3rd floors, stairwells, toilets and landings are served by other HVAC systems. Cooling is provided by two packaged chillers, with a total Nominal Cooling Capacity of 740 kW. The boiler plant consists of three gas fired cast iron sectional boilers with a total heating capacity of 1.4 MW. The building systems are controlled by a BMS, and the HVAC systems generally operate on optimized stop and start control algorithms.

The consumption data presented in this report starts in June 2003 and includes energy consumption of gas and electricity. From December 2006 onwards the rolling annual electricity use of the whole building starts to reduce. The initial reduction from a peak of 184 kWh/m²a in August 2005 to around 169 kWh/m²a in October 2008 is primarily due to the implementation of an Eco-champions network at Cardiff University. The prior project to iSERVcmb, HARMONAC (2007 to 2010), started to make an impact from December 2008 onwards achieving a reduction in the HVAC systems' electrical energy use. The continued steep reduction after this date to a current consumption of 124 kWh/m²a is due to the improved control being exerted on the building's HVAC system arising from better understanding. These electricity savings represent a total reduction of 33% from the initial electricity use peak. The annual electrical savings achieved in the building are currently 528,000 kWh, with approximately 395,000 kWh/ annum arising from better understanding and control of the HVAC plant.

Regarding replicability, it's likely that these savings will be at the upper end of what is possible to achieve in commercial buildings without major design changes, as some of the measures undertaken, such as changing set-points for the HVAC system components, have led to increased complaints from occupants which are likely to require additional energy to rectify in the longer term. However, with electrical energy savings of 50% to 70% in the HVAC components alone, there is room to trade off energy savings for increased comfort while still making substantial energy savings. The achieved savings are in line with the upper end of savings predictions from HARMONAC.

The information coming back from HERO, iSERVcmb's online application, indicates that there are also further savings to be made, but these will require further investment. HERO's capabilities are currently being extended by introducing targeted ECOs (Energy Conservation Opportunities) in the reports sent back to the HVAC system owners. Specific to the energy performance of an HVAC system or its components, users will be informed via these ECO's about quantified potential energy and cost savings they could realise by implementing various energy efficiency measures.

The project hopes to identify further McKenzie House savings once the iSERVcmb ECO's are all fully integrated into the HERO analysis and reporting system. It is clear from the project that the availability of end user HVAC data, presented in an easy to understand fashion, encourages owners to take action while at the same time helping to make legally required inspections more efficient. In order to test and deliver high-quality reports for end-users, the project is still looking for system owners, facilities managers and HVAC manufacturers who would like to contribute to the project. Appropriate systems should already have monitoring equipment in place – or their owners should be willing to install monitoring equipment – and be able to contribute monitoring data to the project. In return they will be able to use HERO to learn more about possible improvements to their system(s) and contribute to the development of benchmarks relevant to their systems. ■

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