- For every 1ºC of heating above recommended temperature ranges (19-24ºC for offices and residences, and 19-21ºC for teaching buildings) fuel consumption will increase by 8-10%

HIGHLY COMMENDED

Cooling - A Hot Issue at the University of Bristol

Bristol University's energy consumption for cooling has been rising - to the point where, in 2006, its summer peak electrical load matched that of midwinter. To reverse this trend, the University has devised more energy efficient methods of supplying chilled water, and policies to control air conditioning.

The pilot site for chilled water was the highly serviced Dorothy Hodgkin Building, where it accounted for 36-40% of normal electricity consumption. To reduce this, a Liquid Pressure Amplification (LPA) pump was added to the main chiller to create a constant outlet pressure. This reduces compressor load and enables the plant to operate within optimum design parameters, regardless of ambient conditions. The more uniform load should also extend lifespan, and require fewer replacement units and parts. In addition, the Building Energy Management System (BEMS) was modified to optimise loading, and variable speed drives were installed on the primary chilled water pumps. The total cost of the project was £71,950.

During the summer of 2006 electricity consumption for the building was reduced by 10%, equivalent to annual savings of up to £30,000 and 145 tonnes of CO_2. The payback of the project was therefore 2.4 years. Subsequent improvements have increased savings to 18% of the December 2005 level. Following the success of the project, the Energy & Environmental Management Unit has prepared a case study and commissioned a refrigeration specialist to review all of the University's 22 chilled water systems with a view to replication.

The LPA pump (photo: Excalibur)

The project co-ordinator, Karen Gallagher, highlights "the collaborative approach needed for the initiative, both internally - e.g. between the in-house design team and maintenance staff - and with external organisations such as the LPA pump distributor, the chiller manufacturer (who was initially sceptical that the technology would work) and the BEMS suppliers." She also believes that the project has raised staff awareness about the high costs of chilled water.

In parallel, the University is now tackling air conditioning. In 2006 the University had several hundred split units, with a summer load of up to 2.7MW. According to Energy and Environmental Manager Martin Wiles, "these units are often inefficient and poorly controlled. The problem is also worsening, with almost 100 requests for new units in 2006."

All new requests must now use a specially developed decision tree to check that special cooling needs do exist, and then apply a heat gain tool to analyse whether the load is sufficient to require cooling. If so, a new specification ensures that equipment is energy efficient, and is properly installed. Martin Wiles believes that these measures "should control the growth of new installations. The next stage is to roll back consumption by auditing all existing applications, and identifying opportunities to remove them, or increase their energy efficiency."

Judge's Comments on Energy and Water Efficiency (continued)

The University of Bristol's installation of liquid pressure amplification to its chilled water units is 'state of the art'. Its introduction required considerable commitment and team working, both internally and with external suppliers. Bristol's leadership now makes it easier for other universities and colleges to make an informed decision about using this exciting technology. The parallel campaign to reduce air conditioning load is at an earlier stage, but has developed an impressive and co-ordinated approach, and practical tools, which should ensure continued savings in future.