Revolutionising energy efficiency with chiller optimisation

A chiller is designed to remove heat, a key part of the air conditioning system's ability to cool down a building. Chiller systems are complex to optimise and maintain.

The challenge

With three chillers to maintain at the Synergy building on our Black Mountain site, and a goal to achieve net zero emissions by 2030, as part of our Sustainability Strategy 2020–2030, we sought advanced techniques to enhance the performance of the building's Heating, Ventilation and Air-conditioning (HVAC) system.

Performance improvement targets included:

- Reducing energy consumption with the aim of reducing greenhouse gas emissions.
- Reducing peak demand with the opportunity to reduce our energy bill by reducing peak demand charges.
- Reducing ongoing maintenance costs by minimising chiller compressor run-time and sharing the load more evenly across the available compressors.

The solution

The solution lay in leveraging CSIRO's Data Clearing House (DCH) to provide data to third party expert industry providers, so that they could apply their AI tools for optimising chiller operations.

DCH is a cloud-based digital platform designed to house, manage, and extract valuable insights from smart building data. It allows for seamless data ingestion from various data sources, and it stores data in open formats for interoperability and data discovery.

By deploying the DCH digital platform, vendors are able to quickly access the data they need to deploy their HVAC data analytics and control optimisation solutions. This is done in a way that prevents the building owner from becoming overly dependent on a single vendor.

Identified data analytics and control solutions, that could be used for optimising the Synergy building HVAC plant, included chiller staging, chilled water temperature setpoint management, and load balancing between chillers.

By using the DCH to extract and process historical data from the Synergy building, the third-party AI provider was able to rapidly generate optimal control setpoints.

These optimised setpoints were then supplied to Synergy's Building Management System (BMS) contractor for seamless integration into their BMS controller.

The result

A comparison against baseline operation (before optimisation) revealed a measurable energy consumption reduction of 3.4%, equating to a reduction of 12,500 kilowatt-hours per year, equivalent to 8.5 tonnes/year of CO_2 emissions saved.

Significantly, from a cost savings perspective, analysis showed an estimated reduction in peak demand of 18% (but noting that peak demand is difficult to baseline) and a 7.5% reduction in chiller run time.

Contrary to many traditional implementations, the DCH platform enabled data identification, data provision and solution analysis all to be achieved in less than 2 months.

These tangible outcomes not only demonstrated the effectiveness of chiller optimisation but also underscored the transformative power of the DCH as an enabling data management platform.

Subbu Sethuvenkatraman, Group leader
+61 416 528 314 | subbu.sethuvenkatraman@csiro.au

B&M | 24-00354