"The full building functional test is largely a view of effectiveness on the building management control systems and mechanical systems. The teams at Johnson Controls and Fredon deserve congratulations for this fine piece of work. The fact that issues between Johnson Controls' solutions have been "totally silent" demonstrates the value of the integrated solution."

Dru Spork
Grocon's Sustainability and Services Manager

Case Study

Grocon's Liberty Place in Sydney Achieves 6-Star Green Star Rating with Integrated Building Technology Solution from Johnson Controls

State-of-the-art tri-generation and building management control system fully controls project's primary energy needs of cooling, electricity and heating efficiently

Summary

Liberty Place, developed by Grocon, is a new premium grade office complex in Sydney that comprises office and retail components. Johnson Controls delivered a comprehensive building management solution that included the delivery of a truly operational tri-generation system and a propane gas chiller. Today, Liberty Place is a multi-award winning project, and has received the 5.0 Star NABERS and 6-Star Green Star Rating for base building interiors and legion house, delivering a 6+6+6 outcome.

The Story

Liberty Place, formerly known as 161 Castlereagh St, is a new 45-storey premium grade office complex with 58,316 sqm of office space and 2,800 sqm of retail space in the heart of the Sydney's central business district (CBD). Spanning five separate sites, it comprises ANZ Tower, 167 Castlereagh Street, an outdoor retail plaza, a carpark as well as Legion House, a heritage building. The 42-level ANZ Tower features unrivalled harbor and city views and incorporates a dual street frontage, connecting Castlereagh and Pitt Streets.

Collaborative effort to deliver a sustainable result

As the leading developer in Australia, Grocon wanted a qualified industry partner who can deliver results as well single source responsibility. Johnson Controls assembled a solid team of cross-functional expertise to deliver a comprehensive solution that includes the supply of three YORK® YK centrifugal chillers and two YORK absorption chillers for the tri-generation plant, a Sabroe® SABlight air-cooled chiller, central plant optimization software, *Metasys*® building management system (BMS) and *Metasys* Energy Dashboard software.

In every aspect, the Johnson Controls team had to offer innovation and an integrated solution that can deliver a world-class building from a sustainability perspective. Therefore, the key focus was to think out of the box to surpass conventional standards in plant efficiency. Throughout the project, the team offered significant input in the plant design and control strategies and collaborated with the mechanical contractor of Liberty Place seamlessly.

Case Summary

Customer Challenges:

- Aims to be a zero carbon energy building
- Implement an operational tri-generation system (combining cooling, heat and power) to significantly reduce greenhouse gas emissions and enhance building's energy efficiency

Our Solution:

Comprehensive retrofit solution including:

- Five high-efficiency chillers (three YORK® YK centrifugal chillers and two YORK® YIA absorption chillers) with 1,200 kilowatt tri-generation* plant
- Use of Sabroe® SABlight air-cooled chiller to reduce power consumption and maintenance costs
- Implemented Central Plant Optimization™ 10 (CPO10) software powered by *Metasys®*
- Incorporated *Metasys®* Energy Dashboard software to monitor and measure performance to optimize efficiency

Customer Benefits:

- High efficiency chillers generates significant energy savings per year by using its excess heat to heat water
- Rainwater is harvested and sprinkler test water is collected for re-use
- Achieved 5.0 Star NABERS and 6-Star Green Star Rating for base building interiors and legion house, delivering a 6+6+6 outcome

Johnson Controls also actively engaged and communicated with key partners throughout the process. The beta testing was conducted involving key senior stakeholders including five mechanical contractors, four general contractors and consultants. This tight collaboration ensures stakeholder acceptance prior to onsite works and helped to minimize post completion re-work.

Fully operational tri-generation plant

For Liberty Place, one of the unusual requirements of the tri-generation system – a system which involves the production of electricity, heat and cooling in one process through the generation of heat from waste - was the automatic staging of the generator, absorber and chilled water system. In the chilled water system, the three YORK YK centrifugal chillers are connected in a parallel layout while the two YORK absorption chillers are in an upstream sidecar arrangement in series with the electric chillers, resulting in the best running chiller efficiency during the course of a standard day and savings of 20 percent. The team also introduced the Central Plant Optimization™ software, which helps to optimize the performance of the chiller plant.

In addition, the plant room on Level 14 was re-engineered to accommodate the mechanical services within two-thirds of the spatial allocation originally offered. This involved a complex process of incorporating multi-levels of the plant while balancing safety requirements. Johnson Controls also re-engineered the primary and secondary pumping systems to a variable primary flow chilled water system, resulting in significant savings in chiller pump power.

"We have achieved a major milestone at Liberty Place by managing a fully operational tri-generation system. The industry is gradually recognizing that too often "operational" does not mean that the system is truly integrated into daily building operations. Liberty Place's system is operating in fully automated mode. The gas generators auto-start daily when the electrical load in the building is sufficient. The absorption chillers then modulate to maximize the cooling output from the available waste heat from the generators to the available cooling load in the building. These are automatically controlled by the building management system and generator control systems," said Dru Spork, Grocon's Sustainability and Services Manager.

An innovative *Metasys* Energy Dashboard software was also included in the overall solution to measure the savings from each parameter using baseline targets for 5 Star NABERS. This enables the holistic analysis of the energy efficiency of the building, as well as an overview of the data via a dashboard of the energy consumption, such as lighting and power, electrical chillers, AHU fans, and water pumps. The result was outstanding levels of cost savings with energy efficiency.

Conserving heritage buildings the sustainable way

Within the Liberty Place site are two heritage buildings - the Legion House and 167 Castlereagh St. Grocon wanted to lead the way by introducing new approaches to building sustainability, with the ultimate goal of achieving zero carbon status for the building in Sydney.

To do that, Grocon planned to generate power for the two buildings using recycled wood and paper waste. In line with that, Johnson Controls' recommended the use of the Sabroe SABlight air-cooled chiller, which gives the developer the option of generating power either via the synthetic gas produced by a gasifier, or natural gas.

Achieving Industry's Firsts

Liberty Place has achieved new standards in sustainable development design and has been awarded the Heritage Award at the 2013 API NSW Excellence in Property Awards, the "6-Star Green Star Office Design" award, and in 2014 was awarded "Best Building" in the office category at the World Architecture Festival in Singapore. The asset has also achieved a 5.0 Star NABERS (National Australian Built Environment Rating System) energy rating.
"Excellent work, guys, and truly a great outcome knowing how other tri-generations are sized in other buildings," concluded Geoff Briggs, National Services Manager, Grocon.