201 Charlotte Street, Brisbane, Queensland

Building Profile

Building	201 Charlotte Street, Brisbane, Queensland
Construction date	1983
Refurbishment date	2001
Owner	Savio Central Pty Ltd.
Building Size	12,830 m2 NLA / 18 Levels
Refurbishment Team	N/A
Building Management	Jones Lang LaSalle
Awards	Runner-Up: AIRAH Awards 2011 - *Best sustainable retrofit*
Ratings	3.5 Star NABERS Energy (Base Building) (without GreenPower)

Overview

201 Charlotte St in Brisbane reduced base building energy consumption by 34 per cent[1] and secured a 3.5 Star NABERS Energy Rating through best-practice building management practices and targeted efficiency upgrades, rather than relying on major replacement of plant and equipment. The building had undergone a major refurbishment in 2001, but it wasn't until five years later when an energy efficiency program was implemented that the full potential of the upgrade was realised.

A lack of commissioning and maintenance in the years following the 2001 refurbishment meant that by 2007 the building was performing poorly. Then, with the aid of a Green Building Fund grant, a number of energy efficiency upgrades and controls improvements were implemented. This new retrofit program focused predominantly on good tuning, maintenance and reporting along with targeted improvements to metering, monitoring and BMCS systems, and these measures have helped to create a more efficient and better performing building.

This case study demonstrates the importance of good building management practices in helping to deliver energy efficiency improvements. Energy efficient design elements are not sufficient on their own to deliver these. Good building management practices and engaged building management personnel are the key element that allow efficiency gains to be realised. Central to this are practices such as thorough commissioning, good knowledge

[1] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.

transfer protocols and continual monitoring and evaluation to guide upgrade initiatives and deliver a high performance building.

Design Elements

Monitoring and Control Technology

Energy metering makes energy performance data more visible and facilitates optimal management of building systems to maximise efficiency. Energy metering installed in the building allows monitoring of a number of building systems, including chillers and boilers, common area lighting, lifts, pumps and domestic hot water.[2]

The 2001 refurbishment included a new Building Management System, but service and support issues over the ensuing years resulted in the need for its replacement with a new generation system and upgrades to wiring, controllers and sensors in 2007. The original system was not connected to energy or water metering and provided no visibility of energy performance data. The new BMS system offers significant improvements, such as improved reliability, enhanced site-management features and user-defined reporting capabilities.[3]

Heating, Ventilation and Air Conditioning[4]

The 2001 refurbishment entailed substantial replacement of HVAC systems, including chillers and associated components, cooling towers, and air handling units, in addition to upgrades to air-handling plant and equipment.[5] The upgraded system comprises three water cooled screw chillers, a VAV air-handling system and an outdoor air pre-conditioner. Zoned HVAC is configured with separate perimeter and central zones to allow improved control. Additionally, supplementary water-cooled packaged units serve retail areas.

A new energy efficient cooling tower and other associated HVAC components such as pumps were also upgraded. The HVAC system was reconfigured from the ground up, with new controls and monitoring infrastructure. This enabled the reprogramming of minimum set points to allow for efficient low-load operation. The system was programmed to operate at the lowest minimum power consumption, and reprogrammed to deal with increasing load efficiently.

[2] James, G. (2012) *Personal Communication*, Gary James, Director of Energy and Sustainability services, Jones Lang LaSalle, 11/09/2012.
[3] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.
[4] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.
[5] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.

Building Management

Operation and Management Practices

The energy efficiency program first focused on improving monitoring capabilities and assessing building systems to determine priority areas for upgrades. Control systems were adjusted to improve efficiency. Previous standard BMCS control algorithms did not facilitate optimum building performance so reprogramming and improving control strategies was a priority.[6] The BMS had not been reprogrammed from the initial installation and this created a maintenance issue due to a lack of support for the system.[7] A number of controls and programs in the HVAC system were revised, including the temperature set points and the way they are managed. As the system includes electric re-heating, the band between cooling and heating was adjusted to reduce inefficient simultaneous heating and cooling. New controllers and dampers were also installed to facilitate greater control of outside air. A number of HVAC control strategy improvements were undertaken, including:[8]

- optimum start
- night purge
- supply-air fan variable static pressure reset
- supply-air temperature reset
- return air fan speed control
- VAV box minimum and maximum airflow reset
- minimum outside air control
- chilled water reset strategy
- outside air pre-cooler optimisation.

An on-site building management team contributes to improved building performance and provides a quick response to alarms or issues. Anomalies in the daily operation are picked up through an Environmental Sustainability Platform developed by Jones Lang LaSalle. The onsite building management staff can then be notified when there is an unexpected change in the metered amount of electricity, gas or water. It is vitally important that these changes are picked up early as it not only signals problematic equipment; it can also be expensive and impact on NABERS ratings. Scheduling has been adjusted to improve performance, and lighting and HVAC systems have also been adjusted to match hours of occupancy, reducing unnecessary after-hours operation and complying with the protocols of NABERS.

[6] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.
[7] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.
[8] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.

Reporting and Evaluation

The upgrades to monitoring and control systems have facilitated improved reporting and evaluation practices. Initially, the building didn't have the capability to relay energy usage information electronically, which limited the frequency of energy assessments. Since the renovation, energy usage anomalies can be identified, and facility management can be notified within 24-48 hours.

To guide the upgrade, a monitoring and reporting program assessed baseline performance in order to identify priorities. At the time, base-building systems were calculated to consume approximately 2,236 MWh of electricity per year; equivalent to about 1 star NABERS Energy performance. Following the refurbishment program, electricity consumption was reduced to 1,480MWh per year, equivalent to 3 Star NABERS Energy performance.[9] Performance has continued to improve, with the building achieving a 3.5 Star NABERS Energy Rating (without GreenPower) in 2012.

Management Personnel, Communication and Education

Good knowledge management processes have been a key factor in the improved performance of the building. A monitoring and reporting program has allowed the building management team to identify expected savings from individual initiatives and to evaluate success.[10] A sustainability performance report is given to the onsite building management team on a monthly basis. The report tracks consumption and serves as an important record of changes made to the building. Electricity, gas and water are monitored remotely through energy meters. This information is then analysed, processed and reported to building management. The owners are also kept up-to-date with information about building performance and how they can make timely equipment upgrades.[11]

During the renovation and commissioning of the building, it was noted that knowledge transfer protocols within the building required improvement.[12] The sustainability performance report has helped to bridge the gap between owners, building managers and onsite facility managers since it lists all actions that have been undertaken. When there was a change of contractor, for instance, it provided the new contractor with a history of changes made.[13]

Commissioning and Tuning

Following the 2001 refurbishment, the BMCS system was not properly tuned and was thus contributing to poor building performance.[14] Good commissioning and tuning protocols were put in place following the 2007 upgrade program to ensure optimal performance of new

[9] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.
[10] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.
[11] James, G. (2012) *Personal Communication*, Gary James, Director of Energy and Sustainability services, Jones Lang LaSalle, 11/09/2012.
[12] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.
[13] James, G. (2012) *Personal Communication*, Gary James, Director of Energy and Sustainability services, Jones Lang LaSalle, 11/09/2012.
[14] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.

systems. This has also helped identify conflicting design issues and control strategies in existing systems, such as duct heaters serving multiple zones.[15]

Agreements and Culture

The monitoring of building energy consumption provides the onsite building management with information about abnormal or excessive energy utilisation by tenants. Management then assesses how to engage the tenants or adjust the building controls.[16]

Communication and Education

Jones Lang LaSalle has an 'Environmental Sustainability Platform' (ESP) that is used to monitor and report environmental performance to the building owner.[17] The building owner and the building management team use the ESP to track and communicate energy, gas and water performance. Monthly sustainability reports are produced to inform the building owner of options for improvement and any required equipment upgrades. Tenants have greater control over their after-hours HVAC and lighting usage, and have communication pathways for reporting on aspects of building performance.[18]

Commitments and Targets

The building management team set a NABERS Energy target, which helped guide the upgrade process. Energy performance and key building systems are continually monitored to ensure the building is on track to achieve the target. Achieving these targets requires early identification of any problems.[19]

Occupant Experience

No formal occupant satisfaction surveys have been identified. However, general satisfaction surveys are performed every 12 months. These cover the question of whether complaints are being dealt with in a timely manner, any key maintenance issues, and overall satisfaction with the building.[20]

Indoor Environment Quality

No IEQ testing is currently idenitfied.

[15] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.
[16] James, G. (2012) *Personal Communication*, Gary James, Director of Energy and Sustainability services, Jones Lang LaSalle, 11/09/2012.
[17] James, G. (2012) *Personal Communication*, Gary James, Director of Energy and Sustainability services, Jones Lang LaSalle, 11/09/2012.
[18] McGowan, S. (2012) *Good Charlotte*, Ecolibrium, March 2012, Australian Institute of Refrigeration, Air Conditioning and Heating online: www.airah.org.au/imis15_prod/Content_Files/EcoLibrium/2012/March%202012/2012_03_F01.pdf, accessed 30/08/2012.
[19] Matthews, T. (2012) *Personal Communication*, Property Manager, Property and Asset Management, Jones Lang LaSalle, 17/09/2012.

[20] Matthews, T. (2012) *Personal Communication*, Property Manager, Property and Asset Management, Jones Lang LaSalle, 17/09/2012.

Performance Nexus Summary

Key lessons to inform the Performance Nexus concept:

- Good building management practices have resulted in significant improvements to energy efficiency and overall building performance.
- The original refurbishment in 2001 included upgrades to plant and equipment, but a lack of commissioning resulted in poor performance for several years. It wasn't until a focused efficiency program was implemented in 2007 that the refurbished systems were commissioned properly and could then deliver the efficiency gains they were capable of.
- Good knowledge management and transfer are integral to improved building performance.
- Monitoring of energy performance data is vital. A lack of metering and a poor quality BMS prior to 2007 made building management problematic.
- Identifying priority areas, setting targets and regularly evaluating performance is critical to the success of efficiency initiatives.
- Providing energy performance data in a way that is intuitive and actionable assists energy reduction initiatives. The BMS was not originally set up for sustainability and did not interface with energy metering. The upgraded system has facilitated accurate control and optimisation of building systems and contributed significantly to the success of the efficiency program.

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