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THE SINGAPORE ENGINEER

COVER STORY:

MECHANICAL & ELECTRICAL ENGINEERING

313@somerset



FEATURES:

Sustainability • Power Generation • Biomedical Engineering



313@somerset

The development has been re-certified Green Mark Platinum, for its sustainable design and operations.



313@somerset. Image by Lend Lease.

In 2007, Lend Lease's downtown shopping mall icon, 313@somerset, received the prestigious BCA Green Mark Platinum award based on the New Non-Residential Building (NRB) criteria. This recognised best-in class design concepts, implementation of a green lease scheme and extensive use of various innovative green technologies. In 2013, the project team was working towards renewing the development's BCA Green Mark Platinum rating through re-certification under the stricter Existing NRB 3.0 criteria. The benchmarks were higher than before, there were more mandatory requirements, and the building had to show green operations on top of the original green design.

In preparation for this, Lend Lease appointed Singapore's longest standing ESCO, Kaer, as its partner to implement a holistic programme to optimise and maintain the building's operating performance. The objectives of this programme were:

- To upgrade the Building Monitoring and Controls System to a platform that could empower the operations team to make informed decisions to save energy (GM 3.0 M&V compliant).
- To perform chiller plant diagnostics and optimisation to improve the water-side system efficiency.
- To carry out ongoing service and maintenance to the air-side system with clearly defined efficiency targets.

To achieve these objectives, Kaer brought together its three core departments (Building Monitoring & Controls, Engineering, and Service & Maintenance) to develop a unique service offering known as Performance Based Service and Maintenance (PBSM).



Kaer's Performance Based Service & Maintenance programme.

The development of this programme resulted from a solid partnership between the building manager and service provider to ensure all parties were incentivised to put energy efficiency as a top priority. Benchmarks were defined for system efficiency as

well as load reductions and 'penalties' and 'performance bonuses' were written into the service agreement to ensure complete clarity and accountability.

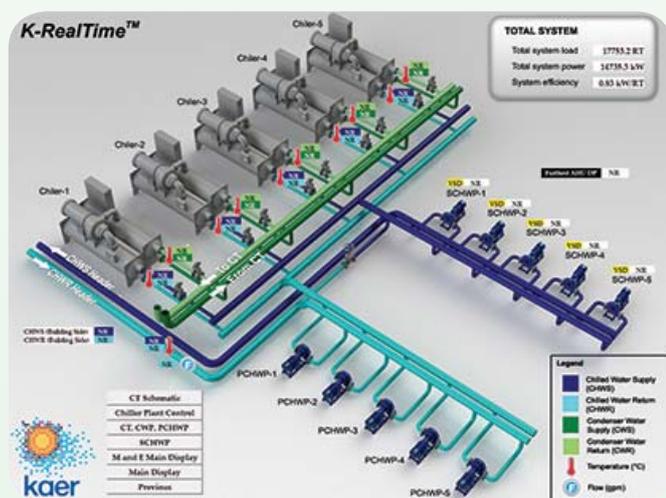
Step 1 - monitoring building performance in real-time

K-RealTime is Kaer's in-house building monitoring and control system designed specifically to measure and track energy efficiency. It consists of highly accurate sensors and meters and runs the data through a cloud-based platform which hosts the data on secure Kaer servers.

This tool is Green Mark 3.0 M&V compliant and allows engineers to view the building's performance data on an interactive user interface that can be accessed at any time on a computer or iPad.

K-RealTime was chosen due to its ability to empower the on-site operations team to do the following:

- Measure and verify the current system efficiency (at any specific time as well as time period averages).
- Implement ongoing control-based energy efficiency protocols (such as controlling variable speed drives).
- Provide diagnostic alerts for the service and maintenance team.
- Provide data and reports for BCA Green Mark submissions.



Sample of a K-RealTime interactive display.

Step 2 - chiller plant system optimisation

The Kaer P3 programme, standing for 'performance, performance, performance', incorporates the seamless integration of the performance of the chilled water plant system, the air-conditioning airside system and the operators in charge.

P3 measures and verifies the operating system efficiencies of the main chilled water plant system, and benchmarks them against the stipulated system efficiency or energy efficiency targets. It then identifies areas for optimisation to achieve energy savings, streamlined operations and improved comfort conditions.

The programme consists of three key stages:

- Unfreeze: Kaer worked with Lend Lease to understand the design intent and operational objectives.
- Transform: Kaer implemented optimisation protocols with feedback from the operations team to identify best practice for the particular site and specific equipment.
- Refreeze: Kaer set the optimised operation protocols as standard operating procedures by updating the SOP documentation and automating key processes.

Step 3 - ongoing performance based service & maintenance

The standard maintenance approach focuses on individual items within the plant and on the ACMV equipment. It is scheduled to keep the system in operation and minimise potential complaints and, because of this, usually wastes energy through additional cooling capacity to overcome problems. Simply put, the parameters used for benchmarking success are the number of complaints and 'is it cold enough?'

The PBSM approach is to set a service & maintenance guide with strict performance and energy efficiency targets. This allows Kaer and Lend Lease to:

- Make informed decisions about every piece of equipment in the building.
- Evaluate the entire system instead of each AHU or FCU in isolation.
- Implement tailored maintenance programmes.
- Ensure each piece of equipment performs at its peak ability.
- Ensure the system as a whole provides the correct conditions for a complaint-free building.

Summary

As an early adopter of environmental, social and economic sustainability principles, Lend Lease continuously develops programmes to ensure its properties achieve the highest green certification standards. It started with the innovative 'green lease' initiative and has been taken one step further through collaboration with Kaer to develop an industry-first PBSM contract.

The key achievements due to the implementation of the PBSM programme at 313@somerset include:

- Installation of a permanent BCA Green Mark 3.0 compliant monitoring system to track building performance.
- Management of building operations by a team of energy efficiency professionals.
- Obtainment of the BCA Green Mark Platinum rating and building efficiency standard.
- Obtainment of continuous energy efficiency improvements and energy savings.
- Obtainment of significant operational cost savings.