CASE STUDIES

LUMILEDS

Manufacturing Plant

Lumileds Singapore

Where
Singapore

Size
12.000 m2

Financial savings per year
$480,000 (USD)

CO2 reduction per year
1200 tonnes

LUMILEDS

Letter of reference for Barghest Building Performance Pte Ltd

Lumileds Singapore launched a tender to improve the Energy Efficiency of our Central Chiller Plant in November 2013. After careful consideration, Barghest Building Performance Pte Ltd (BBP) was awarded the contract to install their optimisation solution at the Lumileds Singapore facility in Yishun between January and June 2014.

The Barghest team were highly professional and managed the design and installation process according to schedule and without disruption to our operations, despite our 24/7 operational requirements. Since commissioning in July 2014, the BBP system has surpassed our expectations, delivering nearly 30% additional savings beyond original estimates with consistent results. BBP also supports the Operational team through automatic equipment selection, auto reports and KPI based alarms.

During the commissioning stage, BBP highlighted the possibility of our chiller plant reaching Green Mark Platinum level of efficiency. They subsequently acted as Green Mark Consultant, supporting Lumileds Singapore through the accreditation process to become the first manufacturing plant in Singapore to achieve the BCA Green Mark Platinum for Existing Buildings. Our combined efforts were also recognised by NEA with an Excellence in Energy Management Award at EENP Awards 2015.

I am happy to recommend Barghest Building Performance's Energy Efficiency Solution to other companies seeking to improve Chiller Plant Energy Efficiency.

Ngo Chee Keong,
Facilities Department Head at Lumileds Singapore Pte Ltd

OPTIMISATION:

A viable alternative to equipment replacement

Barghest
Building Performance

Achieving Green Mark Platinum with a 14-year-old chiller plant

BCA GREEN MARK

In May 2014, Lumileds Singapore (Formerly known as Philips Lumileds) became the first manufacturing plant to achieve Green Mark Platinum for Existing Building v. 3.0.

The Magazine Of
The Institution Of Engineers, Singapore
May 2015 MCI (P) 074/03/2015

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THE SINGAPORE ENGINEER

COVER STORY:

MECHANICAL & ELECTRICAL ENGINEERING

Philips Lumileds Singapore Plant

FEATURES:

Transportation Engineering • Power Generation • Electrical & Electronics Engineering

A Reprint from

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The Magazine Of The Institution of Engineers, Singapore

Philips Lumileds Singapore Plant

The manufacturing facility won a Green Mark Platinum Award, under the Existing Buildings category, at BCA AWARDS 2015.

The Philips Lumileds Singapore Plant is located in Yishun Avenue 7.

Founded in 1999, Philips Lumileds Lighting Company is a leading manufacturer of high-power LEDs and a pioneer in the use of solid-state lighting solutions for everyday purposes including automotive lighting, computer displays, LCD televisions, signage and signalling and general lighting.

The company's patented LUXEON power light sources combine the brightness of conventional lighting with the small footprint, long life and other advantages of LEDs.

In November 2007, Philips Lumileds officially opened its new production facility in Singapore. The LUXEON high power LED plant, its first outside of Silicon Valley, extended Philips Lighting's LED leadership while accelerating the growth of the solid state lighting industry.

Located at Yishun Avenue 7, the Philips Lumileds Singapore plant, which operates round-the-clock, comprises two blocks - the Main Building and the Annex Building. The facility has a total Gross Floor Area of 41,716 m^2 and an open car park area of 1,732 m^2.

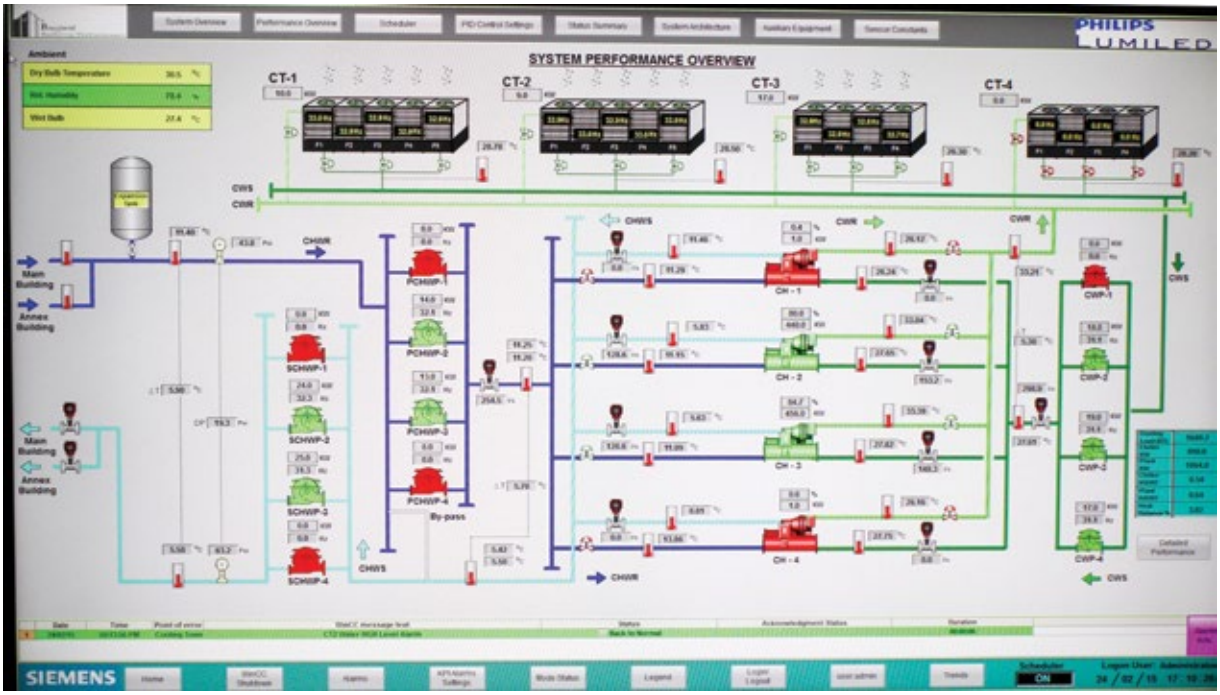
Initiatives in four key areas contributed to Philips Lumileds Singapore becoming the first manufacturing plant in the country to receive the Green Mark Platinum Award.

- The central chiller plant underwent optimisation to achieve an average plant efficiency of 0.64 kW/RT.
- LED lights were installed throughout the building, improving the lighting power budget, in accordance with the Singapore Standards Code of Practice.
- Extensive water recycling efforts have led to significant water savings and the achievement of PUB's Water Efficient Building (Gold) certification.
- Sustainable operations and management are strongly encouraged, through recycling efforts as well as through the implementation of educational and awareness programmes involving employees, contractors and vendors.

CHILLER PLANT OPTIMISATION

To improve overall operational efficiency, the obvious option for Philips Lumileds Singapore was to replace its 14-year-old chiller plant at significant expense. Instead, Philips Lumileds Singapore decided to collaborate with Barghest Building Performance (BBP), a Singapore-based energy efficiency service company in the intelligent building space, which focuses on extracting the best performance from existing central chiller plants. BBP uses data analytics, cloud-based optimisation and deep Heating, Ventilating and Air-Conditioning (HVAC) domain expertise to deliver energy savings for its clients.

BBP provided an alternative to Philips Lumileds Singapore,



The chiller plant management system enables the required cooling to be delivered in an energy-efficient manner.

By optimising its 14-year-old chiller plant, Philips Lumileds Singapore was able to achieve energy-efficient operations.

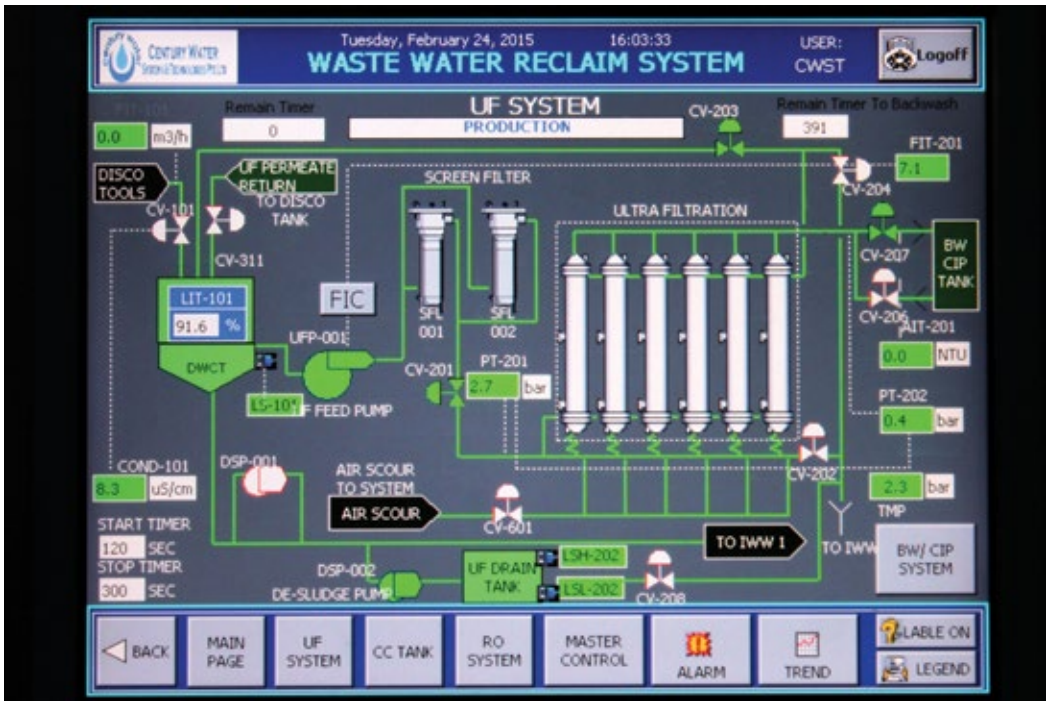
that is, optimising the current chiller plant, to deliver the required cooling in an energy-efficient manner.

The optimisation solution provided by BBP includes the connection of variable speed drives to the chilled water and condenser water pumps as well as to the cooling towers.

Further, in line with the BCA Green Mark requirements for effective measurement and verification, dedicated digital power meters have been connected to all major equipment like chillers, cooling towers and pumps. Every chiller is connected to a magnetic, full bored flow

Instrumentation panels enable the remote monitoring and control of the air-conditioning system.

Installation of next-gen LED lighting improved the lighting power budget.



The waste water reclamation system helps to reduce the consumption of potable water.

meter and high accuracy temperature sensors on both the chilled water and condenser water sections. The heat balance is determined at every chiller and header level.

BBP also connected each site to a cloud-based central system, enabling Philips Lumileds Singapore to have access to remote monitoring, auto reporting and other features to improve day-to-day operations.

As a result of all these efforts, Philips Lumileds Singapore achieved a 27% improvement in the chiller plant's efficiency, without needing to replace major equipment or disrupt operations at the plant. With sustained savings of 30% of initial energy consumption, Philips Lumileds Singapore was able to realise a reduction of S$ 700,000 in annual energy costs.

Performance Contracting

In order to ensure sustained savings over time, Philips Lumileds Singapore has entered into a long-term performance contract with BBP, under which, BBP will be paid only upon measurable performance improvements at the Philips Lumileds Singapore plant. The efficiency improvements will be verified on a monthly basis by an independent third party, DNV GL, through the DNV GL, Clean Technology Centre in Singapore.

For its next project, BBP plans to evaluate and optimise the plant and office air handling unit system, in order to reduce energy consumption.

INSTALLATION OF LED LIGHTING

Being in the LED business, lighting optimisation was an

obvious area of interest for Philips Lumileds Singapore. The company thus took steps to replace light fixtures, chiefly by installing a newly launched generation of next-gen LED lighting. The improvement in lighting power budget, compared to the code, is expected to reach 40%.

ACHIEVING WATER EFFICIENCY

Philips Lumileds is also focusing on water efficiency. It has installed a water recycling plant that has a capacity of 300,000 m^3/year, to capture condensate water from the air handling units (AHUs), production waste water as well as water rejected by the reverse osmosis system. The requirement for potable water is significantly reduced, due to the utilisation of recycled water and NEWater.

Smart meters capture the daily water consumption and link it to the building management system (BMS) and also to PUB, for monitoring purposes.

SUSTAINABLE OPERATIONS AND MANAGEMENT

Besides encouraging recycling efforts among employees, Philips Lumileds Singapore conducts awareness programmes for employees, suppliers and contractors, to promote environmental sustainability including energy and water conservation.

FUTURE EFFORTS

Although the Green Mark Platinum Award is a milestone for the Philips Lumileds Singapore plant, the site team is continuing its efforts to improve operations and reduce environmental impact. The Philips Lumileds Singapore team is continuing its programme, started three years ago, to reduce energy intensity and water usage as well as increase environmental awareness among all stakeholders.

(With effect from 1 April 2015, Philips Lumileds Singapore Pte Ltd has changed its name to Lumileds Singapore Pte Ltd).

Equipment required for ensuring process water quality include filters (image above) and reverse osmosis high pressure pumps (image below).

The company encourages recycling efforts.

Why We Are Unique

BBP's solution can be customized to any central chiller plant, independent of age and brand.

Many companies offer advice on how to improve energy efficiency. Recommendations often include buying new equipment. BBP offers an alternative approach. We lean towards solutions that help buildings achieve long-term measurable and sustainable energy savings by operating existing equipment optimally.

We offer performance contracts, where clients pay for our solution through the savings we achieve together over the long-term. This aligns our incentive with that of our clients.

We focus on Air Conditioning Systems since it's the most energy intensive system in a building, but can offer a range of other energy efficiency related services. Do visit us at **www.bbp.sg** to read more about our company, our technology and our services.

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SINGAPORE GREEN BUILDING SERVICES SGBC
Energy Performance Contracting Firm

SINGAPORE GREEN BUILDING SERVICES SGBC
Enviromental Sustainability Design

Hotel

Resorts World Sentosa

Where
Singapore

Size
14.000 m2

Financial savings per year
$530,000 (USD)

CO2 reduction per year
1680 tonnes

Resorts World Sentosa Singapore a Genting Resort

TO WHOM IT MAY CONCERN

Re: Letter of reference for Barghest Building Performance Pte Ltd

In August 2014, DCP (Sentosa) Pte Ltd, a subsidiary of Resorts World at Sentosa Pte Ltd launched a tender to improve Energy Efficiency of its District Cooling Plant. Barghest Building Performance Pte Ltd (BBP) suggested a solution that offered higher energy savings than any other tenderer. After several rounds of tender interviews and site visits, BBP was awarded the tender despite the need for higher investment from our side.

BBP installed its solution within agreed timeframe to our satisfaction. Since commissioning, the BBP system has consistently delivered 8.5%-10.8% improvement in Energy Efficiency, exceeding their minimum contractual commitment. The BBP team has been professional throughout the project and post-commissioning stages, often times providing technical expertise in areas beyond the scope of their initial project on a goodwill basis. As an example, BBP has included both operational flexibility as well as provision to migrate entire chiller plant operation to our system should it be required, at no additional cost to us.

I have no hesitation in recommending the BBP solution to industrial and commercial Facilities Management teams looking for ways to reduce Central Chiller Plant Energy consumption.

Please note that this letter should only be used for the purposes of BBP's tender for Micron Semiconductor Asia Pte Ltd, 1 Woodlands Industrial Park D Stree1,Singapore 738799.

Alexander Amirtham
General Manager
For DCP (Sentosa) Pte Ltd.

CC:
Lee On Nam – SVP, Resorts Services, Resort World at Sentosa Pte Ltd
Nelson Yau – VP, Engineering Services, Resort World at Sentosa Pte Ltd
Chan Mun Tat – AVP Facilities and Engineering, Resort World at Sentosa Pte Ltd

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EENP Awards 2017

Best Practices (Honourable Mention)

Installation of Plant Optimizer

Background

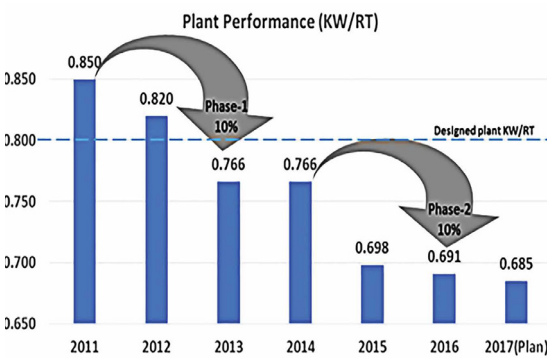
DCP (Sentosa) Pte Ltd ("DCP") is a subsidiary of Resorts World at Sentosa Pte Ltd ("RWS") and is tasked with operating the district cooling plant supplying chilled water to the entire property including casino, hotels and the Universal Studios Singapore.

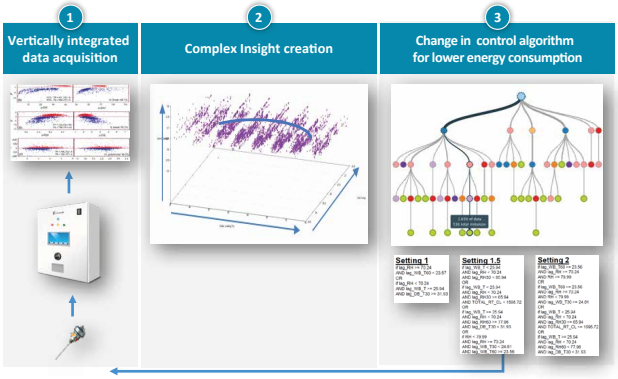
BBP is a leading regional company focusing on operational performance of existing heating, ventilation and air-conditioning systems to achieve energy savings. BBP's system has improved old central chilled water plants to 0.63 kW/RT and achieved up to 35% reduction in energy consumption. BBP offers its service as a fully funded solution without any capital outlay from customers.

Project Description

In line with RWS's commitment to sustainability, DCP is constantly evaluating new opportunities to reduce its energy consumption and environmental impact. Prior to this project, DCP had already undergone equipment upgrading as well as one round of performance improvement.

This project started with BBP offering to explore and evaluate potential energy efficiency opportunities at DCP. BBP was selected due to: (i) high guaranteed energy savings, (ii) the operational improvements brought by the BBP control system, and (iii) the good track record of successful energy efficiency improvements. DCP and BBP worked closely to customize and install the chiller optimizer solution, keeping in mind the critical operation of a district cooling plant. The system optimized the energy use of chillers, pumps and cooling tower fans using an algorithm-based dynamic control to achieve and maintain better plant efficiency across varying load profiles without affecting the comfort of occupants. The system also allowed for continuous improvement through remote monitoring, daily performance reports and data analytics that lead to immediate corrective actions whenever necessary.





Results

The successful implementation of project resulted in a 10% improvement in plant efficiency, or 5.5 GWh of annual energy savings without disruption to the operations of the plant.

Office

HP Singapore

Where
Singapore

Size
12,000 m2

Financial Savings per year
$190,000 (USD)

CO2 reduction per year
1,312 tonnes

BEST PRACTICES (HONOURABLE MENTION)

EENP AWARDS 2018

About Hewlett-Packard and Barghest Building Performance

Hewlett-Packard (HP) Inc. creates technologies – computing, printing and imaging – through constant reinvention. At the heart of HP Inc.'s reinvention is the need to create a business that can have a lasting sustainable impact on the world. Not only is this the right thing to do, HP Inc. also believes that it fuels their innovation and growth, and creates a stronger and healthier company in the long term.

Barghest Building Performance (BBP) offers an advanced solution that optimises the operation of existing central chilled water systems. BBP's bespoke solution has no operational risk and allows for remote monitoring and continuous improvement through advanced analytics. Completed and ongoing installations of BBP's solution would result in over 80 MWh of annual energy savings, translating to 40,000 tonnes of CO_2 reduction every year.

Chiller Plant Optimization and Data Driven Continuous Performance Improvement

HP Inc. targets to achieve 25% reduction in carbon emissions by 2025 based on 2015 baseline. In 2016, HP Inc. launched a program to establish best practices and national guidelines for facility energy management. The objective of the program is to enhance energy-related operations, technology, and processes. To achieve the intended impact, HP Inc. worked with BBP to create customised solutions for its chilled water systems which had been in operation for more than 20 years.

Using advanced data analytics, BBP's control algorithm optimised equipment set points (e.g. temperature and flow) to improve the efficiency of the existing chilled water systems. The remote monitoring and analytics capability created a platform for data driven discussions on how to further improve system efficiency. The automated reports generated also helped changed HP Inc.'s maintenance perspective from "equipment availability-based maintenance" to "performance-based maintenance".

Achievements

HP Inc. achieved annual energy savings of over 2 GWh. The low temperature chilled water system efficiency improved from 0.89 KW/RT to 0.64 KW/RT while the high temperature chilled water system efficiency improved from 0.789 KW/RT to 0.72 KW/RT.

Hotel

Shangri-la

Where
Singapore

CO2 reduction per year
302 tonnes

Financial Savings per year
$81,000 (USD)

Shangri-La's
Rasa Sentosa Resort & Spa
SINGAPORE

10 Sept. 2020

Singarayar Wilson Lourdu Xavier
Director – Asset Management
Barghest Building Performance Pte Ltd
108,Pasir Panjang Road,#04-02 Golden Agri
Plaza Singapore 118535

Attn: Wilson

Letter of Appreciation to BBP's Project Team

I am writing this letter to inform you of our appreciation for the support and execution that BBP has provided to Shangri La Rasa Sentosa in its energy savings, and building optimization efforts, and the fact that BBP has saved a significant amount of operating costs for its project at Shangri la.

We have saved 2,144,971kWh over 3 years (Aug 2017 to Jul 2020) on our BBP energy optimization project and are happy with the result thus far. Our Green Initiatives have also been augmented and we have reduced CO_2 Emissions by 24.7 percent.

The technical competence, professionalism and enthusiasm from the project team is highly commendable during the installation project of Rasa Sentosa Chiller Optimization works and our experience has been very good working with BBP.

Please continue to keep up your good work and looking forward to work closely with BBP in order to achieve more energy saving.

Thank you.

Yours sincerely,

Sunny Goh
Director Of Engineering
Shangri-la's Rasa Sentosa Resort and Spa Singapore

GRUNDFOS