



KEPPEL BAY **Keppel Land** TOWER

Keppel Bay Tower is conveniently located at Harbourfront and within five minutes' drive from the CBD. It offers excellent connectivity via the Harbourfront MRT station, major roads and expressways. Tenants enjoy a wide array of dining and lifestyle choices with the building in close proximity to Vivocity and Resorts World Sentosa. The 18-storey office building has approximately 394,000 square feet of overall floor area.

Keppel Bay Tower has recently implemented five state-of-the-art energy saving technologies. Click on a technology provider below to find out more details on what has been achieved.

Overall EEI

Before Improvement
147.0 kWh/m²/year

Overall EEI

After Improvement
114.2 kWh/m²/year

Overall Achieved Savings

22.3%



G-Energy offers a wide array of integrated energy and project management services, acting as the System Integrator in the Keppel Bay Tower project



Danfoss and Novenco provide engineering solutions that utilize resources in the smartest possible way to drive the sustainable transformation of tomorrow.



Innovative Polymers Pte Ltd specializes in providing advanced technological chemical free cooling water management system for air-conditioning and mechanical ventilation system (ACMV).



IES are leading global innovators in integrated performance based analysis, and home to the largest building analytics team in the world.



Lumani use their expertise to reduce energy consumption using intelligent algorithms, so that people enjoy more sustainable lives.



YITU integrates state-of-the-art AI technologies with industrial applications for a safer, healthier and faster world.

This Project is supported by the NRF, BCA and GBIC

Keppel Bay Tower – Gearing Towards a Super Low-energy Building

An innovative test-bedding project supported by the BCA Green Building Innovation Cluster



Energy Efficient Air Distribution System features an air handling unit fan which is about 25% more energy efficient than other best-in-class technologies



Demand Control Fresh Air Intake System utilises integrated sensors to regulate fresh air intake according to indoor activities, optimising energy usage for better thermal comfort and indoor environmental quality



Intelligent Building Control System employs a high precision physics-based simulation engine to improve data analytics and control



Cooling Tower Water Management System utilises a patented solution that reduces cooling tower water usage and eliminates the need for chemical water treatment



Smart Lighting System utilises occupancy sensors which allow seamless transition in lighting levels according to building occupancy



Annual Cost Savings
\$250,000



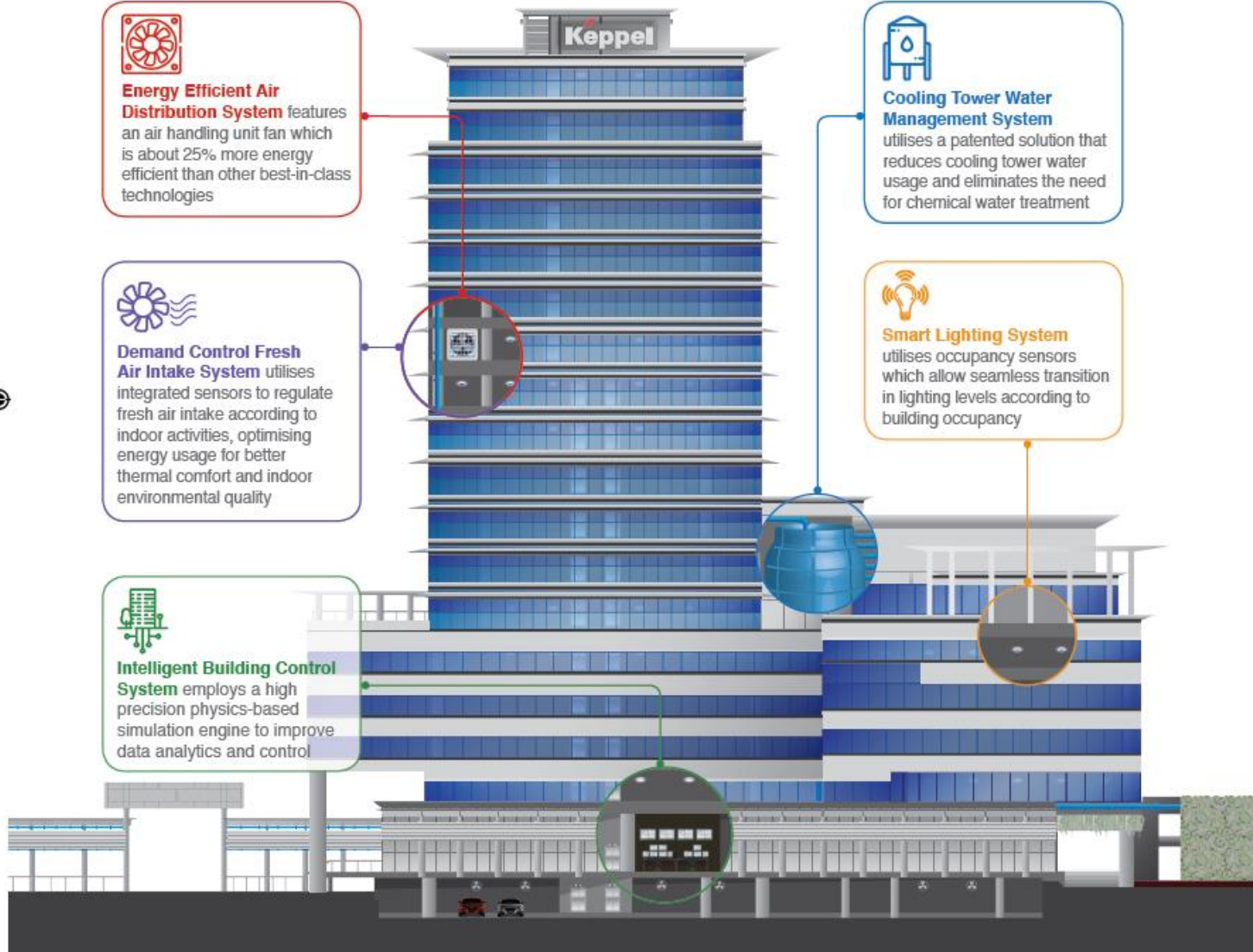
Cooling Tower Water Savings
7,000m³ per year
which is equivalent to the amount of water needed to fill 3 Olympic-size swimming pools every year



Overall Energy Savings
20% (from best in class standard) or
1.5mil kWh/year which is equivalent to the amount of energy required to power more than 250 5-room HDB flats for a year



Energy Efficiency Index (EEI)
115 kWh/m² per year
An average Green Mark Platinum building has an EEI of 145 kWh/m² per year

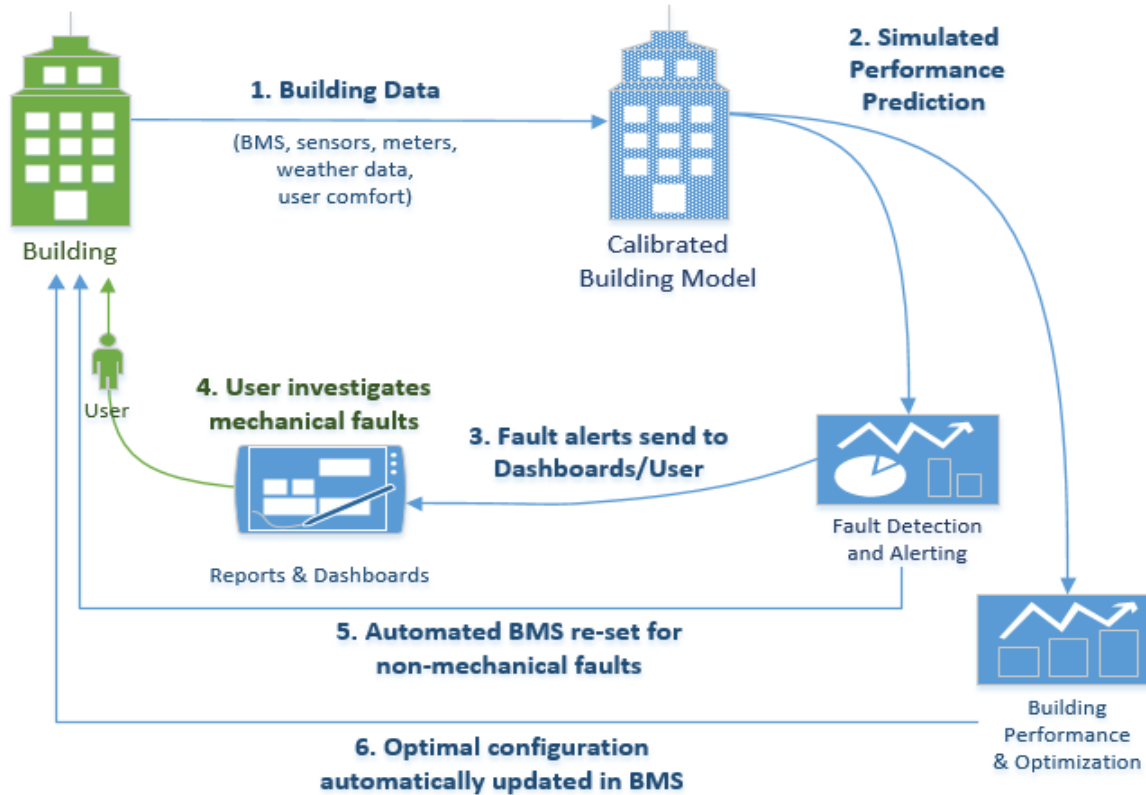




About the Technology

IES developed an energy model of the KBT building which was calibrated to accurately reflect the performance of the actual building based on operational data received, to create a "Digital Twin" of KBT. This was used to fully analyse the building's performance and identify a range of energy savings opportunities for the building.

Building IES Intelligent Building Control (IBC) Cloud-based solution



Estimated Annual Energy Consumption

Before Improvement
122.8 kWh/m²/year

Estimated Annual Energy Consumption

After Improvement
114.2 kWh/m²/year

Achieved Savings

7%

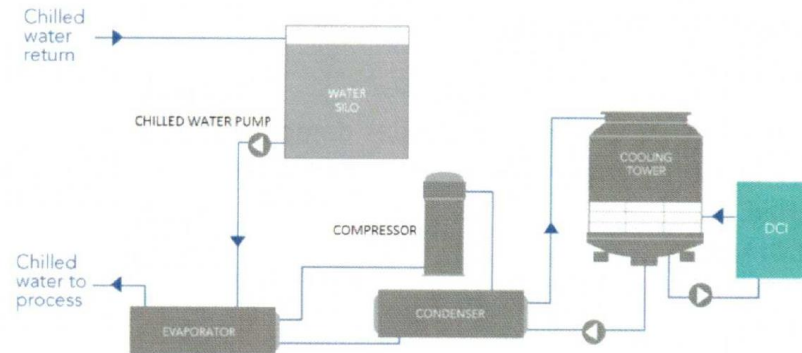
Number of ECM Implemented

8



About the Technology

Innovative Polymers installed the DeCalon™ (DCI), first of its kind, is a revolutionary approach to control scaling, corrosion and bio-fouling in cooling water systems. Through applied electro-chemistry, CataGreen™ and a patented intelligent controller, DCI automatically manage the water quality in cooling systems without the need for hazardous chemicals. The innovation provides a green technological solution to Keppel Bay Tower's ACMV systems. With this capability, the ACMV system is able to perform at peak efficiency all the time.



Chiller Plant Efficiency

Before Improvement
0.620 kW/RT

Chiller Plant Efficiency

After Improvement
0.575 kW/RT

Achieved Savings (Chiller Plant)

7%

Blowdown Water

Before Improvement
7.2 m³

Blowdown Water

After Improvement
1.1 m³

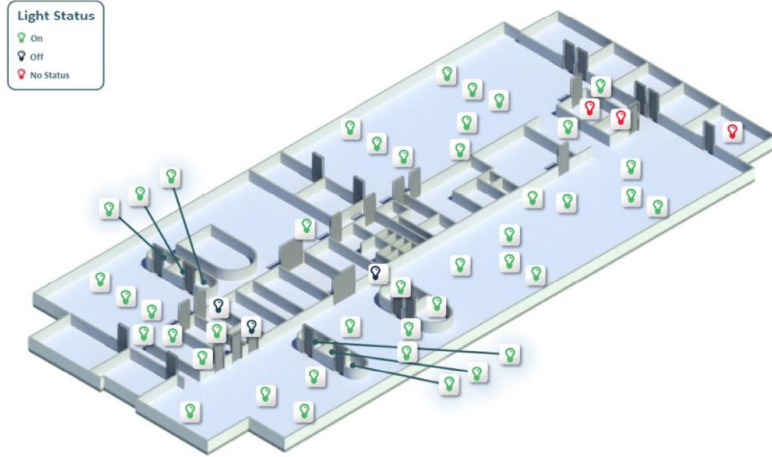
Achieved Savings (Blowdown Water)

85%



About the Technology

The Lumani smart lighting system utilises sensors to continuously adjust (dim) the lighting levels according to building occupancy. This fully autonomous system is at least 10% more energy efficient than best-in-class LED lighting systems. The technology is installed at multiple floors within the building.



**Achieved Savings
(Compared to T8)**

70.0%

**Achieved Savings
(Compared to LED)**

13.4%

Estimated Annual Lighting Energy Use

Before Retrofit (T8)
34.8 kWh/m²/year

Estimated Annual Lighting Energy Use

Before Improvement (LED)
12.1 kWh/m²/year

Estimated Annual Lighting Energy Use

After Improvement (Smart LED)
10.2 kWh/m²/year

Level 12 Lighting Power Density

Before Retrofit (T8)
11.2 W/m²

Level 12 Lighting Power Density

Before Improvement (LED)
3.9 W/m²

Level 12 Lighting Power Density

After Improvement (Smart LED)
3.3 W/m²



About the Technology

Danfoss and Novenco installed a high efficiency AHU technology (Zerax EC+) in the building. The technology delivers the highest "wire-to-air efficiency" of 80-85% and energy savings of 40-60% in the fan system of a typical AHU with the utilization of high efficiency Danfoss VSD that has motor independence technology, high efficiency Zerax Fans and high efficiency permanent magnet motor. The technology replaced fan, motor and VSD of an existing belt driven AHU on the 12th floor of KBT building and the performance could be compared between the two.



Estimated Annual Fan Energy Consumption

Before Improvement
31.2 kWh/m²/year

Estimated Annual Fan Energy Consumption

After Improvement
14.9 kWh/m²/year

Level 12 AHU Fan Efficiency

Before Improvement
0.433 W/CMH

Level 12 AHU Fan Efficiency

After Improvement
0.230 W/CMH

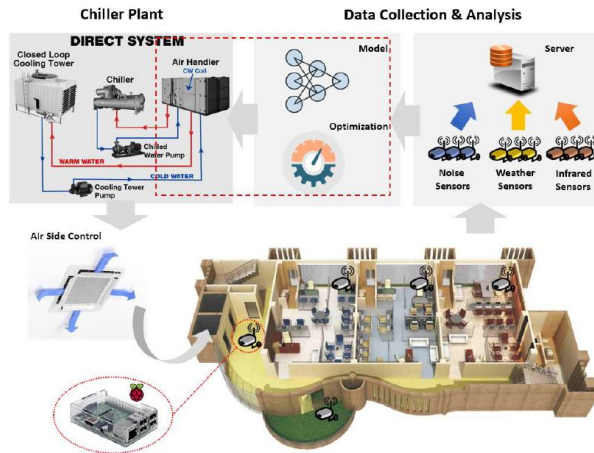
Achieved Savings

46.8%



About the Technology

Yitu's technology focuses on integrating different kinds of sensors to monitor human activities and control the fresh air intake accordingly to save energy by incorporating Artificial Intelligence. The technology was installed in 4 zones on the 12th floor of KBT, where Yitu monitored the room humidity, room temperature and human activity data.



Estimated Annual Cooling Energy Consumption

Before Improvement
52.4 kWh/m²/year

Estimated Annual Cooling Energy Consumption

After Improvement
42.8 kWh/m²/year

Level 12 Cooling Load

Before Improvement
38.46 RT

Level 12 Cooling Load

After Improvement
33.87 RT

Achieved Savings

12%