ICC Hong Kong: Exemplary Performance

Patrick Leung, Senior Technical Manager, Sun Hung Kai Properties
1. Company Profile

2. International Commence Centre ICC

3. Engineering Facilities Overview

4. Business Continuity Management

5. Energy Management

6. Conclusion
1. Company Profile
Sun Hung Kai Properties Limited

Sun Hung Kai Properties Limited ("SHKP") was publicly listed in 1972 and is now one of the largest property companies in Hong Kong. It specializes in developing premium-quality residential projects, offices and shopping centres. The Group employs about 37,000 people.
Kai Shing Management Services Limited

One of the largest Property and Facility Management Companies in Hong Kong

Variety of portfolio includes offices, shopping centers, residential buildings, industrial buildings and leisure clubs

Managed over 130 million square feet of space

Over 8,000 staff

Hong Kong, Mainland China

1st to acquire ISO9001, ISO14001, ISO50001 and ISO22301 certifications
2. International Commence Centre ICC
Hong Kong Central and Kowloon Peninsula
- Prime location at West Kowloon District
- Facing Victoria Harbour
- Linked with variety of transportation network
3 million square feet, the largest composite building in Hong Kong

Source: www.ctbuh.org

1st in Hong Kong, 7th tallest in the world
3. Engineering Facilities

Overview
Air Conditioning System

11 Sets Largest Indoor Cooling Tower

6 sets High Voltage Water-Cooled Chiller (12,000TR)
Electrical System

- Normal Power Capacity: 100 MVA
- Essential Power Capacity: 65 MVA with 39 sets of Generators
- Back up by Auto-Fuel Supply System
Vertical Transportation System

- 86 nos. of Elevators with VVVF motors
- 40 are Double-Deck Elevators
- Destination Control are adopted
Excessive regenerated power can be used
Building Management System

BMS provides controls and monitoring for

- Electrical Installation
- Lighting Installation
- Fire Services Installation
- Lift Installation
- MVAC Installation
- Plumbing Installation
4. Business Continuity Management
ISO 22301:2012 Business Continuity Management System
Continuous Fresh Water Supply

- Mobile tanks
- Water tankers

4 x 1m3 Mobile Water Tank

7.5m3 – 6m3 Water Tankers
Continuous Fresh Water Supply

Water Refilling Points

Kwai Fong

Mong Kok

CTBUH Conference 2015
ICC HK: Exemplary Performance
Business Continuity Management
Continuous Fresh Water Supply

- New Isolating Valve
- New Fresh Water Inlet Pipe
- Existing Fresh Water Inlet Pipe
- Dual Feed Water Supply
- Fresh Water Inlet

Long Term Solution
Continuous Electrical Power Supply

Emergency Power supply sources
- FSI generators
- Non FSI generators
- Tenant dedicated generators
- HV generators

Continuity Plans
- Generator Back Up
- Auto Fuel Supply
- Manual Fuel Deliver
- Back-up of the Back-up
Continuous Electrical Power Supply

Drill & Test Results

Table 2.1 Fuel Re-Filling Drill Test Results

<table>
<thead>
<tr>
<th>Time</th>
<th>M1-1</th>
<th>12 Floor</th>
<th>50 Floor</th>
<th>M2-1</th>
<th>49 Floor</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Target</td>
<td>Actual</td>
<td>%Fuel</td>
<td>Target</td>
<td>Actual</td>
<td>%Fuel</td>
</tr>
<tr>
<td>06:30</td>
<td>0</td>
<td>0</td>
<td>100%</td>
<td>0</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>06:45</td>
<td>0</td>
<td>0</td>
<td>63%</td>
<td>0</td>
<td>0</td>
<td>64%</td>
</tr>
<tr>
<td>07:00</td>
<td>0</td>
<td>0</td>
<td>65%</td>
<td>0</td>
<td>0</td>
<td>68%</td>
</tr>
<tr>
<td>07:15</td>
<td>0</td>
<td>0</td>
<td>52%</td>
<td>0</td>
<td>0</td>
<td>52%</td>
</tr>
<tr>
<td>07:30</td>
<td>0</td>
<td>0</td>
<td>39%</td>
<td>0</td>
<td>0</td>
<td>36%</td>
</tr>
<tr>
<td>07:45</td>
<td>0</td>
<td>0</td>
<td>36%</td>
<td>0</td>
<td>0</td>
<td>29%</td>
</tr>
<tr>
<td>08:00</td>
<td>2</td>
<td>2</td>
<td>39%</td>
<td>4</td>
<td>5</td>
<td>34%</td>
</tr>
<tr>
<td>08:15</td>
<td>2</td>
<td>2</td>
<td>42%</td>
<td>4</td>
<td>5</td>
<td>38%</td>
</tr>
<tr>
<td>08:30</td>
<td>3</td>
<td>3</td>
<td>46%</td>
<td>4</td>
<td>6</td>
<td>43%</td>
</tr>
<tr>
<td>08:45</td>
<td>2</td>
<td>0</td>
<td>29%</td>
<td>4</td>
<td>3</td>
<td>44%</td>
</tr>
<tr>
<td>09:00</td>
<td>2</td>
<td>0</td>
<td>52%</td>
<td>4</td>
<td>3</td>
<td>41%</td>
</tr>
<tr>
<td>09:15</td>
<td>2</td>
<td>2</td>
<td>35%</td>
<td>4</td>
<td>4</td>
<td>42%</td>
</tr>
<tr>
<td>09:30</td>
<td>2</td>
<td>0</td>
<td>30%</td>
<td>4</td>
<td>4</td>
<td>43%</td>
</tr>
<tr>
<td>09:45</td>
<td>2</td>
<td>2</td>
<td>43%</td>
<td>4</td>
<td>4</td>
<td>43%</td>
</tr>
<tr>
<td>10:00</td>
<td>2</td>
<td>2</td>
<td>43%</td>
<td>4</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>10:15</td>
<td>2</td>
<td>0</td>
<td>29%</td>
<td>4</td>
<td>4</td>
<td>45%</td>
</tr>
<tr>
<td>10:30</td>
<td>2</td>
<td>2</td>
<td>31%</td>
<td>4</td>
<td>4</td>
<td>43%</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>24</td>
<td>48</td>
<td>48</td>
<td>27</td>
<td>27</td>
</tr>
</tbody>
</table>

Table 2.2 Fuel re-fill rate

<table>
<thead>
<tr>
<th>Floor Designation</th>
<th># Caddy delivery over first 4 hour</th>
<th>Fuel replenish rate (Litre/4Hr)</th>
<th>Fuel consume rate (Litre/Hr)</th>
<th>Fuel consume rate (Litre/4Hr)</th>
<th>Assumed successful replenish rate/diversity in consume rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/F</td>
<td>27</td>
<td>2700</td>
<td>915</td>
<td>27</td>
<td>119</td>
</tr>
<tr>
<td>49/F</td>
<td>26</td>
<td>2600</td>
<td>915</td>
<td>27</td>
<td>119</td>
</tr>
<tr>
<td>M2-1</td>
<td>2</td>
<td>200</td>
<td>50</td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>12/F</td>
<td>48</td>
<td>4800</td>
<td>1528</td>
<td>6113</td>
<td>76</td>
</tr>
<tr>
<td>M1-3/F</td>
<td>20</td>
<td>2000</td>
<td>672</td>
<td>2688</td>
<td>75</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>12300</td>
<td>4068</td>
<td>16352</td>
<td>76</td>
</tr>
</tbody>
</table>
5. Energy Management
1st Hong Kong commercial property acquires ISO 50001:2011

ISO 50001:2011 Energy Management System

Model of ISO 50001 EnMS

Act

Plan

Check

Do

3 Significant Energy Uses

Electrical Lighting

Lift & Escalator

MVAC

3rd Hong Kong commercial property

CTBUH Conference 2015

ICC HK: Exemplary Performance

Energy Management

© Council on Tall Buildings and Urban Habitat
Energy Management – Planning

- Use of Advanced technologies
  - To control Building Services Systems
  - Power Monitoring & Analysis

Building Management System (BMS)  
Power Monitoring System (PMS)
**ICC Energy Management Approach**

<table>
<thead>
<tr>
<th>Energy Management Opportunity (EMO)</th>
<th>ICC Energy Management Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMO I</td>
<td>Housekeeping practice for saving energy</td>
</tr>
<tr>
<td>EMO II</td>
<td>Replacement of less energy efficient apparatus with the more energy efficient one with a reasonable outlay</td>
</tr>
<tr>
<td>EMO III</td>
<td>Substantial savings over a long term with capital investment</td>
</tr>
</tbody>
</table>
Identification of Significant Energy Sources

- Air Conditioning System
- Vertical Transportation System
- Electrical System
Principles of Operating the Air-conditioning System

- Diligently maintain the air conditioning system to achieve optimal performance
- Temperature to achieve an optimal comfort level
- Control the operating hours of the air conditioning system to eliminate energy wastage
Air conditioning System

Optimizing operating hours
- Shorten the operating hours of mechanical ventilation system
  → AHU & exhaust air fan

Indoor Temperature Settings
- Washroom: 24°C
- Office Lift Lobbies and Podium Zone: 24°C to 26°C
Collaboration with Professional Bodies

- Collaborate with local university on carrying out study of about the operating efficiency of the chillers
- Adopt building life cycle testing and commissioning approach
- Identify opportunities for running cost optimization

Optimal Control Strategies for Enhanced Energy Efficiency in ICC

Building Energy and Automation Research Laboratory
Department of Building Services Engineering
The Hong Kong Polytechnic University
Optimization Strategies for Air-conditioning system

1. Optimized chilled water supply temperature
2. Optimized cooling tower control
3. Optimized chilled water pump operation for heat exchanger system
4. Optimized heat exchanger control logic
5. Optimized fresh air control
6. Tackling inherent deficit flow
Optimized Chilled water supply temperature

- Lower chiller water supply temperature -> Save more chiller pump power
Optimized Cooling Tower Control

- Providing same cooling effect with power saving about 47%

Optimized Fresh Air Control

- By using Building Modeling Technique
- Feedback control parameters to our system e.g. amount of fresh air supply and exhaust air supply
- Reduce fresh air load without sacrifice IAQ
Optimized Chilled Water Pump Operation for Heat Exchanger System

Primary pumps are switched off

Original operation

Revised Operation
Optimized HX Control Logic
Tackling inherent of Deficit Flow

To Podium
CHWS

To Zone2
CHWS

To Zone 3&4
CHWS

Mixed
8.2°C

Deficit
9.5°C

Evaporator
Condenser

Evaporator
Condenser

Evaporator
Condenser

© Council on Tall Buildings and Urban Habitat
Basic Idea: Limiting the secondary chilled water flow not more than the flow rate of primary chilled water at supply side by resetting the pressure control set-point at secondary loop.
Energy Management – Electrical Lighting

**Reschedule of Operating Hours**

1. Switch off lighting at mechanical floors
2. Lighting schedule Adopts AHU operating schedule

**De-lamping**

Reducing excessive lamps at common areas such as lift lobbies

- **2422 LAMPS** **REduced**
- **8760 HRS.** **REduced**
  
  **(66% SAVING)**
- **5304 HRS.** **REduced**
Use of Timers and Sensors
Installation of Timers and Sensors to control lighting area which is not covered by BMS

LED Lamps Replacement
Most of the defective lights were replaced by LED tube, MR16, LED Down light

USE OF TIMERS AND SENSORS IN PLANT ROOMS

3049 LAMPS REPLACED
Energy Management – Electrical Lighting

BMS Lighting Operation Schedule

**Original Schedule**
Mon to Fri: 0630 - 2300
Sat: (i) 0630 - 1400
(ii) 1730 - 0000
Sun: 1730 – 0000

**New Schedule**
Mon to Fri: 0700 - 2000
Sat & Sun: Off
Energy Management – Lift & Escalator System

Suspension of Lifts & Escalators
During non-peak hours & holidays
(i) Zone 1-5 Office & Shuttle Lifts
(ii) Level 1, 2, 3, 8, 9, 48 & 49 Escalators

LED lamps
Replace all lift car spot lamps by LED lamps

Make Use of Staircase
Encourage staff and tenants to walk for several floors

42 LIFTS SUSPENDED
312 NOS. REPLACED
Energy Management – Checking and Management Review

- Regular Monitoring, Measurements & Analysis
  - Effectiveness of action plans
  - Energy performance

- Nonconformities (NC)

- Corrective Actions & Preventative Actions

- Senior Management Involvement
  - to review the status of energy performance, audit results, corrective and preventive actions
  - to make decisions and take actions to change policy, objectives, targets, resources allocations
Communication

Kai Shing Newsletter

ICC Green Keeping to Tenants

No Ties Friday

Celsius 26 Campaign

CTBUH Conference 2015
ICC HK: Exemplary Performance

Energy Management
Green Practices on Technical Aspect – Energy Saving

Over 70 action plans

18% saving for 2014 over 2012
6. Conclusion
Thank You