Energy Saving by Installation of Double Bundle-type Heat Pump

IndonesiaJCM Model Project

Date: 22nd February 2016
Venue: Bogor, Indonesia

Project Owner:
(Japan) Toyota Tsusho Corporation,
(Indonesia) PT.TTL Residences
**Project Outline**

1. **Location**
   - Lippo Cikarang, Bekasi, West Java, Indonesia

2. **Type, Use**
   - Hotel, Service apartment

3. **Land Area**
   - 8,284㎡

4. **Structure**
   - RC structure: 13 Floors (Maximum height: 54.4m)

5. **Floor Area**
   - 13,358㎡: (Residential area: 10,700㎡)

6. **Schedule**
   - 1st June 2013 ~ 31st July 2014 (14 Months)

**Mechanical and Electrical Facility Outline**

1. **Substation**
   - 3φ 3W 20kV/400-230V 1,000kVA x 1

2. **Generator**
   - 3φ 4W 400-230V 630VA x 1 (50% Back up)

3. **Main Feeder**
   - CVT Pre-fabrication Branch cable

4. **Lighting**
   - Public: LED Down light, Tube FL Lamp Corridor 150Lx, Office 500Lx
   - Residence: LED Ceiling Lamp with Variable lumen and color

5. **Weak current**
   - TEL, LAN, Public Address, CCTV, Card Key security

6. **Plumbing**
   - Direct supply with inverter pump
   - Underground tank 240m³

7. **Hot water**
   - Kitchen, SPA: Central system from Boiler 230kW x 2 sets with solar
   - Residences: Local system with 100 liter hot water tank, and heater

8. **Filtering**
   - SPA: 22m³/h (2 turn/h), Swimming Pool: 16m³/h (4 turn/day)

9. **Fire fighting**
   - Sprinkler, Internal and External Hydrant system, fire extinguisher
   - Air-cooled Heat pump with Freon R-410

10. **AC system**
    - Public area: Multi system with ceiling cassette
    - Residence: Single wall mounted and small multi-system

**Project Organization**

- **Project Manager**: Kitayama
- **Site Manager**: Butarbutar
- **ME Manager**: TADA
- **ME Chief**: Yanto
- **Total Site staff**: 63 staffs

**Schedule**

- **Construction**: July 2013 ~ September 2014 (15 Months)
Project Outline

1) Location
LIPPO Cikarang, Bekasi West Java, INDONESIA

2) Type, Use
Hotel, Service apartment, Restaurant

3) Land Area
8,284m²

4) Structure
RC structure 13 Floors (Maximum height 52.88m)

5) Floor Area
13,303m² (Residential area: 8,219m²)

6) Schedule
1st Oct 2014 ~ 31st March 2016 (18 Months)

Mechanical and Electrical Facility Outline

1) Substation
3φ3W 20kV/400-230V 1,000kVA x 1

2) Generator
3φ4W 400-230V 630VA x 1 (Back-up : 70%)

3) Main Feeder
CVT Pre-fabrication Branch cable

4) Lighting
Public : LED Down light, Tube FL Lamp Corridor 150Lx, Office 500Lx
Residence: LED Ceiling Lamp with Variable lumen and color

5) Weak current
TEL, LAN, Pubric Address, CCTV, Card Key security

6) Plumbing
Direct supply with inverter pump Under ground tank 60m³

7) Hot water
Kitchen, SPA : Central system: 37.8kW x 6 set
Double bundled Heat pump With 45m³ hot water tank
Residences: Local system with 100 liter hot water tank, and heater
Only 12-13F rooms are included in central system

8) Filtering
SPA : Internal Bath 22m³/h(2turn/h), Roten(External) : 16m³/h (2turn/h)

9) Fire fighting
Splinkler, Internal and External Hydrant system, fire extinguisher

10) AC system
Public : Double bundled (Water cooled) chiller 27.6kW x 6set
with Heat storage tank 240m³, Secondary FOU, AHU
Residences : Wall mounted single type R-410

Organization

<table>
<thead>
<tr>
<th>Project Manager</th>
<th>Site Manager</th>
<th>ME manager</th>
<th>ME Chief</th>
<th>Total Japanese</th>
<th>Indonesian staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitayama</td>
<td>Butarbutar</td>
<td>TADA</td>
<td>Yanto</td>
<td>4 staffs</td>
<td>61 staffs</td>
</tr>
</tbody>
</table>

Schedule
1st Oct 2014 ~ 31st March 2016 (18 Months)

External View (Completed Image)
Boiler + VRV system
Double bundled Heat pump system
AHU
+ Standard system (tower1)
Advanced System (Tower2)
Boiler + VRV system
Heat pump + AHU

CO₂ emission: 450 ton-CO₂/ year → 380 ton-CO₂/ year = 170 ton-CO₂/ year
Solar consumption: 112 m³/ year → 0 m³/ year = 112 m³/ year
Running Cost: 980,000,000 Rp/ year → 280,000,000 Rp/ year = 700,000,000 Rp/ year
Initial Cost: 8,300 juta Rp. → 8,900 juta Rp. = 600 juta Rp. up
(Expected 0.8 year pay back)

Funded by JCM Model Project

System schematic

Tower 1 system (Standard)
Boiler + VRV system

Tower 2 system (Advanced system)
Double bundled Heat pump system + AHU
Double Bundled Heat Pump system (Water cooled chiller)

Why Save Energy and reduce CO2

Tower 1 (Standard system)
Air cooled Chiller or VRV system

12°C → 7°C

For making 5 degree cooler water
Discharge the 5 degree heat to air

Boiler system

Solar

For making 35 degree hotter water
Burn the solar for heating and CO2 discharge

Solar

65°C → 30°C

Tower 2 (Advanced system)

Double bundled Heat pump

12°C → 65°C

7°C → 30°C

For making 5 degree cooler water
Shift heat to Freon Cycle

For making 35 degree hotter water
Get Heat from Freon Cycle

Without discharge the Heat and CO2

What is the advanced technology

1. Sensitive Freon control
   Hot water side 35°C differential
   Cool water side 5°C differential
   Balanced in the same cycle

2. Heat balance design
   Cooling water for Air Conditioning cannot be made without Hot water Consumption
   Heat balance in the building designed equally
**Theme/Plan**
1. Reduction of CO2 emission
2. Reduction of Fossil Fuel Consumption
3. Less and Easier work for Facility Staff
4. Better Profitability Balance
5. Make Superiority in the Market

**Solution/Do**
1. High Efficiency with Double bundled system
2. No consumption of solar for heat source
4. Reduction of Initial and Running Cost
5. Symbolized as the Friendship between Indonesia-Japan

**Achievement/Check**
- Authorized as the JCM Project
- Get the Subsidy by Government
- Reduction of running cost Rp.700 juta/year
- Reduction of CO2 emission 170C-ton/year
- Invent the New Parallel operated small units

**Development/Action**
- Find best balance between cool and heat during the monitoring term of CO2 reduction
- Analyze the profitability except subsidy
- Establish the fascinating scheme from Japan only based on the Advanced technology and Subsidy

---

**Cost comparison tower 1 and 2**

- **JCM authorized Double bundled Heat pump**

  - **Effect of Subsidy**
    - Energy cost Reduction 700 juta/year
    - CO2 emission Reduction 170 ton-C/year
Status of this Project

- Mar 2015: Installed all equipment
- Jun 2015: Approved JCM Methodology
- Sep 2015: Start PDDF to end of Mar 2016
- Apr 2016: Start System operation
- "Validation" within one year after start operation (Mar 2017)
- "Verification" After one more year (Mar 2018)
Thank you