Energy Saving for Air-Conditioning at Shopping Mall with High Efficiency Centrifugal Chiller
About Pakuwon Jati & Tunjungan Plaza

**TUNJUNGAN PLAZA RETAIL MALL**

- **The most famous and symbolic** shopping mall
- **Opened in 1995** as the first large-scale mega complex in Surabaya
- **Total area 125,000m² + α** (Still expanding)

**SUPERBLOCK GANDARIA CITY**

Located on a 7.5 hectare site, Superblock Gandaria City is the largest integrated mixed-use development in South Jakarta, with a total gross floor area of 564,784 square meters and over 4,000 car park lots. Positioned as a "one-stop lifestyle hub" Superblock Gandaria City consists of a retail mall (Gandaria City), two towers of executive condominium (Gandaria Heights), a Green Mark office tower (GandariaRia 8) and a five-star hotel.

Strategically located in the prime residential neighborhood and emerging commercial hub of South Jakarta, Superblock Gandaria City is situated on the main thoroughfare that connects northwest and south Jakarta and is 5 kilometres away from the outer ring road.

**SUPERBLOCK TUNJUNGAN CITY**

Superblock Tunjungan City is a landmark and lifestyle destination of East Indonesia. Located on a 7.4-hectare site in the heart of Surabaya's City Center. Tunjungan City is the first Superblock in Indonesia and consists of Tunjungan Plaza, Mandiri Office Tower, Condominium Regensi and the five-star Sheraton Surabaya Hotel and Towers.

**SUPERBLOCK KOTA KASABLANKA**

Located on a 9.5 hectare site, Superblock Kota Kasablanka is the largest integrated mixed-use development in South Jakarta, with a total gross floor area of 564,784 square meters and over 4,200 car park lots. Positioned as a "one-stop lifestyle hub" Superblock Kota Kasablanka consists of a retail mall (Kota Kasablanka).
About NTT FACILITIES

Total Power Reduction campaign by NTT Group

NTT FACILITIES has led NTT group’s effort for TPR
NTT FACILITIES is

- One of the largest design & engineering firm in Japan
- Providing Energy-Architecture-ICT combined services

Est. : December 1, 1992
Employees: 5,300
Revenue : 261 billion JPY

We Create “Smart & Safety”
Project Scheme

Inter-governmental (G-to-G)

Inter-city (City to City)

Surabaya

Kitakyushu

Indonesia

Japan

International Consortium (B-to-B)

Funding

Building Owner

PT. Pakuwon Jati Tbk.

EPC Company

NTT FACILITIES
1. Objective of the Kitakyushu Model

- Kitakyushu, which faced and overcame pollution for the first time in Asia, became a leading environmental city in Japan.
- Kitakyushu is developing the Kitakyushu Model (support tool) that systematically arranges information on the technologies and know-how of Kitakyushu from its experience in overcoming pollution to its quest as an environmental city.
- Kitakyushu is utilizing the Kitakyushu Model to promote the export of customized infrastructure packages to cities overseas, and grow together with Asia.

2. Applications of the Kitakyushu Model

- Support tool to examine future ideal city image and for cities to take appropriate measures and procedures to achieve this.
- Support tool to examine management systems for waste, energy, water and sewage services, and environmental protection.
- Support tool to develop sustainable master plans that integrates waste, energy, water and sewage services, and environmental protection.

Surabaya, Indonesia: 2nd largest city in Indonesia with a population of 3 million

Target areas: Energy, waste management, transportation, water resources

Participating Japanese companies: 13

Green Sister City agreement signed (Nov 2012)
Transition of JCM Feasibility Study in Surabaya

**FY2013**
- Energy sector: 63,000t-CO₂/yr
- Transportation sector: 1,000t-CO₂/yr
- Solid waste sector: 72,000t-CO₂/yr
- Water resource sector: 15,000t-CO₂/yr

**FY2014**
- Energy sector
- Solid waste sector
- Water resource sector

**FY2015**
- Energy sector
- Solid waste sector

**Prioritization**
(feasibility & cost-effectiveness)

- These FS have been developed by Kitakyushu City and IGES
- Tunjungan Plaza was one of potential buildings in Energy sector

**Application & Expansion**
(feasibility study → model project)
The project aims to reduce electricity consumption in the shopping mall through introducing advanced & efficient Japanese centrifugal Chiller system. The project is to replace existing central cooling system with high efficient centrifugal chiller with capacity of 966TR x 4 units and 569TR x 1 unit in Pakuwon’s shopping mall, Tunjungan Plaza, as well as to replace existing 8 cooling towers with efficient Japanese models.

More than 30% Energy Saving

The GHG emission reductions are calculated based on the estimated electricity consumptions based on the conservatively estimated COP of a reference cooling system and a project COP of the centrifugal chiller as well as the grid emission factor.

Estimated GHG Emission Reductions

398tCO₂/year

Sites of JCM Project

Java Island

Tunjungan Plaza(@Surabaya)
Advantages of Introduced Technology

**HC-F-GXG-S/GFG-S Series**

1. **Ozone-Safe HFC-134a**
   - Adopting HFC134a refrigerant

2. **High Efficiency**
   - **COP over 6.5** (in case of $\Delta T = 5 \, ^\circ C$)
   - Excellent Energy Saving

3. **Compact Design**
   - Space Saving & Easy Replacement

4. **Easy Operation**
   - With Color Touch Panel Screen

5. **High Reliability**
   - Based on 80 years’ experiences with various unique technologies
   - Wide operation range (at high CW temp)
   - No Surging Design etc.

**Capacity Range**

- **300 ~ 2,500RT** (1,055 ~ 8,790kW)
  - with single compressor
  - 380~460V, 3/3.3kV, 6/6.6kV, 10/11kV, 50/60Hz
  - Max. 5,000RT (17,580kW) with Twin Module (LEAD-LAG) Application
## Project Progress

### Schedule

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**Project Implementation**
- **2015**: Site Survey, Design
- **2016**: Manufacture, Factory test, Shipping
- **2017**: Replacement of Chillers and Cooling Towers

**MRV**
- **2015**: Preparation of MRV methodology
- **2016**: PDD
- **2017**: Monitoring
- **2018**: Registration

*Utilize existing MRV methodology (ID_AM002)*

### Implementation Image

- Chillers before replacement
- Carrying out
- Unloading Machinery
Project Progress

Implementation Image

Demolishing wall for unloading

Unloading Chiller

Lifting Chiller from unloading shaft

Chillers after replacement

Cooling Towers before replacement

Cooling Towers after replacement

Challenges in Implementation
- Every Chillers and CTs had to be replaced one by one, while keeping normal operation of shopping mall.
- Unloading conditions of Chillers and limited time and work space of CTs
Energy Saving Result (vs BaU)

More than 30% Reduction (Approx. 3.4BIDR/year cost saving)
Further development

1. **Viewpoint of technology replication**

   Technology replication is not difficult technically. Number of supply record of Japanese high efficient chiller is increasing little by little thanks to this symbolic JCM project. Getting easier to convince building owners of OPEX benefit (Low Life Cycle Cost).

2. **Contribution to realize Smart City**

   Deployment of high efficient cooling system in shopping malls is one of the strategies to realize Smart City based on City to City collaboration. More cooperative approach of stakeholders in various field will be necessary.

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**Smart City Image by C2C Collaboration**

- **Office/Commercial**
  - Efficient Cooling, PV (Shopping mall/Office)

- **City Infrastructure**
  - Solid Waste
  - Water Resource

- **Transportation**
  - Eco-Drive
  - LED Street Lighting

- **Low-Carbon Port**

- **Industry**
  - Efficient facility (Factory)
  - Biomass, PV

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Terima kasih atas perhatian Anda.