High efficiency products with central management as a key solution to achieve lowest power consumption of air conditioning systems

TRANSITION FROM GOODS TO EXPERIENCE
AGENDA

1. Daikin Activities
2. Case
3. Brazilian Challenges
CORPORATE PROFILE
Inauguration: October 25, 1924

Total Sales
Total of Subsidiaries 269
Number of Employees 70,263
Number of Production Bases Over 90
Countries of Sales Activities Over 150

20.6 billion USD

Main Businesses
HVAC&R | Air conditioners, ventilation equipment, freezers, etc.
Chemicals | Fluorochemical products
Oil Hydraulics | Hydraulic equipment
Electronics

EMEA
80 subs
9,227 employees

CHINA
32 subs
18,599 employees

AMERICAS
80 subs
16,175 employees

ASIA & OCEANIA
49 subs
14,250 employees

JAPAN
28 subs
12,012 employees

HEADQUARTERS
OSAKA - JAPAN
DAIKIN BRAZIL
Inauguration: Since 2011

Manaus | Factory

São Paulo | HQ
Brazil – 4 branches

São Paulo | Office
São Paulo | Showroom

EMAK9 | Daikin McQuay Ar Condicionado Brasil Ltda
Background | What happens in the world?

- Heatwave
- Storm
- Flood
- Forest fire
- Pollution
- Infection

Global warming is considered to be affecting
**Background | What Daikin can?**

**Our contribution to SDGs for sustainable growth**

<table>
<thead>
<tr>
<th>SDGs</th>
<th>Description</th>
</tr>
</thead>
</table>
| 3 | **Good Health and Well-being** through the power of air
Contribute to good health and well-being in the office
Office productivity, IAQ, prevent infection etc. |
| 11 | **Sustainable Cities and Communities**
Contribute to sustainable cities and communities
ZEB, energy management, demand response, reducing CO₂, create and use renewable energy |
| 12 | **Responsible Consumption and Production**
Ensure responsible production
Energy saving, reducing CO₂, save resources during manufacturing |
| 13 | **Climate Action**
Tackle climate change as a large emitter
Highly efficient products, heat pump, lower GWP refrigerant, etc. |

Source: United Nations

EMAK9 | Daikin McQuay Ar Condicionado Brasil Ltda
**Daikin’s vision for sustainability**

**Daikin will develop while contributing to society**

**Daikin Environmental Vision 2050**

We will provide safe, healthy air environments while striving to reduce our CO2 emissions to zero.

**Long term vision**

- Through products
  - Open Innovation IoT and AI

- Through solutions
  - Open Innovation IoT and AI

- Through the power of air
  - Open Innovation IoT and AI

We will reduce the CO2 emission generated throughout the entire life cycle of our products.

Furthermore, we will create solutions that link society and customers as we work with stakeholders to reduce CO2 emission to zero.

Using IoT and AI, and open solutions, we will meet the world’s needs for air solutions by providing safe and healthy air environments while at the same time contributing to solving global environmental problem.
Background | Expansion of energy saving products

Daikin has expanded Inverter A/C all over the world

Market share of Inverter A/C


Reduced 54 million ton-CO₂ (2017)
(Only Daikin’s contribution)
Daikin has reduced HFC by R-32

R-32 refrigerant cuts global warming by about 70%

- Daikin has sold more than 15 million R-32 units in over 50 countries so far
- 55 million R-32 units were sold in the world (92 million ton-CO₂ equivalent)

(Daikin estimation, Jun. 2018)
CASE | DAIKIN OFFICE

Dramatically reduced Daikin’s office energy consumption using higher efficiency products with automation
Case | Daikin office energy consumption reduction

- Proper design of AC system
- Central management
- Higher efficiency product

Total reduction
### Daikin office energy consumption reduction

**New office address:**
Av. Vital Brasil, 305
São Paulo/SP

<table>
<thead>
<tr>
<th>Office</th>
<th>Cerro Corá (Lapa)</th>
<th>Butantã</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building</strong></td>
<td>2 floors 1 underground</td>
<td>5 floors</td>
</tr>
<tr>
<td><strong>Area</strong></td>
<td>Total: 1,592 m²  With air conditioner: 677 m²</td>
<td>Total: 2,070 m²  With air conditioner: 1,143 m²</td>
</tr>
<tr>
<td><strong>Air Conditioner System (VRV)</strong></td>
<td><strong>Type</strong></td>
<td>VRV-II Multi Split</td>
</tr>
<tr>
<td><strong>Capacity</strong></td>
<td>35 HP (14+10+8)+(3)</td>
<td>52 HP (22+22+8)</td>
</tr>
<tr>
<td><strong>Indoor Units (QTY)</strong></td>
<td>24 units</td>
<td>29 units</td>
</tr>
<tr>
<td><strong>Automation</strong></td>
<td>N/A</td>
<td>Central Manager iTM + SVM</td>
</tr>
</tbody>
</table>

**DIFF (%):**
- Air conditioned area → **170%**
- Air conditioner capacity → **150%**

**Reduction of installed A/C capacity of 12%**
# Daikin Office Energy Consumption Reduction Case

**New office address:**

Av. Vital Brasil, 305  
São Paulo/SP

## Energy Bills

<table>
<thead>
<tr>
<th>Energy Consumption</th>
<th>Old (2016-2017) kWh</th>
<th>New (2017-2018) kWh</th>
<th>DIFF kWh (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>November</td>
<td>9,351.10</td>
<td>6,311.30</td>
<td>32.5%</td>
</tr>
<tr>
<td>December</td>
<td>9,053.20</td>
<td>2,770.30</td>
<td>69.4%</td>
</tr>
<tr>
<td>January</td>
<td>10,578.90</td>
<td>8,008.00</td>
<td>24.3%</td>
</tr>
<tr>
<td>February</td>
<td>9,813.40</td>
<td>7,030.00</td>
<td>28.4%</td>
</tr>
<tr>
<td><strong>AVG</strong></td>
<td><strong>9,699.15</strong></td>
<td><strong>6,029.90</strong></td>
<td><strong>37.8%</strong></td>
</tr>
</tbody>
</table>

**Estimated as lightning and others 1/3 of energy consumption**

- Old (2016-2017) = 3,233.05 kWh
- New (2017-2018) = 3,233.05 kWh

**Only A/C kWh**

<table>
<thead>
<tr>
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<th>New (2017-2018) kWh</th>
<th>DIFF kWh (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AVG</strong></td>
<td><strong>6,466.10</strong></td>
<td><strong>2,796.85</strong></td>
<td><strong>56.7%</strong></td>
</tr>
</tbody>
</table>

## Analysis

- Air conditioned area = 170%  
  → Thermal load = 170%  
  Correct comparison → Energy Consumption = 170%

**Equalizing for the same area:**

\[
\text{Energy Consumption (New)} = \frac{\text{Energy Consumption (Old)}}{\text{Area (Old) \times 170\%}} = \frac{6,466.10}{6,466.10 \times 170\%} = 25\% 
\]

→ 75% of reduction
Central Management of Air Conditioning System

Equipment management on site

CENTRAL MANAGER FUNCTIONS
- Monitoring / Operation
- Failure viewing
- Record of operation history
- Remote access via internet
- Schedule timer
- Setpoint limit
- Function block
- Interlock of units and functions
- **Energy management**
- Etc...

Remote access for users
- Through smartphone, tablet or PC
- Login and password to access certain units
- Adjustable access and limitations
Case | **Daikin office energy consumption reduction**

**Central Management of Air Conditioning System**

Remote management of Multi Sites

- Performance comparison of different sites
- Detection of deficiency and improvement planning
Case | **Daikin office energy consumption reduction**

- Due to proper design of AC system: **12%**
- Due to central management: **26%**
- Due to higher efficiency product: **37%**

Total reduction: **75%**
Brazil is far behind in terms of energy saving regulation and performance measurement compared to the world. Daikin will contribute to the development of the Brazilian air conditioning market through actions toward the government.
Improve labelling program is the key to increase EE

End user cannot understand the difference between non-inverter and inverter.

Most of the Splits registered at INMETRO are A Class with Procel. ENCE shows classification (from A to D) and energy consumption.

But the methodology is the same, so, it doesn’t show the difference between both technologies.

**Which one saves more energy?**
Remarkable institutes to run field testing

**WHERE**
- **SANTA CATARINA FEDERAL UNIVERSITY (UFSC)**
  - FLORIANÓPOLIS/SC
- **MAUÁ INSTITUTE**
  - SÃO CAETANO DO SUL/SP
- **PUC-RJ UNIVERSITY**
  - RIO DE JANEIRO/RJ

**WHY**
Well known universities, with remarkable academic history, experienced in Energy Efficiency research, Brazilian government and United Nations Environment consultancy and climate change.
Introduce to Brazil R-32 Inverter benefits

Evaluate energy savings of the Daikin’s Inverter Mini Split equipment operating with environmentally friendly refrigerant R-32 vs. most common Mini-Split in Brazilian market, Non-Inverter working with refrigerant R-410A and also vs Daikin’s Inverter R-410A manufactured in Brazil (ZFM).

Goal:
Clarify the benefits of high energy efficient inverter air conditioners which adopted low GWP refrigerant R-32 in order to contribute with establishment of new Public Policies and refrigerants transition decisions in fulfillment with Kigali Amendment.

- Disseminate Inverter R-32 technology in Brazilian Market;
- Increase the Market share of Inverter technology in Brazil.
**Demo Test | Air conditioning demonstrative project in Brazil**

**Demonstrative tests to show field conditions**

**UFSC**: Federal University from Santa Catarina;
1st: R-410A INV DK vs NON
2nd: R-32 INV DK vs R-410A INV DK
2 rooms

**IMT**: Mauá Technology Institute;
R-32 INV DK vs R-410A NON
2 rooms

**PUC-RJ**: Pontifícia Catholical University Rio de Janeiro
R-32 INV DK vs R-410A NON
1 room
Final results from field tests

Energy consumption comparison between Non-inverter R-410A vs Inverter R-32

- **UFSC**
  - FLORIANÓPOLIS/SC
  - JAN ~ FEB/2018
  - 58%* saving

- **MAUÁ**
  - SÃO CAETANO/SP
  - MAR ~ MAY/2018
  - 65% saving

- **PUC-RJ**
  - RIO DE JANEIRO/RJ
  - APR ~ JUN/2018
  - 59% saving

*Indirect analysis
Leandro Lourenço
Product Engineering Manager
leandro.lourenco@daikin.com.br