Social and Environment benefits offered by Energy Efficient Air Conditioners

Shu Kawasaki
Vice President
Daikin Latin America Operations
Today´s Contents

❖ Climate Impact of Air-Conditioners
   • GHG emissions can be reduced by transition to Inverter technology and adopting Lower GWP refrigerants

❖ Social and Environmental Benefit by Energy Efficient Air Conditioners
   • Building new generation capacity (power plants) can be avoided by Inverter technology
   • Consumers can get economical and environmental benefit by transition to Energy Efficient Air-Conditioners

❖ Challenges and Opportunities for Latin America and Caribbean region
   • Energy Efficiency Standard and Labeling (S&L), adopting Seasonal Matrix will help reducing drastically GHG emission as well as energy consumption.
Who’s Daikin

Key words that Express Daikin:

- Founded in Osaka, Japan 1924
- Over 90 Years of History
- Comprehensive AC Manufacturer handling both AC equipment and refrigerants

- More than 100 global production bases for localized production
- Operating in more than 150 countries
- More than 80,000 employees 80% outside Japan

- 76% of our sales are from outside Japan
- Overall Sales of more than 2 Trillion Yen
- People-Centered Management

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Over 90 Years of History

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People-Centered Management
Daikin’s AC Product Lineup

AC solutions are realized for all types of needs including those for energy-savings, the environment, comfort, peace-of-mind, safety, and health.
Background

Worldwide AC stocks in the market are increasing
(IEA report “The future of cooling”)

- Energy demand will more than triple between 2020 and 2050. Growth is driven by residential sector.
- Electricity demand, especially at peak, is increasing.
Issues that we have to solve: Electricity demand increment

- Increase Air Conditioner demand
- Increase electricity demand
- Newly-built power plants
  With increase CO2 emission
- Accelerate global warming

Global Electricity Consumption in 2030 – Business as Usual

Need to build new generation capacity, with additional public finance burden

What technology can help avoidance of this problem?

Chart source from: U4E (United for Efficiency)

- Air-conditioners
- Lighting
- Electric motors (0.75-375kW, excluding AC & refrigerators)
- Information technology
- Refrigerators
- Transformers

Total: 31,000 TWh

Σ 56% of global electricity use
Issues that we have to solve: global warming by refrigerant

HFC emissions will increase and cause large global warming impact (Velders et al)

- China/Asia/India will cause large emissions without control
Dakin Group Environmental Initiatives
Daikin’s policy on Climate Change

“Environmental Vision 2050”

- Provide safe and healthy air satisfying the air-related needs, such as safeguard against heatstroke, better work, better sleep in the world.
- Reduce GHG emissions from our products through the entire life cycle in cooperation with stake-holders by using IoT, AI, and open innovation.
How can Daikin achieve net GHG zero goal?

Daikin will achieve net GHG zero through products, solution, collaboration and offset

- More efficient products
- Lower GWP refrigerant
- Heat-pump heating

- Energy service solution

- Collaboration with stakeholder
  low energy building
  renewable energy

- Support to use HFCs with low GWP, such as R32
- Recovery/recycle of HFCs
- Forest conservation etc.
Underlying Energy Saving Roadmap

**Equipment**
- Individual product assessment
- Energy efficiency measured at rated points

**Building**
- Consider environmental impact of completes solution, with real operating conditions
- Connectivity and interoperability between building systems

**Community**
- Integrated communication platforms
- Asset management to guarantee a seamless and efficient operation

- Diffusion and Expansion of Inverter
  - Reduction of cost

- nZEB realization technology
  - Systematization
  - Using natural energy
  - Optimization of design and operation

- Demand control of electricity in demand site
  - Control of AC systems to offer flexibility to grid operators or electricity market players
  - Power demand prediction system
**Dissemination of Inverter technology**

**Daikin has been promoting inverter AC since 2007**
- About 60% of residential AC sold in 2018 were inverter type
- Latest inverter AC can reduce electricity by about 60%

**Power consumption (example)**

<table>
<thead>
<tr>
<th>Non-Inverter AC</th>
<th>Latest Inverter AC</th>
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</thead>
<tbody>
<tr>
<td>100%</td>
<td>42%</td>
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</table>

58% Energy Saving

**Penetration of inverter type AC**
(from JRAIA website)

<table>
<thead>
<tr>
<th>Region</th>
<th>Inverter type ratio of annual sales (2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>100%</td>
</tr>
<tr>
<td>China</td>
<td>75%</td>
</tr>
<tr>
<td>Europe</td>
<td>79%</td>
</tr>
<tr>
<td>Asia</td>
<td>39%</td>
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</table>
Diversity of refrigerant Choice, and Sooner the better for the future Environment

- There is no one-size-fits all solution.
- Need to find appropriate solution for each application
- GWP is not only factor to make a decision. Need to take holistic approach to make the decision.
- Once an appropriate refrigerant is found, Daikin takes at most effort to swiftly introduce it to the market to reduce future environmental damage.

Note: Other refrigerants not listed above are also applied in products outside of Daikin’s portfolio, some examples include hydrocarbons (Isobutane, Propane) for refrigerators and window air conditioners or HFO refrigerants for mobile air conditioners.
CLIMATE IMPACT OF AIR-CONDITIONERS

Refrigerants transition to reduce Climate and Environment Impacts

- Ozone Depleting Substance (ODS)
- HFC R22: 1980s
- HFC R410A: ODS alternative but High GWP 2000s
- HFC R32: Lower GWP 2010s

Key elements is... **Sooner, the Better Approach**
As soon as the most balanced and feasible solution for an application is found, manufactures should commercialize and disseminate the technology.
GHG emission reduction through lower GWP refrigerant

Comprehensive measures can help to be achieved low-GWP target of Kigali Amendment as an international agreement.
Highlight on Latin America and Caribbean region
SOCIAL IMPACT OF AIR-CONDITIONERS

Key elements are...

ACCESS TO COOLING
Wider access to cooling is necessary, bringing benefits to human development, health, well-being and economic productivity.

ACCESS TO ELECTRICITY
Expand access to cooling will have a significant impact on countries’ overall energy demand. It is also critical to expand and maintain a renewable energy.
Standard & Labeling issues in Brazil

Standard & Labeling system must guide consumers to choose efficient products accessibly, however....

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.

NON-INVERTER vs INVERTER

Which one saves more energy?
AC demonstration project in Brazil (JICA)

PROJECT SCOPE

- Analysis of policy impact based on actual measurements of Energy consumption results.
- Study and knowledge transfer of Japanese air conditioners market and Japanese energy efficiency policy.
- Building program of refrigerant service training.

PROJECT PLAYERS

- UFSC: Federal University from Santa Catarina;
- IMT: Mauá Technology Institute;
- PUC-RJ: Pontificia Catholic University Rio de Janeiro.

TARGET

1. São Paulo
2. Florianópolis
3. Rio de Janeiro

UFSC
FLORIANÓPOLIS/SC
JAN ~ FEB/2018

MAUÁ
SÃO CAETANO/SP
MAR ~ MAY/2018

PUC-RJ
RIO DE JANEIRO/RJ
APR ~ JUN/2018

Presentation of the project results at
The 3rd Konwakai Latin America.
What JICA Project conduct to deliver the transitions

1. Support to implement Seasonal Efficiency Standard of ISO 16358
2. Recommend to set an appropriate table for all types of AC (Inverter AC and Non Inverter AC)

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<table>
<thead>
<tr>
<th>Star Rating</th>
<th>Min CSPF</th>
<th>Max CSPF</th>
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<tbody>
<tr>
<td>A</td>
<td>x.xx</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>x.xx</td>
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<tr>
<td>C</td>
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<td>x.xx</td>
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<tr>
<td>E</td>
<td>-</td>
<td>x.xx</td>
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</tbody>
</table>

Policy Action can Create Social and Economical Benefit

✓ Reduces the need to build new generation capacity.
✓ Lead to a reduction in cooling-related CO2 emissions.

Currently 90% products rated “A”
AC demonstration project in Mexico (JICA)

OBJECTIVE
Comparison of electricity consumption between R-32 Inverter and R-410A ON-OFF mini-split AC, climate and economic impacts in five cities: Cancun, CDMX, Guadalajara, Monterrey and Mexicali

PROJECT PLAYERS
1. Mexicali: SAT (Tax Administration Service)
2. Monterrey: SCT (Secretariat of Communications and Transport)
3. Guadalajara: INIFAP (Institute of Forestry and Agricultural)
4. Mexico City: CENACE (National Centre of Energy Control)
5. Cancun: DICONSA (Provisions to Rural Areas Programme)
IAQ Solution: Safe and Healthy Air vs COVID-19 Pandemic

Will provide safe and healthy air satisfying the air-related needs
- We spend about 90% of life time indoors
- Daikin can control IAQ and provide sage and healthy air

Air-related needs

Healthy/Comfortable air
- Reduce sleep disorder
- Reduce stress
- Reduce heat shock

Bountiful air
- Productive office
- Power concentration
- Better sleep

Safe/Secure air
- Prevent heat stroke
- Protect pollution

How we control
Product/Solution selection is based on customer needs, current a/c system installed and other variables.

Filter efficiency
- Air to filter off particles, dust, bacteria, etc.
- MERV 8 filter (particles >10μm)
- MERV 9 filter (particles >1μμm, 99.97% efficiency)
- Ultraviolet (UV) treatment with waves of light for 20-30 seconds
“Air as a Service/Integrated Air Solutions (IAS)”

- One stop solution, includes installation, update, operating, maintenance, monitoring (7/24)
- Daikin owns the assets on behalf of the building owner.
Thank you very much for your kind attention!

¡Muchas gracias por su amable atención!
Muito obrigado pela sua atenção!

Shu Kawasaki
Vice President
Daikin Latin America Operations
shusaku.kawasaki@daikin.co.jp