Environment

Why is it Important?
Achieving both Environmental Protection and Business Expansion

Environmental problems such as climate change constitute top priorities for manufacturers. In addition, air conditioners consume large amounts of energy during their operation, and hydrofluorocarbons that are used as refrigerants contribute to climate change. We are striving to reduce greenhouse gas emissions throughout the entire supply chain, develop products and services, and carry out environmental and social contributions to contribute to sustainable growth both for Daikin and for the Earth.

DAIKIN’S POLICY
Introduce State-of-the-art Technologies to the Market in Order to Address Environmental and Energy Issues

Contributions to reducing emissions through refrigerants with low global warming potential
Contributions to reducing emissions through energy-efficient technologies

Energy-induced CO₂
CO₂ from deforestation and other land use
Methane
Dinitrogen monoxide
Fluorocarbons (HFCs, PFCs, SF₆)

Note: Contribution of Working Group III to the Fifth Assessment Report of the IPCC

Feature Japan’s Environmental Technologies Becoming the Global Standard

Creating a New Market that Contributes to the Mitigation of Global Warming

DAIKIN’S APPROACH
Disseminating Environmental Technologies that Mitigate the Effects of Air Conditioners on Climate Change

Air conditioners make people’s lives more comfortable and productive, but we cannot overlook their contribution to climate change through hydrofluorocarbon refrigerants and energy consumption. Global warming is expected to become a growing problem in the economically advancing emerging countries where air conditioner demand is on the rise. An effective means of reducing the Earth’s overall global warming is to spread the use of energy-efficient air conditioners that use refrigerants with low global warming potential in emerging countries and regions.

As the only company in the world producing both air conditioners and their refrigerants, Daikin has striven to mitigate the effects of climate change from the standpoint of both refrigerants and energy consumption. For example, we have been working toward greater worldwide dissemination of air conditioners using HFC-32, a refrigerant with lower global warming potential than conventional refrigerants. We have been striving to increase the ratio of highly efficient inverter (variable speed) products in countries where there is still a low penetration rate of such products.

Estimates for Reduction of Global Greenhouse Gas Emissions (Residential Air Conditioners)

<table>
<thead>
<tr>
<th>Year</th>
<th>Emission reductions (Billion tons-CO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>Versus 2010 global greenhouse gas emissions*</td>
</tr>
<tr>
<td>2030</td>
<td>Reduction due to refrigerants with low global warming potential</td>
</tr>
<tr>
<td>2040</td>
<td>Approx. 8% reduction</td>
</tr>
<tr>
<td>2050</td>
<td>Approx. 4% reduction</td>
</tr>
</tbody>
</table>

Note: Compiled by Daikin based on “Benefits of Leapfrogging to Superefficiency and Low Global Warming Potential Refrigerants in Room Air Conditioning (2015),” published by Ernest Orlando Lawrence Berkeley National Laboratory
Creating a New Market that Benefits Local Economies, Daikin Business, and Environment

In order to disseminate new low-global-warming-potential refrigerants and energy-efficient technologies, Daikin must demonstrate these refrigerants’ reduced environmental impact and promote the proper understanding of their safety and economy. By changing conventional market concepts and building mechanisms that properly evaluate and use these new technologies, we have succeeded in creating a new market that is open to the application of these technologies. But Daikin cannot do it alone: efforts will only succeed through cooperation among many stakeholders, including local governments, industry groups, local manufacturers, and product installers.

Daikin works with the government of Japan, United Nations organs, and international organizations to spread the use of its environmental technologies and thus help create a new market. The thorough creation of a new market not only provides end users with high-performance products at the earliest possible time; it also leads to higher local technological levels and greater advancement of regional industry. Opportunities for Daikin to grow its business and contribute to the mitigation of environmental impact also extend. The result of all this is that we are aiming to ensure benefits for local economies, Daikin business, and the environment: a “win win win” situation.

Creating a New Market for the Dissemination of Environmentally Conscious Technologies

**How We Are Creating New Markets**

1. **Identify challenges**
   - Grasp conventional market concepts
   - Market survey
   - Dialogue with concerned parties

2. **Address challenges**
   - Build mechanisms for proper evaluation and use of new technologies
   - Create evaluation methods (indices, standards, environmental labeling, etc.)
   - Train technicians
   - Build a supply system
   - Raise awareness

3. **Results**
   - Establishment of systems
   - Higher local technological levels
   - Expanded sales
   - Greater awareness

**Benefits for all sides: local economy, Daikin business, and the environment**

**Collaboration with Stakeholders**

- Standards organizations
- Industry groups
- United Nations
- Japanese government
- Technical support
- Local manufacturers
- National governments
- Market (users)
- Support, aid
- Safety standards, environmental labels
- Products, environmental education

Daikin representatives meet with air conditioner industry experts at a Daikin air conditioner forum for the Asia and Oceania region.
Daikin Strives to Spread the Use of Refrigerants with Low Global Warming Potential by Collaborating with Governments and International Organizations on Technical Support in Emerging Countries

DAIKIN’S PERFORMANCE
Free Access to Daikin Patents Worldwide Hastens Dissemination of Low-Global-Warming-Potential HFC-32 Refrigerant

The Montreal Protocol and the Kyoto Protocol restrict the use of conventional refrigerants that deplete the ozone layer and contribute to global warming, making conversion to next-generation refrigerants a pressing issue. Choosing a next-generation refrigerant must of course take into account overall factors such as environmental performance, safety, and economic performance, but its suitability for use in different kinds of products including air conditioners, hot water heaters, and refrigeration equipment must also be considered. As a result of international-level discussions and exhaustive evaluations and considerations, Daikin has concluded that HFC-32 is an optimal refrigerant for residential and commercial air conditioners and is working to promote its use worldwide. Daikin had sold 6.5 million HFC-32 air conditioners in 48 countries as of the end of fiscal 2015.

To allow manufacturers around the world to manufacture HFC-32 air conditioners and contribute to its further dissemination, since 2011 we have offered free access in emerging countries to a cumulative total of 93 patents related to the manufacture and sale of HFC-32 air conditioners. In September 2015, we extended this access to all countries, thus embarking on free access to those patents in developed countries, where regulations for refrigerants are becoming increasingly strict. It is estimated that if all air conditioners in developed countries using the conventional R-410A were converted to HFC-32, the global warming impact from HFCs in 2030 could be reduced by 19%, or 800 million tons CO2-equivalent.

Adressing Local Challenges in India to Create a New Market for HFC-32 Dissemination

Spreading the use of the new refrigerant HFC-32 requires efforts in manufacturing and sales as well as in promoting understanding and technical advancement. In many

Note: Other refrigerants not listed above are also applied in products outside of Daikin’s portfolio, some examples include hydrocarbons (isobutane, propane, etc.) for residential refrigerators and window air conditioners or HFO refrigerants for mobile air conditioners.
emerging countries, mildly flammable HFC-32 is considered the same as highly flammable refrigerants such as propane. The use of such refrigerants is limited.

In fiscal 2012, Daikin conducted HFC-32 inverter air conditioner demonstration tests in eight locations in four cities in India as part of the Study of Countermeasures Against Global Warming of the Ministry of Economy, Trade and Industry of Japan (METI). The results show that HFC-32 is safe to use when handled properly and that when used in combination with inverters can reduce CO2 emissions by at least 30% compared to conventional refrigerants. In December 2013, we held a seminar for Indian government officials, members of the Refrigeration and Air Conditioning Manufacturers Association (RAMA), and other concerned parties, where we promoted greater understanding of HFC-32 by explaining the results of the study and the benefits of HFC-32. We were also able to raise individual technical skills through training sessions on proper handling of HFC-32 for 3,600 air conditioner installers and service engineers.

As a result of these efforts, since Daikin began selling HFC-32 air conditioners in India in 2013, more than 10% of air conditioners sold each year, including those by local manufacturers, use HFC-32.

Cooperating with Government and Industry on Technical Support in Thailand and Malaysia

Through Daikin’s efforts in India, the company acquired experience and know-how that would allow it to identify local needs and further spread the use of HFC-32 by cooperating with the governments of Japan and India and with international organizations. Leveraging our success in India, starting in fiscal 2015 in Thailand we took part in a METI-launched support project on request from the World Bank and the government of Thailand, and in April we started activities including technical support for conversion to HFC-32 for local manufacturers. In February 2016, we began a similar project in Malaysia on request from that country’s government.

By building the market environment through efforts including training technicians and creating standards, in addition to building a distribution network and conducting marketing, Daikin has globally launched air conditioners using HFC-32 and thus contributed to the mitigation of global warming impact. For this, we received the Minister’s Prize of Economy, Trade and Industry, the Fiscal 2015 Grand Prize for Excellence in Energy Efficiency and Conservation, organized by the Energy Conservation Center, Japan (ECCJ).

Daikin Helps Mitigate Environmental Impact of Refrigerants Worldwide through a Clear Policy Stance

Although we are working to spread the use of HFC-32 refrigerant in residential and commercial air conditioners around the world, our policy is to choose an optimal refrigerant for each application. We clarified this policy and published it in the Daikin’s Policy and Comprehensive Actions on the Environmental Impact of Refrigerants in December 2015 so that concerned industry parties could refer to it when choosing refrigerants. In addition to Daikin’s thoughts on choosing refrigerants detailed in sections on diversity of refrigerant selection, the policy paper declares Daikin’s stance of working to further reduce environmental impact throughout the refrigerant’s entire lifecycle.

As a leading air conditioner company, with the goal of solving the increasingly important issue of proper recovery and recycling of refrigerants, Daikin is clarifying its policy and building the necessary mechanisms for establishing appropriate systems and infrastructure together with relevant stakeholders.

For details, see “Daikin’s Policy and Comprehensive Actions on the Environmental Impact of Refrigerants.”
Highly energy-efficient inverter air conditioners are ideal for emerging countries, which face problems such as severe energy shortages due to rapid economic growth and which must take prompt measures to deal with global warming. An inverter air conditioner is a product using inverter technology for controlling the voltage, current, and frequency of the air conditioning mechanisms. It consumes about 30% less electricity than a non-inverter air conditioner. Although inverter air conditioners have a 100% penetration rate in Japan, the rate is still low in the rest of the world; for example, in Asian countries excluding Japan and China the rate is only about 20%.

One reason for this is that there are no mechanisms in place to evaluate the energy-efficiency performance of inverter products. In the past, the most common index for evaluating an air conditioner’s energy-efficiency performance was COP (coefficient of performance), under which the amount of energy consumed was calculated at a fixed efficiency without adjusting for air temperature changes. However, COP cannot be used to properly evaluate the performance of inverter products, which operate at an optimal level depending on the changes in ambient temperature. Therefore, Japan’s air conditioner industry has led calls for a switch to using APF (annual performance factor), and since 2013 APF has been used in ISO standards. Daikin is helping build evaluation standards in the emerging countries where this new index is in the process of being adopted.


In India in 2013, Daikin began assisting with the introduction of the CSPF (cooling seasonal performance factor) method for evaluation of cooling operation. Together with METI, the ECCJ, and other Japanese manufacturers, we explained the effectiveness of CSPF to the Indian government. As a result of support we provided in creating systems from a technical standpoint, in fiscal 2015 a new voluntary energy label system was launched that used CSPF as the evaluation standard for properly evaluating inverter products. Daikin residential air conditioners were the first to earn labels under this system.

Helping Create Energy-Efficiency Performance Evaluation Standards and Working with Emerging Country Governments and Industry Groups to Boost Awareness of Inverter Products
As the Only Manufacturer of Both Air Conditioners and Their Refrigerants, Daikin Strives to Mitigate Global Warming Throughout the Entire Lifecycle

In the ASEAN region, where it has already been decided to introduce an energy label system for inverter products, in fiscal 2016 we will continue collaborating with the Japan Refrigeration and Air Conditioning Industries Association to promote understanding of CSPF and provide support toward the harmonization of the system in all countries. It is hoped that standardization and energy label systems will raise awareness of inverter products and help disseminate energy efficient air conditioners, and in turn lead to a mitigation of the global warming impact from air conditioners.

**Stakeholder’s Comment**

**Adoption of Standard Contributes to Climate Change Mitigation and Sustainable Development in India**

The introduction of a seasonal energy efficiency ratio standard in India was an important step in accelerating the penetration of energy efficient air-conditioners in the Indian market. The increased market demand for energy-efficient air conditioners will not only help to reduce the peak loads but also contribute to mitigating climate change issues significantly. We acknowledge the support of the air conditioning industry for working closely with BEE and developing Indian Seasonal Energy Efficiency Ratio standards. We also recognize the lead taken by Daikin in increasing the energy efficiency of air conditioners and contributing to the overall sustainable development of India.

Sanjay Seth  
Energy Economist and Secretary (O), Bureau of Energy Efficiency (BEE), Ministry of Power, India

A Daikin air conditioner in India bears a new energy label representing an index for the proper evaluation of inverter products.

**NEXT CHALLENGE**

**Continue to Create New Markets through Collaboration with Stakeholders**

Daikin has worked with a range of stakeholders—including the governments of Japan and other countries, international organizations, and industry groups—to mitigate the impact of global warming through its refrigerant and inverter technologies. These efforts are beginning to carve out a path to a new market environment.

By forging ahead with the dissemination of its environmental technologies and promoting infrastructure building, Daikin is working with a range of stakeholders to benefit not just itself but local economies, Daikin business, and environment: a “win win win” situation. And as the only manufacturer of both air conditioners and their refrigerants, our mission is to reduce global warming impact throughout the entire lifecycle.