



Shaping air to your needs



DAIKIN INDUSTRIES, LTD.

Head Office:
Umeda Center Bldg., 2-4-12, Nakazaki-Nishi,
Kita-ku, Osaka, 530-8323 Japan

Tokyo Office:
JR Shinagawa East Bldg., 2-18-1, Konan,
Minato-ku, Tokyo, 108-0075 Japan

http://www.daikin.com/global_ac/

© All rights reserved
Printed in Japan 09/12/006 SS

JIV1203



Message

In a now-established product line that is greeting its 30th anniversary, benefits such as individual unit controllability, energy-efficient operation, design flexibility, and easy installation and maintenance have proven to be highly desirable in the market.

While VRV technology was initially installed mainly in small and mid-sized commercial buildings, its obvious advantages over conventional centralized systems for large buildings gradually became apparent. Today, besides widespread installation in structures such as high-rise residential buildings, hotels, shopping centers, hospitals, stadiums, VRV has been used for skyscrapers that rise more than 50 stories high.

Naturally, since the 1982 launch, to make sure that the technology is fit for such broad, general application, on a daily basis, it has been necessary to work on upgrading product performance and continually surpass past improvements.

Coming into the present era, all over the world, energy efficiency has become a priority demand in the air-conditioning sector. Believing that general availability of VRV was the most effective way of meeting this need, starting more than 20 years ago, Daikin extended production beyond Japan and set up manufacturing facilities in Belgium, China, Thailand, India, and is even now about to enter into production in Brazil.

Determined to fulfill its role as leader of the air-conditioning industry, Daikin will continue its groundbreaking development of VRV and go on meeting expectations with excellent products.



Yoshihiro Mineno

Executive Officer
General Manager
Global Operations Div.

A stylized, handwritten signature in black ink.

Background of VRV development

The 1st Generation

VRV series released in 1982

<The birth of innovative products that changed the history of air conditioning technology>



Conceptual diagram of a multi air conditioner for buildings



- 2.5 years development term
- Completion of development in May, 1982
- Technical award of Japan Society of Refrigerating & Air-conditioning Engineers in 1983

Development history

To meet the needs of the times, we've continued to develop technology continuously as the leading air conditioning manufacturer in the world.



'82
VRV C series
-Cooling only-



'88
VRV F series
-Cooling only-



'84
VRV D series
-Cooling only-



'90
VRV G series
-Heat pump-



'96
VRV K series



'92
VRV G series
-Heat recovery-



'99
VRV K Plus series



'95
VRV H series
Made possible to connect to BMS using the DIII-NET



'00
VRV KA series



'02
VRV L series
Adopted the new R407C refrigerant



'04
VRV M series
Adopted the new R410A refrigerant



VRV S series



'05
VRV II MA series



VRV WII series

'07

VRV III-C series
-Low outdoor temp. area use-



'06
VRV III series

VRV III-S series

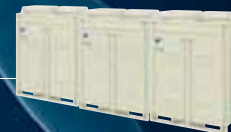
'08

VRV WIII series



'10

VRV III-Q series
-Replacement use-



'11

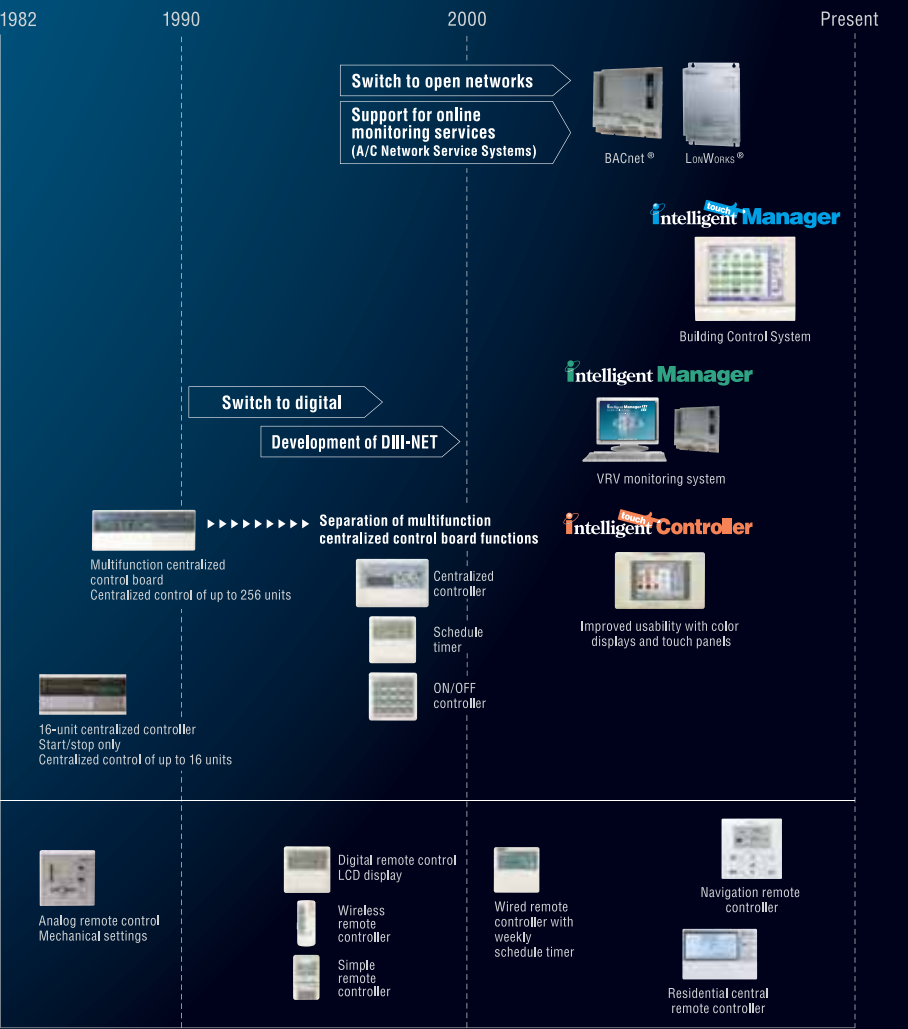
VRV III Connection to residential indoor unit series



VRV Multi function series
-Cooling/heating, hot water supply-

2012	Heat Pump	Heat recovery	Cooling only	Heating only
Normal temperature area	 Air cooled type (4~54HP)	 Air cooled type (8~48HP)	 Air cooled type (4~54HP)	 Air cooled type (8~54HP)
	 Air cooled type connection to residential indoor unit series (8~18HP)		 Air cooled type connection to residential indoor unit series (8~18HP)	<div>Cooling/heating + hot water supply</div>  Air cooled type (4~16HP)
	 Air cooled replacement type (5~48HP)	 Air cooled replacement type (10~30HP)		
High outdoor temperature area at cooling	 Air cooled type (8~36HP)			
Low outdoor temperature area at heating	 Air cooled type (10~20HP)			
All area	 Water cooled type (8~30HP)	 Water cooled type (8~30HP)		

At first, even initially centralized control systems—which consisted only of start/stop control for 16 indoor units—took a great step forward with the development of DIII-NET, a proprietary control communication method employing digital technology. This allowed up to 1024 indoor units to be centrally controlled with the simplicity of a common remote control, simply by wiring a single system. Now, they continue to evolve through support for open networks and robust Web access functions.



Performance difference between 1982 and 2012 model

	1982	2012
Energy Efficiency (COP) <10HP>	2.78	3.54
Max. refrigerant piping length difference between indoor & outdoor unit	70m	165m
Max. refrigerant piping height difference between indoor & outdoor unit	30m	90m
Capacity range – Outdoor unit	10,15HP	4~54HP
Capacity range – Indoor unit	2.5HP	0.8~20HP
Max. connectable indoor unit's number	6 units	64units
Network control system	None	-intelligent Touch Controller -intelligent Manager -intelligent Touch Manager (2012-) -BACnet interface -LonWorks Interface -A/C Network Service System
Target project size	Approx. 5,000m ²	No limit (Combination with water cooled VRV)

Groundbreaking technology has been applied to VRV



Compressor

- Variable speed inverter compressor
- Scroll compressor with relief mechanism
- Contact-less scroll compressor
- Hydraulic thrust force control
- Reluctance DC motor (IPM (Inner Permanent Magnet) synchronous motor)
- Neodymium magnet
- Sensor-less DC inverter
- Sign wave inverter
- Less suction pressure loss discharge gas compressor motor cooling

Heat exchanger

- Sub cool circuit for longer piping
- e-Pass cooling pipe location

Refrigerant circuit

- Oil recovery control logic

Control system

- Hi-speed DIII protocol
- intelligent Manager, intelligent Touch Controller, intelligent Touch Manager
- BACnet Interface, LonWorks Interface
- A/C Network Service System
 (Air Conditioning Network Service System,
 Energy Saving Air Conditioning Network Service System)

Future direction

Super large project

- Integration with applied system

Multi function

- Cooling/heating/ floor heating/hot water supply
- Cooling+heat recovery for hot water

Further Hi-COP

- Hi-COP refrigerant
- Revolutionary compressor/heat exchanger

Optimization for residence

- Connection with HA automation
- Price optimization by residence concentrated specification

Diversification of the heat source

- Electric
- Gas
- Geo thermal...etc

VRV

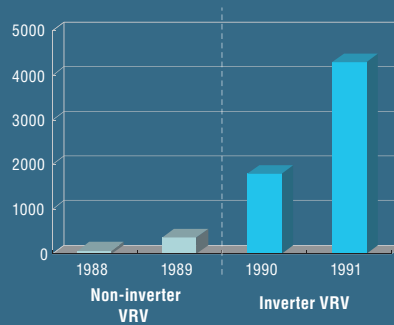
The 1st turning point



The 1st generation Inverter VRV G series

Inverter VRV!

Its design flexibility expanded sales volume drastically.



The 1st break through



54F high rise office & commercial building in Shenzhen, China

Sharing the roll with water cooled chiller system, VRV was installed in large & high rise building. After this project, VRV was started to be installed in large scale project.

1~15F (Commercial zone)	Water cooled chiller+FCU+AHU (Air conditioning & treatment of fresh air)
17~54F (Office zone)	VRV(Air conditioning) Water cooled chiller + AHU (Treatment of fresh air)



Les Miroirs

Paris La Defense, France

Project Outline

Completion : 2007
Number of Floors : 16F
Total floor area : 63,000m²

Equipment

VRV : Outdoor unit x 120
Indoor unit x 1952



Procisa-Edificios de Oficinas Terciario La Finca

Madrid, Spain

Project Outline

Completion : 2002
Number of floors : 4F
Total floor area : Approx.150,000m²

Equipment

VRV : VRV-K & Plus x 4,947HP
Outdoor units x 255
Indoor units x 4,154
Control system : I-Manager x 18





Colorado Tower

Stuttgart, Germany

Project Outline

Completion : 2003
Total floor area : 7,500m²

Equipment

VRV : Outdoor unit x 17
Indoor unit x 276



The Ritz Carlton Hotel in Pacific Place Jakarta

Jakarta, Indonesia

Project Outline

Completion : 2007
Application : Hotel
Number of floors : 4F
Total floor area : 9,300m²

Equipment

VRV : Outdoor units x 29
Indoor units x 134



Banco Santander S.A.

Sao Paulo, Brazil

Project Outline

Completion : 2009
Application : Office
Number of Floors : 31F
Total floor area : 101,458m²

Equipment

VRV : Outdoor unit x 62
Indoor unit x 1442



Net Center

Padova, Italy

Project Outline

Completion : 2006-2008
Number of floors : Tendenza Bldg. 5F
Acciolo Bldg. 20F
Economia Bldg. 5F
Total floor area : Tendenza Bldg. 16,800m²
Acciolo Bldg. 13,800m²
Economia Bldg. 9,500m²

Equipment

VRV : VRV1 x 1,710HP
Outdoor units x 187
Indoor units x 1,142
Ventilation : Heat Reclaim Ventilator x 168
Control system : BACnet interface x 10
Remark : 72m refrigerant piping
height difference



Shangyu Baiguan Building

Shangyu, China

Project Outline

Completion : 2011
Application : Office / Commercial complex
Number of floors : 50F + B2F
Total floor area : 120,000m²

Equipment

Air cooled VRV x 5,600 HP
Water cooled VRV x 920 HP



Shenzhen NEO Building

Shenzhen, China

Project Outline

Completion : 2011
Application : Office
Number of Floors : 62F
Total floor area : 130,000m²

Equipment

VRV11, CMS, VRV-S x 4,822HP





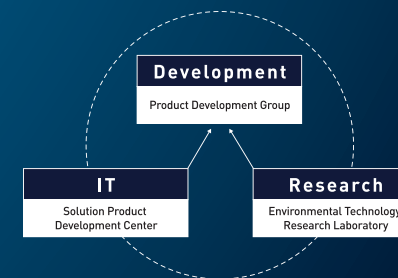
Creating value through innovative technologies as a leader in bringing changes, and carrying out research and development on the world's most advanced air conditioning technology.

R&D is indispensable for the creation of excellent products that enrich people's lives. As symbolized by the VRV, Daikin has put forth a multitude of technology and products that have always been, and continue to be, at the forefront of the age.

To be able to offer such products and services that delight and astound our customers, we have constructed an advanced R&D system.

Formation of a three division system of research, IT, and development to support development of Daikin's superior products

To create more advanced functions and new value, Daikin has instituted specialized R&D divisions: the "Environmental Technology Research Laboratory" and the "Solution Product Development Center". In combination with Product Development Group, each of the three divisions works in close cooperation to precisely ascertain the customers' needs and to enable commercialization of products incorporating advanced technology that take the lead over our competitors.

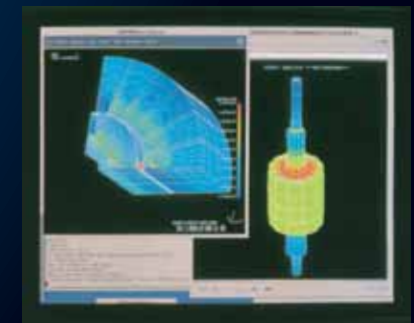


The Solution Product Development Center: Integrating Air Conditioners with IT

Keeping in mind the changes in business brought by the computerization and networking of society, we have integrated IT into our air conditioners including communication technology, software technology, and digital control. We are initiating R&D that will offer new system services, such as realizing comfortable environments with superior energy savings by networking air conditioners to enable them to exchange information with service centers.

Environmental Technology Research Laboratory: Intensive research on Environmentally Conscious, Energy Saving Air Conditioning Technology

Amidst accelerating globalization of our air conditioning business, diversifying needs in the countries of the world are increasing our research challenges. We have furthermore established a research laboratory devoted to the two fields of "air conditioning" and "the environment". With our mission to promote energy savings in air conditioners, we are engaged in R&D on technologies that can give birth to superior products from fundamental research on motor inverters, and other areas on up to support of individual product development. Going forward, we will advance our technological development toward even further global business expansion.



Simulation for predicting the magnetic flux distribution of motors to increase energy-savings



Expansion of the country of sale

Sales is undergoing in more than 70 countries

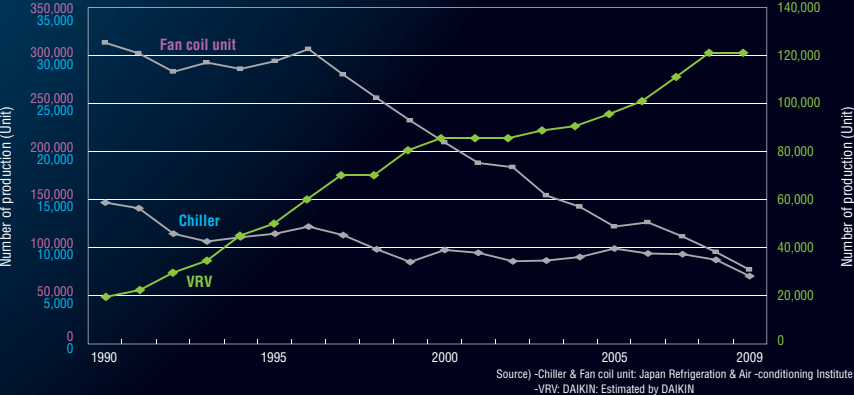


VRV market in the main country (2010)

(Resource: 2011 BSRIA report)

Area	Country	Market size		Area	Country	Market size	
		Q'ty	Value(Mill.USD)			Q'ty	Value(Mill.USD)
Europe	Italy	16,534	209	Asia	China	306,795	1,996
	France	12,680	172		Japan	108,000	1,693
	Spain	14,490	203		Korea	60,000	583
	UK	13,907	190		Taiwan	9,600	72
	Germany	8,650	105		Vietnam	8,750	63
	Russia	8,700	68		Malaysia	1,588	26
					Thailand	3,700	34
North & South America	USA	17,183	231		Indonesia	2,864	26
	Mexico	1,441	13		India	11,250	106
	Brazil	6,290	89	Oceania	Australia	16,801	178
	Argentina	1,350	17		South Africa	3,903	47
Middle East Asia	Saudi Arabia	869	14	Africa			
	UAE	1,814	17				

The influence of VRV - Central system market in Japan



Global production base of VRV



With our global customer support system, we are offering services that satisfy our customers all over the world.

Along with the activation of our global air conditioning business, Daikin has established service centers in various countries around the world and is strengthening its support system. Aiming to further equip our service systems in other regions overseas to match the levels of service in Japan, we are moving ahead to build systems most suited to the unique conditions of each country, and to expand our service capabilities.



Remote monitoring of customer installations at the ACC center. The Air Conditioning Network Service System offers more efficient management and faster service.

Founding of the Global Operations Division for building and expanding our overseas sales networks

The founding of Daikin Europe, N.V. (DENV) in Belgium in 1973 marked the beginning of our global expansion in earnest. As the major issues raised for managing our air conditioning global strategy, we then proceeded with building and expanding overseas bases in various countries of the world, and constructed an overseas sales network. In the process, and with the further globalization of the economy, we implemented organizational reforms to strengthen Daikin's aggressive global expansion. In 1996, we merged the "International Sales Headquarters" with the "Air Conditioning Production Strategy Labs" to create a "Global Operations Division". With demand for air conditioners gradually expanding overseas, the organization plays a major role in examining holistic global strategies in synch with the trends of changing world.



Daikin Europe, Belgium



Daikin Industries, Thailand

Presenting of air conditioner showrooms in various countries around the world

As another element that supports our global air conditioning business, we have opened air conditioner showrooms in various countries around the world. These facilities exhibit Daikin's latest air conditioning products and provide information on our state-of-the-art technologies.



Europe



China



Thailand

Five-Year Results for the Environmental Action Plan 2010

Under the five-year FUSION 10 strategic management plan, which targeted fiscal 2010, the Daikin Group strove to develop and promote the use of environmentally conscious products and services on a basic policy of actively contributing to solving global environmental problems and expanding our business. Our environmental measures were conducted under our Environmental Action Plan 2010.

1. Reducing Environmental Impact from Products

Five years result

Promote and Expand the Use of Environmentally Conscious Products to Meet the Particular Needs of Each World Region

We have developed and provided air conditioner products and services that meet the environmental needs of each world region in terms of weather, culture, and economy.

Five years target

Promote the Use of Environmentally Conscious Products, Particularly in Rapidly Growing Developing Countries

Daikin will continue to provide air conditioning products and services that meet the environmental needs of each world region. Particularly in developing countries, which are growing fast but where increasing environmental impact is a problem, Daikin will provide products and technologies that contribute to economic progress yet still protect the environment.

Europe

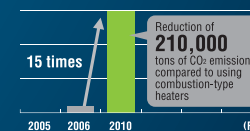
Fifteen-Fold Increase in Heat-Pump^(*) Hot Water and Space Heating

We have successfully promoted the use of the Daikin Altherma hot water and space heating system, in the process contributing to the reduction of 210,000 tons of CO₂ emissions.

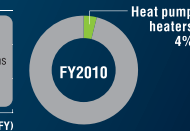


Proliferation results

Units of Daikin Altherma Sold in Europe



Heat pump heaters as percentage of all heaters sold in Europe



(*) Heat pump: A method of performing space heating and water heating by extracting and transferring thermal energy stored in the air (or water).

China

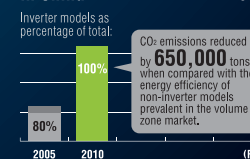
Promoting the Use of Affordable Inverter^(*) Products

The spread in use of inverter air conditioners reduced CO₂ emissions by 650,000 tons when compared with the energy efficiency of non-inverter models prevalent in the volume zone market.

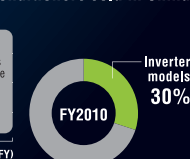


Proliferation results

Units of Daikin residential air conditioners sold in China



Daikin inverter models as percentage of all air conditioners sold in China



(*) Inverter: Inverters are frequency conversion devices that enable the minute control of room temperature and thus reduce power consumption.

Japan

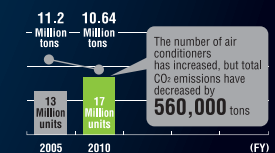
A New Approach to Energy Efficiency

Daikin has worked to raise the energy efficiency of equipment and spread the use of new energy-efficiency services.



Proliferation results

Daikin residential air conditioners in use in Japan and their CO₂ emissions



No. of customers for energy-saving tuning



United States

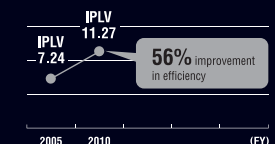
Establishment of Applied Development Center Signals Start of Full-Scale Energy-Efficient Product Development

The Applied Development Center was established in fiscal 2009 to accelerate development of energy-efficient products.



Proliferation results

Energy efficiency magnetic bearing centrifugal chillers (IPLV^(*))



(*) IPLV: Integrated part load value. A measure of annual performance under conditions of actual use. The higher the value, the better the performance.

2. Reducing Environmental Impact during Production

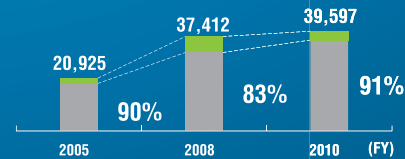
Management to Reduce Impact

Five years result

Daikin Group's Global Integrated Management Moving Ahead

Daikin has been building and gradually implementing environmental management systems around the world. Currently 90% of all Daikin employees, including those in the OYL Group, which joined the Daikin Group in 2006, belong to facilities that have obtained ISO 14001 certification.

Ratio of employees Belonging to Facilities That Obtained ISO14001 Certification



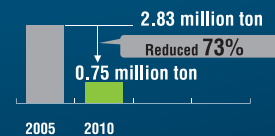
Impact Reduction Results

Five years result

73% Reduction Against Fiscal 2005, Exceeding Target

In the Chemicals Division, we have done everything possible to recover and destroy fluorocarbons. As a result, we exceeded our target by reducing CO₂ emissions during production by 73% against fiscal 2005.

CO₂ emission during production



Five years target

Managing the Setting and Progress of Environmental Targets for the Entire Daikin Group Including OYL

We will implement environmental management systems based on ISO 14001 at all worldwide production sites. We will monitor Group-wide progress towards this target, sharing information worldwide and stepping up activities.

Five years target

Reduce Emissions in Fiscal 2015 to One-Third of Fiscal 2005 Levels

Although Daikin business will expand in the coming five years, through energy efficiency measures and the recovery and destruction of fluorocarbons, we aim to reduce CO₂ emissions in fiscal 2015 to just one-third of fiscal 2005 levels.

3. Expansion of Green Heart Efforts

Five years result

Dramatic Expansion of Environmental Protection Activities in Which Group Employees Can Participate

Five years target

Conduct Environmental Activities Geared to Local Characteristics

Daikin will conduct activities geared to the characteristics and needs of worldwide bases and regions, in the process instilling people with a concern for nature that will carry on into future generations.



Clean-up volunteer (USA)



Eco-drive campaign (India)



Planting trees (Costa Rica)



Environmental education in elementary school (Japan)