

ENVIRONMENTAL INITIATIVES THROUGHOUT THE PRODUCT LIFE CYCLE

1

2



MANUFACTURING



SALES & SUPPLY



Daikin's efforts to reduce its environmental impact start as early as the manufacturing stage, comprising of:

RESEARCH & DEVELOPMENT

PROCUREMENT

ASSEMBLY

While expanding its sales and supply activities, Daikin is working hard to raise awareness among its affiliates and their customers to help protect and conserve the environment:

SALES ACTIVITIES

LOGISTICS



USE



END OF LIFE

Environmental efforts don't stop once Daikin Europe N.V. has sold its products. Throughout its entire product range, Daikin Europe N.V. shows the same pioneering concern for reducing the global warming impact caused by energy use and potential refrigerant emissions:

RESIDENTIAL

COMMERCIAL

INDUSTRIAL

Proving its concern for the environment, Daikin Europe N.V. is among the first manufacturers in the HVAC-R industry to set up voluntary take-back schemes across Europe:

RECYCLING SCHEMES

USE

ENVIRONMENTAL EFFORTS DON'T STOP ONCE DAIKIN EUROPE N.V. HAS SOLD ITS PRODUCTS. THROUGHOUT ITS ENTIRE RANGE OF PRODUCTS, DAIKIN SHOWS THE SAME PIONEERING CONCERN FOR REDUCING THE IMPACT CAUSED BY ENERGY USE AND POTENTIAL REFRIGERANT EMISSIONS, BOTH OF WHICH CONTRIBUTE TO GLOBAL WARMING.

→ RESIDENTIAL

→ COMMERCIAL

→ INDUSTRIAL

WHAT IS DAIKIN DOING TO DECREASE GLOBAL WARMING IMPACT DURING PRODUCT USE?

1. Raising the energy efficiency of our products is a safe and immediate way to reduce their global warming impact. The following pages contain examples of energy efficient, award winning, Daikin cooling and heating products.
2. At the same time, refrigerant emissions must be avoided, since refrigerants only contribute to global warming if released into the atmosphere. The European F-gas regulation will contribute to this goal, as it requires regular inspection of air conditioning and heat pump systems, as well as the certification of installers and service technicians.
3. And of course, we are also pursuing research efforts into the use and potential applications of low GWP⁵ refrigerants or natural refrigerants such as ammonia and carbon dioxide (CO₂). Although alternative refrigerants may have a lower GWP compared to the HFC refrigerants used today, there still are a number of obstacles to be overcome, such as safety. Therefore, it will not be easy to use these refrigerants on a wide scale in the near future.



➡ In 2008, Daikin launched the industry's first VRV[®] system using CO₂ as refrigerant.

Award

DAIKIN FRANCE AWARDED GOLD FOR INNOVATIVE VRV[®] CO₂

Daikin France was awarded the Enéo d'Or by a jury consisting of trade organisation representatives and the trade press in the equipment category for Daikin's CO₂ based VRV[®] solution at the third edition of the Enéo Energy, Climate Control and Water Management Exhibition held in Lyon, France, from 25 to 28 February 2009.

This innovative product combines Daikin's pioneering VRV[®] technology with CO₂ refrigerant, which is a low GWP refrigerant. Parallel to this development, Daikin continues to pursue improvements in its current HFC based VRV system with respect to both energy-efficiency and environmental impact.

➡ ⁵ GWP: Global Warming Potential of 1kg of fluorinated greenhouse gas relative to 1kg of carbon dioxide over a period of 100 years. R-410A, R-134a and R-407C are fluorinated greenhouse gases with a GWP of respectively 1975, 1300 and 1652.5 (values used by the European F-gas regulation).

WHY ARE HEAT PUMPS BETTER FOR THE ENVIRONMENT THAN TRADITIONAL HEATING SYSTEMS?

Heat pumps are an excellent answer to the so-called 20/20/20 objectives of the European Union: 20% less energy consumption, 20% reduction of CO₂ equivalent emissions and achieving a share of 20% renewable energy sources in the European energy mix, all by 2020.

1. HEAT PUMPS CONSUME LESS ENERGY

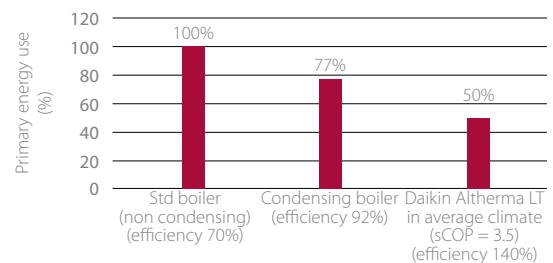
Because heat pumps can generate more heating or cooling energy compared to the energy they consume, their efficiency is excellent. This yields considerable energy savings compared to traditional fossil fuel based heating systems. The comparison below (based on measurements of the Daikin Altherma heat pump at the Daikin Energy Saving House) shows that the primary energy use can be substantially lower compared to a fuel oil or gas boiler system.

2. HEAT PUMPS REDUCE CO₂ EMISSIONS

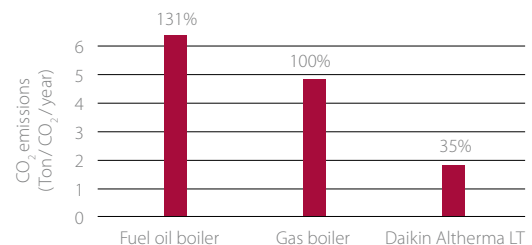
Since heat pumps consume less energy than traditional heating systems, they also generate less CO₂ emissions. Thus, heat pumps can contribute to reducing the impact of global warming. The comparison below shows that a Daikin heat pump can generate 65% less CO₂ emissions than a fuel oil boiler (based on measurements at the Daikin Energy Saving House).

3. HEAT PUMPS USE RENEWABLE ENERGY SOURCES

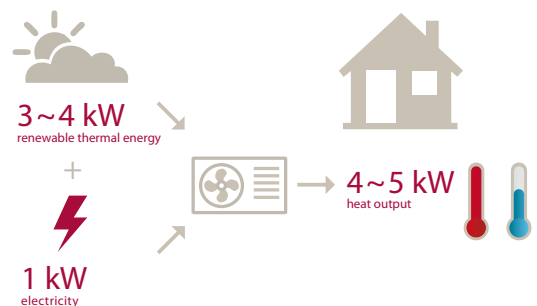
Heat pumps use energy from renewable sources: from the ground, from water or from the ambient air. These energy sources are renewable and inexhaustible. Of course, heat pumps also need energy to function (mostly electricity), but increasingly this electricity can also be generated from renewable energy sources (solar energy, wind energy, hydropower, biomass). The Directive on the promotion of energy from renewable sources – published in June 2009 – intends for final energy consumption in the European Union to include a 20% share of renewable sources. A noteworthy aspect of the Directive is its recognition of air and water as renewable energy source, and heat pumps as a technology for exploiting it. As a result, the way is open for local governments to stimulate heat pump technologies via awareness campaigns and various incentive schemes.



➔ Comparison of primary energy use between conventional boilers and Daikin Altherma LT. Result is for Daikin Altherma LT in average climate (Strasbourg). Application: underfloor heating - floating setpoint: 35°C.



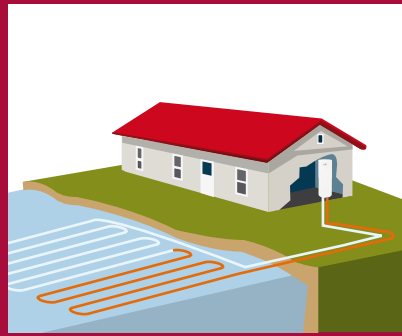
➔ **Calculation data:** Country: Belgium, Power generation emission: 276g of CO₂/ kWh, Gas emission: 202g of CO₂/ kWh, Gas boiler efficiency: 90%, Fuel oil boiler emission: 268g of CO₂/ kWh, Efficiency fuel oil boiler: 90%



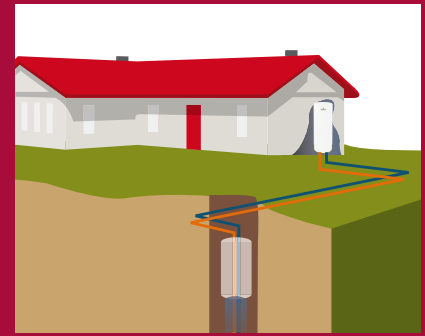
➔ By making use of renewable energy sources, heat pumps can deliver 4 to 5 times more heat energy than the electrical energy they consume.



AEROTHERMAL HEAT PUMP



HYDROTHERMAL HEAT PUMP



GEOOTHERMAL HEAT PUMP

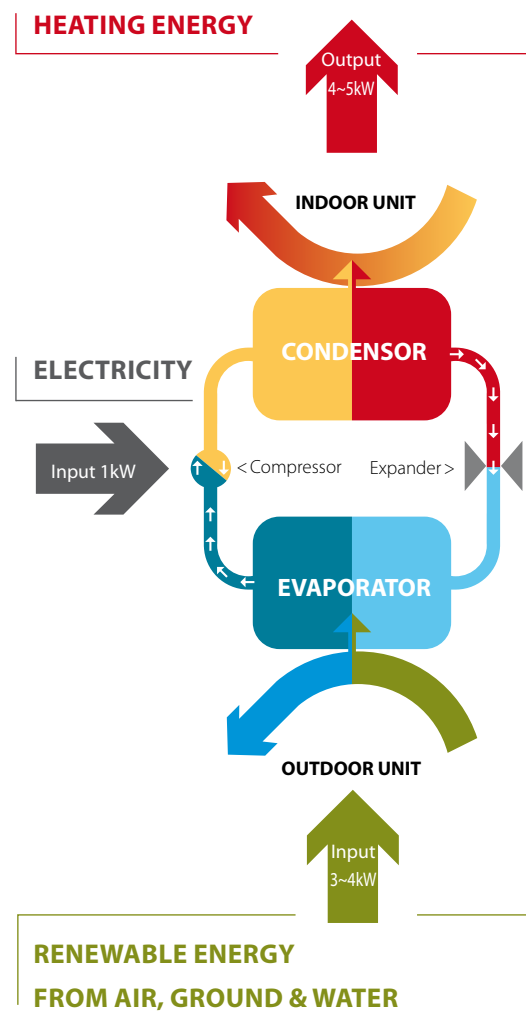
HEAT PUMPS: THE RIGHT ENERGY SAVING, LOW CARBON CHOICE

WHAT ARE HEAT PUMPS AND HOW DO THEY FUNCTION?

Heat pumps are highly energy-efficient, all-in-one heating and/or cooling devices. In heating mode, they extract thermal energy from the ambient air (so-called aerothermal heat pumps), from water sources (hydrothermal heat pumps) or from the ground (geothermal heat pumps), and 'pump' it into buildings. In cooling mode, they do the opposite. Some heat pumps are also equipped with a function to provide domestic hot water.

Inside the building, the generated heat or cold can be distributed directly to the indoor air, or indirectly via a water circuit (floor heating systems, fan coils, radiators). Thus, all kinds of heat pump types are offered on the market: water to air, air to water, ground to water, water to water, air to air etc. Daikin has ample experience with all of these heat pump types.

The energy transfer in heat pumps occurs via a substance called 'refrigerant' that circulates through a closed circuit of pipes and heat exchangers in an evaporation and condensation cycle. During this cycle, heat is transferred from one area to another: in evaporation mode, the refrigerant absorbs heat, whereas in condensation mode, the refrigerant releases heat. By doing so, heat pumps can transfer heat from the ground, water or outdoor air, lift the temperature to a higher level and bring it inside a building (or vice versa in the case of cooling). Heat pumps can transfer heat from outdoors to indoors, even at outdoor temperatures down to minus 25°C.



RAISING CONSUMER AWARENESS OF ENERGY-SAVING MEASURES IN HEATING AND COOLING

Daikin leaves no stone unturned to make consumers aware that everyone can contribute to a cleaner world. Thus in its brochures, manuals, and other sales literature, Daikin gives ample recommendations how to optimise the use of its units in both heating and cooling mode. An example of that pioneering care are the “We care icons” that have now become a recognisable item in all Daikin sales catalogues.

WE CARE ICONS

Daikin units incorporate many different features, including energy saving ones. Consumers are informed on these features via icons in product catalogues. These “We care icons” indicate those product features that have an impact on reducing energy consumption. Many of our units integrate some of these features.



ENERGY EFFICIENCY

Daikin units are energy efficient and economical.



ECONO MODE

This function decreases the power consumption so that other appliances that need large power consumption can be used. This function is also energy saving.



MOVEMENT SENSOR

The sensor detects whether someone is in the room. When the room is empty, the unit switches to economy mode after 20 minutes and restarts when a person enters the room.



FAN ONLY

The air conditioner can be used as fan, blowing air without cooling or heating.



ENERGY SAVING DURING STANDBY MODE

If the room is empty for 20 minutes, the system shifts the set temperature by ± 2 degrees to reduce the consumption.



TWO AREA INTELLIGENT EYE

The air flow is sent to a zone other than where the person is located at that moment. If two people are detected in the room, the movement sensor, together with the comfort mode (cooling directed at the ceiling, heating directed at the floor), will see to it that the air flow is projected away from the occupants. If no people are detected, the unit will automatically switch over to the energy-efficient setting.



NIGHT SET MODE

Saves energy, by preventing overcooling or overheating during night time.



INVERTER TECHNOLOGY

Inverter compressors continuously adjust compressor speed to actual demand. Fewer power-consuming starts and stops result in decreased energy consumption (up to 30%) and more stable temperatures.

→ RESIDENTIAL APPLICATIONS

The following pages showcase Daikin Europe N.V.'s award winning products for residential, commercial or industrial use. Daikin Europe N.V. won a number of awards for products that limit the impact on the environment.

1. AIR TO AIR HEAT PUMPS



URURU SARARA: UNIQUE COMFORT AND EXCELLENT ENERGY SAVINGS

Ururu Sarara is Daikin's total residential climate control solution that ingeniously combines heating, cooling, humidification, dehumidification and air purification, all in one package. Advanced inverter technology and Daikin's 50 years of experience in heat pump development allow this product to deliver more than 5 times the heating and cooling energy than the electrical energy it consumes, with a corresponding reduced impact on CO₂ emissions. Thus Ururu Sarara is one of the industry's most energy efficient products, in both heating and cooling modes. During FY2008 Daikin also introduced Ururu Multi. This system brings fresh, purified air into multiple rooms via one or two stylish wall mounted indoor units. Interesting features from an environmental point of view are its energy-saving 2-area intelligent eye and an energy-efficient Econo mode. The Ururu Multi's outdoor unit has enhanced energy-efficiency thanks to its swing compressor.



URURU SARARA WON THE FOLLOWING AWARDS

IN THE LAST YEARS:

- **Home Appliance Environmental Prize (Japan, 2006)**
- **Eneo d'Or Award (France, 2006)**
- **Eco Hitech Award (Italy, 2007)**

ECO-LABEL

The European Eco-label – also known as “the Flower” due to its flower logo – denotes products and services representing the top of their class concerning environmental performance. Products bearing the voluntary eco-label scheme are certified to meet EU-wide environmental criteria, and compliance is verified by an independent test body. The eco-label is available for 28 product groups, including heat pumps. Daikin Europe N.V. was the first in its sector to obtain the Eco-label for Daikin Altherma, emphasizing its ongoing commitment to the environment.



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2. AIR TO WATER HEAT PUMPS

DAIKIN ALTHERMA: ‘AIR TO WATER’ HEAT PUMP YIELDS STRIKING ENERGY SAVINGS

Daikin Altherma is Daikin’s versatile, highly efficient year-round solution for houses with underfloor heating elements, both low as well as high temperature radiators. Daikin Altherma also offers optional hot water heating and cooling. Adding to Daikin Altherma’s environmental sustainability is the fact that it can also be linked to solar panels. The result is substantially increased energy efficiency and a significant reduction in CO₂ emissions when compared to traditional fossil fuel based systems (see also page 27).

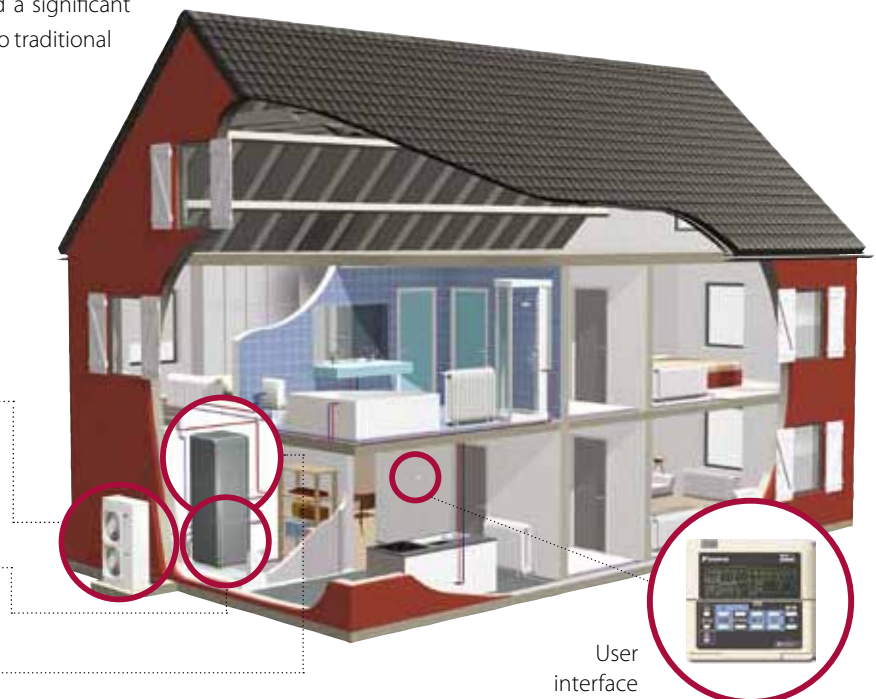
The following Daikin Altherma low temperature models received the Eco-label:

ERHQ006B-EKHBH008B, ERHQ007B-EKHBH008B, ERHQ008B-EKHBH008B, ERHQ011B-EKHBH016B, ERHQ014B-EKHBH016B, ERHQ016B-EKHBH016B, ERHQ006B-EKHBX008B, ERHQ007B-EKHBX008B, ERHQ008B-EKHBX008B, ERHQ011B-EKHBX016B, ERHQ014B-EKHBX016B, ERHQ016B-EKHBX016B

Outdoor unit:
An efficient use of
energy from the air

Indoor unit:
The heart of the
Daikin Altherma
system

Domestic hot water tank:
for low energy consumption



User
interface

➔ Daikin Altherma is available in several configurations and combines ease of installation, year-round comfort and drastic energy savings.

Use **31**

→ COMMERCIAL APPLICATIONS

DAIKIN SKY AIR AND VRV® REPRESENTS DAIKIN'S ULTIMATE TECHNOLOGY IN CLIMATE COMFORT AND ENERGY EFFICIENCY FOR SMALL TO LARGE OFFICES, HOTELS AND OTHER COMMERCIAL FACILITIES, PROVIDING YEAR-ROUND HEATING AND COOLING.

VRV®: COMMERCIAL HEAT PUMPS FOR VERSATILE, HIGH LEVEL COMFORT

Daikin's VRV® systems are available as air source, water source as well as ground source heat pumps. They circulate just the required amount of refrigerant volume to the various circuits in a building, allowing different rooms to simultaneously enjoy different temperatures. Daikin's inverter technology allows the system to adjust the power needed to actual requirements, ensuring maximum comfort (temperature fluctuations are minimised) and maximum efficiency (no unnecessary energy-consuming starts and stops). VRV® heat recovery systems also allow diverting exhaust heat from indoor units in cooling mode (which would otherwise be lost) to areas requiring heating, resulting in additional savings.



➡ Scheme of a water to air VRV® heat pump, using ground water (geothermal) energy as a renewable energy source.

DAIKIN WATER-COOLED VRV® SYSTEM IN UNIQUE ZERO-EMISSION OFFICE BUILDING IN THE NETHERLANDS

A Dutch Real Estate developer set the bar high when specifying its new Magna Porta office building in Almelo, the Netherlands. The 12-storey, 54-metre high building had to be CO₂ neutral. Daikin technology played a significant role in meeting this objective with a unique combination of Daikin water-cooled VRV® system and groundwater heat/cold storage. In addition to being emission free, the building realises a 55% savings in energy consumption compared to traditional technologies, thanks in large measure to Daikin heat pumps.

“The project is a unique combination of Daikin water-cooled VRV® and groundwater energy recuperation, a prevalent technique in the Netherlands.”

Raymond Nijhuis, Daikin Netherlands

GROUNDWATER HEAT/COLD STORAGE IN THE NETHERLANDS

Raymond Nijhuis of Daikin Netherlands was closely involved in the project, and explains: “The large amount of groundwater in the Netherlands can play a useful role in storing energy. In this technique, groundwater serves as a medium to store extracted energy during cooling and heating. In the winter, heat is removed from water 20 to 30 metres deep in the ground, and in the summer heat is returned. The connection with ground water can be direct, or – as in the case of the Magna Porta project – via a closed collector circuit.”

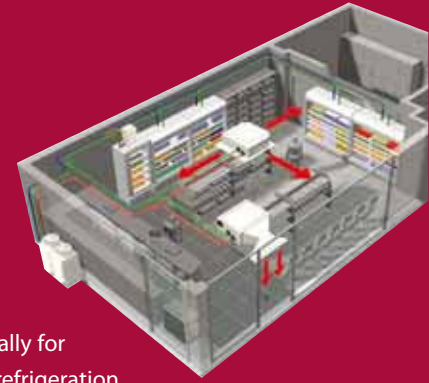
THE VRV® ADVANTAGE

The groundwater storage technique is often used in the Netherlands with water-to-water chillers. But adding VRV® technology to the mix increased the energy exchange benefit tremendously due to its ability to exchange heat between floors and even between building zones on the same floor. Thus, heat extracted from the sunny side of the building is used to warm the cooler zones, and much of the time the building itself supplies a large part of its own energy needs.

The electricity needed to run the efficient heat pumps is generated from windmills, completing the emission free story. And of course, the traditional benefits of VRV® with respect to cleaner indoor air and better temperature control remain.



→ CONVENI-PACK ACHIEVES HUGE ENERGY SAVINGS FOR SERVICE STATIONS



CONVENI-PACK: REFRIGERATION, FREEZING AND HEAT PUMP TECHNOLOGY IN ONE

Daikin developed Conveni-pack - an all-in-one freezing, refrigeration and heat pump system - especially for convenience stores (e.g. at petrol stations). It reduces energy consumption by integrating freezing, refrigeration, heating and air conditioning functions into one system. Conveni-pack reduces annual energy consumption up to 60% compared to conventional systems, by utilising the heat exhausted from freezers and refrigerators to heat the shop in winter. The compact solution also allows for maximum installation flexibility.

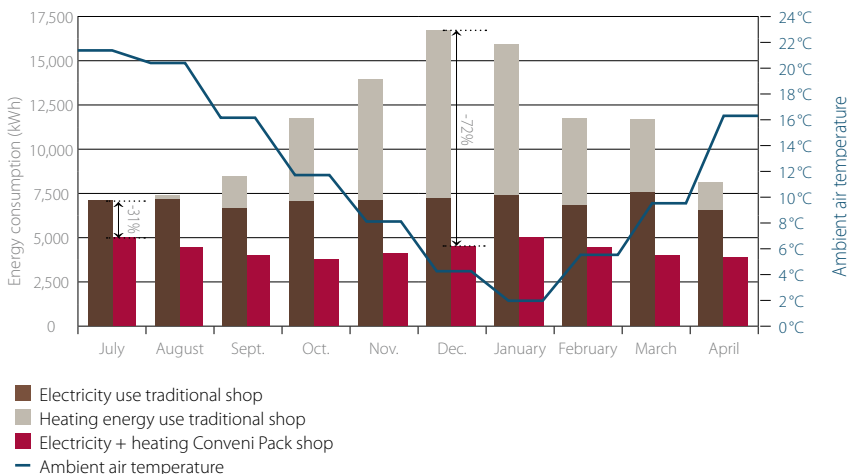
A project set up at a petrol station in Wavre, Belgium, in June 2008 shows that a Conveni-pack equipped service station shop achieves dramatic energy savings compared to a conventionally equipped shop. As a result of this test case, the petrol company decided to equip all of its own service station shops with Conveni-pack in Belgium, the Netherlands and Luxembourg.

NEW SHOP EQUIPPED WITH CONVENI-PACK

When opening a new service station in Wavre at the beginning of 2008, a major petroleum company installed a complete Conveni-pack system (2 units) in order to compare energy consumption in the new facilities to that of an existing service station with standard equipment. The installation in the conventionally equipped service station at Cambre (Brussels) consisted of 4 integral freezers, 1 freezer room, 4 showcases, 1 fridge and 1 shop counter. The equipment installed in the new Wavre service station shop consisted of 3 showcases, 2 fridges, 1 freezer room, 1 show counter and 4 cassettes. A Conveni-pack system consisting of 2 units handled all the cooling requirements, as well as heating the shop via heat recovery.

UNBELIEVABLE RESULTS

Total capacity in Wavre exceeded those of Cambre, yet the first measurements after 6 months were incredibly positive. Even the customer found it difficult to believe. Niko Baekelandt, Specialist Refrigeration at Daikin Europe N.V.: "We had predicted a 45 to 50% decrease in energy use. So when we presented the spectacular measurement results – 61% energy savings – at first the customer did not believe us. The truth sank in only after checking the energy bill. In the meantime this same customer has decided to equip all new shops in Belgium, the Netherlands and Luxembourg with Conveni-pack."



Award

AWARDS WON BY DAIKIN'S CONVENI-PACK:

- Energy Conservation Grand Award of Japanese Ministry of Economy, Trade and Industry (2003)
- Environmental Product of the Year (UK, 2006)
- Incentive Award by the German Environment Ministry (Germany, 2009) BMU-Förderpreis "Kälte und Wärme"

→ LARGE COMMERCIAL AND INDUSTRIAL APPLICATIONS

DAIKIN CHILLERS: 'AIR TO WATER' AND 'WATER TO WATER' HEAT PUMPS IN ALL SIZES

Daikin chillers are available in sizes from 5 kW to 9 MW and are used in many industries: from fish farming, wine processing and agriculture, through pharmaceuticals and food production, to comfort heating and cooling in large buildings. Unique in their precision, power, low operating noise, easy maintenance and low running costs, Daikin chillers represent the sure and safe route to an indoor environment or process application that is comfortable and consistent.

SIEMENS BACON BUILDING: VIENNA, AUSTRIA

In this renovated Siemens building, a hybrid system consisting of Daikin water cooled chillers and dry coolers is used to air condition the office space (30%) and to provide year-round cooling of the server rooms. The new system, developed in consultation with the customer, allows the use of "free cooling" that partially or fully bypasses the water cooled chillers when outdoor temperatures are low, taking advantage of cool ambient air and thus saving energy and reducing CO₂ emissions. Calculated savings are 234,000 kWh per year or a reduction of 64.6 ton of CO₂ per year.



→ Siemens Bacon Building in Vienna: Efficient chiller application using free cooling option.



WATER TO WATER CHILLER



AIR TO WATER CHILLER

Use — **35**