DAIKIN

Green Building

Retrofit Case Study

Sustainability Dubai Chamber Network

DUBAI CHAMBER
CENTRE FOR RESPONSIBLE BUSINESS

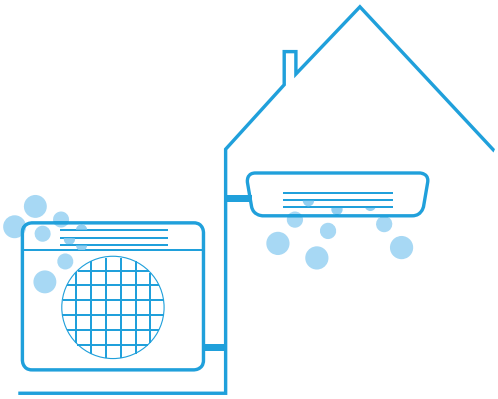
Pushing forward the drive for sustainability

Daikin Industries is a global leader in developing and manufacturing advanced, high-quality air conditioning, heating, ventilation, and refrigeration products (HVAC-R) providing solutions for residential, commercial, and industrial applications.

Founded in Japan in 1924, the company strives to combine expertise and experience to create new innovative technologies by anticipating the future requirements of customers and society. Daikin has evolved over nine decades to employ 80,000 people with 100 production bases and presence in 150 countries worldwide.

Daikin's commitment to the local market has been the main driver in the move to a new office inside the Jebel Ali Free Zone to consolidate its manufacturing, sales and training facilities, and become its headquarters in the Middle East and Africa region.

The building needed a complete retrofit to meet Daikin's sustainability standards and to include its renowned air conditioning technologies around the world for its high energy efficiency and low environmental impact.



Daikin's New Headquarters

The Building

Daikin moved to its new headquarters in July 2019.

Daikin's HQ building is in Jebel Ali Free Zone in Dubai, UAE. The building occupies 5000 sqm of space, including a 3500-sqm air handling unit factory, two office floors for its regional functions, and a state-of-the-art training academy.

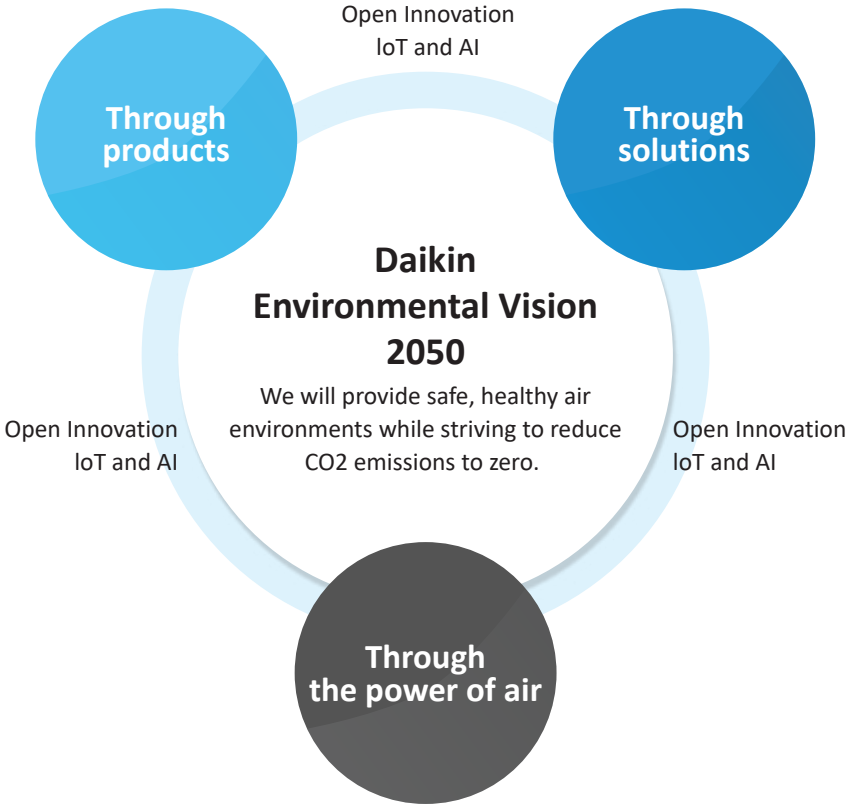
Before and After

Retrofit Solutions

Sustainability is at the heart of Daikin's business strategy.

Daikin's approach to the building retrofit is in line with its goal towards achieving its Environmental Vision 2050 with a target of reducing greenhouse gas emissions to net zero by 2050.

The retrofit solutions focused on facilitating the functions that will be performed in the building, with specific attention to the building users' comfort, the building's environmental impact, and the alignment with the national and global energy conservation regulations and strategies.



This has been achieved by focusing on the following areas:

- Energy-efficient air conditioning equipment
- High-level of indoor air quality
- Energy management systems
- Efficient lighting and controls
- Innovative environmental solutions

Air Conditioning Systems

It is commonly known that the air conditioning systems' energy consumption is the highest in a building while operating in high ambient temperatures.

Daikin has selected in-house designed and manufactured systems to achieve the highest part load efficiency throughout the year with emphasis on high ambient performance and compliance with ESMA Energy Efficiency Performance regulations.

In the offices open space and meeting rooms, Daikin has selected a multi split VRV system with a total cooling capacity of 341 kW. A total of 13 outdoor unit modules are connected to 54 different indoor units across the open space office and meeting rooms. While achieving a high level of temperature control for the different zones, this system is capable of adjusting its power consumption to allow for the highest levels of partial load energy efficiency. All thermostats are set at 25°C and have an built-in function to limit the minimum setpoint to 20°C as per ESMA guidelines.

In the factory and academy facilities, the cooling system needs to cover the heat load of the same area. An air-cooled inverter liquid chiller is installed and connected to the air handling unit and water fan coil units located in many parts of the ground floor. The factory area is maintained at 27°C when ambient temp is above 33°C. When the temperature falls below 33°C, the cooling system is not utilized, but rather the ventilation system only. The inverter AC chiller adjusts its power consumption in relation to the building heat load as well as the outside air temperature.

In the individual function rooms, cooling requirements could be independent from the office and factory areas. For this reason, Daikin has selected a standalone wall mounted inverter split system using inverter technology and low Global Warming Potential (GWP) refrigerants to achieve the lowest carbon emissions while ensuring a high level of comfort.

Indoor Air Quality

The rise in energy-efficient building designs is increasing the need for proper ventilation systems. Energy efficient buildings require more insulation to reduce heating and cooling loss. This means that the air inside the building lingers longer and becomes stale. The stale air also puts the building at a greater risk of allergies, residual odors, condensation, mold and more.

The Fresh Air Handling Units (FAHU) that are installed in the building and manufactured on the same site are designed as per ASHRAE ventilation guidelines to bring in fresh air, filter it from volatile particles, cool it on a chilled water coil supplied by the Inverter Air Cooled chillers. Fresh air is supplied into the different work areas in the building. The FAHU ensures sufficient and more frequent air changes per hour as a COVID-19 countermeasure to increase the building ventilation rate.

Air flows into a sand separator to reduce the dust level of PM 250 before going through high efficiency MERV8 filters. The sand separator elongates filter life and helps in maintaining its efficiency.

Also, two CO2 sensors are placed in the return air duct. These sensors trigger an increase in the fan speed in case CO2 level is higher than set limit.In addition, a double heat recovery wheel is added to the Air Handling Unit to recover cool air from the returned air to the building and this ensures saving energy in normal times.

The ventilation equipment use high efficiency fan motors that ensure lower sound levels, lower power loss, increased longevity and variable speed as compared to traditional fans.

The COVID 19 situation imposed certain modifications to the ventialtion system, and these included the following:

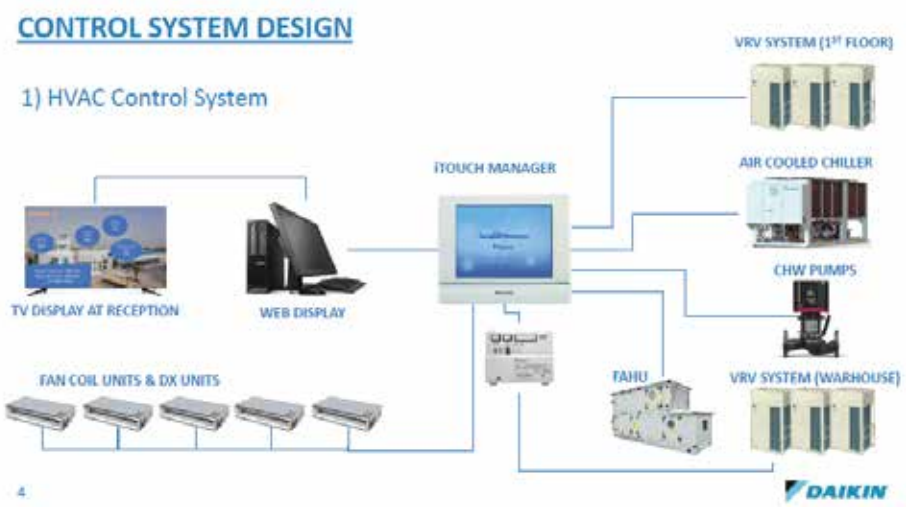
- Increased the rate of fresh air changes by 20%
- Continuous operation of the Fresh Air Handling system
- Upgrade to MERV 11 filters for the Fresh Air Handling system
- Disabled the heat recovery wheel to stop returned air circulation
- Disabled CO2-based demand ventilation since the supply is 100% fresh air

Energy Management Systems

The energy efficiency of the air conditioning systems is enhanced by a group controller known as the Intelligent Touch Manager that allows the limiting of temperature set points and scheduling of the operation in line with the building occupancy to avoid energy wastage. Usually, all thermostats are set at 25°C.

Energy consumption is demonstrated in a graph format, which displays the expected and real data. The Energy Navigator function allows wasted energy detection, while showing units operating out of operation period limits or having too high or too low set points.

Also, different energy consumption related data are recorded in case further analysis is required.It is also worth mentioning that all system operating parameters and malfunction alarms in the Building Management Systems (BMS) could be accessed remotely via Daikin's VRV cloud and Daikin On-Site monitoring programs.



Efficient Lighting and Controls

The indoor high efficiency LED lighting is controlled from through a local switch, a sensor, or through the BMS.

Daylight harvesting is implemented in areas near the glassed exteriors of the building. Unnecessary lights are switched off during non-activity hours to conserve energy.

Open office area lights are primarily operated through a weekly timer based on office hours. After office hours, these lights are controlled using presence detection. In case there is no movement for more than 20 minutes, the lights of the covered zone are switched off automatically.

The same applies for meeting rooms, which are equipped with presence sensors and intelligent switches. Upon entering the room, the person can turn on the lights using the intelligent switch.

Innovative Environmental Solutions

To reduce water consumption, condensate water that forms in the indoor unit is channeled towards a tank and is used to irrigate the plantation around the building. Approximately 45 gallons of condensate water per day is used to irrigate the company's employees' farm through drip irrigation tubes.

Led by Daikin's chairman, a bio farm has been grown in the office grounds with seasonal plants such as tomatoes, roses, and sunflowers and permanent plants such as Baobabs have also been cultivated.

To reduce waste, wooden packaging from incoming deliveries is used to produce wooden chairs and tables for use in the employees' garden and to manufacture wooden green plant pots.

Office waste paper is collected on a regular basis by a recycling company. Till date, 1,624 kgs of paper has been recycled which is equivalent to saving 27 trees or 11,368 gallons of water.

Innovative Environmental Solutions

The factory wasted material is segregated properly. Waste metal is collected on a regular basis by a recycling company. More than 3 tons of metal has been recycled this year. Hazardous waste, which does not count for more than .001% of total waste, is collected by an authorized waste disposal company.

The factory's warehouse uses two permanent all-electric forklifts to avoid any carbon emission generation from fuel-burning.

To reduce emissions and to encourage the use of public transportation, office group transportation was set with pre-defined and regular schedules to and from the closest metro station.

The car park is shaded and equipped with solar powered lighting that automatically operate in low light conditions.

Next Steps

Green building retrofit is a continuous journey of checking, acting, and involving all building occupants

to further reduce the building's power consumption and its carbon emissions, and ultimately, reduce its negative environmental impact.

Currently, Daikin is consuming an average of 78,000 kWh per month, and if projected on a yearly basis, this gives a power consumption of 178 kWh/m2/year.

Daikin is continuously tracking opportunities to reduce the building's energy consumption and as Daikin will shortly complete one year of operating its retrofitted building, through the tracking of its energy bills, Daikin intends to take the first year's consumption as a baseline for future comparison. Daikin targets a 10% reduction of energy consumption in the following year.

Daikin's next ambition that is currently under study is to generate solar electric power by installing PV panels on the roof of the building. This is to further reduce the building's carbon footprint through the use of renewable energy as the main power supply which also feeds back to the grid any excess solar power generated.

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