



DAIKIN VRV
VRV-IV PRODUCTS AND TECHNOLOGY

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VRV Sales Engineer

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People and ideas you can trust.™

Qué significa VRV?

VOLUME

El flujo del refrigerante regulado por EEV
y el compresor de velocidad variable

REFRIGERANT

Sistema R-410A de expansión directa

VARIABLE

La capacidad del sistema varía con la carga



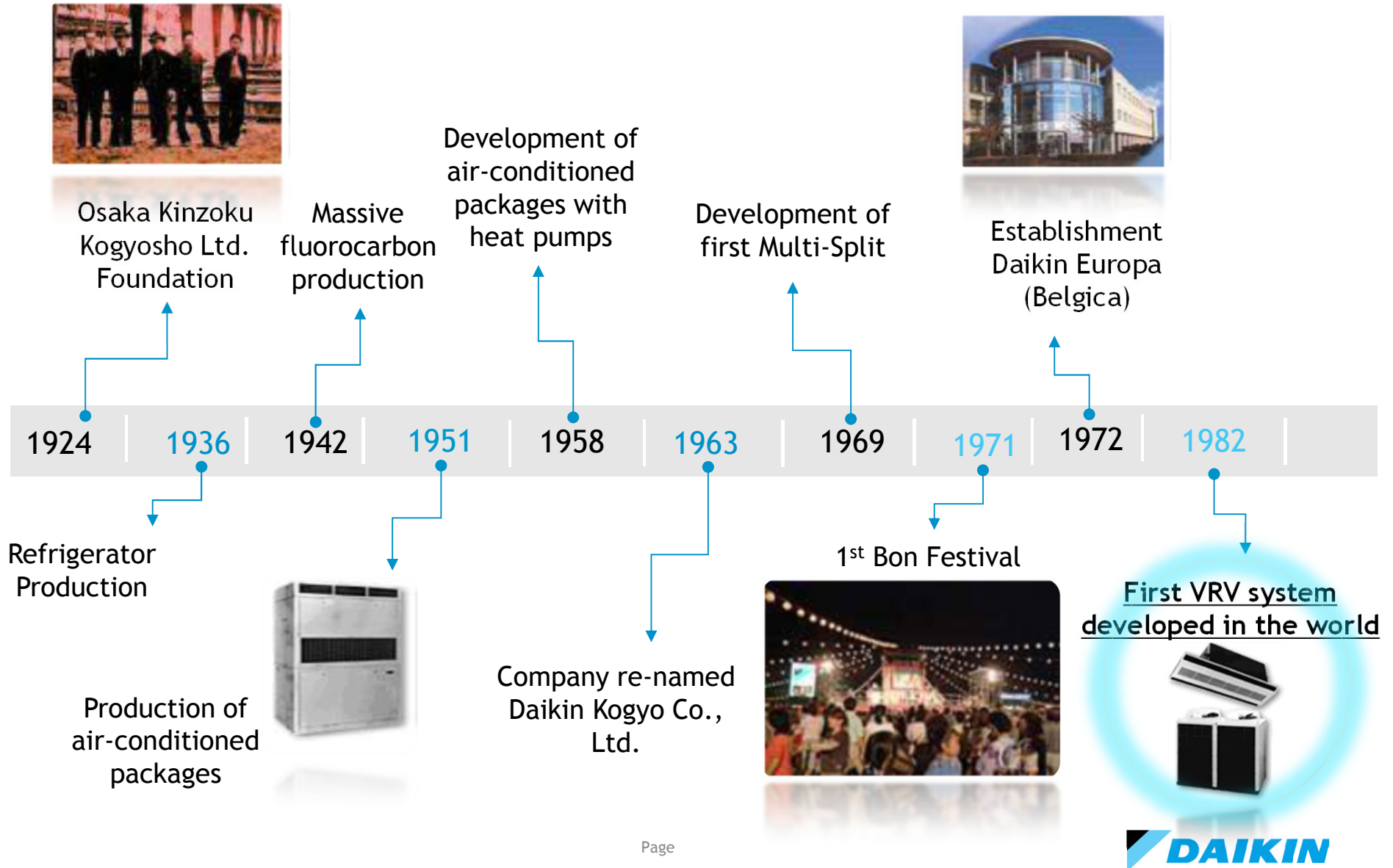
La tecnología VRV fue introducida hace más de 30 años con:

Más de 5,000 instalaciones en América del Norte

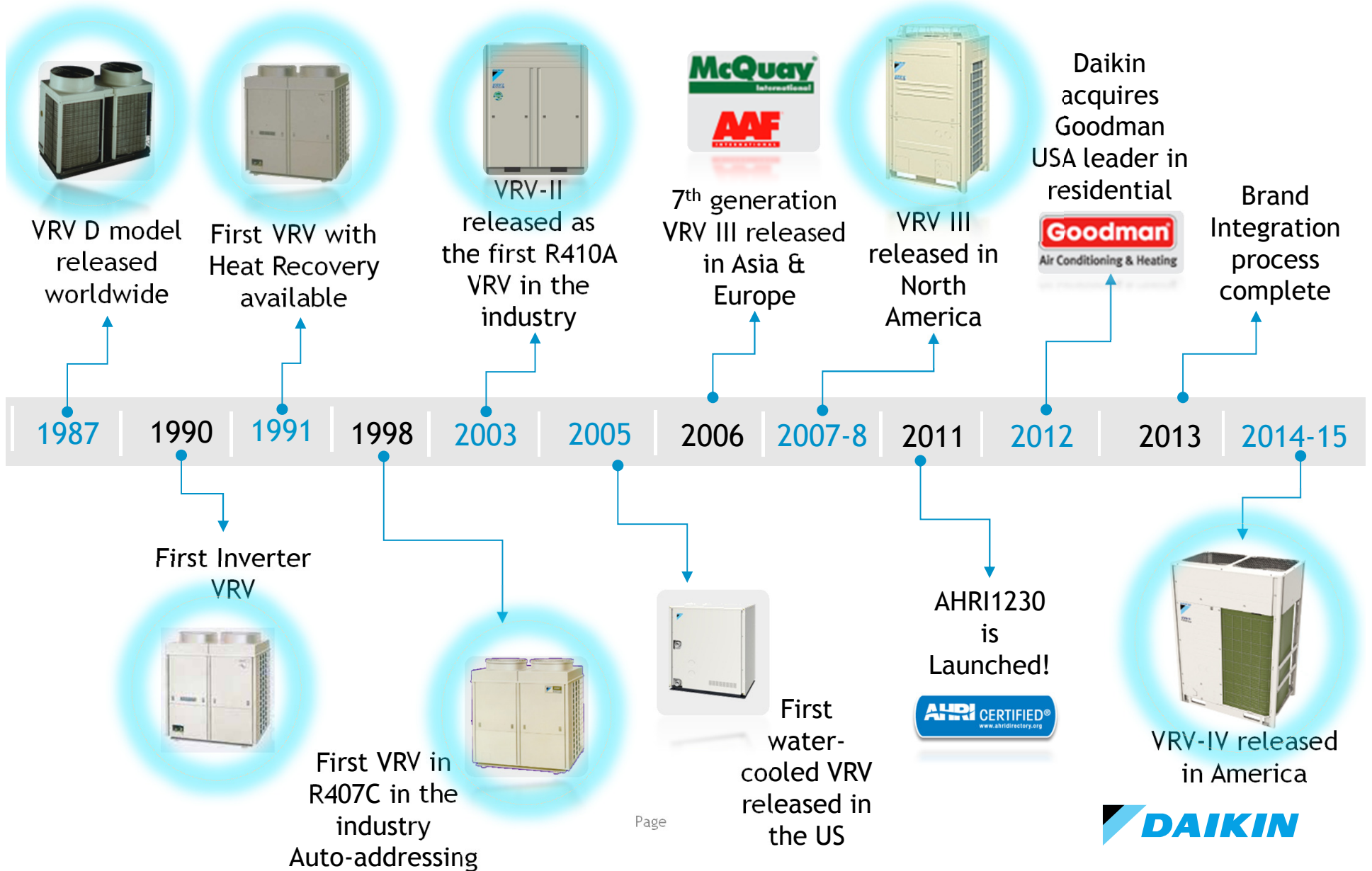
Más de 1,000 instalaciones en Latinoamérica

Más de 1 millón de instalaciones en todo el mundo

Daikin - History



Pioneers in the industry with VRV System





Typical Air-conditioning Systems

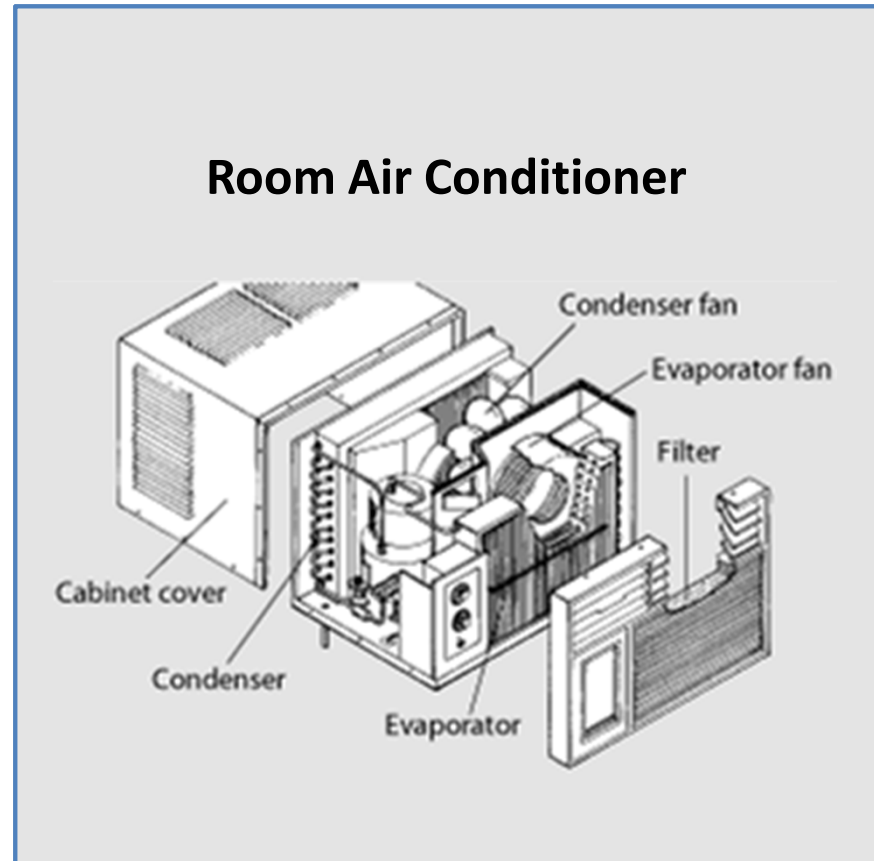
Typical Air Conditioning Systems

Window Air Conditioner



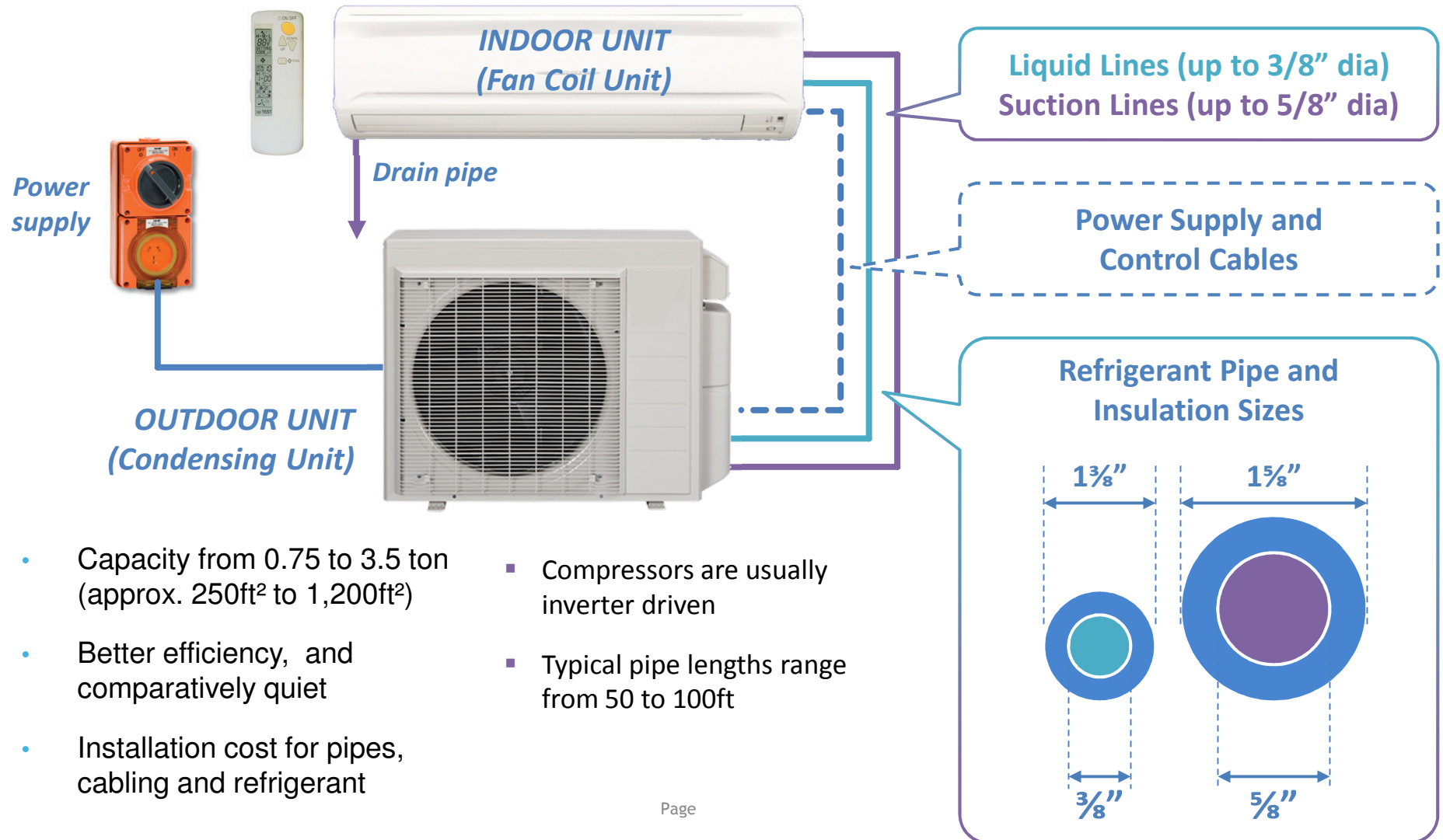
- Low equipment & installation cost
- Low efficiency & noisy
- Historically used in residences and small spaces up to approx. 350ft²

Room Air Conditioner



Typical Air Conditioning Systems

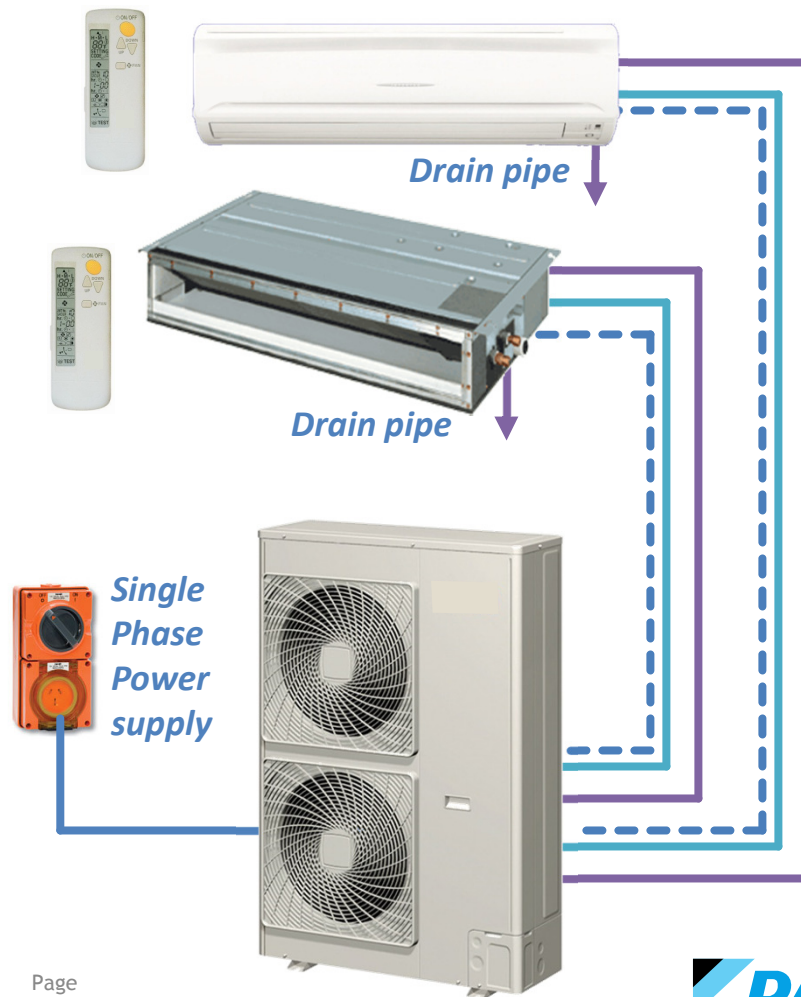
Single Split System



Typical Air Conditioning Systems

Multi Split System

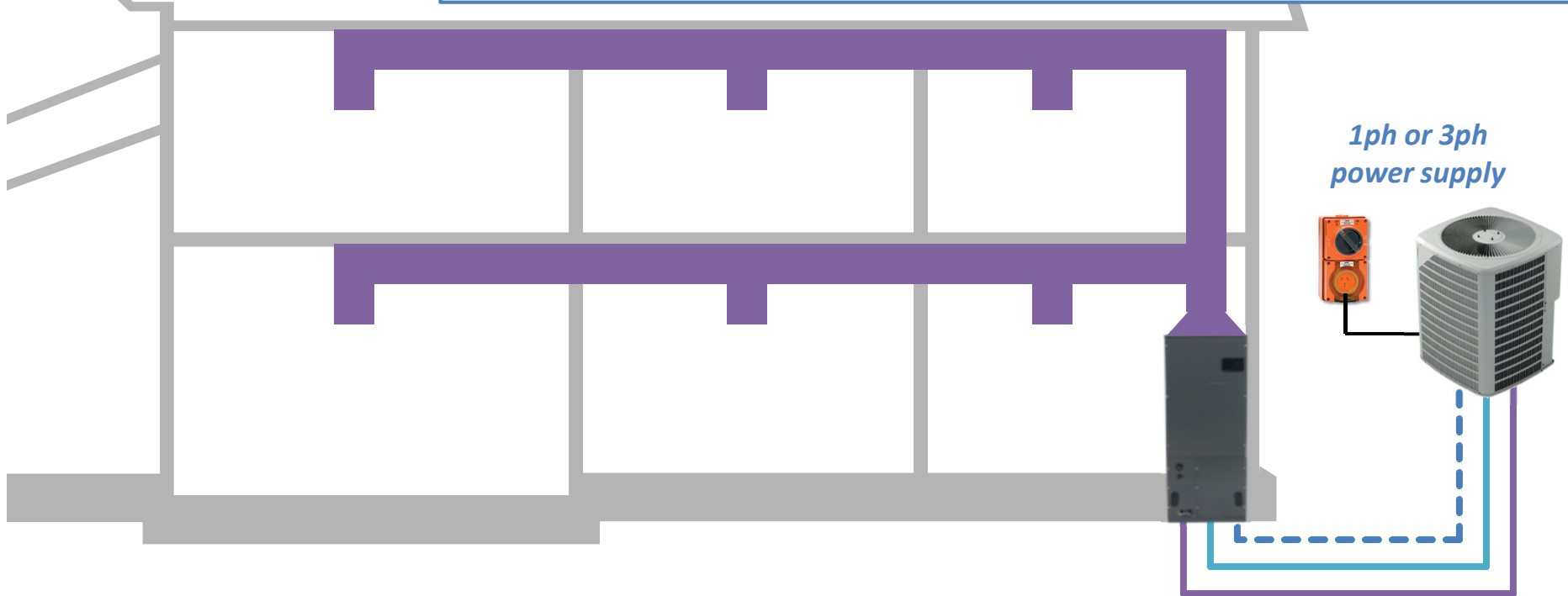
- Ability to provide individual temperature & on/off control in multiple rooms
- Several indoor unit types available
- Individual indoor units and inverter compressors provide better efficiency and comfort
- Provides either heating or cooling
- Installation cost for individual pipes & cabling to each indoor unit (plus
- System capacities up to 3 ton (1200 ft²) and pipe lengths up to 80ft limits its use mostly to residential & light commercial applications



Typical Air Conditioning Systems

Ducted Split System

- Capacity from 1 to 5 tons (up to approx. 3,000 ft²)
- Provides either heating or cooling (often by separate heat source)
- Less equipment cost than multiple indoor units
- Higher installation costs associated with ducting requirements
- Single indoor unit/thermostat prevents individual room temperature or on/off control
- Average efficiency, and a little noisier
- Requirement to balance supply air during commissioning

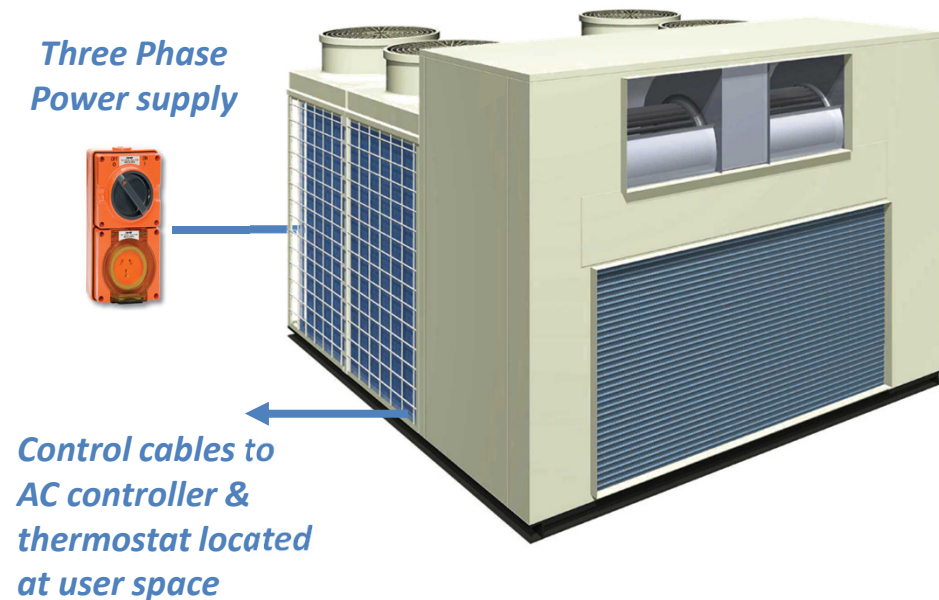




Despite key attributes unitary equipment is often unloved by this industry !

Typical Air Conditioning Systems

Packaged Air Conditioner



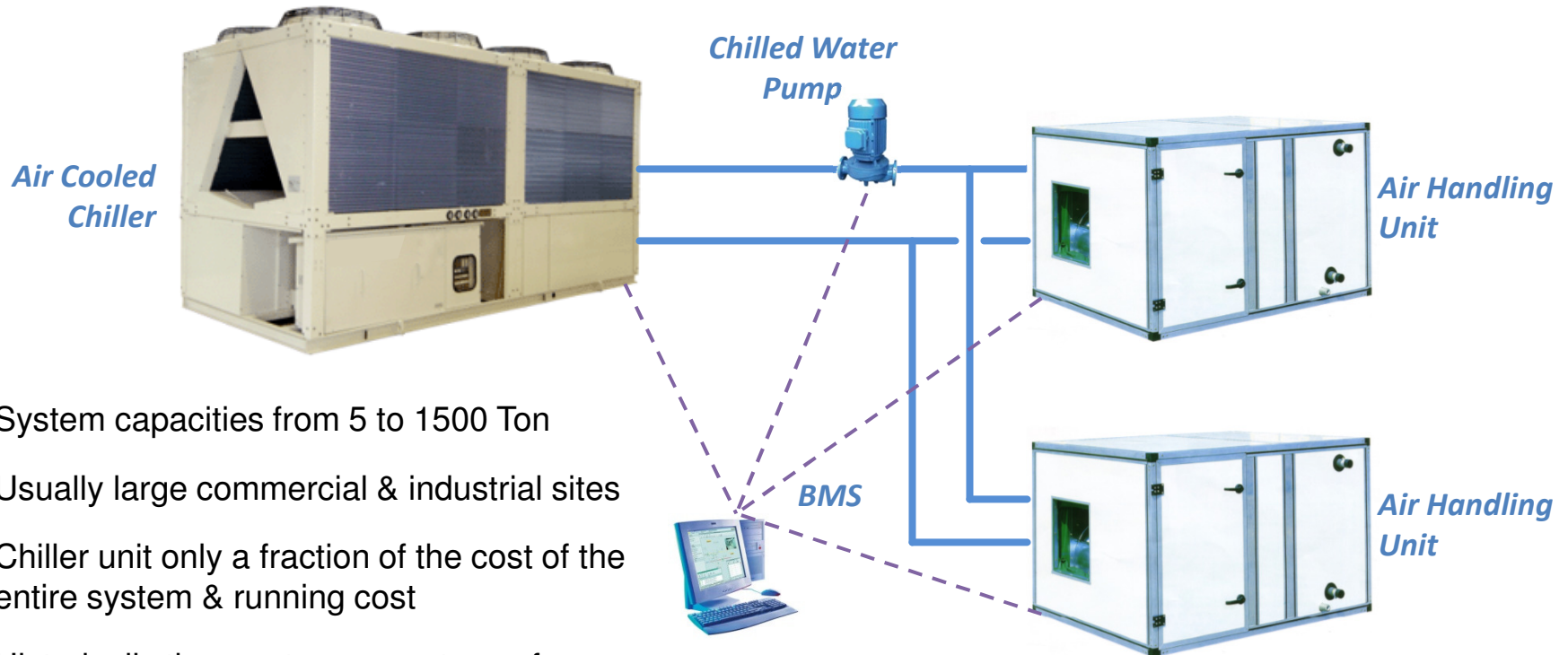
Common Applications

- Supermarkets
- Warehouses
- Wholesale Centers

- Commercial Applications
- Typically mounted on the roof
- Can provide Cooling or Heating
- Lower efficiency than other commercial systems
- Cheaper equipment cost
- Noisier, but noise can be treated
- Usually requires metal ducts to distribute air, grilles & diffusers
- Often requires balancing of supply air during commissioning
- Lacks ability to control differing area demands

Typical Air Conditioning Systems

Chiller System



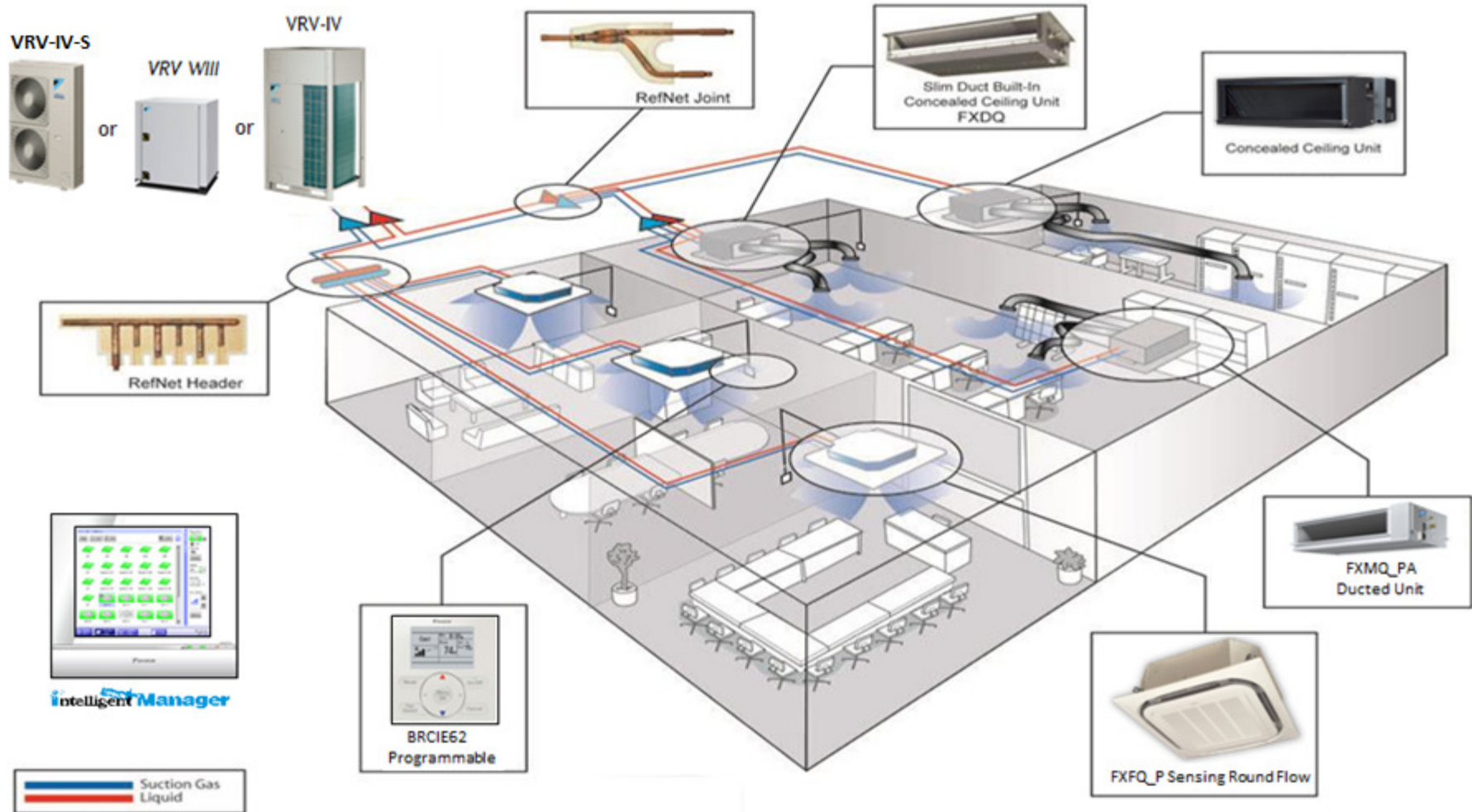
- System capacities from 5 to 1500 Ton
- Usually large commercial & industrial sites
- Chiller unit only a fraction of the cost of the entire system & running cost
- Historically the most common type of system used in larger commercial projects
- Have struggled to keep up with increasing system efficiency requirements demanded

Common Applications

- Hospitals
- Airports
- Hotels
- Retail Centers
- High Rise Commercial Towers

VRV Heat Pump Systems

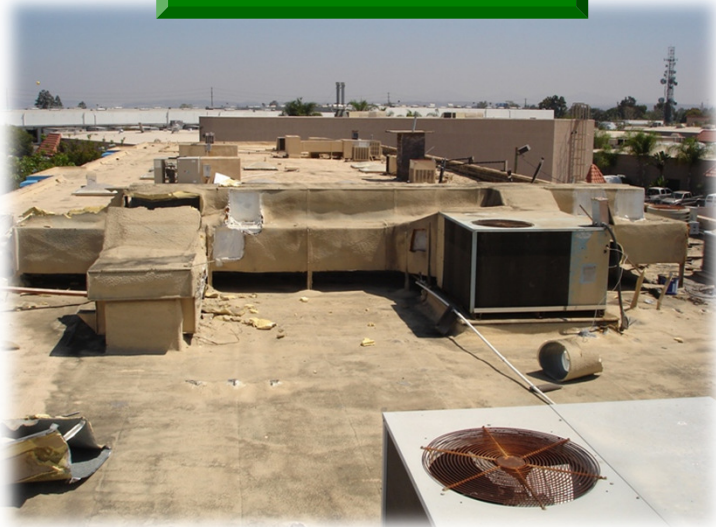
All indoor fan coil units operate in the same mode, Heat or Cool



One Remote Controller is configured as the system Changeover Master

Application example

Packaged Units



VRV



Chiller system



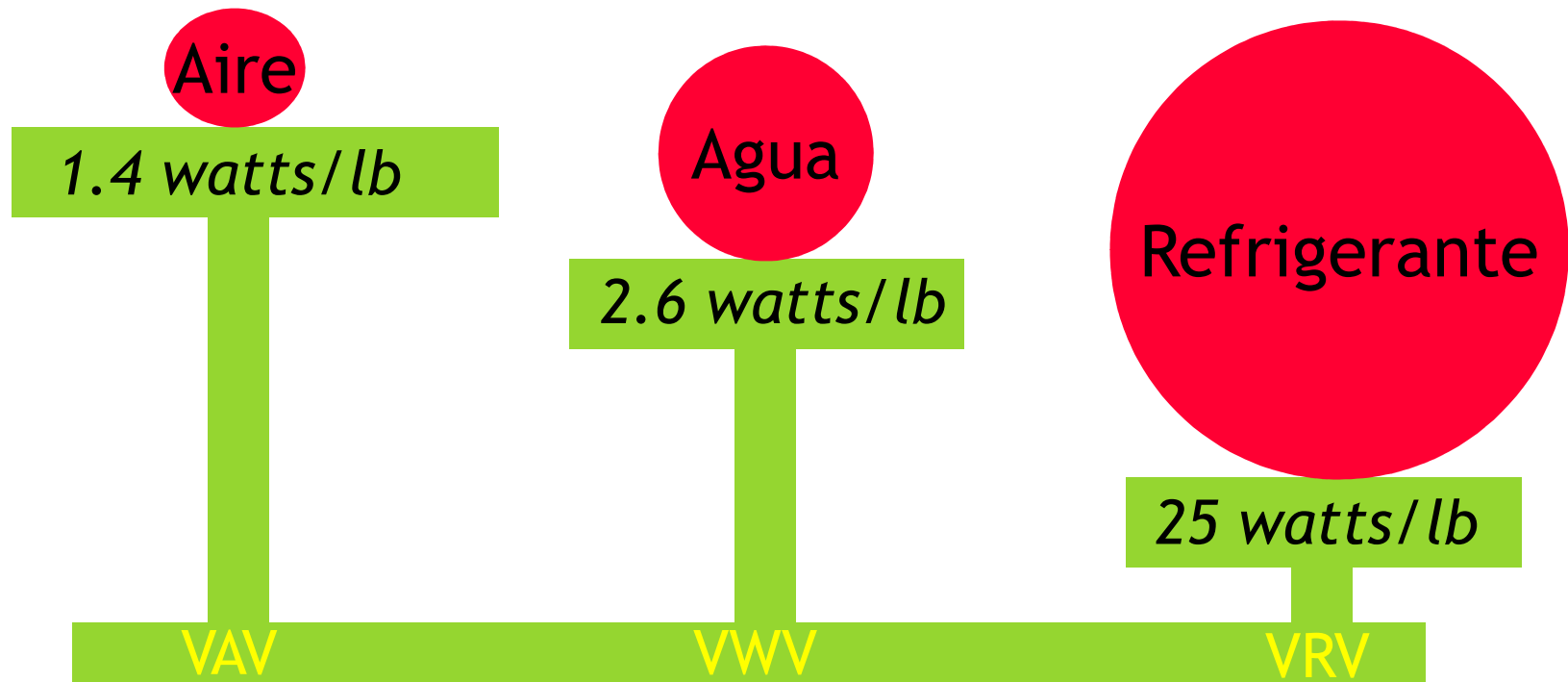
VRV





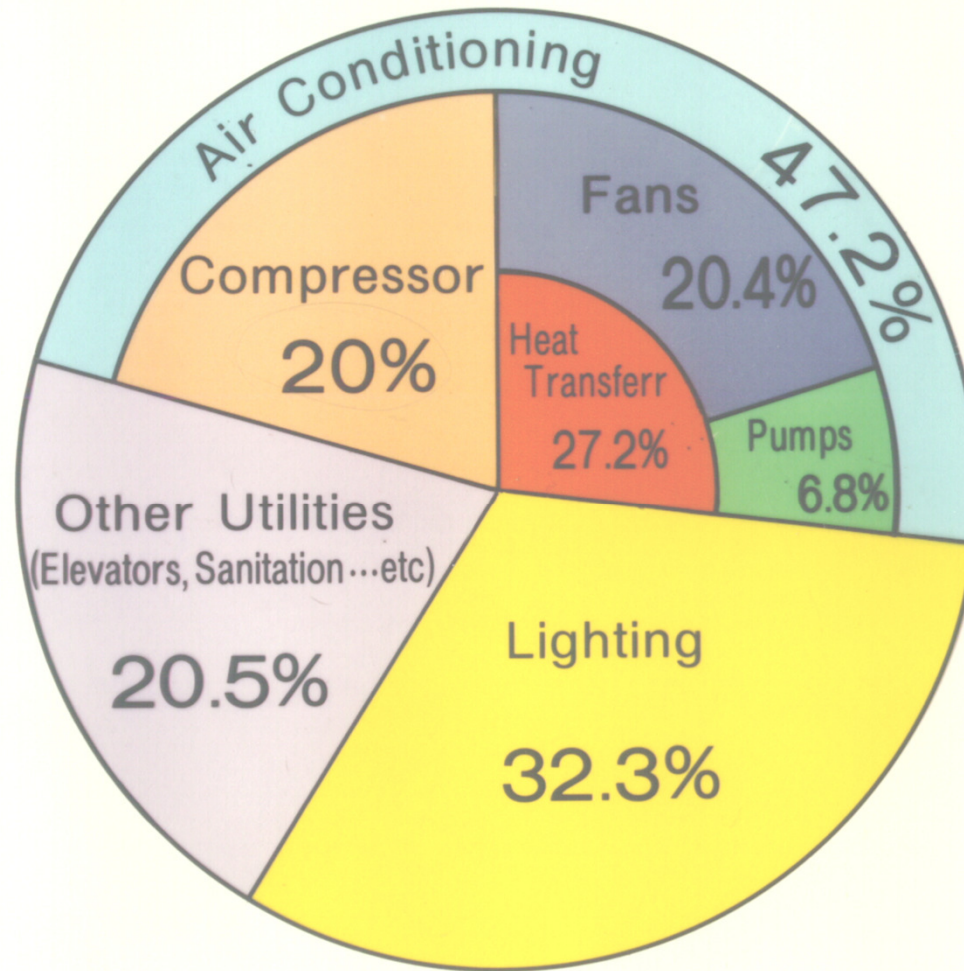
Different Technologies

Heat Transfer Media



- Refrigerante es 10 veces mas eficiente que el Agua
- Refrigerante es 20 veces mas eficiente que el Aire

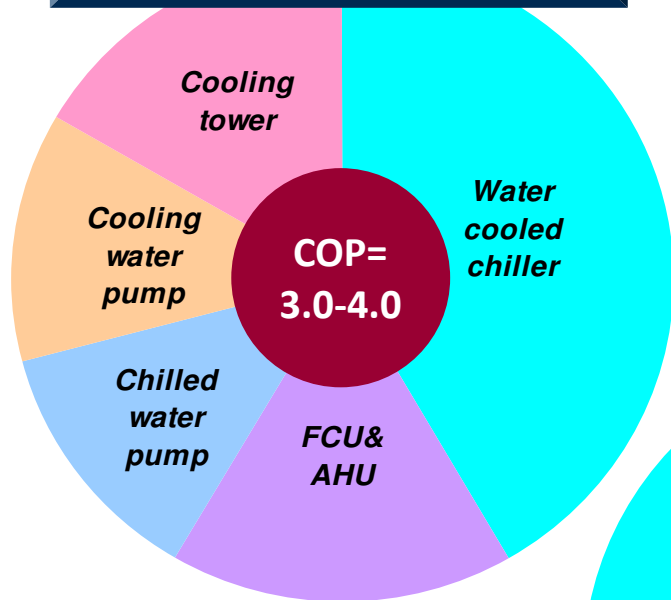
Energy Consumption - Development Opportunities



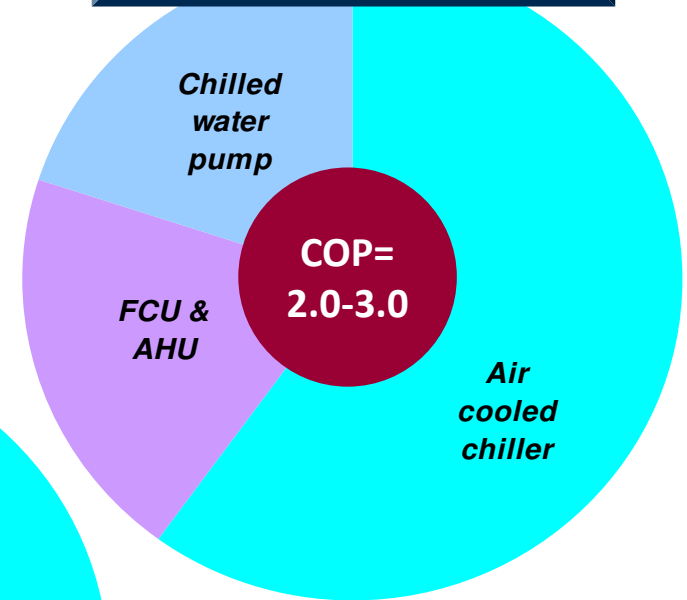
- Casi 50% de energia en un edificio, es consumido por los sistemas de HVAC

Higher system COP

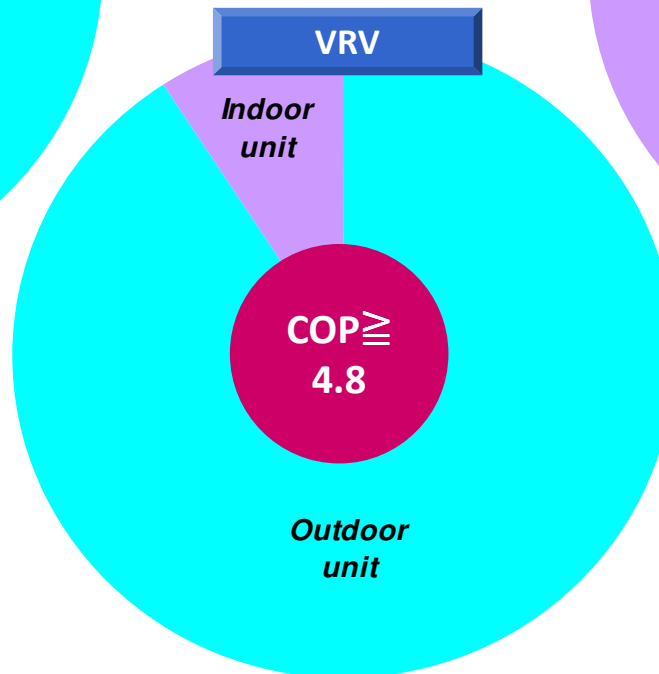
Water cooled chiller system



Air cooled chiller system



VRV

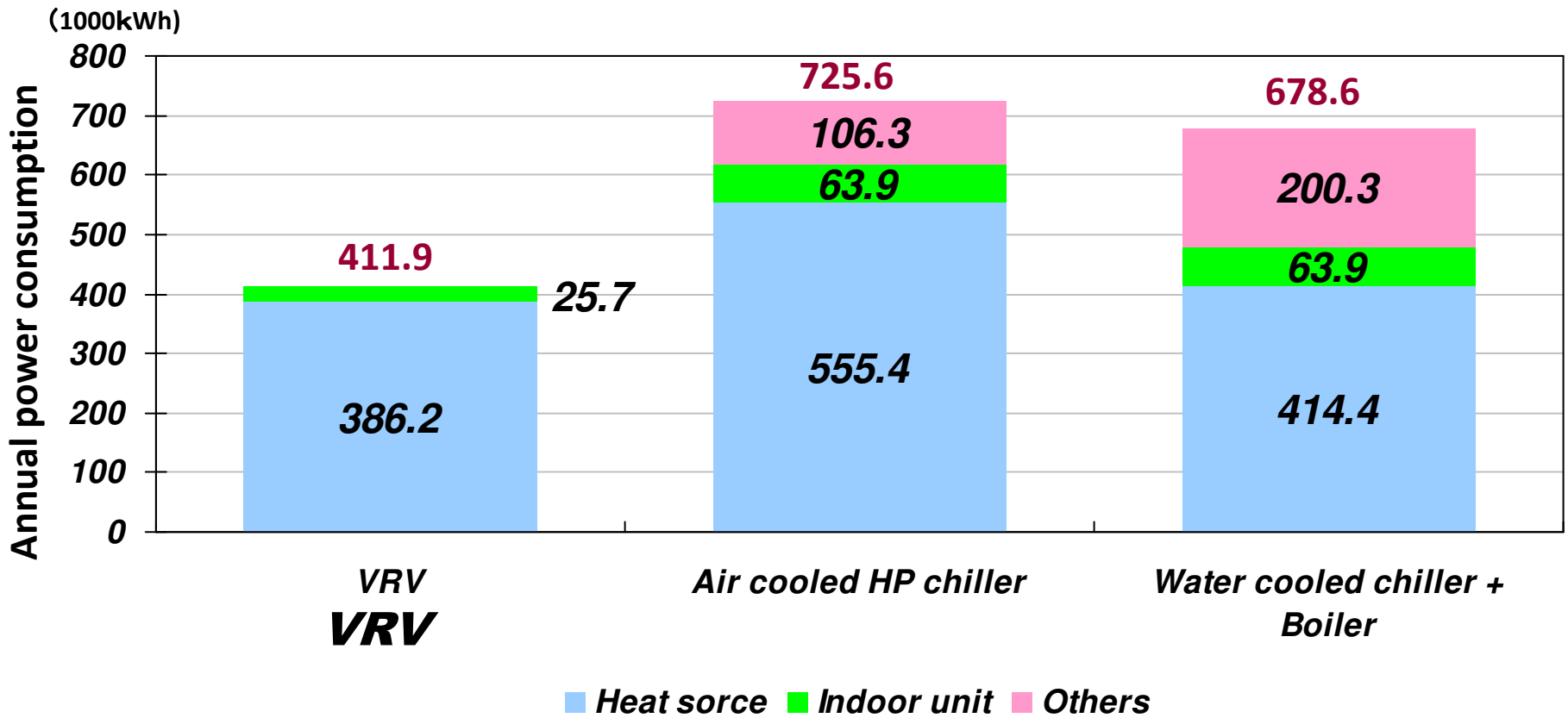


Note)

1. COP is *the value at the rated condition*.
2. Capacity drop of VRV based on refrigerant piping length is considered.

Excellent SEER (Seasonal Energy Efficiency Ratio)

- Annual power consumption of VRV is 30-50% smaller than the one of chiller system.

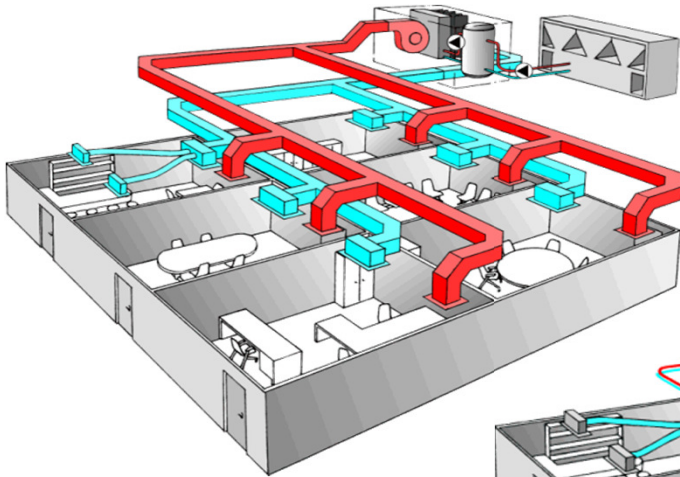


Note) Simulation result in Tokyo/Japan. 8,000m2 building and 400HP air-conditioning system

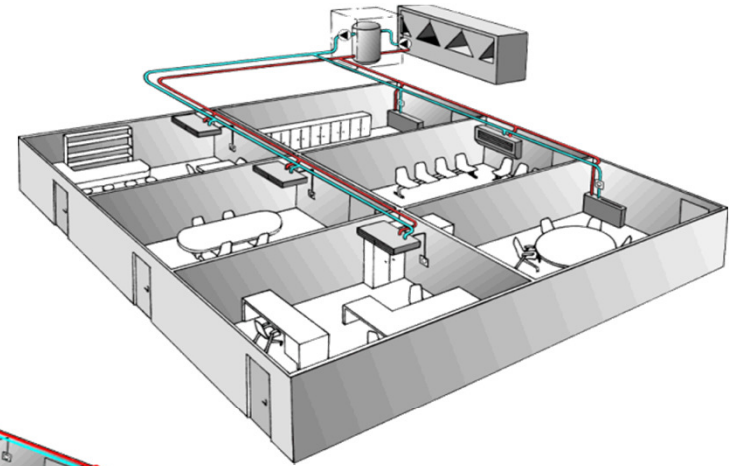


Different Systems

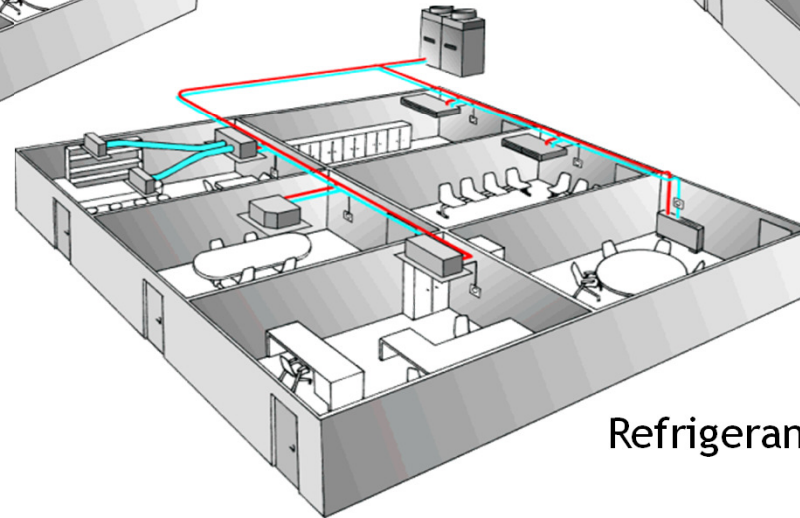
Air transport






Water transport



Refrigerant transport



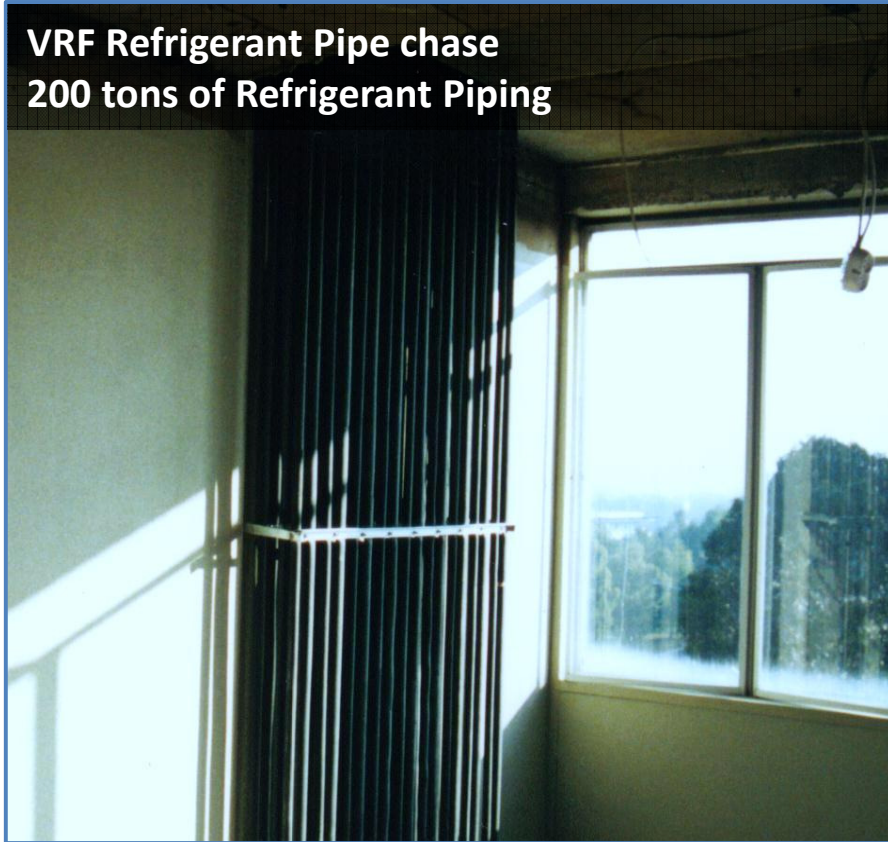
Heat transfer analysis for aprox. 30 Tons

Medium	Medium	Size
Water	Interior Unit Pump	 89mm x 2 3.5in x 2
Air	Duct	 900 mm 35 in
Refrigerant	Interior Unit	 Líquid / Gas 22 / 41 mm 7/8" / 1-5/8"

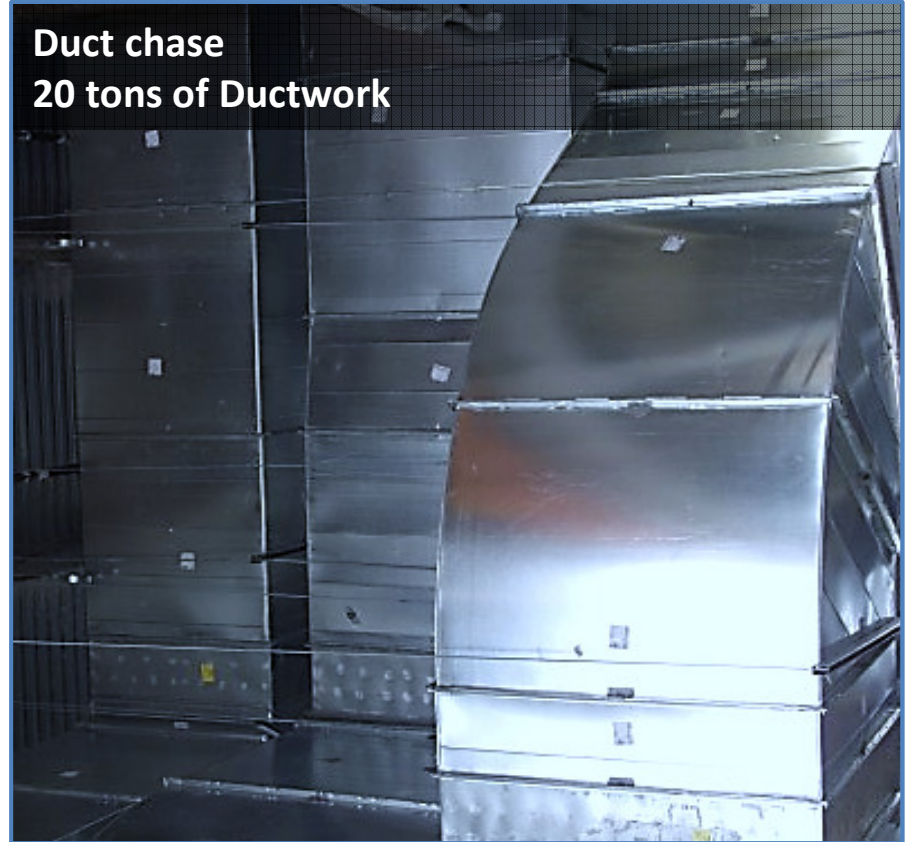
Reduced Construction – Increased Space

Increased Leasable Space - Reducing Building Footprint

**VRF Refrigerant Pipe chase
200 tons of Refrigerant Piping**



**Duct chase
20 tons of Ductwork**

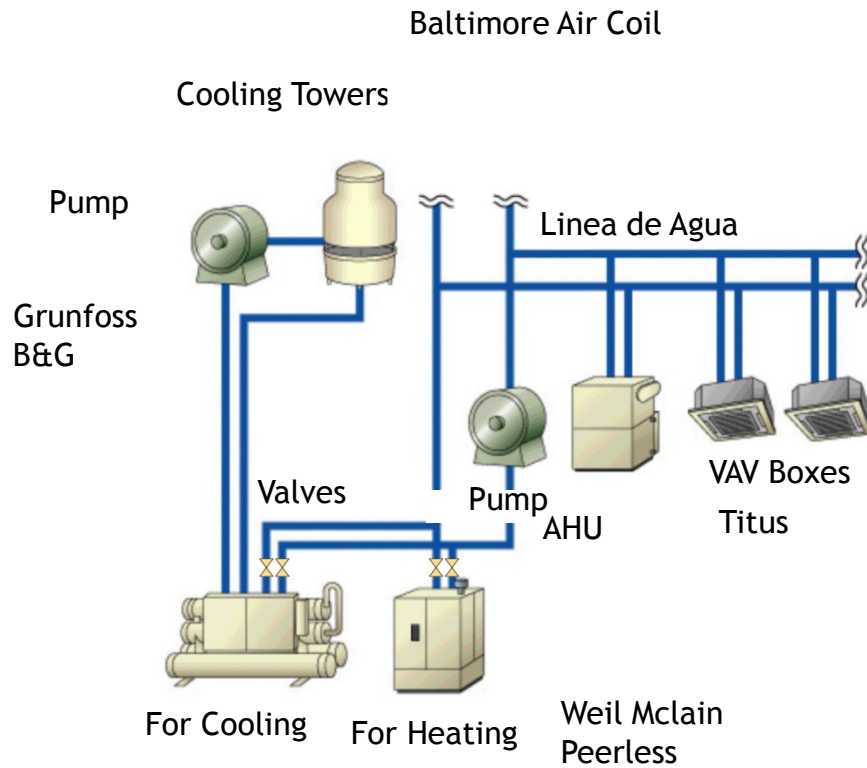


Reduced mechanical chases

No mechanical rooms!

Efficient Operation - Energy savings

Chiller Central System

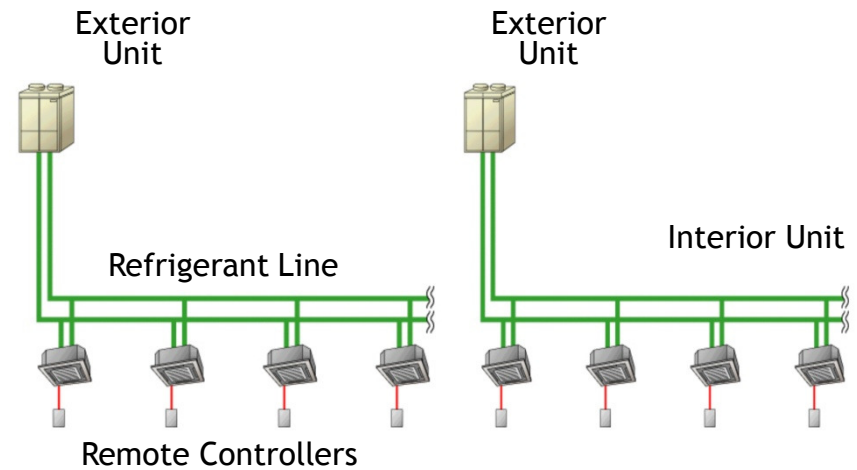


- Trane
- York
- McQuay
- Carrier

Controllers

- Johnson
- Siemens

VRV Modular DX Chiller System

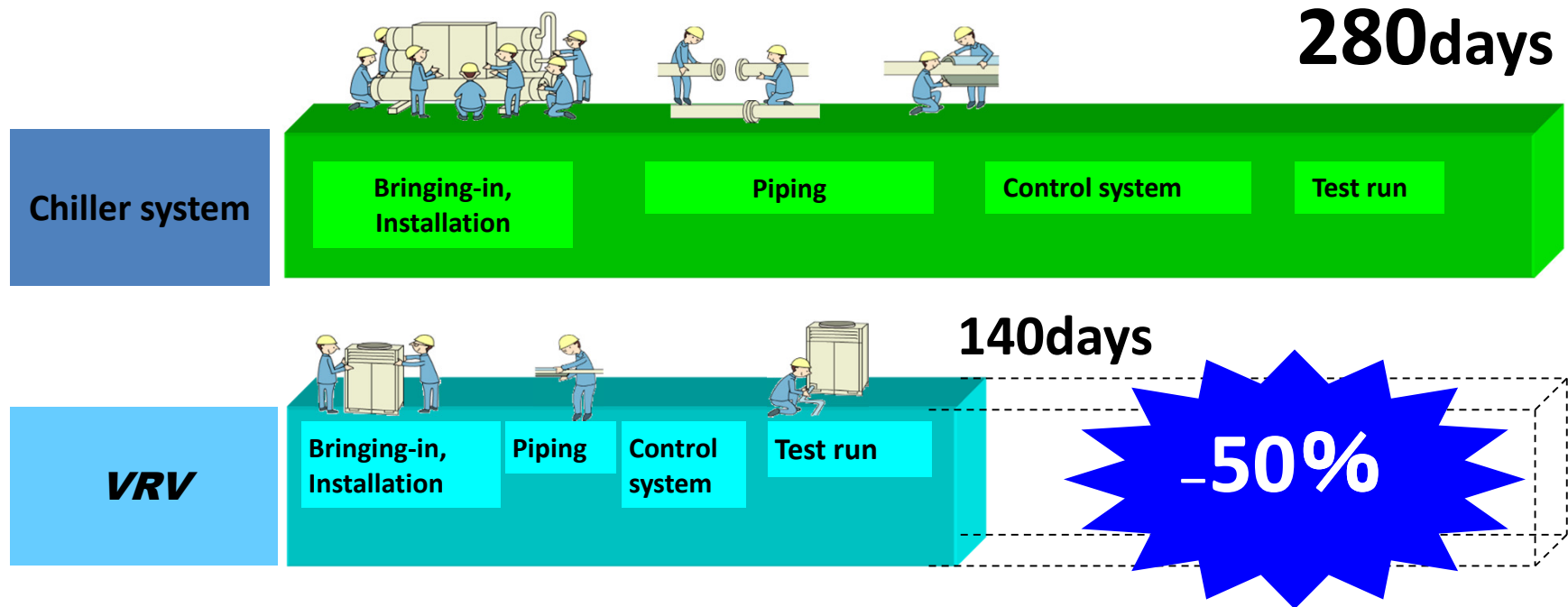


Single purchase location

- Capacitor location flexible
- Long distance piping
- Control different zones
- Centralized control

VRV vs Air cooled chiller system

Reduced installation Time



<Condition>

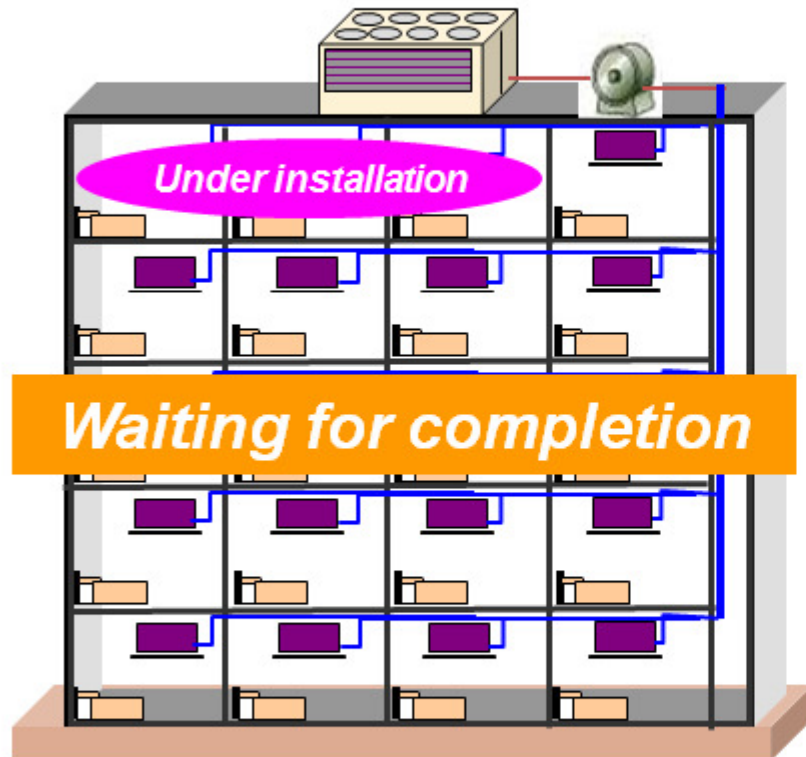
- Application of the building: Office
- Total floor area: 8,000m²
- Number of workers for the installation: 5 persons/day

Central system: 100HP air cooled chiller
x 4 + 250kW boiler
+ Ceiling mounted cassette type FCUs

VRV system: 44HP outdoor unit x 10
+ Ceiling mounted cassette type indoor units

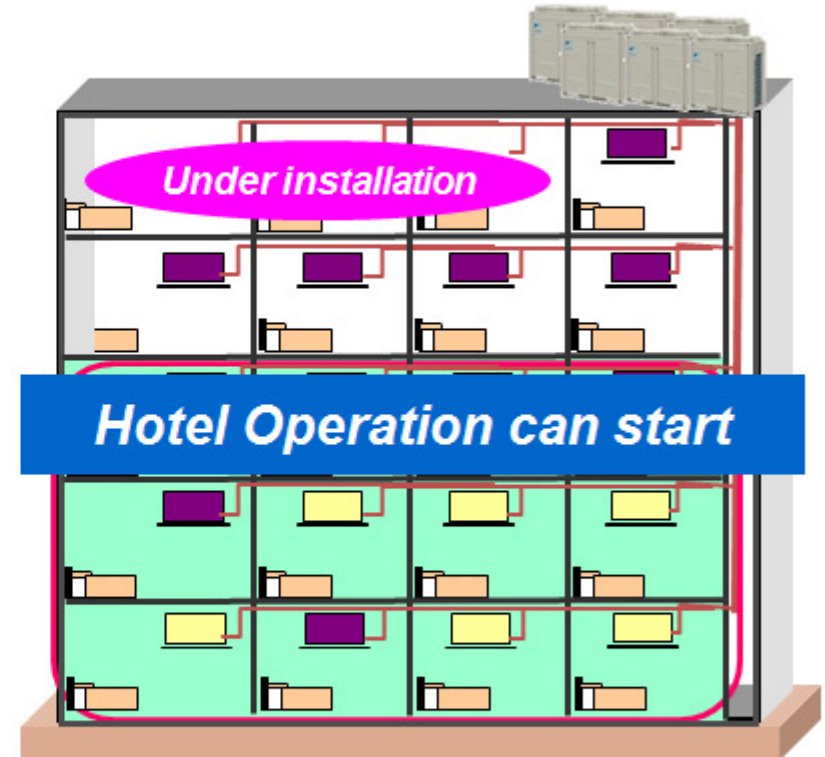
Partial Installation

Chiller System



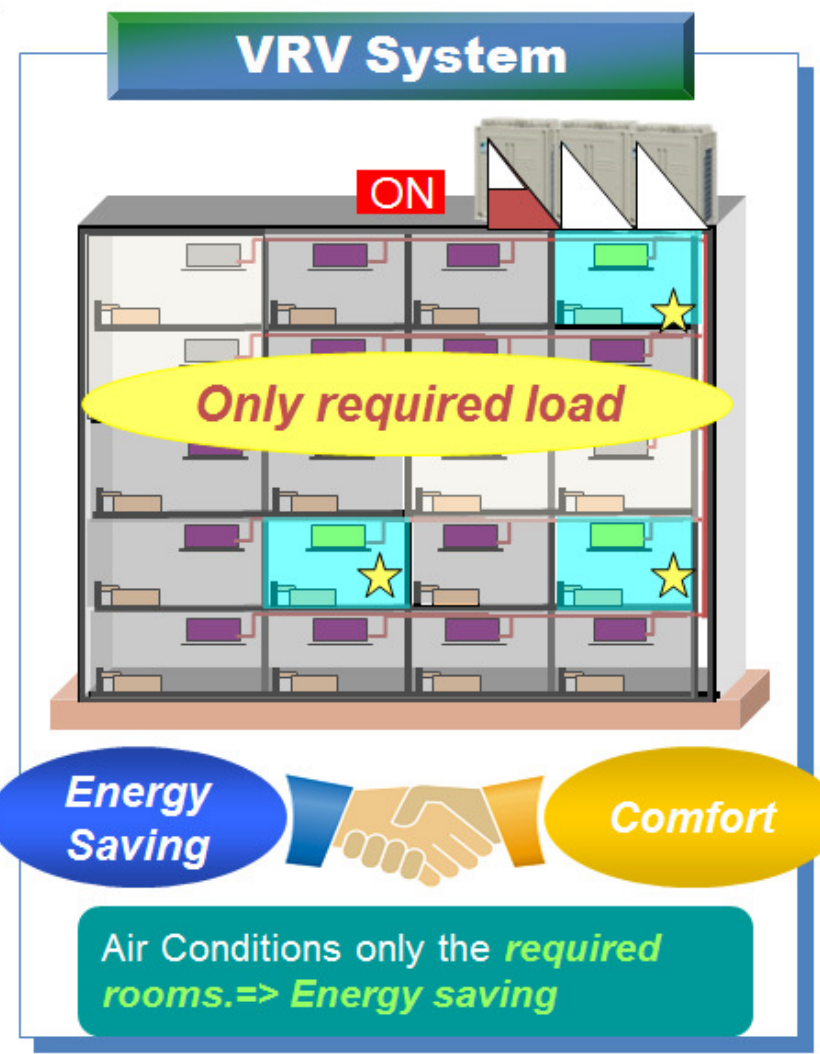
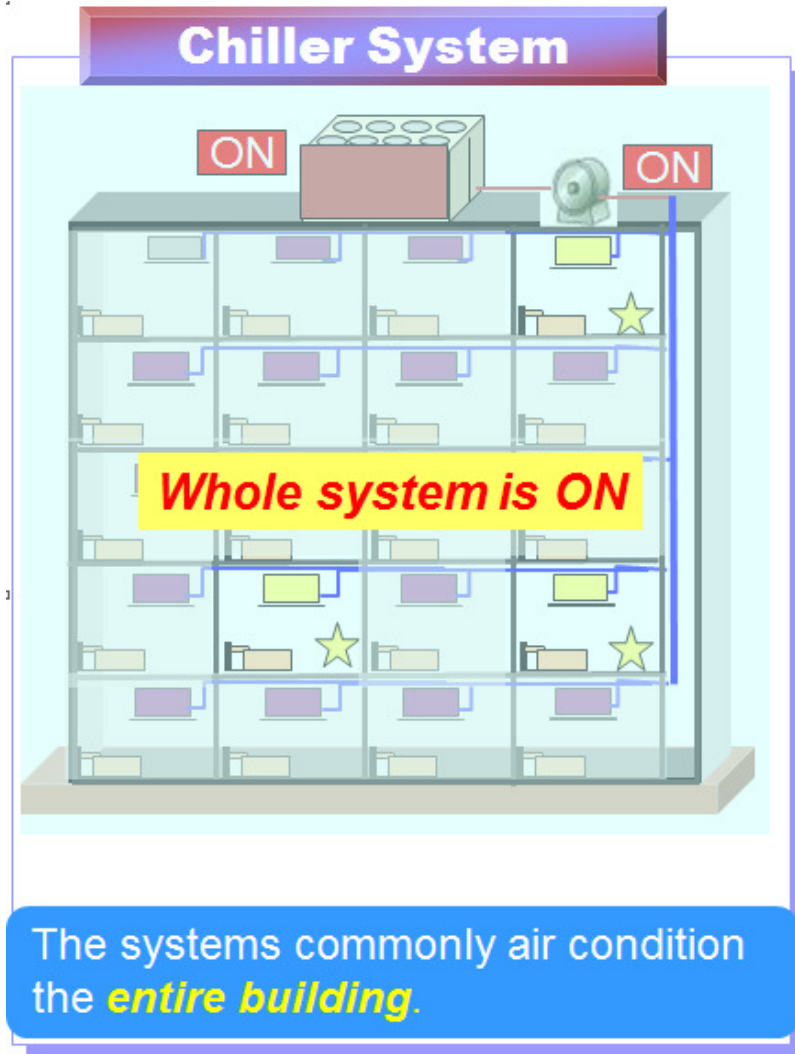
Opening have to wait until whole installation is completed.

VRV System



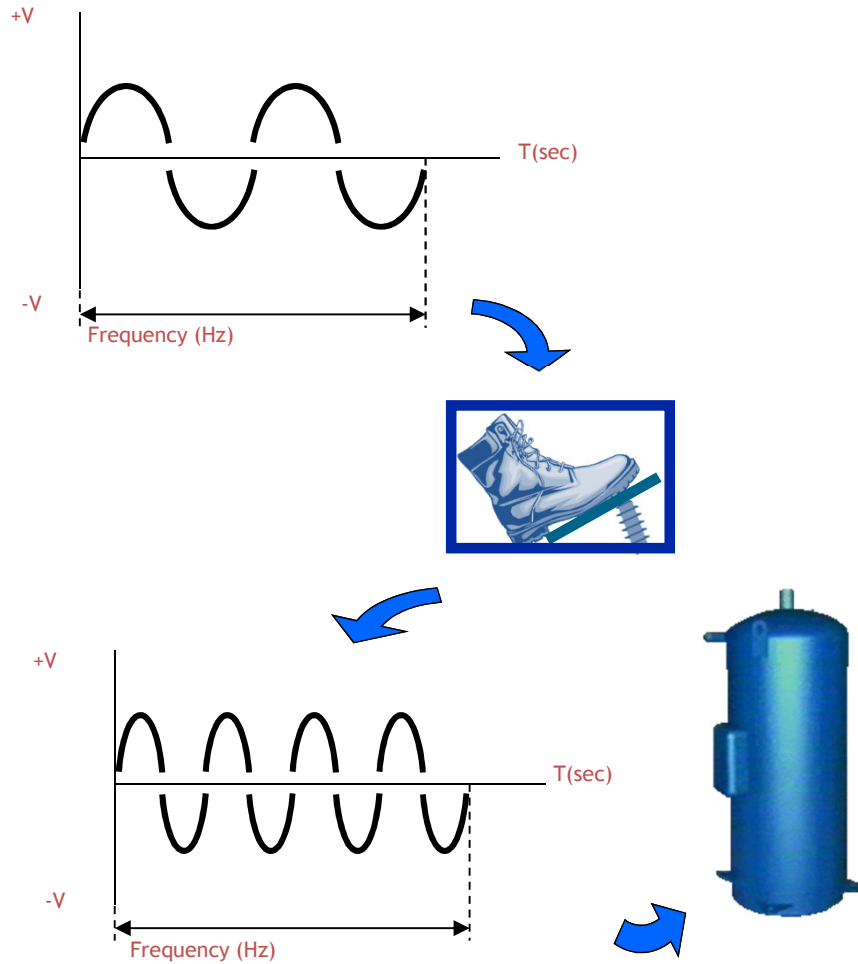
Hotel can open even when some rooms are still under installation.

Partial Load Operation

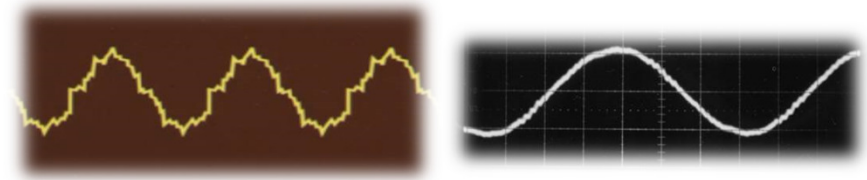


Big Benefit in off season (Low occupancy)

Inverter Technology

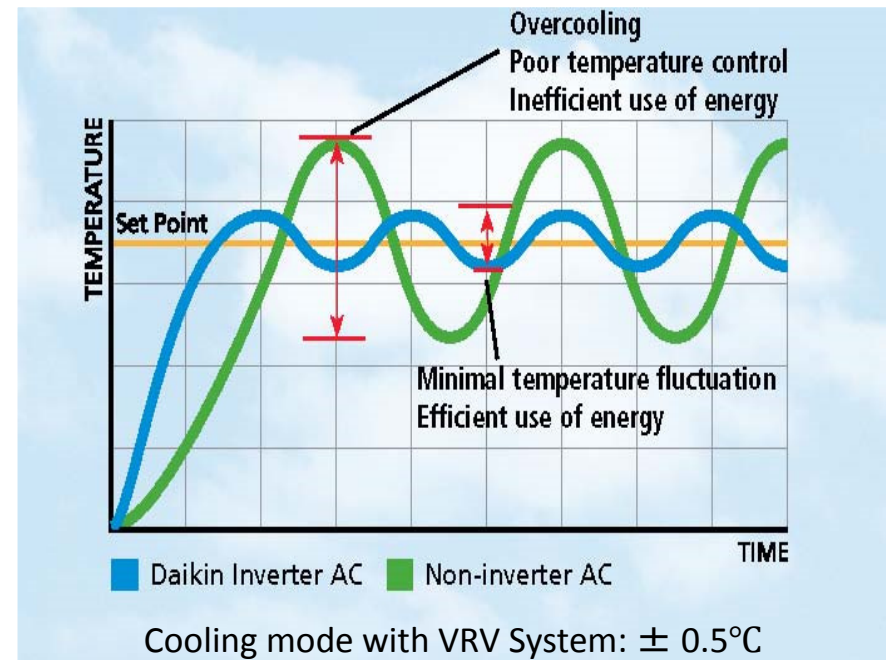


Inverter output current wave



Rough wave

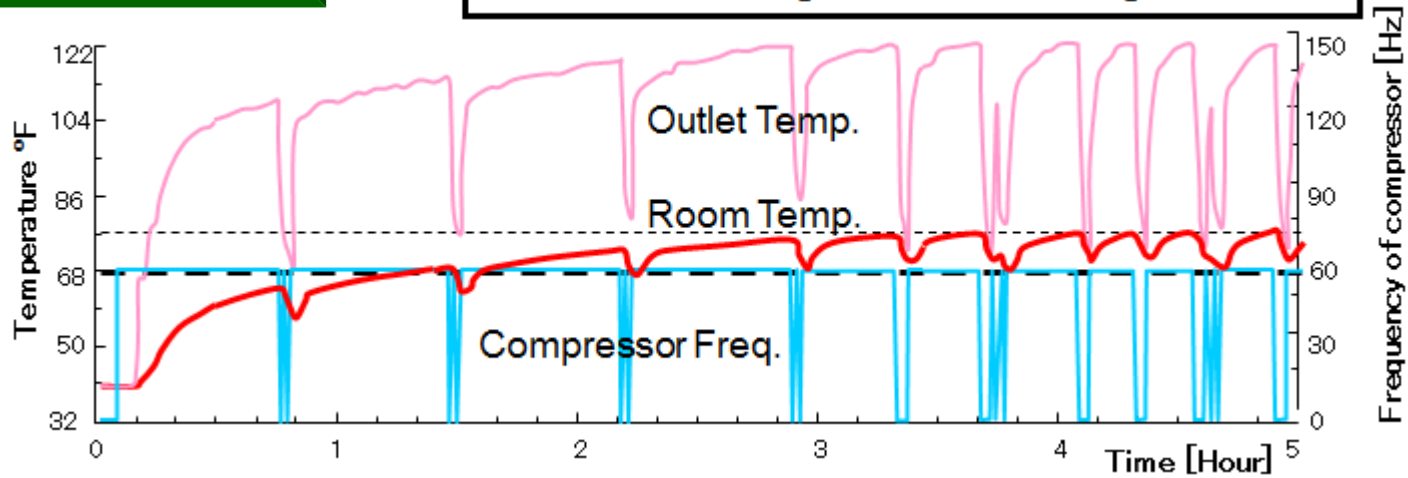
Smooth wave



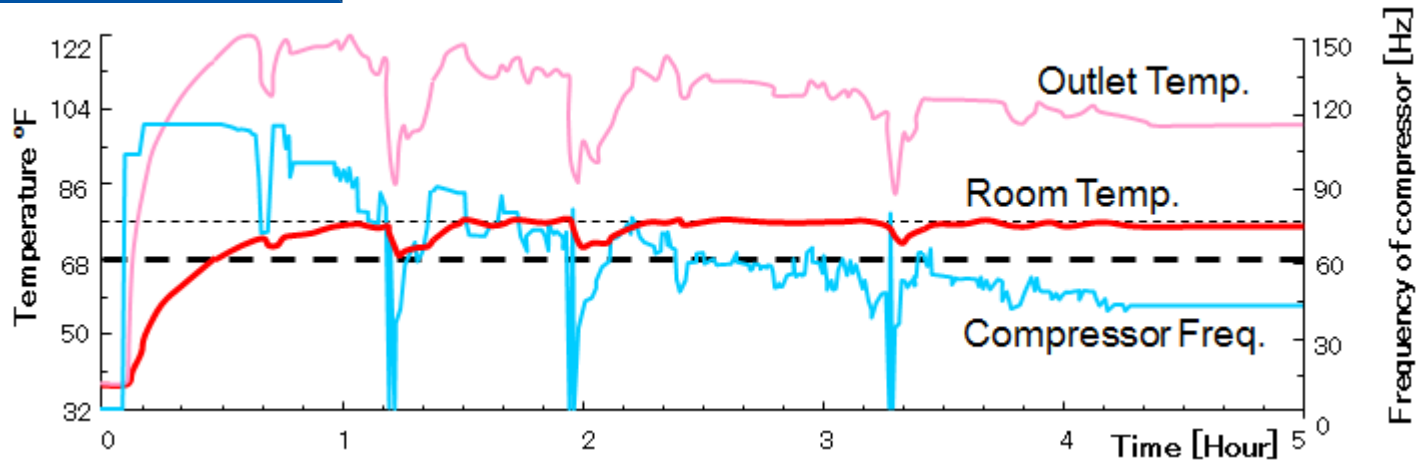
Inverter/Non-Inverter comparison

Non-Inverter Unit

Outdoor temp: 32F Set Temp: 73F



Inverter Unit





VRV-IV Global Models

VRV-IV Global Models

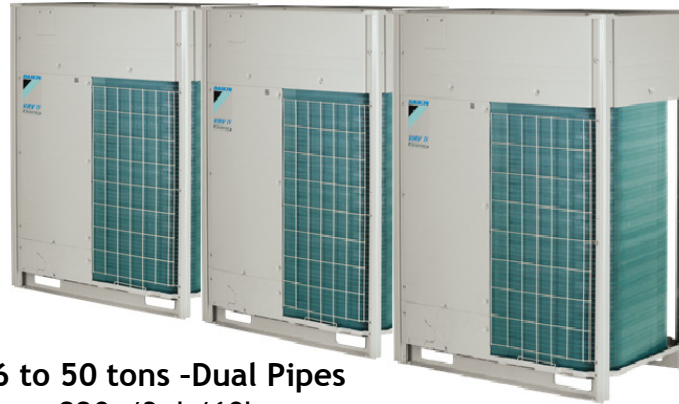
**VRV-IV-S
Heat Pump**



2, 3, 4 & 5 Tons
220v 1ph, 60Hz
6, 8 & 10 Tons
380v/3ph/60Hz



**VRV-IV
Heat Pump**



6 to 50 tons -Dual Pipes
220v/3ph/60hz
380v/3ph/60Hz
460v/3ph/60Hz

**VRV-IV
Heat Recovery**



6 to 38 tons - Three Pipes
208-230v/3ph/60Hz
460v/3ph/60Hz

**VRV WIII
Water-Cooled
HP / HR**



6 to 23 Tons
Heat Pump
Heat Recovery
220v/3ph/60hz
380v/3ph/60Hz
460v/3ph/60Hz

Nominal Capacity (Tons)		2	3	4	5	6	8	10	23	38	50
VRV-IV-S (1ph)	HP	←→									
VRV-IV-S (3ph)	HP					←→					
VRV-IV	HP					←→					
VRV-WIII	HP					←→					
VRV-IV	HR					←→					
VRV-WIII	HR					←→					

VRV IV - What's the New Standard?

But we don't stop there...



- Improved efficiency over all metrics, IEER up to 28
- All inverter compressors
- Maximum of 22HP single module
- Variable Refrigerant Temperature (VRT) for increased comfort and efficiency
- True optimization of diversity up to 200%, (certain models)
- 30m (100 ft.) Level difference between indoor units
- New Cassette and Ducted Indoor Units
- Refrigerant cooled inverter
- Digital read-out

VRT Daikin Innovation



VRT IV

Variable
Refrigerant
Temperature **New**

Variable Refrigerant Temperature Control

New

Automatic VRT mode

Refrigerant temperature (Rt) increase as outdoor temperature decreases

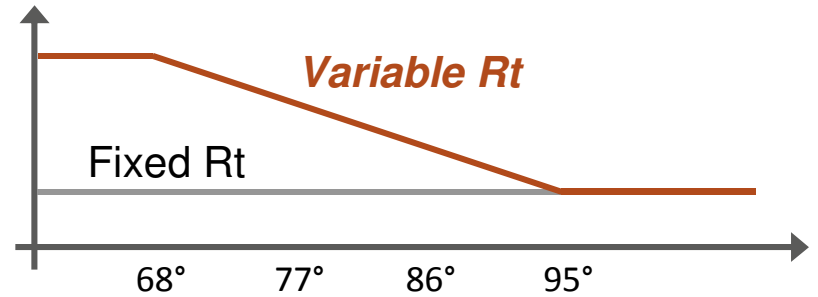


The capacity of the system is adjusted by reducing the speed of compressors AND by increasing the evaporation temperature

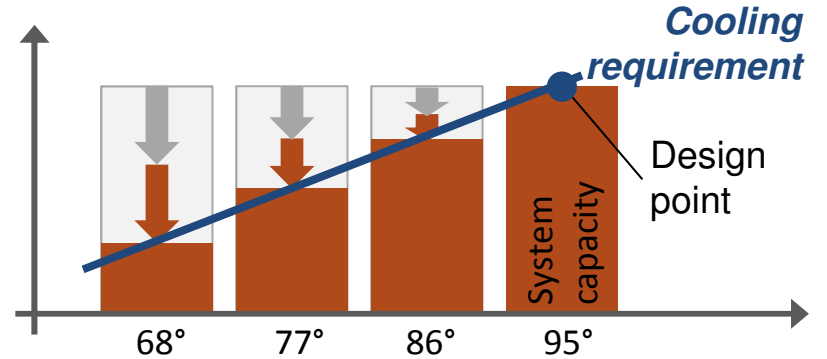


Efficiency increases thanks to decreasing workload of the compressor

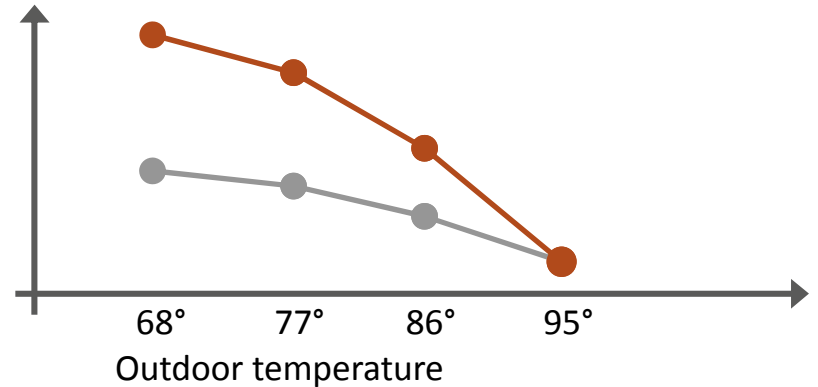
Refrigerant T



Capacity & Load

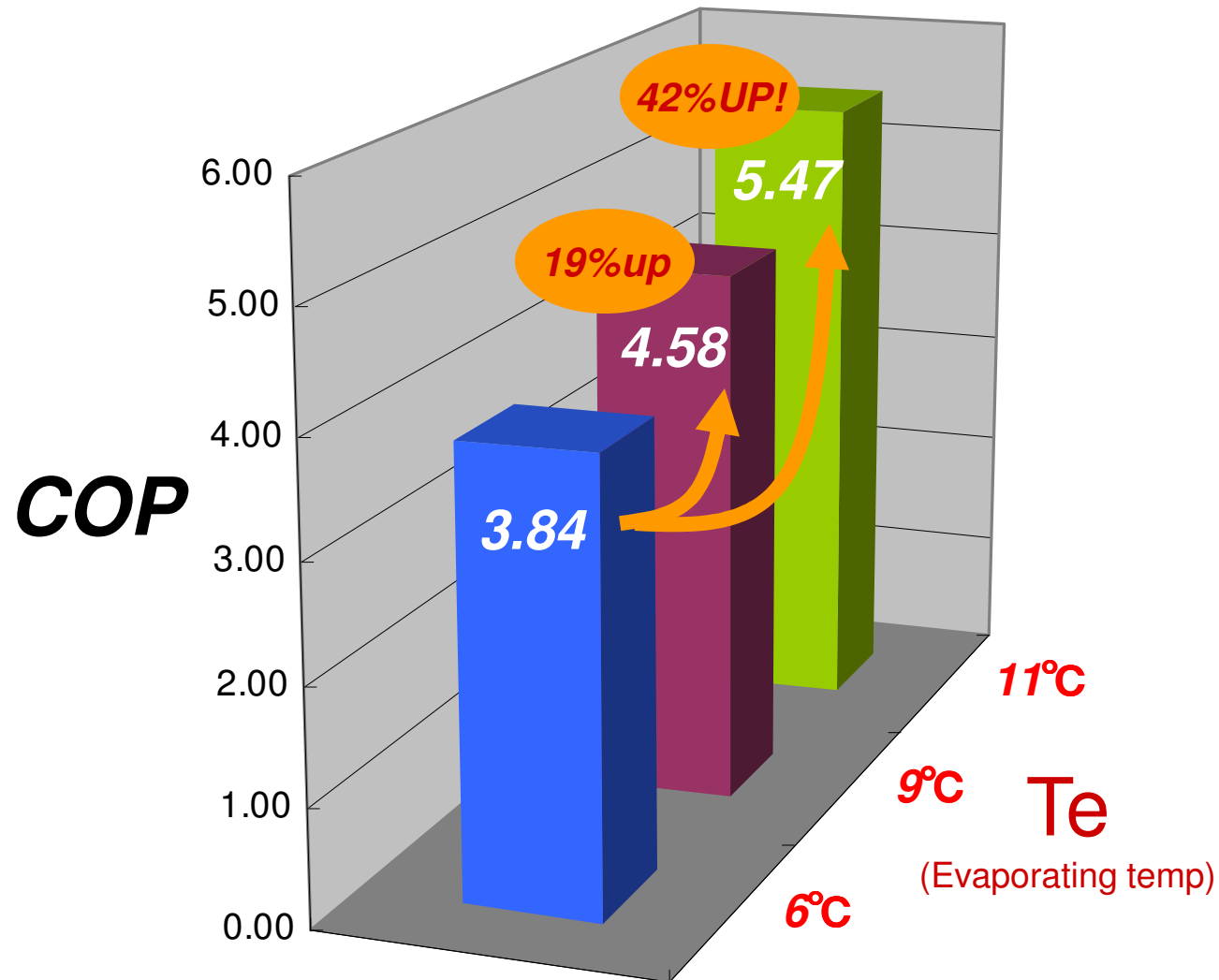


Efficiency



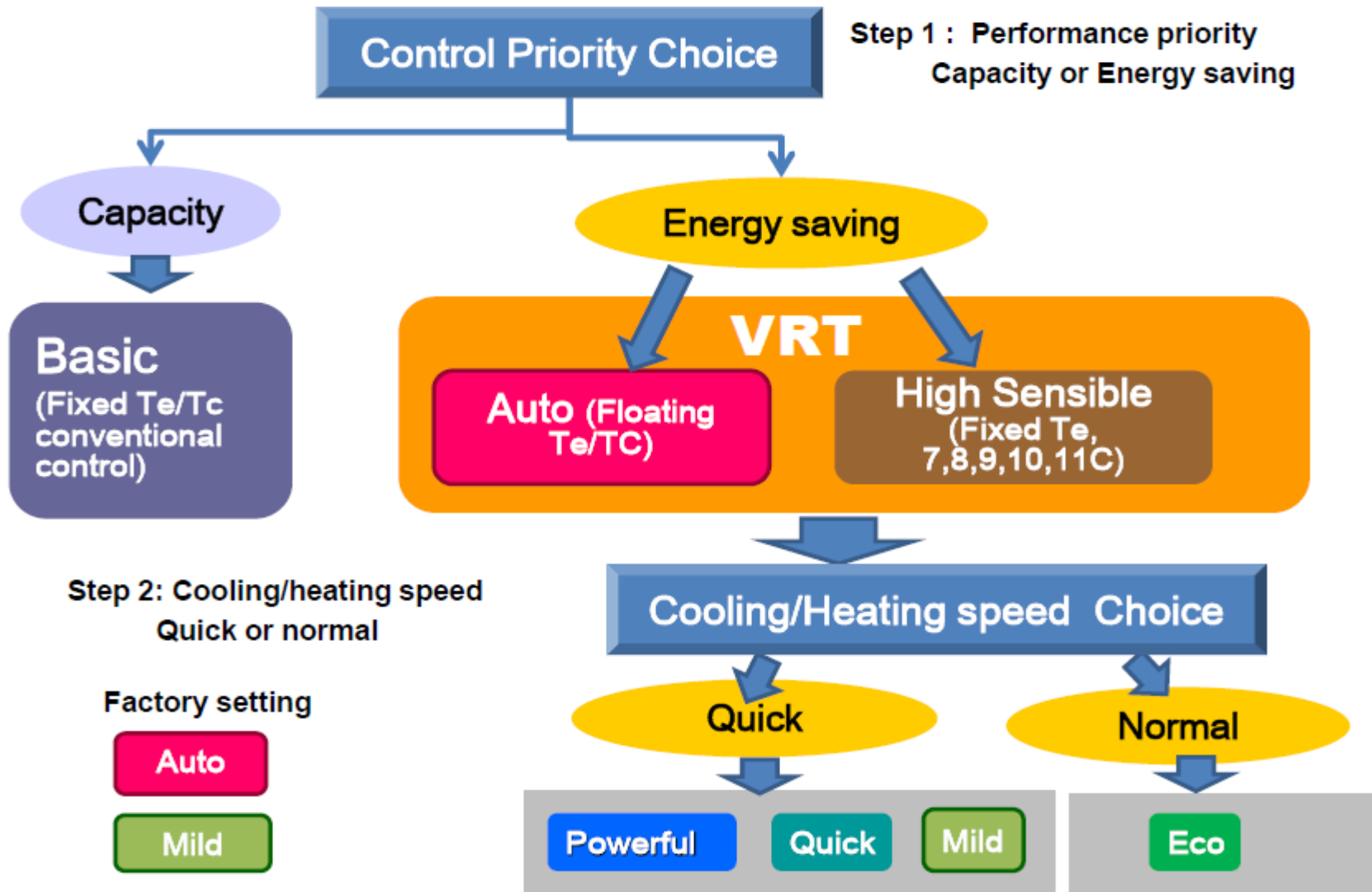
Evidence

RX(Y)Q10TY1 (10HP) <Heat Pump>



- Increased efficiency not counted in IEER standard










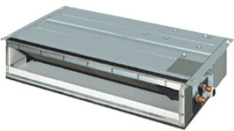








VRT – Control detail





VRV Indoor Units

VRV indoor units Line up

Super wide range of well-designed indoor units						
Ductless Units	Round Flow Cassette	Round Flow Cassette (with Sensing)	4-Way Cassette	4-Way Flow Ceiling Suspended	1-Way Cassette	2-Way Cassette
						
	Wall-Mounted	Ceiling Suspended	Exposed Floor Standing			
						
Ducted Units	Slim Duct Concealed	DC Ducted Concealed	Concealed Ceiling	Concealed Floor Standing	Vertical Ducted	Floor Standing Duct Type
						
Ventilation Units	Heat Recovery Ventilation	100% Outside Air unit	Air Handler Unit			
						



VRV Projects in Latin America

Building Profile

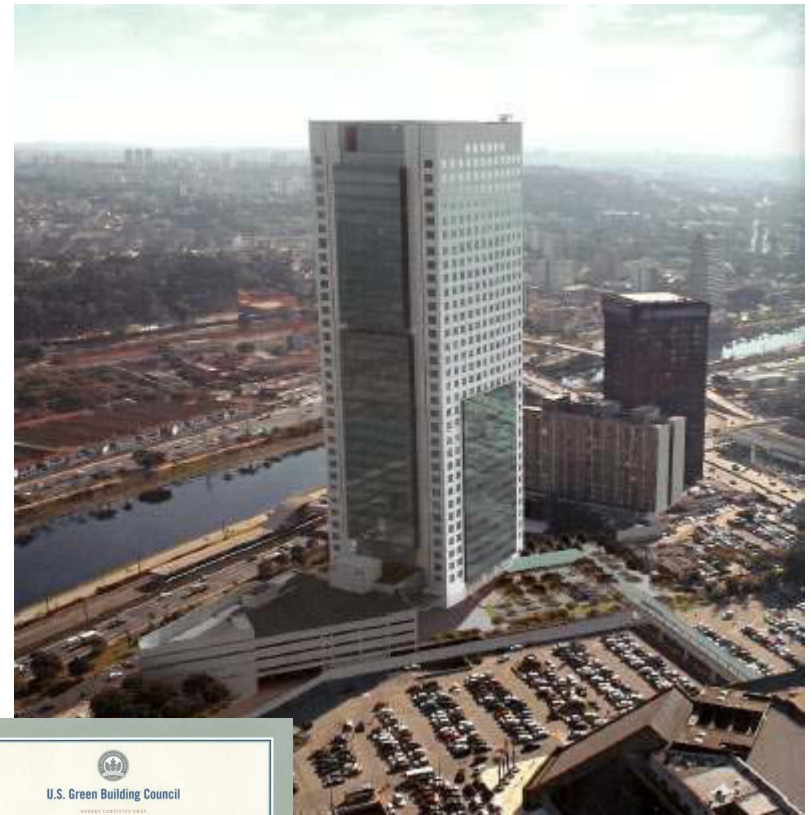
- Location : Sao Paulo, Brazil.
- Office building
- Height : 33F + B3
- Total Floor area : 728,178 ft²
- Typical floor area: 17,222 ft²
- Completion : 2007

Outdoor units : 66

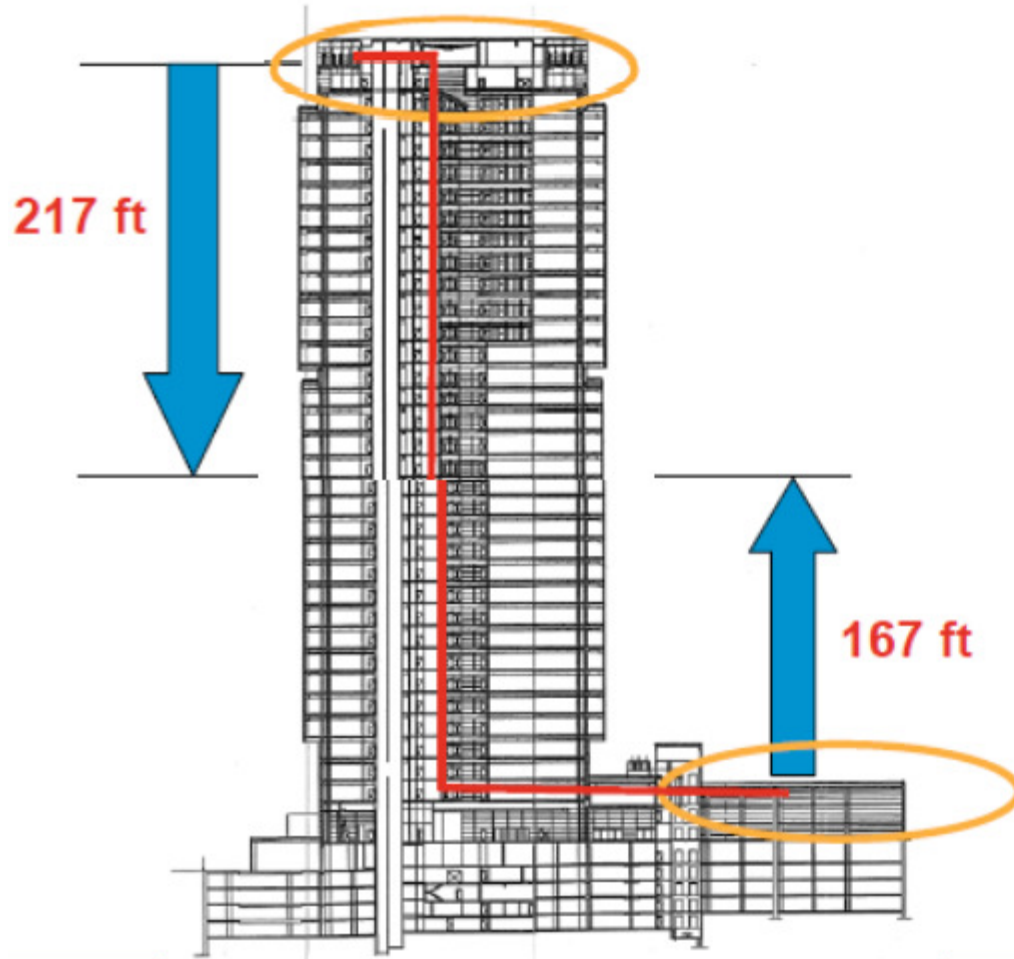
Indoor units: 968

Total Capacity 3,516HP (2,715 TR)

LEED “Platinum”



Brasil



Upper Roof

1454 Tons



Lower Roof

1259 Tons



Brasil

Estádio do Maracanã (Renewal 1st phase)

Rio de Janeiro, Brazil



Completion : 2014
Location: Rio de Janeiro, Brazil
Application: Stadium

Air-conditioner: VRVIII All inverter
Total capacity: 2,232HP
Total outdoor unit's q'ty: 159

Remark: **Main stadium of
2014 World Cup**

Outdoor unit

Model name	Qty
RHXYQ16SYL	104
RHXYQ14SYL	12
RHXYQ12SYL	8
RHXYQ10SYL	12
RHXYQ8SYL	23
Total	159

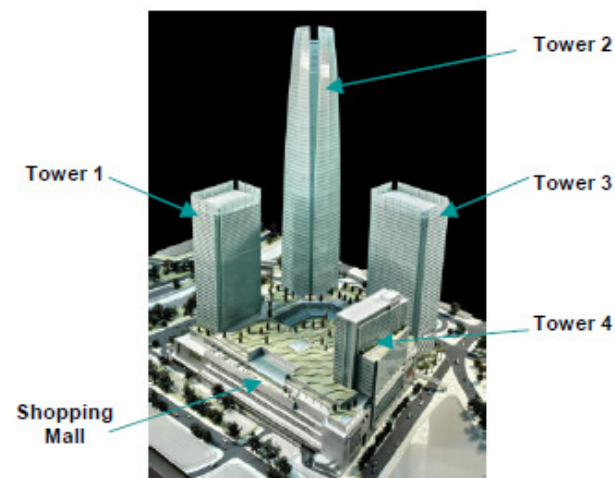
Indoor unit

Model name	Qty
FXMQ200MAVE	137
FXMQ140PVE	9
FXMQ100PVE	1
FXMQ125PVE	187
Total	334

Chile

Costanera Center

Santiago, Chile



Name of building	Floor number	Application	Air-conditioning	Ventilation	Completion
Shopping Mall	7	Shopping mall	Centrifugal chiller + Absorption chiller (Total 12,105RT)	Unknown	2012-6
Tower 4	28	Office + Hotel (4 stars)	Air cooled & Water cooled VRV ^{III} (2,150HP) + i-Touch-Manager	Ventilation fan	Office: 2013-1 Hotel: Beginning of 2014
Tower 2	64	Office	Water cooled VRV ^{III} (6,280HP) + i-Touch-Manager	Ventilation fan	End of 2014
Tower 1	50	Office + Hotel (5 stars)	VRV (Under the design)	Unknown	Pre-construction
Tower 3	50	Office	VRV (Under the design)	Unknown	Pre-construction

Honduras

- Project: **Rectoria de la Universidad Autónoma de Honduras**
- Application : University
- Location: Tegucigalpa
- Area: 30,000 m²
- Completion: 2015
- Equipment:
 - VRV-IV Outdoor units: 70
 - Indoor units: 147
 - Total capacity: 850 TR



Honduras

- Project: **Centro de Convenciones Hotel Copantl**
- Application : Convention Center
- Location: San Pedro Sula
- Technology: VRV Heat Pump , DCC & MPS Package Units (220 tons)
- Completion: 2015
- Equipment:
 - VRV-IV Outdoor units: 12
 - Indoor units: 40
 - Total capacity: 120 TR



Colombia

- > Project: **Edificio Revista Semana**
- > Application : Office Building
- > Location: Bogota
- > Technology: VRV-III Heat Pump
- > Startup: Oct 2014
- > Area: 12,000 m²
- > System Type
 - VRV Outdoor: 42
 - Capacity: 418TR



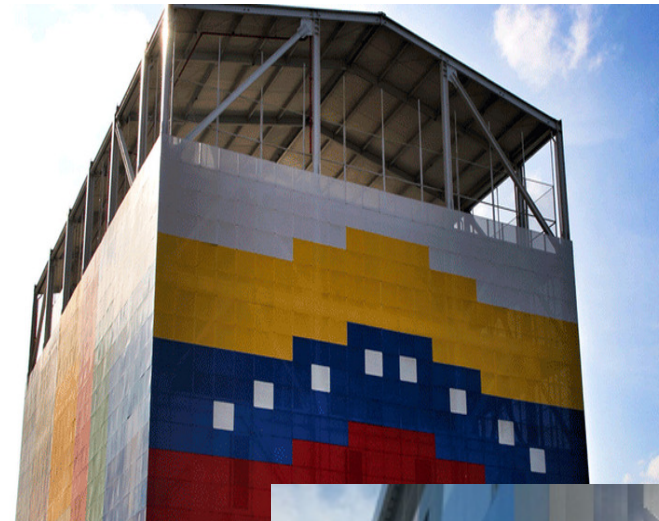
Colombia

- > Project: **Irotama Reservado Hotel**
- > Application : Hotel
- > Location: Santamarta
- > Technology: VRV-III Heat Pump
- > Startup: Feb 2016
- > Area: 22,814 m²
- > System Type
 - VRV Outdoor: 147
 - Capacity: 700TR



Venezuela

- > Project: **Gimnasios Codepaz**
- > Application : Fitness center
- > Location: Different locations around Venezuela
- > Technology: VRV-III Heat Pump
- > Startup: 2015
- > System Type
 - VRV Outdoor: 120
 - Indoor units: 600
 - Capacity: 1585TR (20 Gyms)



Venezuela

- > Project: **Hotel Gran Condor Suites**
- > Application : Hotel
- > Location: Puerto La Cruz
- > Technology: VRV-IV Heat Pump
- > Startup: 2015
- > System Type
 - VRV Outdoor: 34
 - Indoor units: 80
 - Capacity: 360TR



Costa Rica

Project: Valle de Tamarindo

Application: Residential / Apartments

Capacity: 300TR

System: VRV Heat Pump



Costa Rica

Project: Banco Nacional Oficinas Centrales

Application: Commercial

Capacity: 300TR

System: VRV Heat Pump



Curacao

Project: Vida Nova

Application: Commercial

Capacity: 28 TR

System: VRV Heat Pump



Nicaragua

- Project: **Olof Palme**
- Application : Convention Center & Hotel
- Location: Managua, Nicaragua
- Technology: VRV-IV (Heat Pump)
- Completion: 2015
- Equipment:
 - VRV Outdoor units: 32
 - Indoor units: 102
 - Total capacity: 360 TR



Dominican Republic

- Project: **Torre Diagonale**
- Application : Residential - Apartments
- Location: Santo Domingo
- Technology: VRV-III (Heat Pump)
- Completion: 2015
- Equipment:
 - VRV Outdoor units: 32
 - Indoor units: 182
 - Total capacity: 350TR



Dominican Republic

- Project: **INCARNA**
- Application : Food Industry Manufacturing
- Location: Santo Domingo
- Technology: VRV-III (Heat Pump)
- Completion: 2015
- Equipment:
 - VRV Outdoor units: 10
 - Indoor units: 56
 - Total capacity: 105TR



Jamaica

Project: Verizon International

Application: Commercial Building

Capacity: 38TR

System: VRV-III Heat Pump



Trinidad

Project: TGA

Application: Commercial

Capacity: 21TR

System: VRV Heat Pump



Trinidad

Project: Mohamed residence

Application: Residential

Capacity: 46TR

System: VRV Heat Pump



TEMPLO ASPERSUD - TRUJILLO

Project Name : Iglesia de Jesucristo de los Santos de los Ultimos Dias

Owner: Aspersud

Location : Trujillo, Peru

Application : Housing and Temple

Completion : 2014

AC system : VRV-HR (282 TON)



Peru

ESAN GRADUATE SCHOOL OF BUSINESS

Project Name : Edificio C – Data Center

Owner: ESAN

Location : Lima, Peru

Application : Higher Education

Completion : 2014

AC system : VRV (162 TON)



TIENDAS H&M – JOCKEY PLAZA & MEGA PLAZA

Project Name : Tiendas H&M

Owner: H&M

Location : Lima, Peru

Application : Stores

Completion : 2014 - 2015

AC system : VRV (42 TON)



Ecuador

Project: Universidad FLACSO

**Application: University Offices,
Auditorium, Classrooms**

Capacity: 160TR

System: VRV Heat Pump
Outdoor units: 28
Indoor units: 143



Ecuador

- Project: **Sheraton Suites**
- Application : Hotel Rooms
- Location: Quito
- Equipment:
 - VRV Outdoor units: 5
 - Indoor units: 50
 - Total capacity: 42 TR



Ecuador

- Project: **Hotel Holiday Inn Express**
- Application : Hotel Rooms
- Location: Quito
- Equipment:
 - VRV Outdoor units: 7
 - Indoor units: 153
 - Total capacity: 140 TR



Ecuador

- Project: Hospital de los Valles
- Application : Rooms
- Location: Quito
- Equipment:
 - VRV Outdoor units: 11
 - Indoor units: 94
 - Total capacity: 65 TR



Questions?

