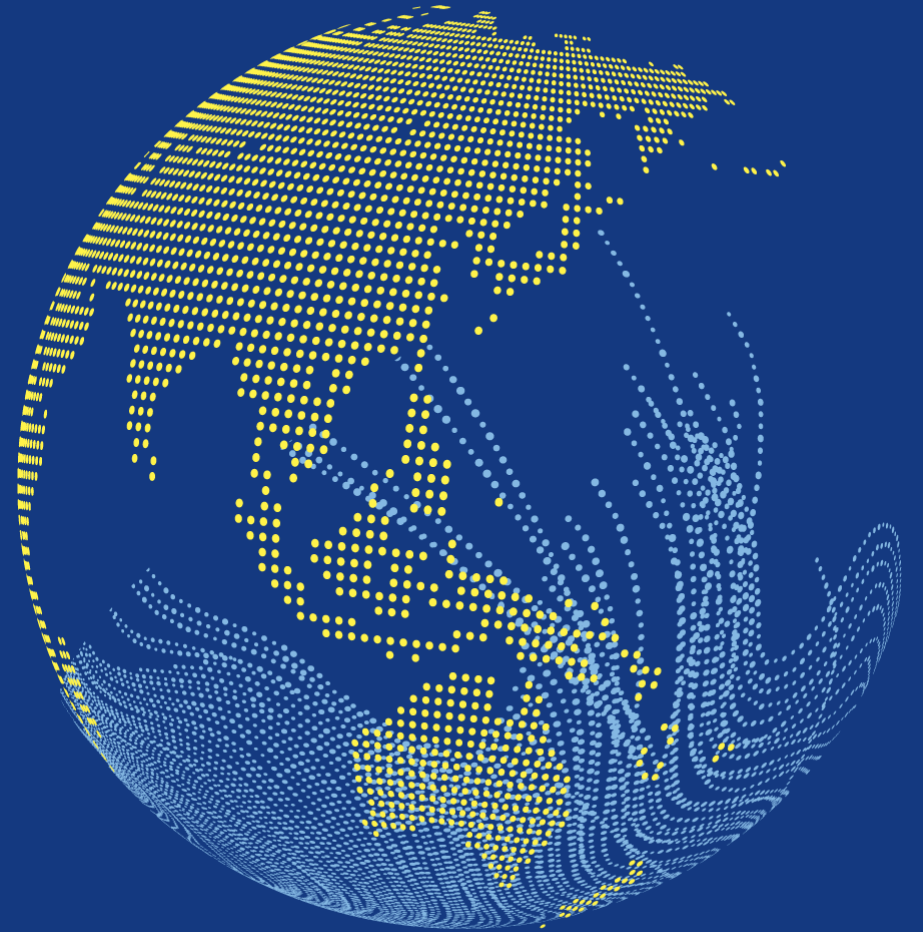




Business Case for
Natural Refrigerants



12/02/2019

TOKYO



Enhance Your Choices with Natural Refrigerants

Makoto Ehara



#GoNatRefs

1. How to choose natural refrigerant equipment (1/2)

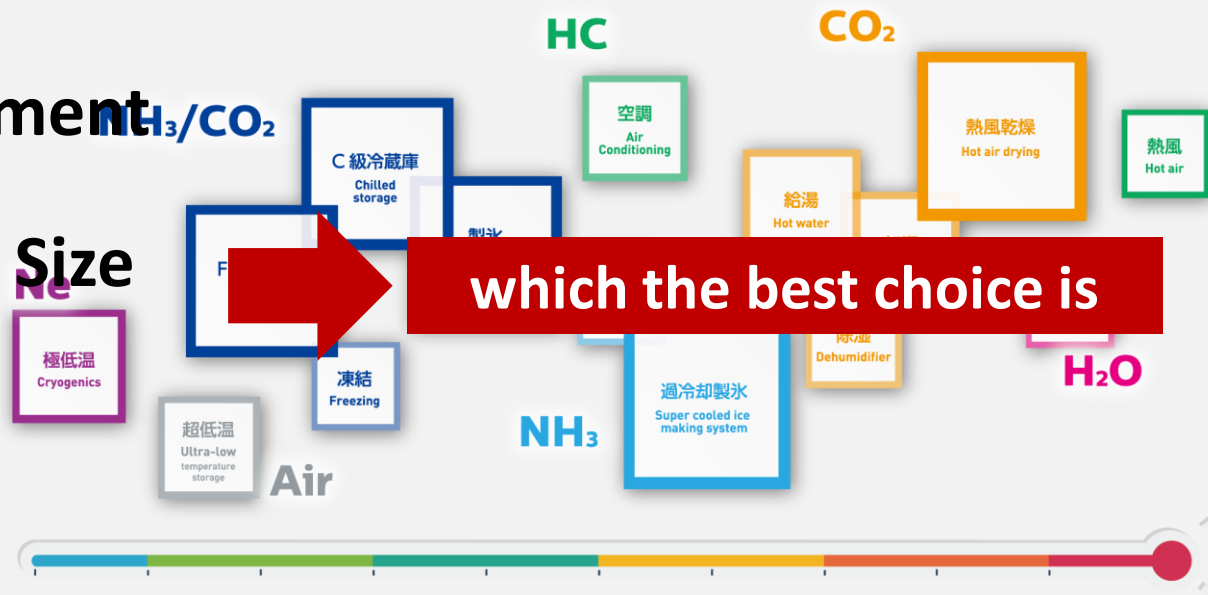
Temperature required

Usage environment

Applications & Size

Initial cost

Running cost...



1. How to choose natural refrigerant equipment (2/2)

**Energy
Saving**

Reducing GHG Emission

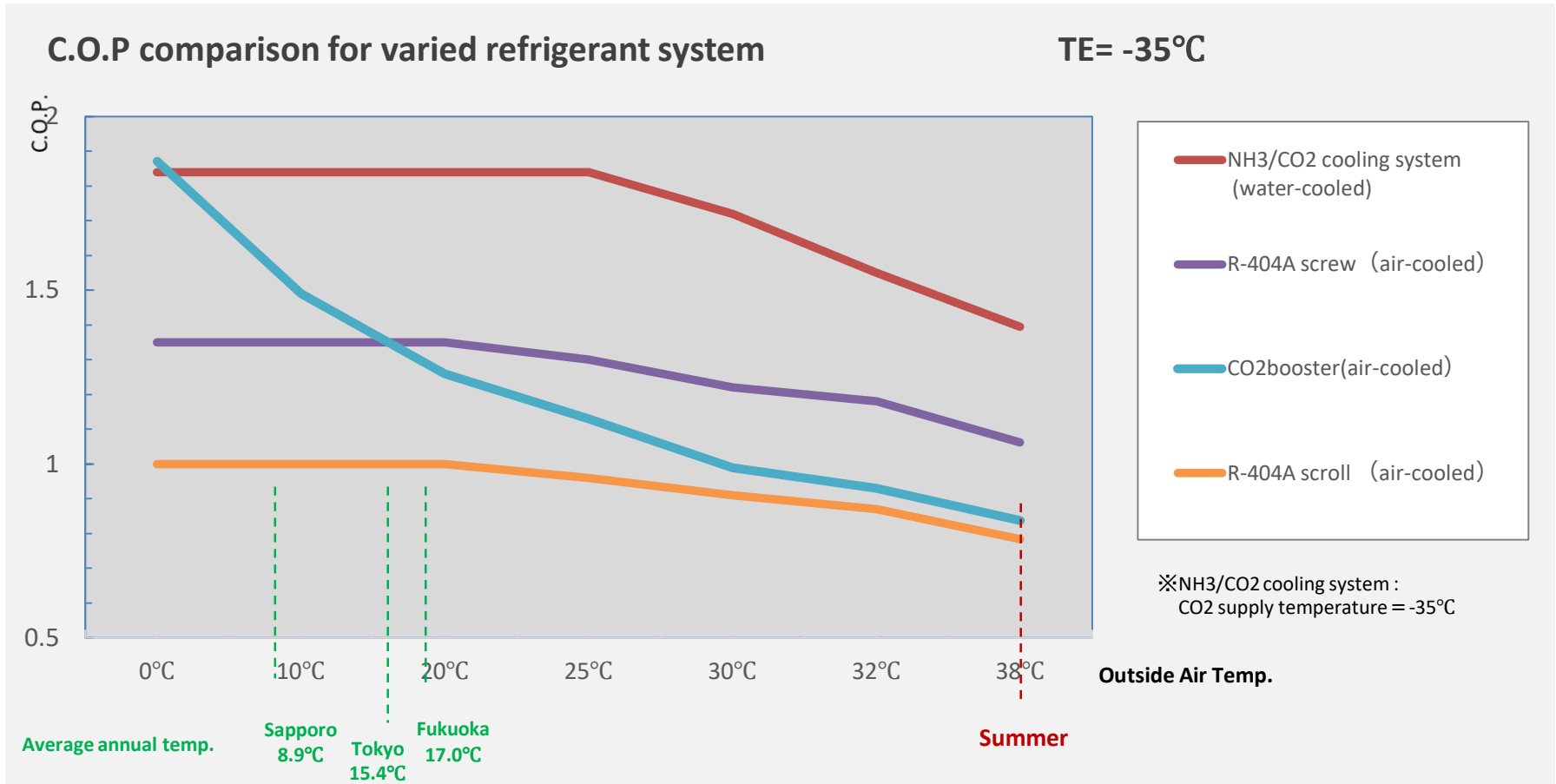
+ Fluorocarbon Free

Natural refrigerant



Stop Climate change

2. Optimum refrigerant for Cold Storage (1/2)



2. Optimum refrigerant for Cold Storage (2/2)

Comparison of electricity cost

Location: Tokyo

1000ton class

(Refrigeration capacity 26.7kW)

Annual electricity costs
(Yen/Year)

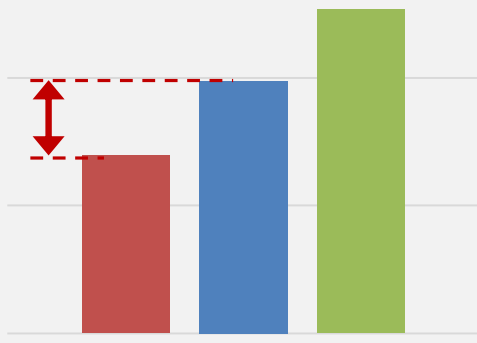
3,000,000

2,000,000

1,000,000

0

About **0.6** million JPY



20,000ton class

(Refrigeration capacity 533kW)

60,000,000

50,000,000

40,000,000

30,000,000

20,000,000

10,000,000

0

Over **10** million JPY

■ NH3/CO2 cooling system (water-cooled) ■ CO2booster (air-cooled) ■ R-404A scroll (air-cooled)

※ Operation time :17 hr/day

Electricity Rate :15JPY/kWh



our mission

Energy Saving

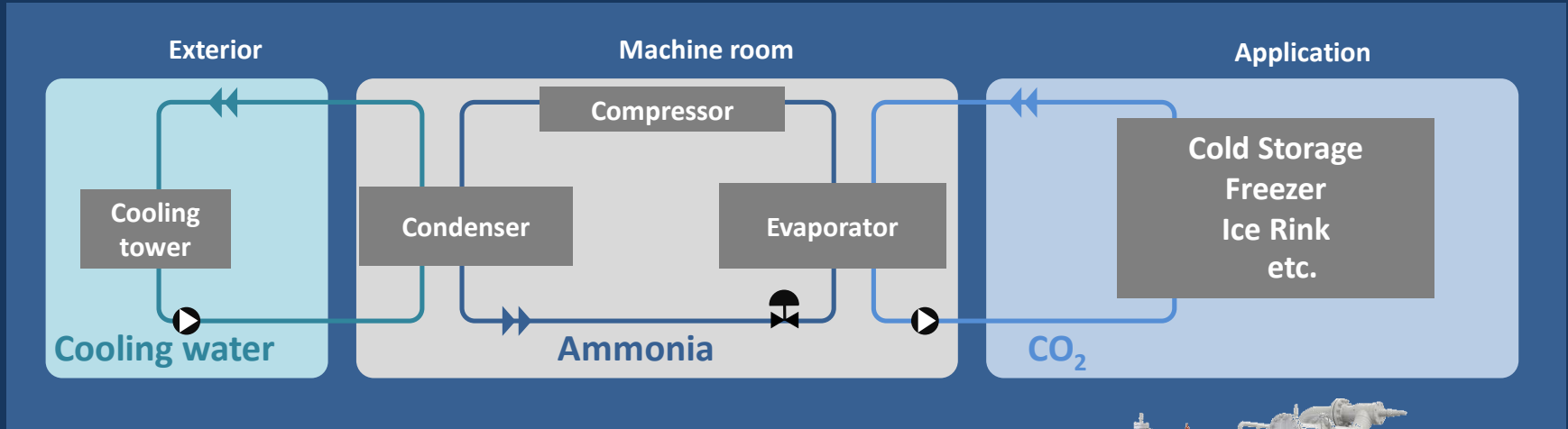
Fluorocarbon Free

+ High Value added

3. NH₃/CO₂ Cooling System “NewTon” (1/6)

NH₃/CO₂

NewTon



3. NH₃/CO₂ Cooling System “NewTon” (2/6)

Cold Storage

Electricity reduction

around **50%**

in the overall cooling system

NewTon’s share

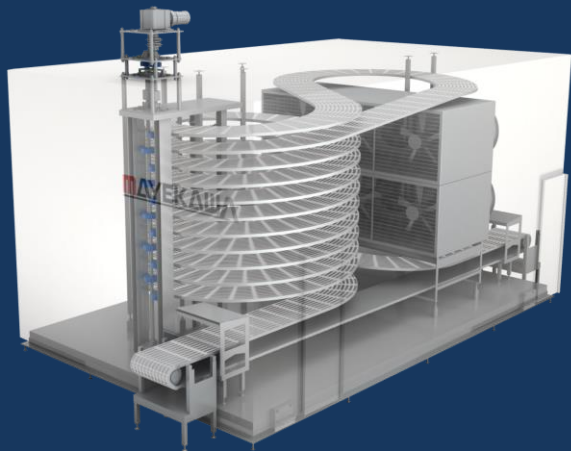
around **30%**

on industrial cold storage
market in Japan

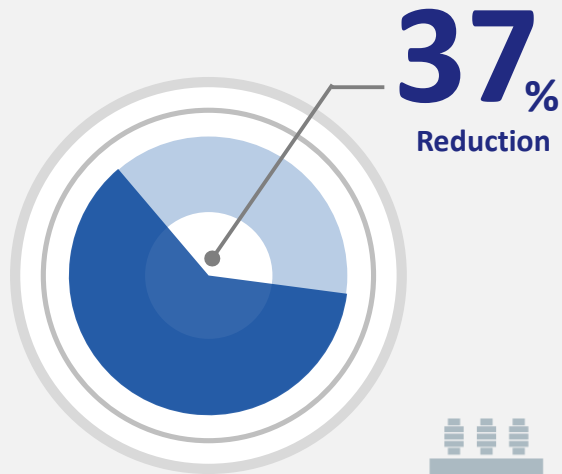


3. NH₃/CO₂ Cooling System “NewTon + Freezer” (3/6)

Freezer

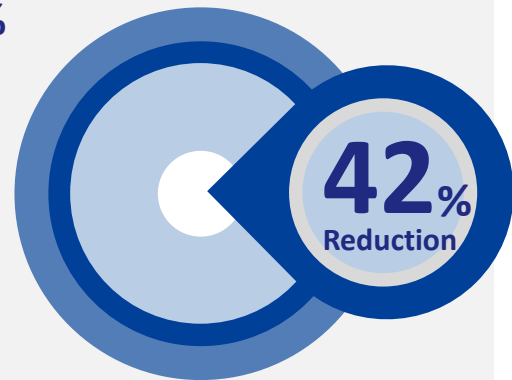


Annual power consumption



We replaced Air-cooled R 404A refrigeration equipment with NewTon F-600

Peak power consumption



We replaced Air-cooled R 404A refrigeration equipment with 4sets of NewTon



Electric power consumption

3. NH₃/CO₂ Cooling System “NewTon”(4/6)

Freezing

33%

of frozen food production
in Japan



Natural refrigerant replacement into various fields



◆ Cold traps of Freeze drying process

30-60%

energy saving



◆ Ice stick hardening process

※ Secondary refrigerant: Calcium Chloride brine

20%

energy saving



◆ Ice arena

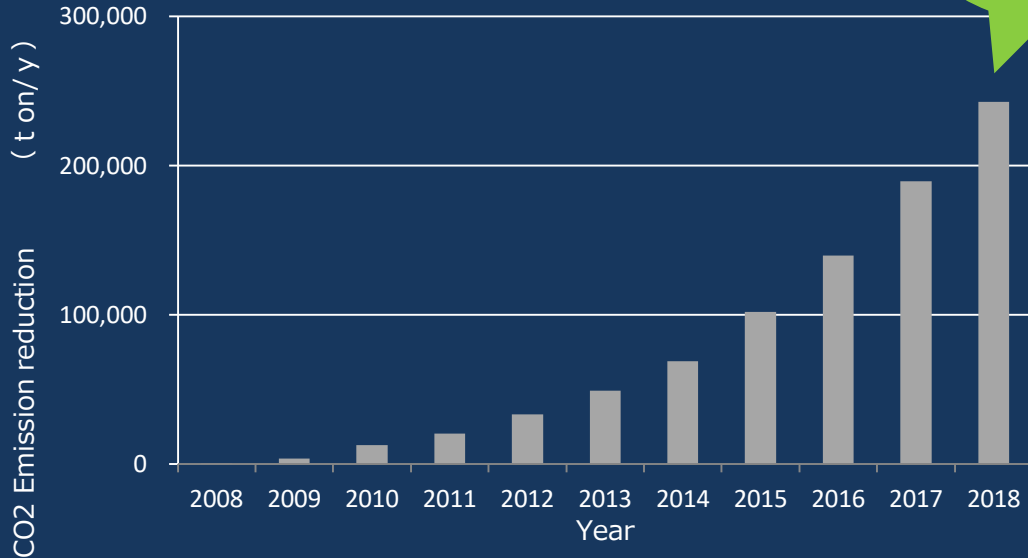
50%

energy saving

3. NH₃/CO₂ Cooling System “NewTon” (6/6)

Reducing CO₂ Emissions by NewTon

Installation :1840 sets as of Dec.,2018



242,400
t-CO₂/y
in year2018

Cumulative CO₂ emissions

862,000 t-CO₂

*in comparison with the use of R404A
Operation time
Cold Storage : 5000hr/year
Freezer : 10hr/day , 300days operation

4. Air Cycle Refrigeration System (1/2)

Air

Cold storage for fish
Blast freezing for meat & other food products
Cryogenic recycling
Semiconductors
Medical and chemical industry

Air Refrigerant

GWP=0

No Cooler

-100 °C

PascalAir



4. Air Cycle Refrigeration System (1/2)

Reducing CO₂ Emissions
by Pascal Air

Installation : 86sets as of Feb.,2018

In 2018

5,290 t-CO₂/y

Cumulative CO₂ emissions

18,000 t-CO₂



5. Slurry Ice System "SLEET" (1/2)



Dairy · Beverages

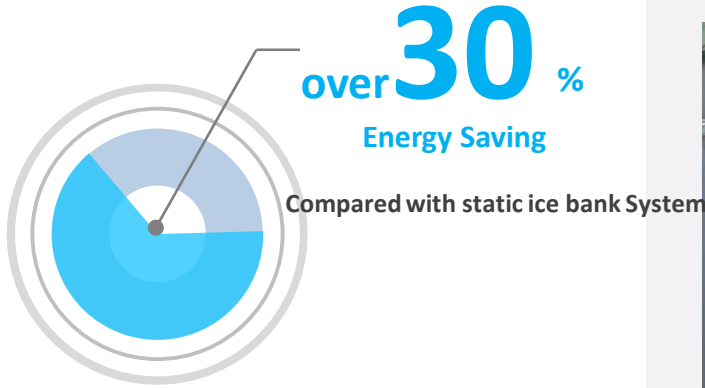
Ammonia refrigerant

Slurry ice thermal storage

Respond to load fluctuations



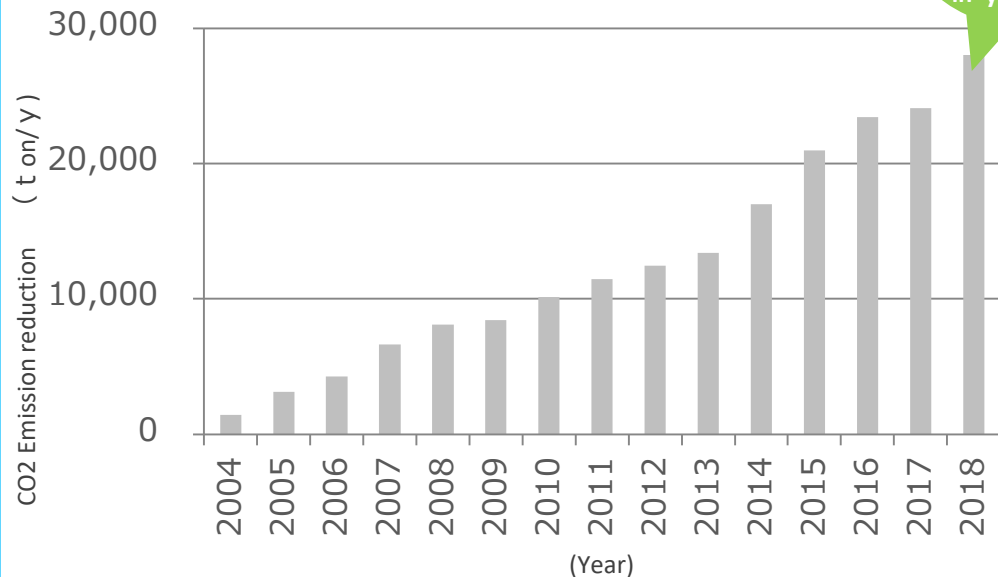
Supply closed to 0°C chilled water



5. Slurry Ice System “SLEET” (2/2)

Reduction of CO₂ Emissions by “SLEET”

Installation : 96sets in Japan (as of 2018.02)



28,000
t-CO₂/y
in year 2018

Cumulative CO₂ emissions

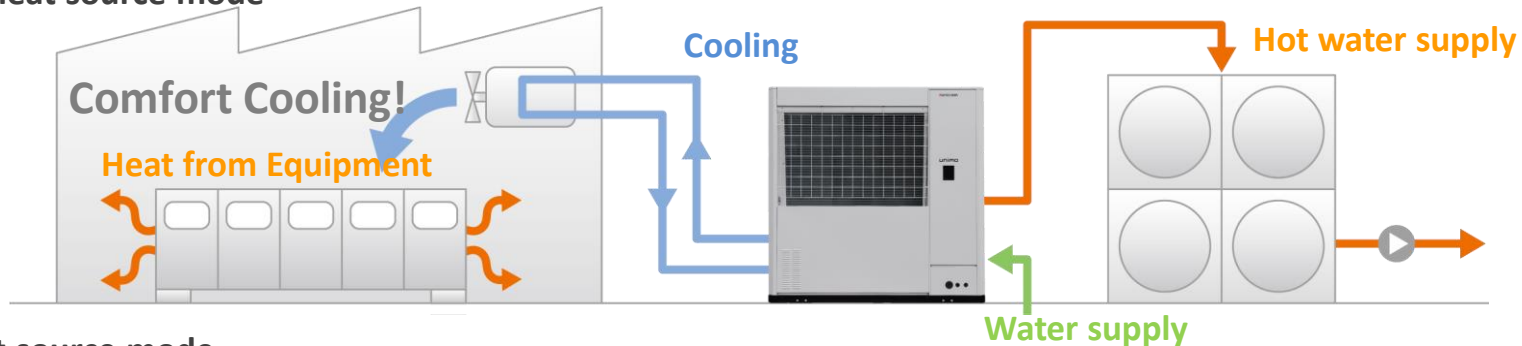
193,000t-CO₂
in Japan

Total Capacity :8400USRT

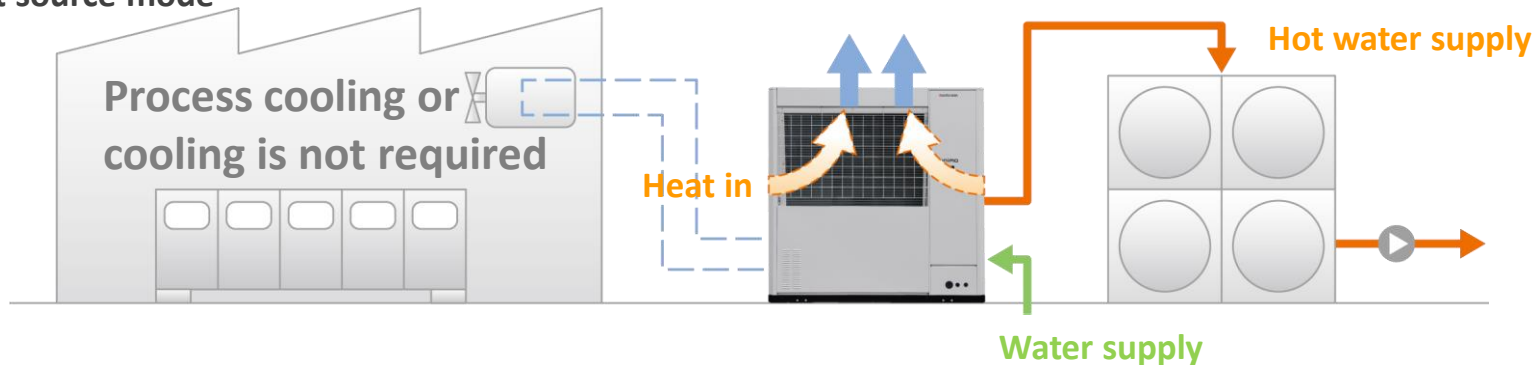
*Operating time :18h/day

CO₂ Heat Pump (Air and water source)

◆ Water heat source mode



◆ Air heat source mode



Reducing CO₂ Emissions by CO₂ heat pump

unimo



WW



AWW



AW



EcoSirocco

Installation : 1062sets as of 2018.02

In 2018

40,120 t-CO₂/y

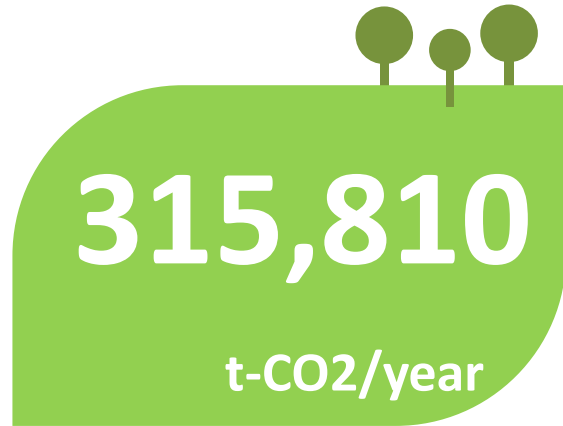
Cumulative CO₂ emissions

250,800 t-CO₂

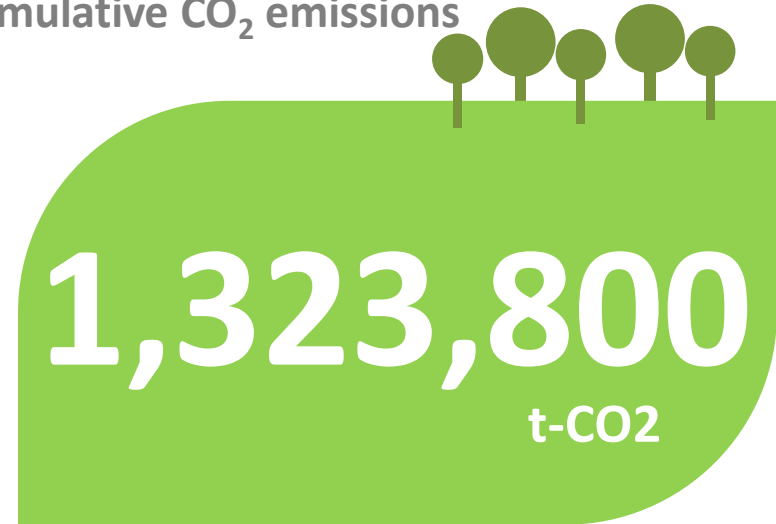
※Compared with industrial steam equipment and chiller (COP = 5)

CO2 emissions reduced by Mayekawa natural refrigerant equipment *

In 2018



Cumulative CO₂ emissions



※ NewTon, PascalAir, Sleet, CO2 heat pumps



Business Case for
Natural Refrigerants

**Thank you
for listening.**

