



Introduction of Panasonic New CO₂ refrigeration system (Technical Part)

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AGENDA

Number of stores installing Panasonic CO₂ refrigeration system in Japan and future prospect

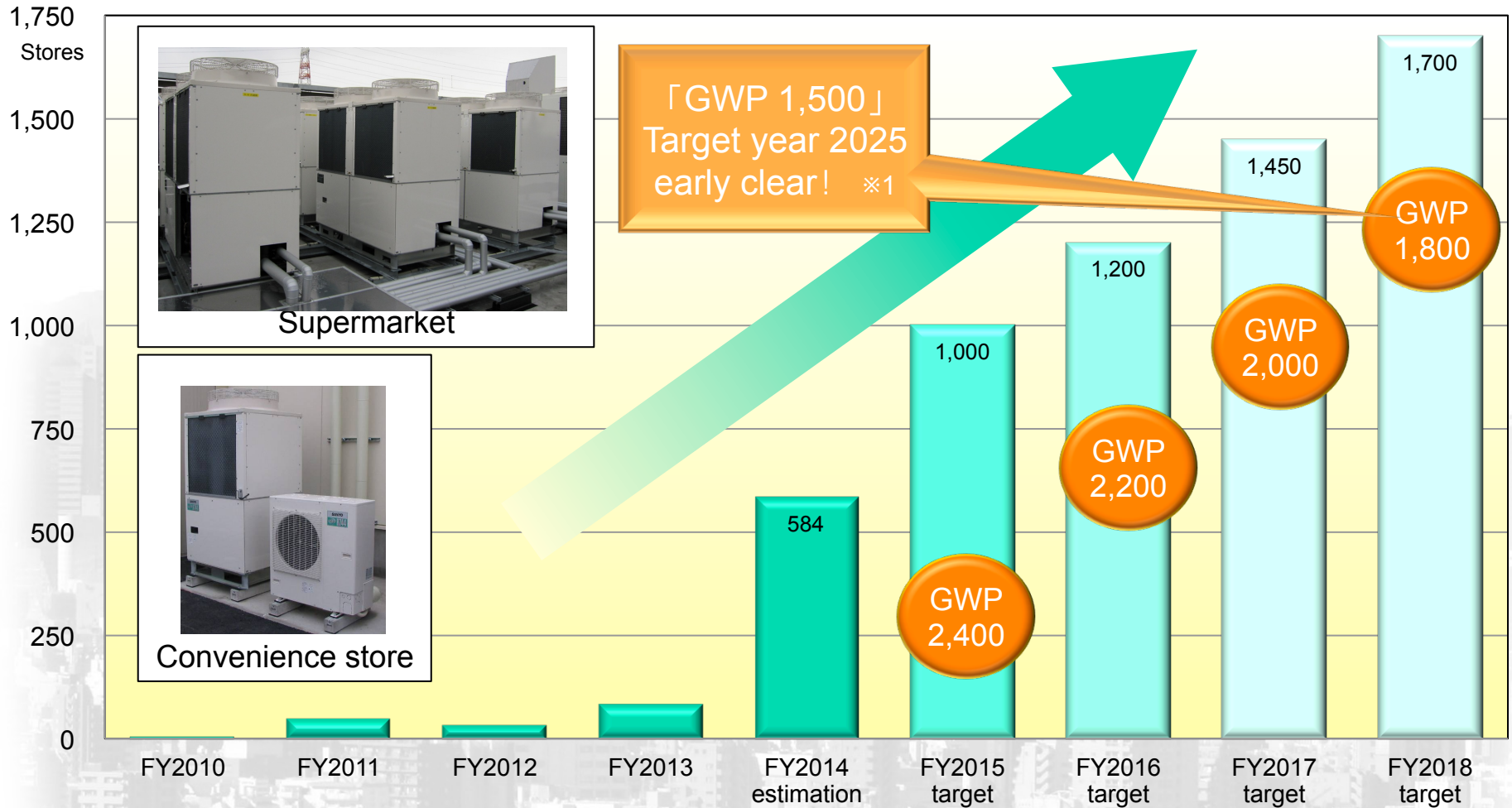
Solutions

Energy saving confirmation results

Issues of CO₂ units and our Future Action

Number of stores installing Panasonic CO₂ refrigeration system in Japan and future prospect

#2

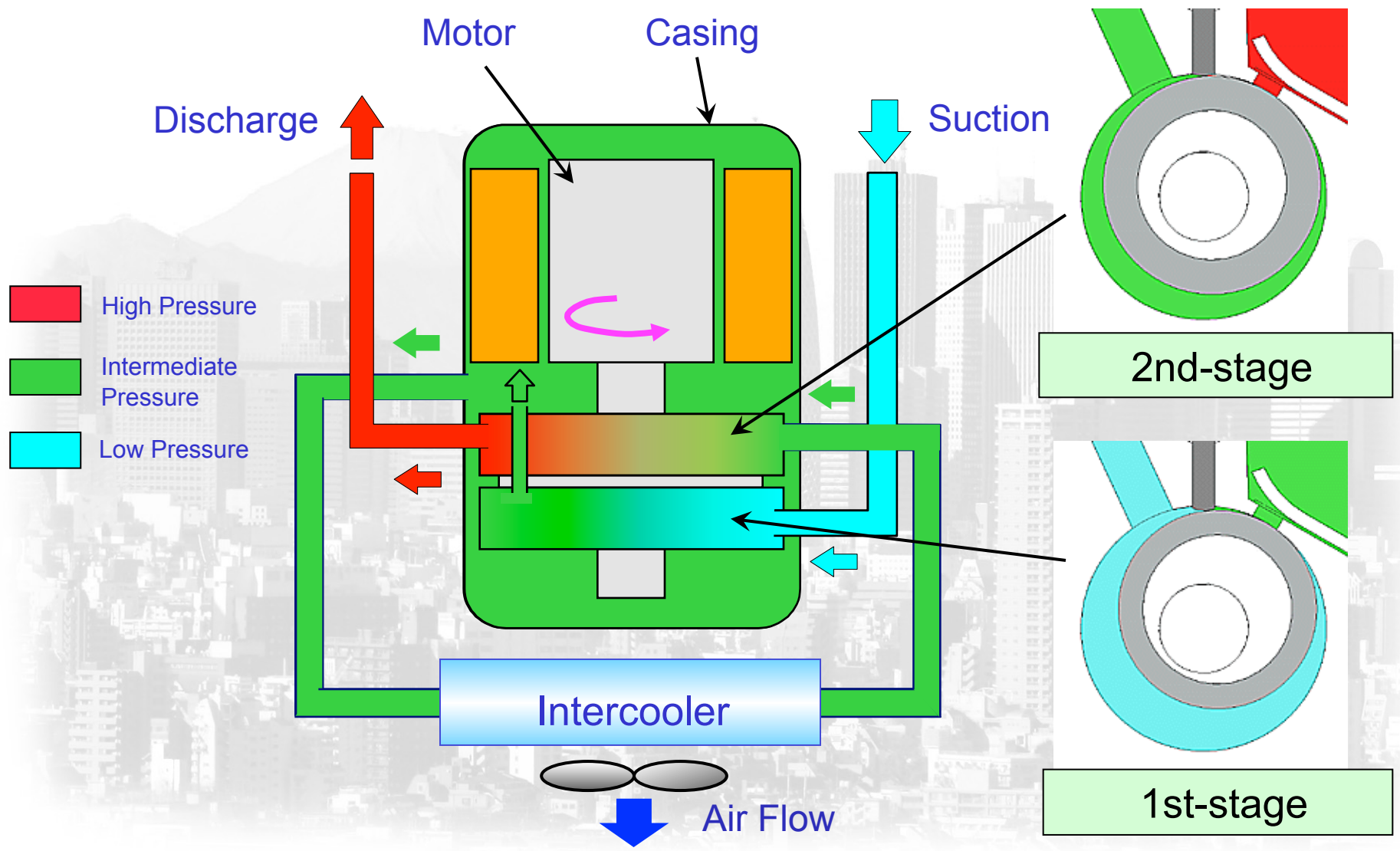


※1 Numerical value of a GWP (1,500) and accomplishment year (2025) target established in a law by the Japanese Government

Solutions

- Development of Compressor
- Development of Split system
- **New technology**
- Development of Pressure adjust control

Structure of 2-stages compression CO2 rotary compressor



Issues and solutions of CO2 compressor

Efficiency

Pressure difference reduction at 2-stages

Refrigerant leakage reduction

Compression efficiency improvement

Weight and Cost

Casing design pressure is Intermediate pressure

Weight saving of the Casing

Cost reduction

Reliability

Vibration and Noise

Distribution of compression torque

Load reduction to the sliding parts

Reliability improvement
Vibration and Noise reduction

Reliability

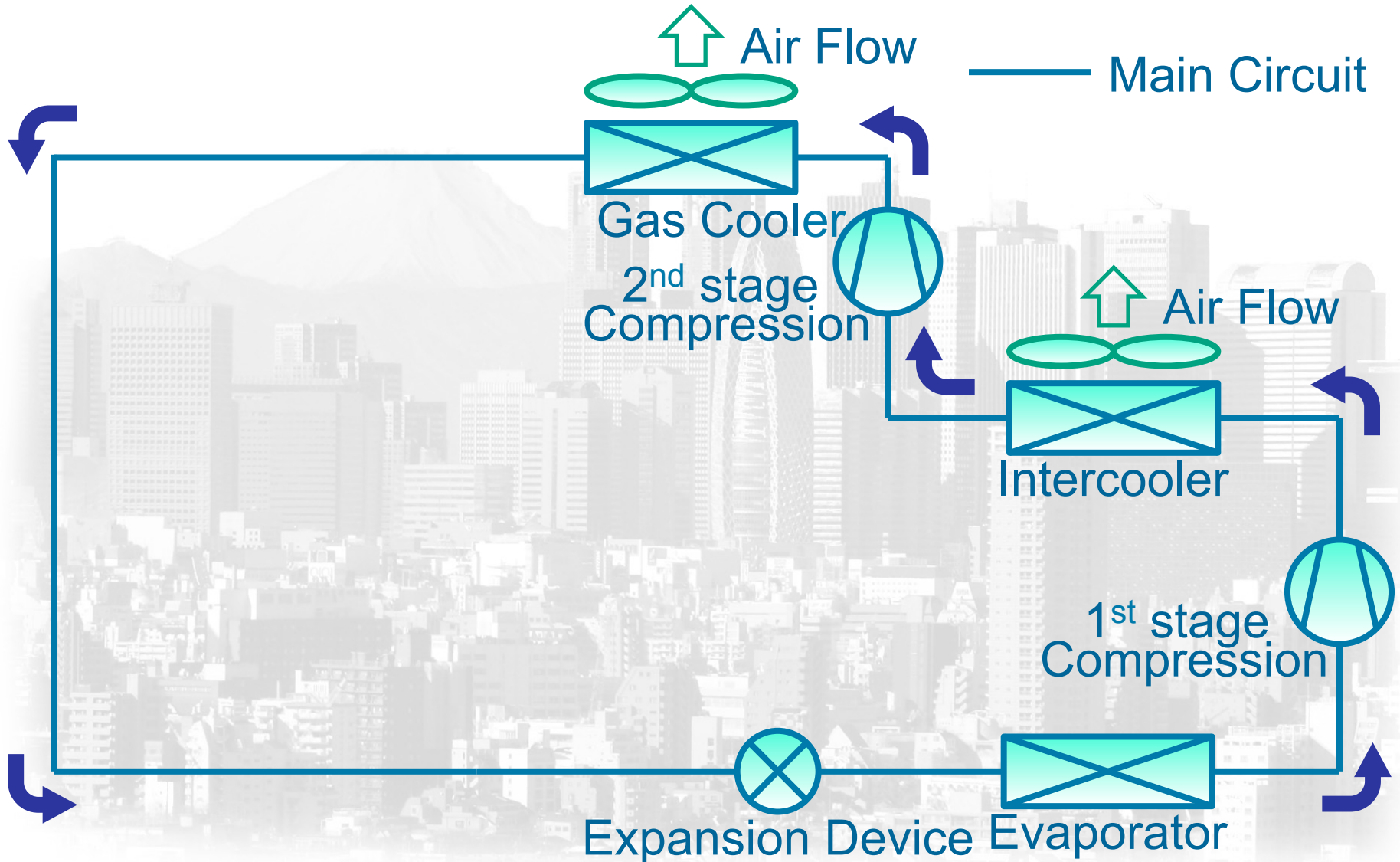
Efficiency

Discharge gas is cooled by the intercooler

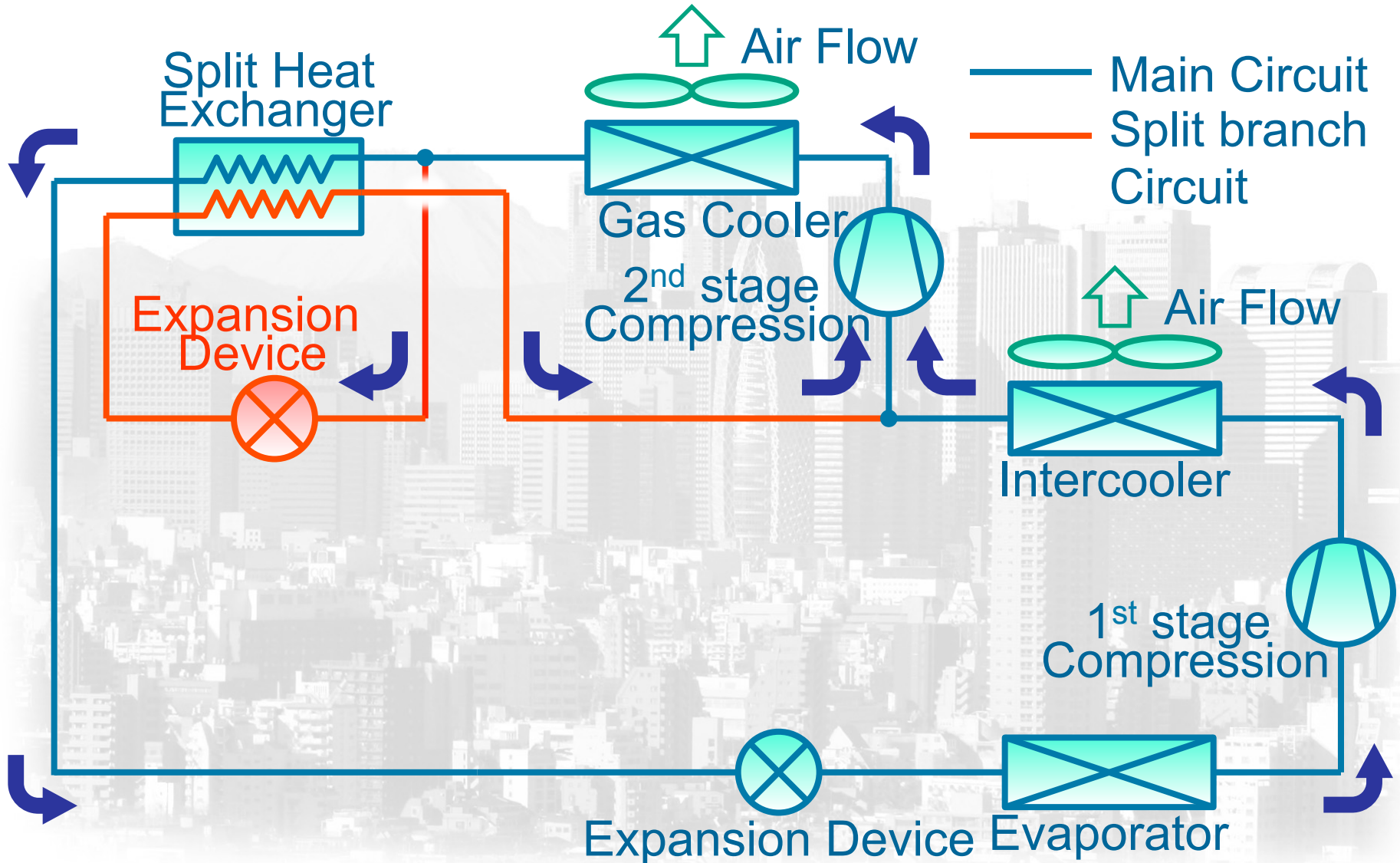
Temperature of the sliding parts and the oil is reduced

Reliability and Efficiency improvement

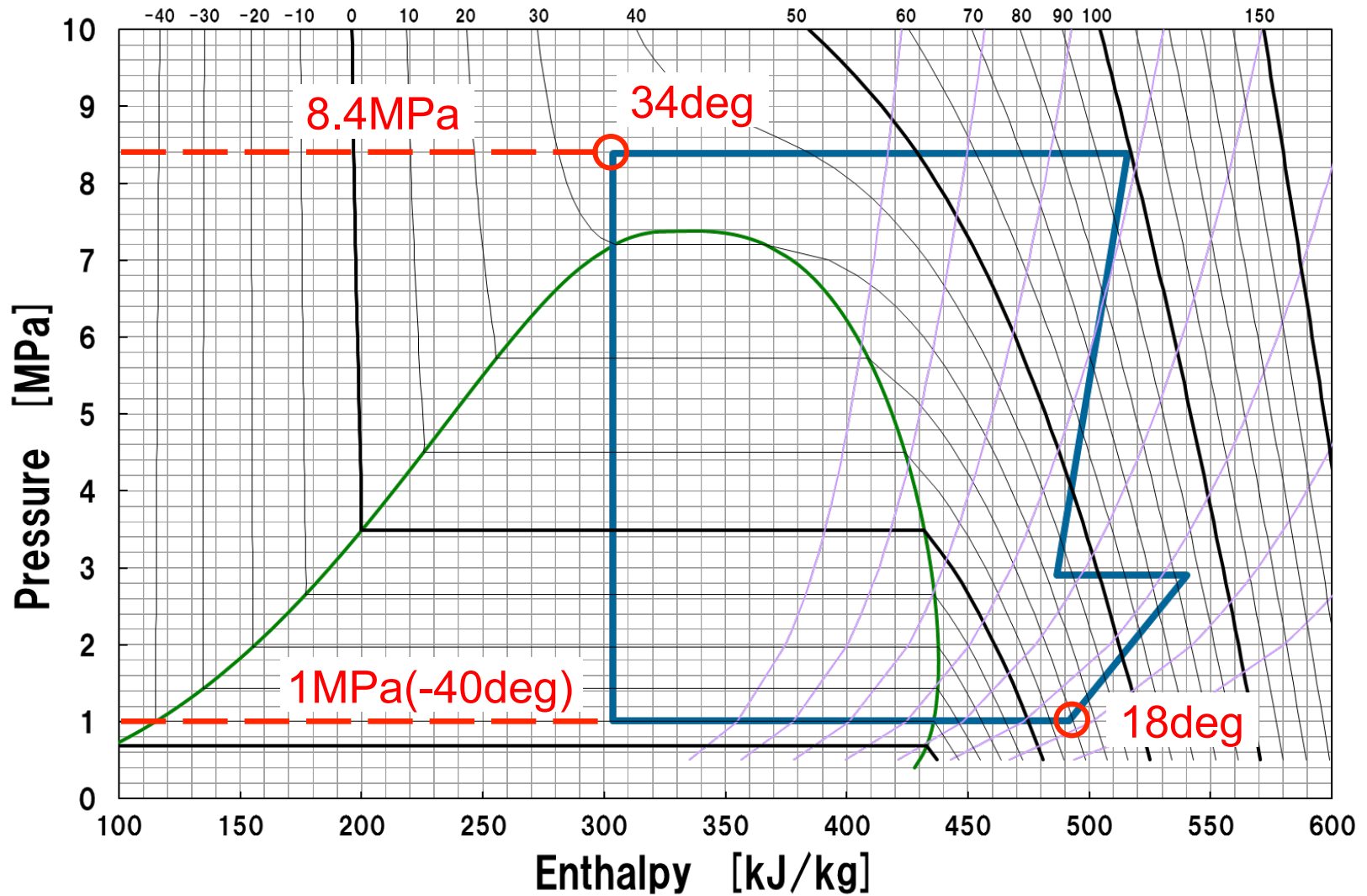
Refrigeration circuit of 2-stage compression



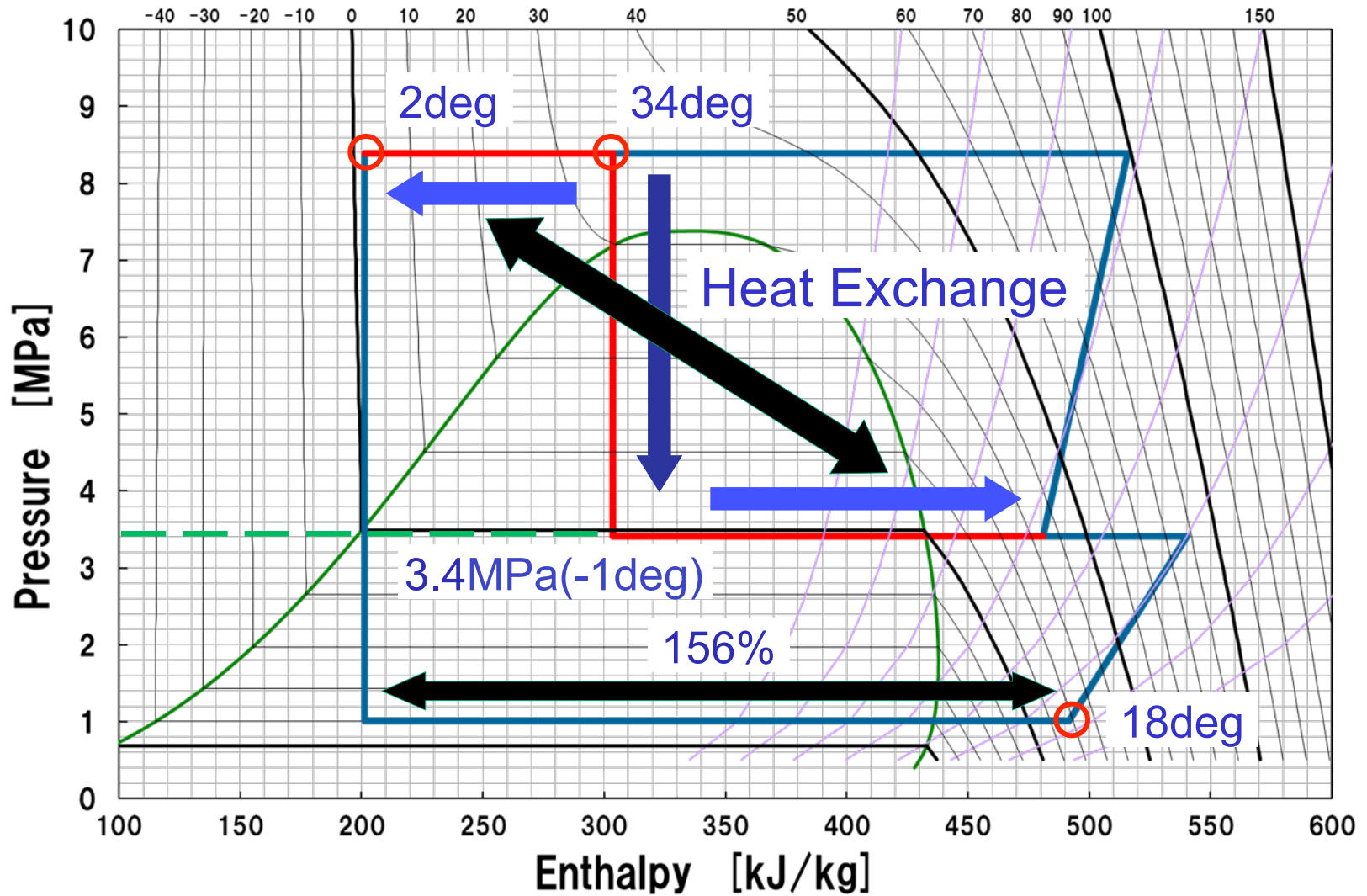
Refrigeration circuit of Split System



Ph diagram of 2-stage compression



Ph diagram of Split System



Solutions

- Development of Compressor
- Development of Split system

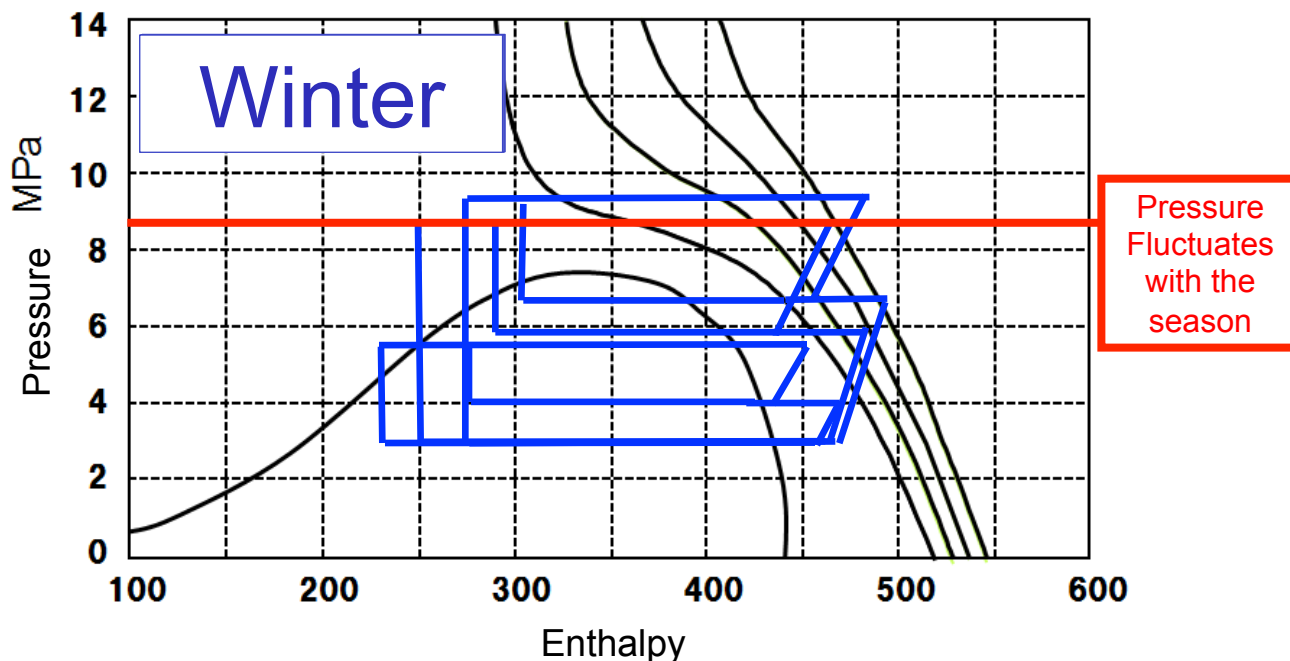
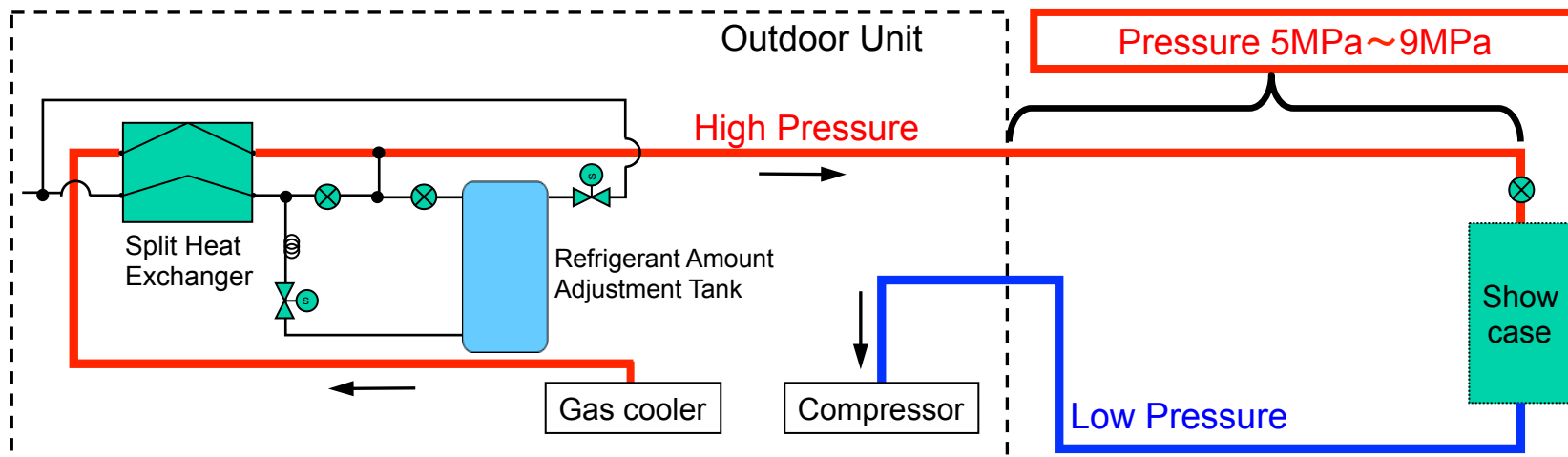
New technology

- Development of Pressure adjust control

Solutions -Development of Pressure adjust control

#11

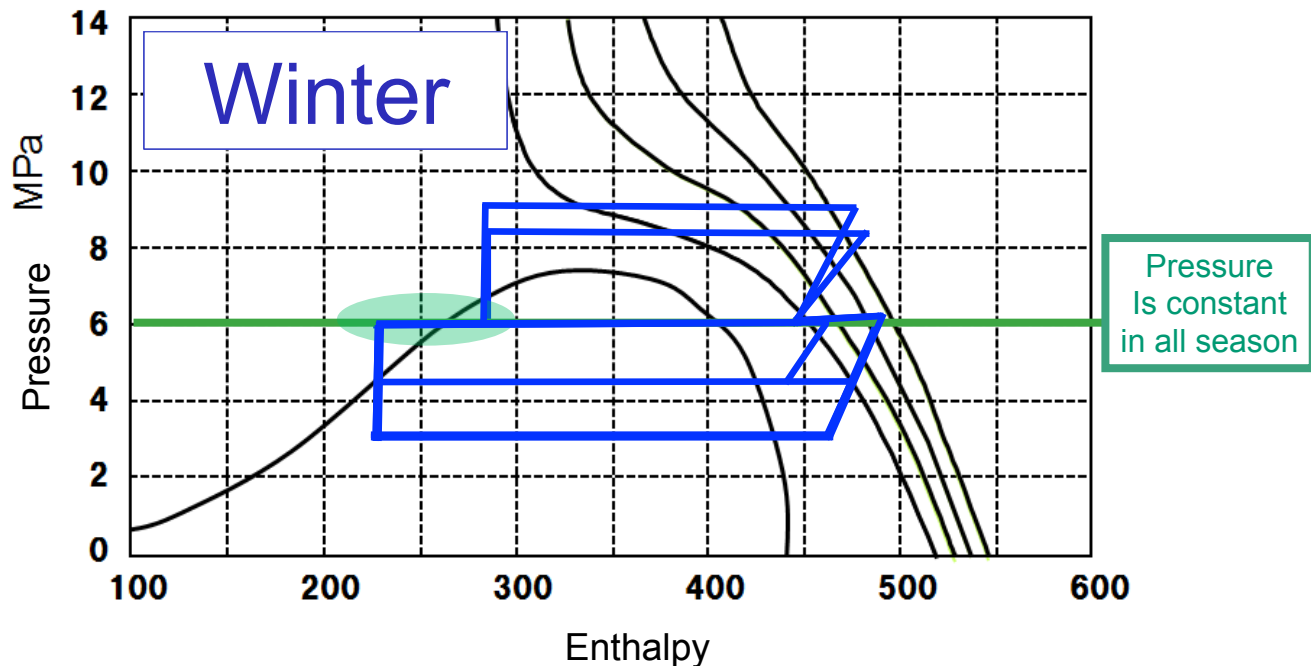
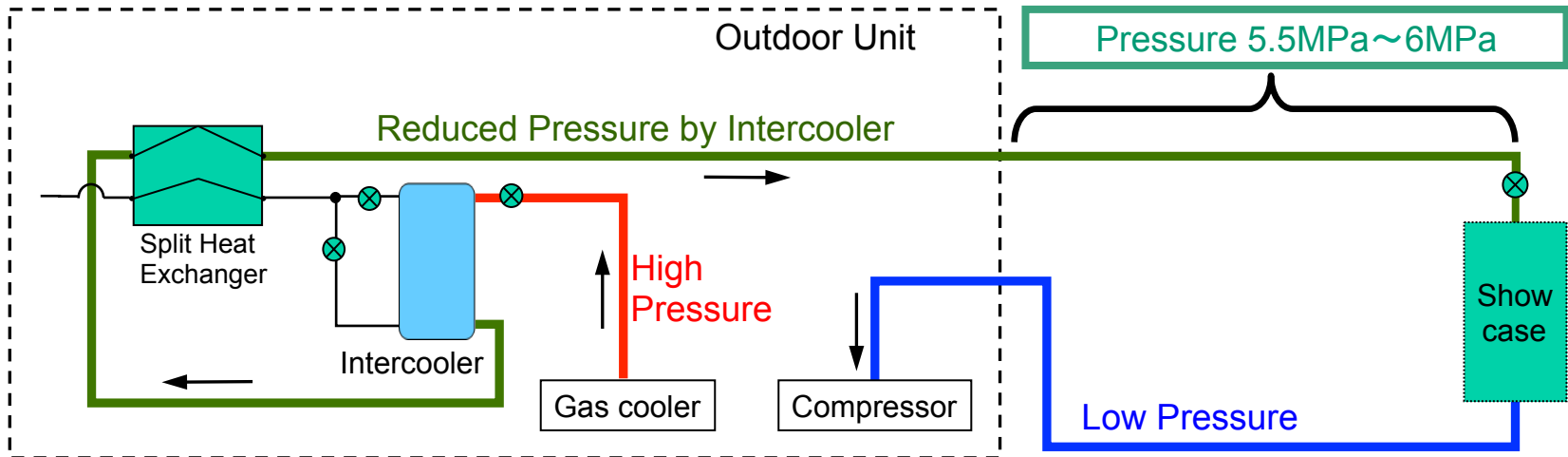
Annual operating pressure behavior of Present model



Solutions -Development of Pressure adjust control

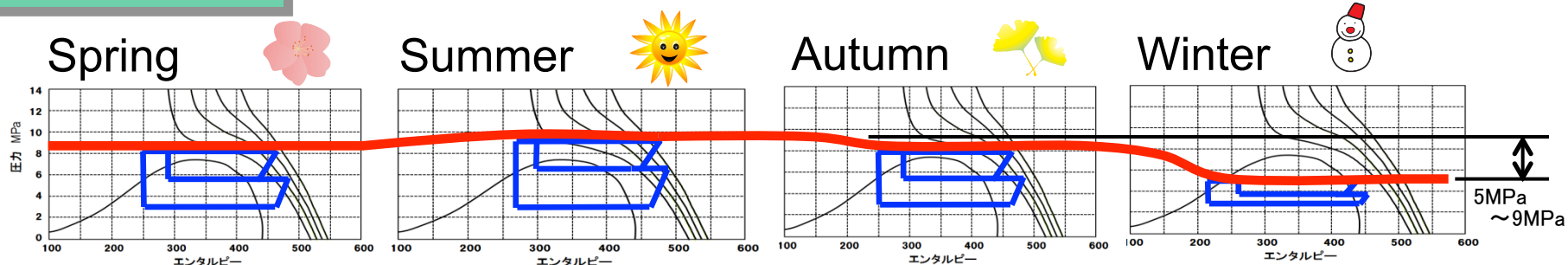
#12

Annual operating pressure behavior of Pressure adjust control type



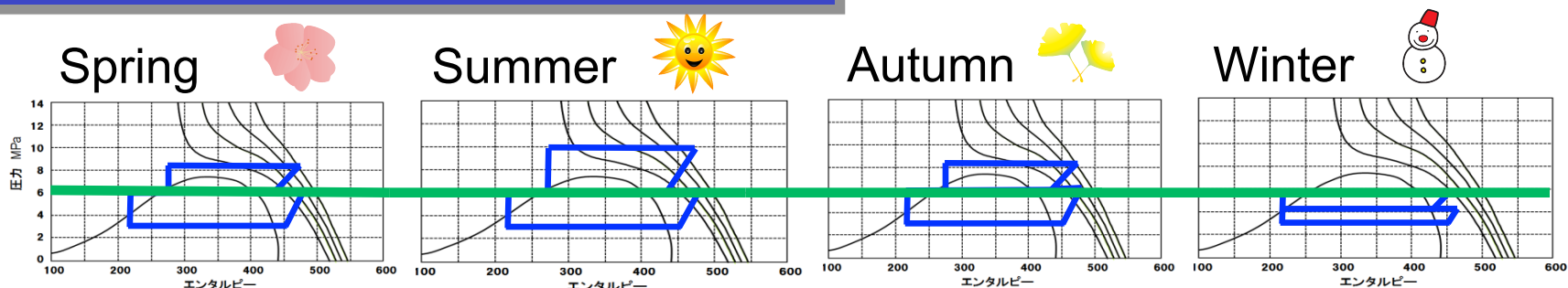
Comparison of the annual operating pressure behavior

Present model



- Pressure to showcase fluctuate **5MPa~9MPa** with the season.
- Airtight examination pressure of the construction plumbing **12MPa**.

Pressure adjust control type 【New model】



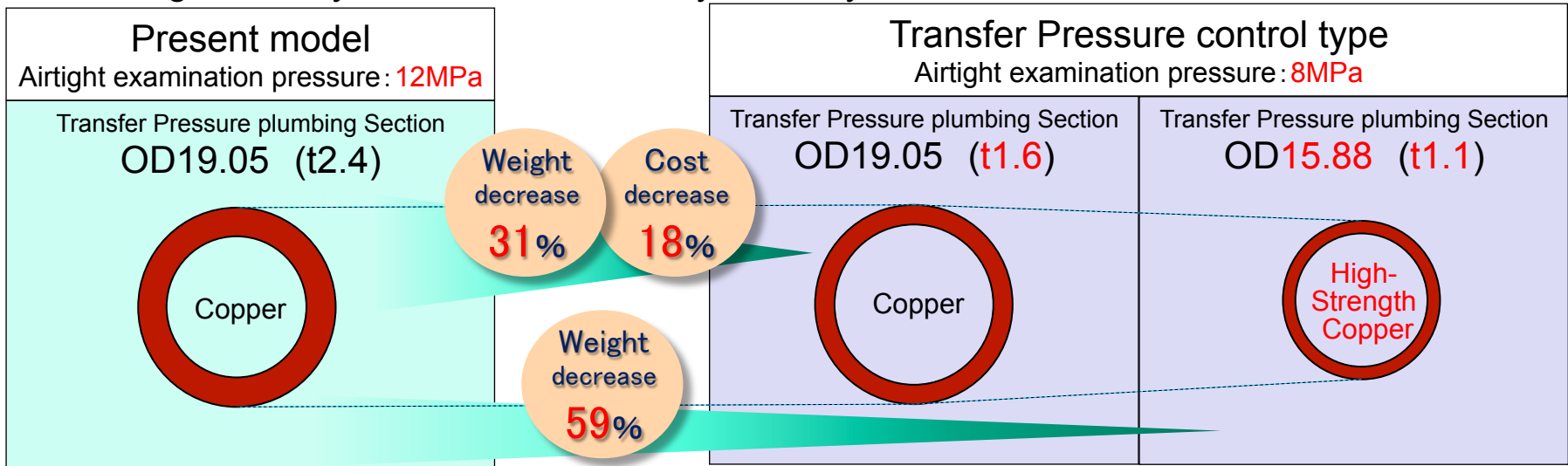
- Pressure to showcase is controlled constant about **6MPa** in all season.
- The necessary refrigerant quantity in a refrigerating cycle is stable in all season.
- Airtight examination pressure of the construction plumbing **8MPa**.

Improvement for installation by the adoption of Pressure adjust control type

(1) Decrease plumbing weight

- Decrease weight and cost of the output pressure plumbing in comparison with Present model.
- By High-strength Copper pipe adoption, Furthermore, decreased plumbing weight and improved installation. (The welding work in the short time and bending of the plumbing is possible.)

Ex. 8 refrigeration systems and 3 frozen systems by 20HP



(2) Simplification of adjustment for appropriate refrigerant quantity

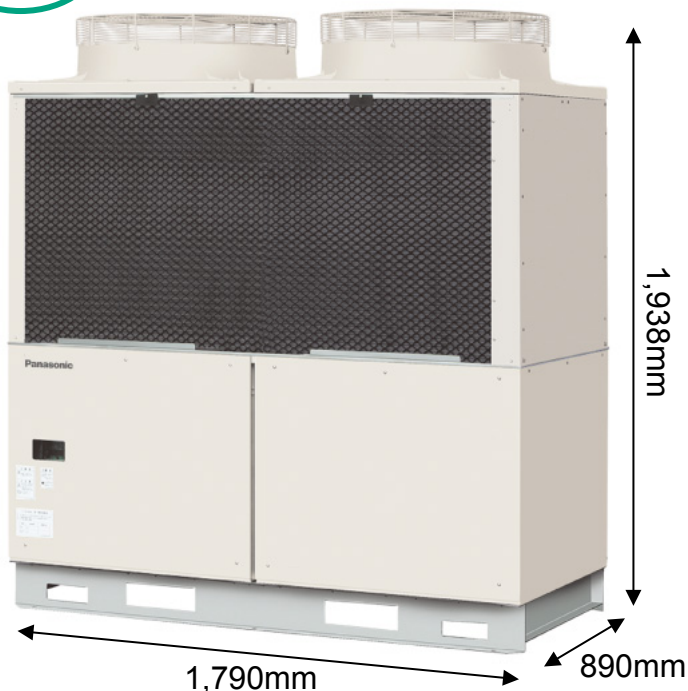
- Complicated adjustment for appropriate refrigerant quantity becomes needless at Operation check.
- The additional setting of Refrigerant Adjustment Tank becomes needless.

Small sizing & light weighting

① 20HP / 15HP

Compact design by the change of the main body size.
More compact at light weight than R404a model. ※1

Present model



Size	3.09 m ³
Weight	594 kg

Size decrease
34%

Weight decrease
20%

2Fans → 1 Fan
decrease of
running sound

New model

Pressure adjust control type



Size	2.05 m ³
Weight	480 kg

※1 It is a about 20HP. (R404a model: 530kg)

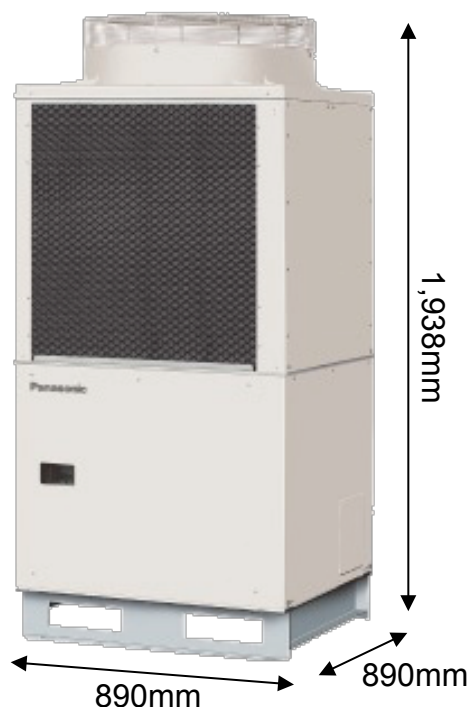
Small sizing & light weighting

②

10HP

Compact design by the structure change to side flow.
The weight is the same as R404a model. ※1

Present model

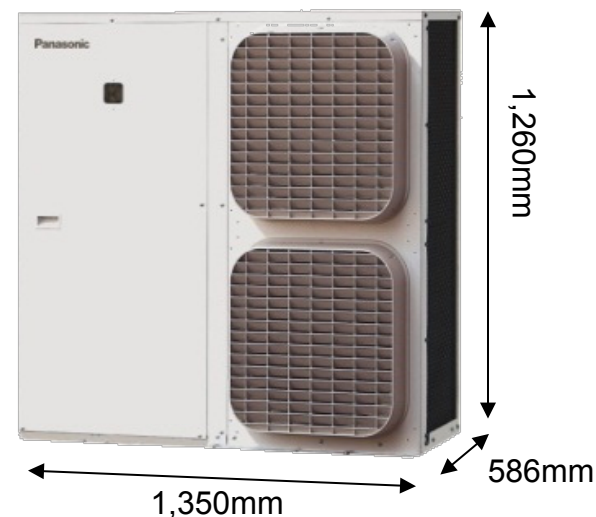


Size decrease
35%

Weight decrease
23%

New model

Pressure adjust control type

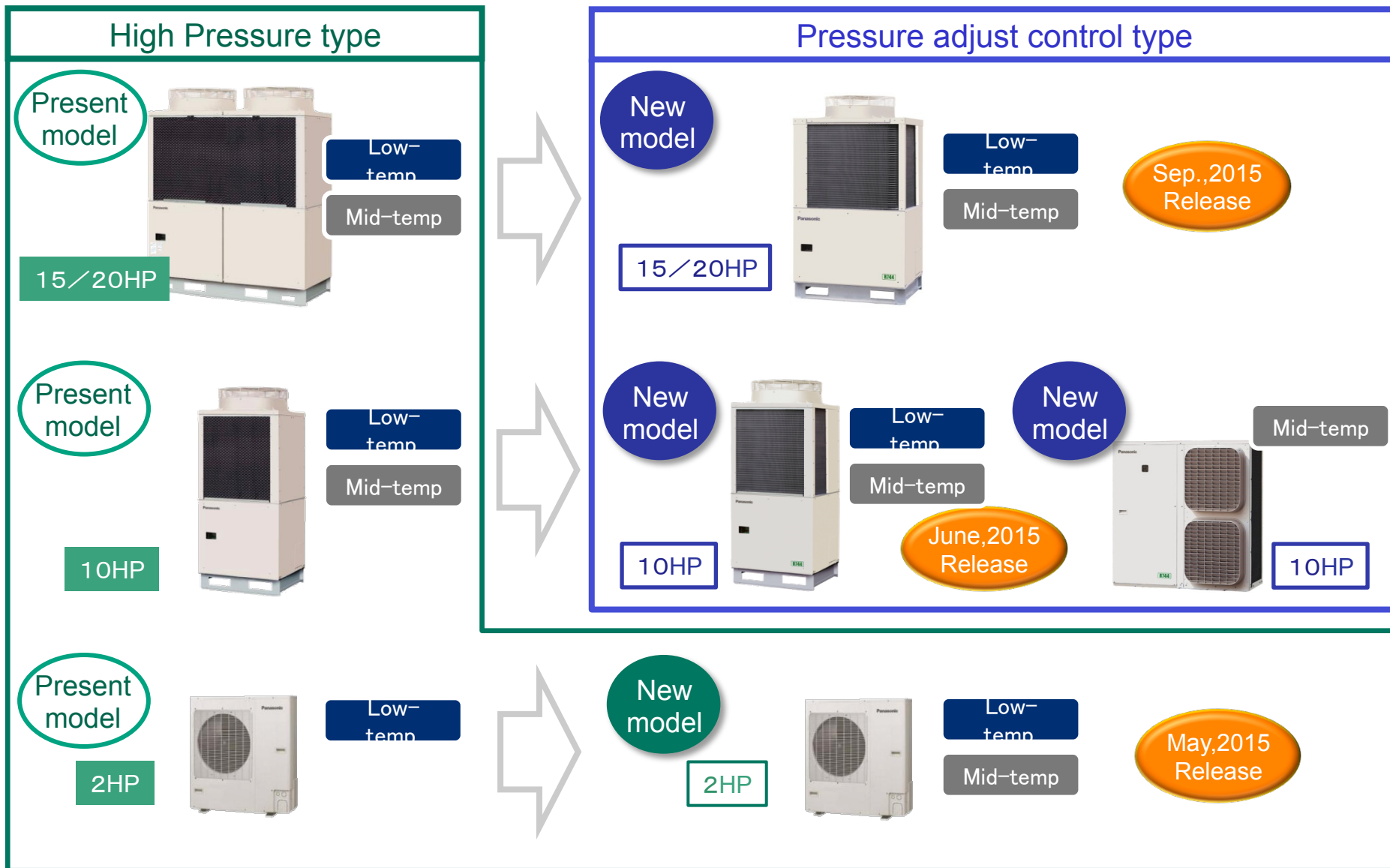


Size	1.53 m ³
Weight	330 kg

Size	0.99 m ³
Weight	255 kg

※1 R404a model :255kg

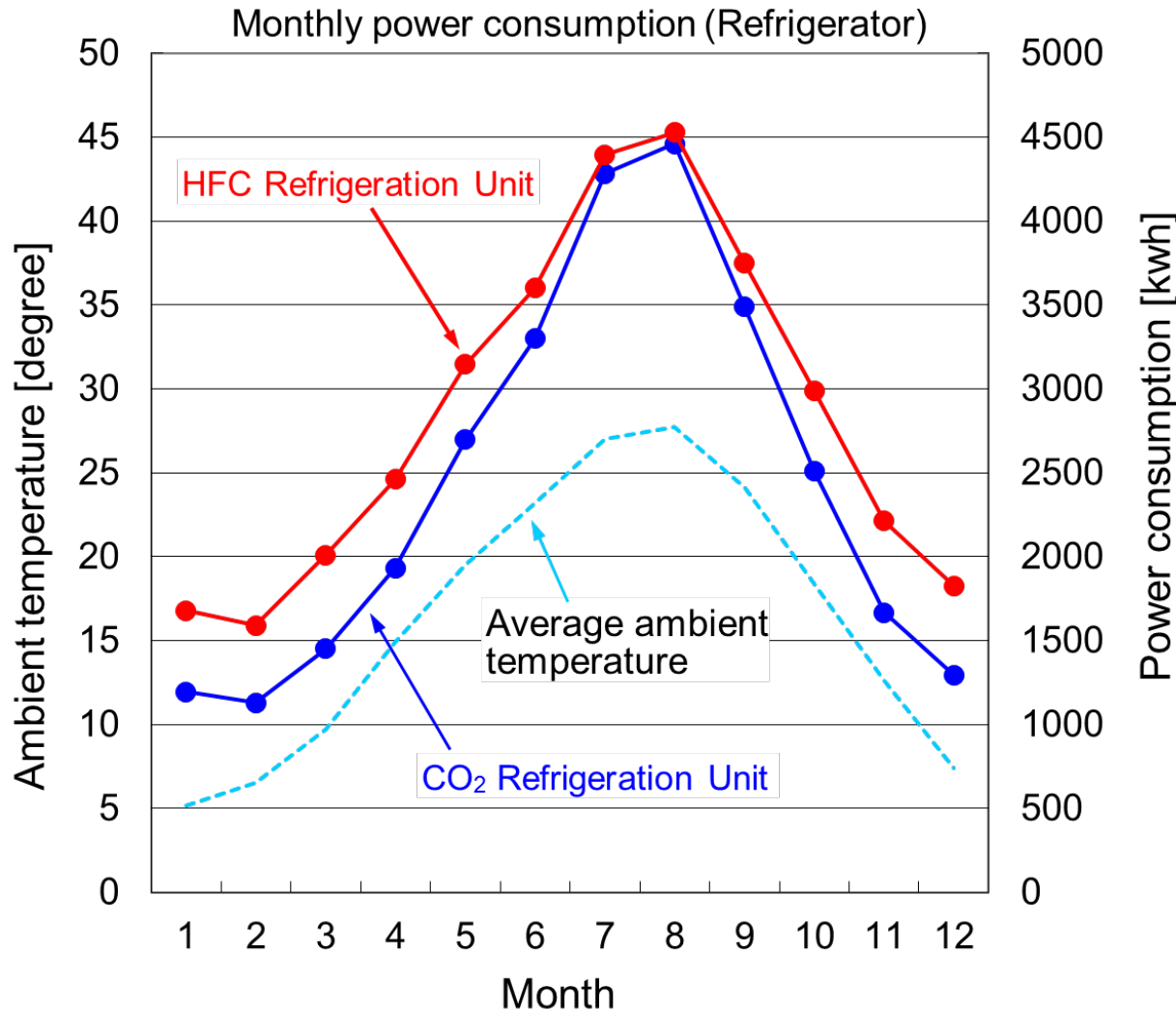
Series lineup of Pressure adjust control type



Actual installed example

- Carried out at 6 stores
- Efficiency and annual CO₂ emission was compared to the conventional refrigeration unit (R404a Inverter)

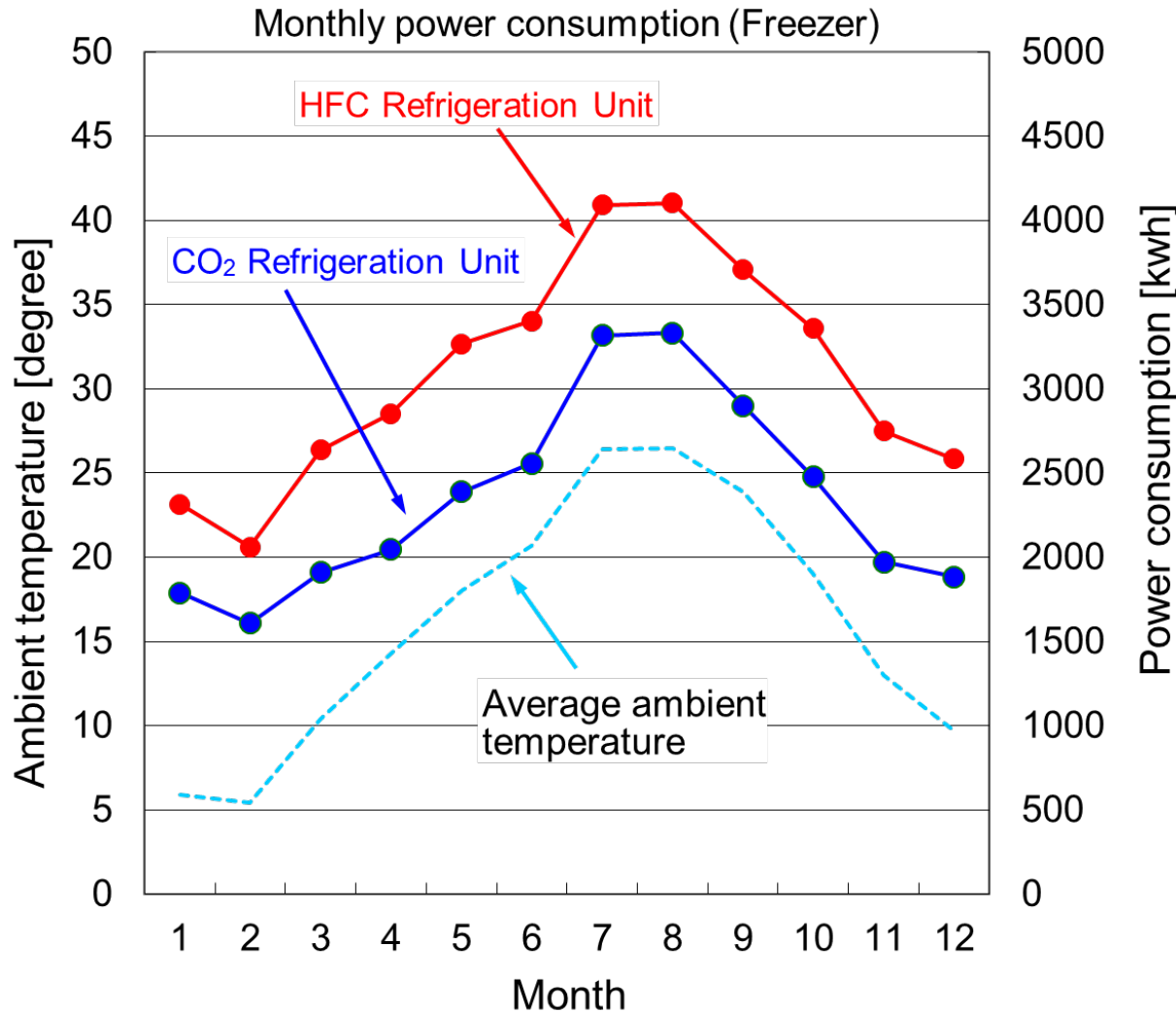
The actual installed example in the Kyushu region



**Efficiency
16.2% better**

* 12.9%-18.2%,
6 stores on Average

The actual installed example in the Kansai region

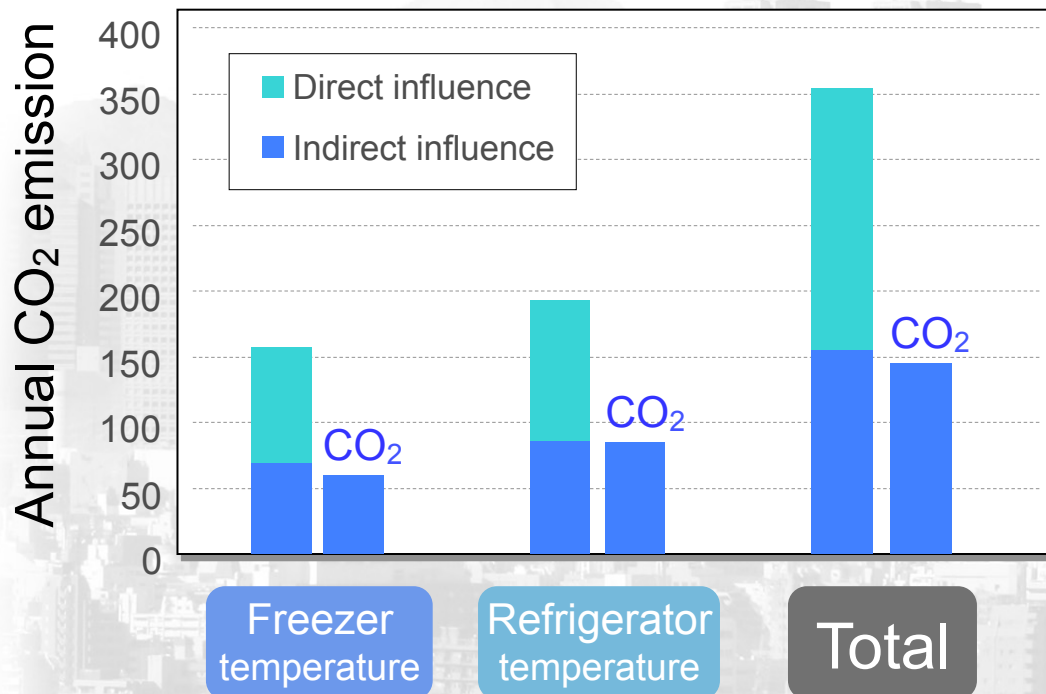


Efficiency
25.4% better

* 17.4%-32.2%,
6 stores on Average

Direct influence of CO₂ refrigerant 'almost zero'

Comparison of R404a and CO₂ Refrigeration Unit



Freezer Temperature
63%

Refrigerator Temperature
56%

Annual CO₂ emission

about **60%** reduction

1. Further Cost Reduction

- Reduction of installation cost by the adoption of Pressure adjust control type.
 - Supply chain maintenance of High-strength Copper pipe and connection parts.
 - Standardization of various parts in condensing unit.

2. Product Improvement

- Efficiency, Noise, and Vibration can be further improved.
 - Product Line-up need to be improved.
 - Outdoor units to be developed 25HP / 30HP (reduction of systems per store) and Indoor units to be diversified.

3. Training of Installers

- Trainings for CO₂ system installation is key issue.
(Installation, Operation check, and Service Maintenance)
Service Manual was prepared and Training courses shall be carried accordingly.



solutions for asia

natural refrigerants

3-5 February 2015 in Tokyo

Thank you very much!