

MAYEKAWA's Natural Refrigerant Technology

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MAYEKAWA's Proposal with [Natural Five]



[Natural Five] are natural refrigerants utilized for refrigerators & Heat Pumps to achieve both [Energy Saving] and [No use of Fluorocarbons] .

Mayekawa has developed wide range of application with [Natural Five].



Air Cycle refrigerator
"PascalAir"



NH₃/CO₂ Indirect Cooling System
"NewTon"



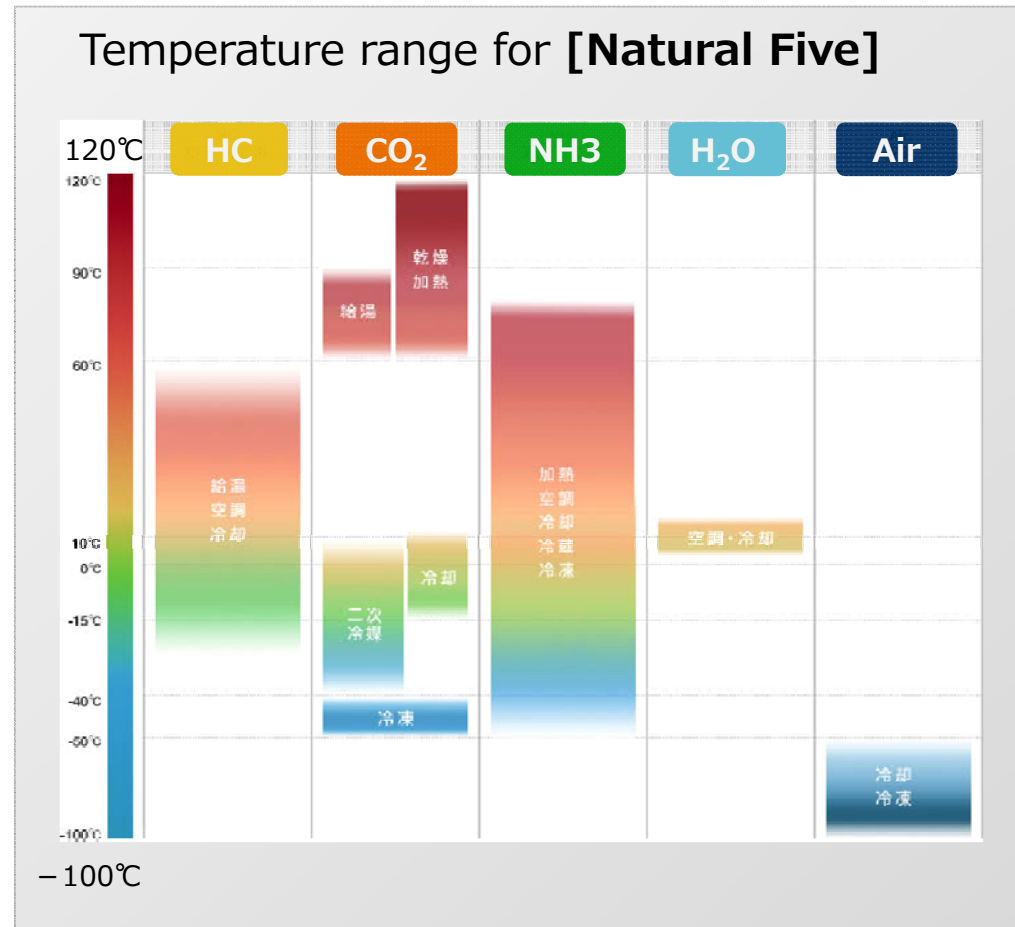
Adsorption Refrigerator
"AdRef-Noa"



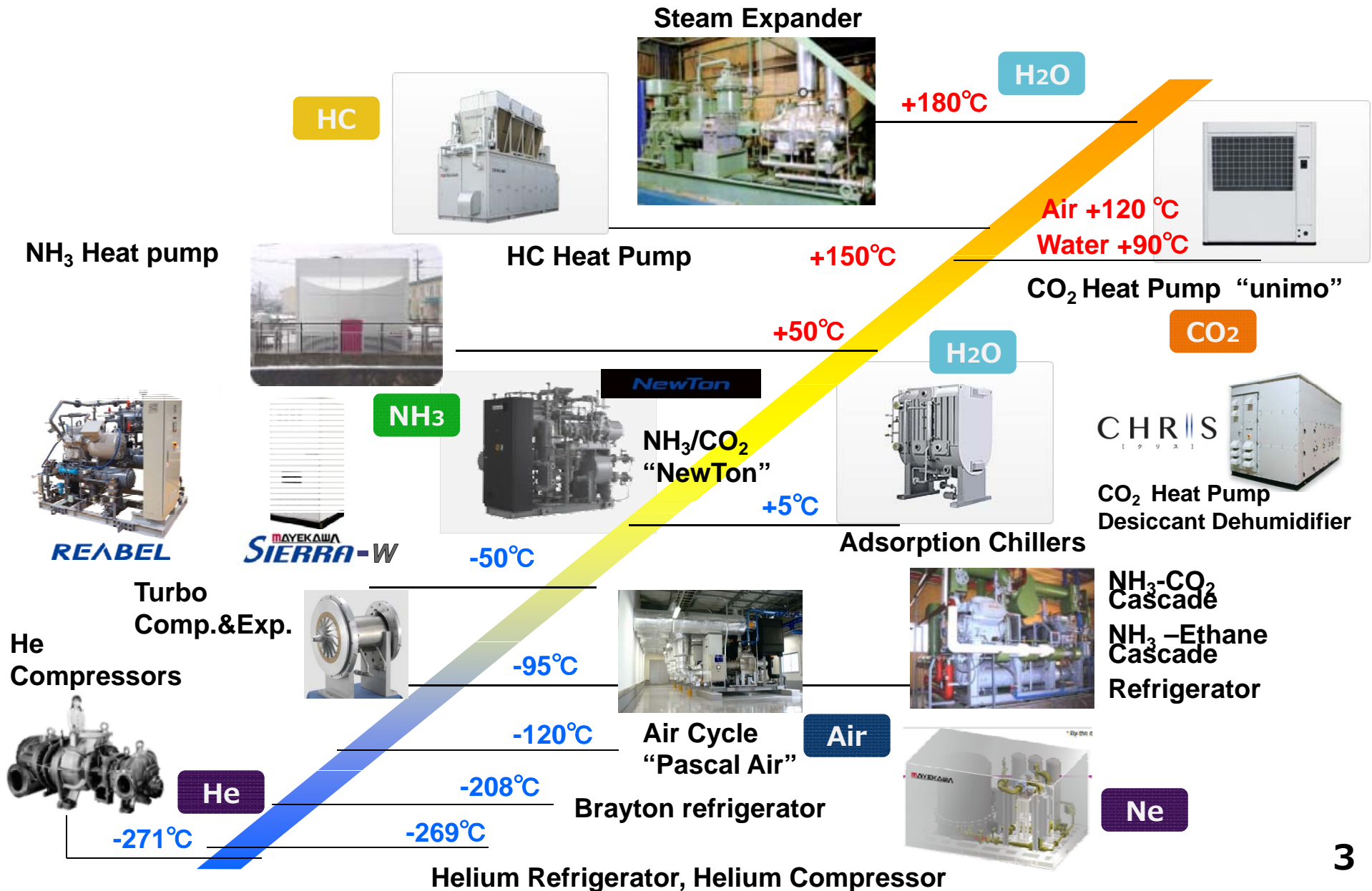
"Eco Cute" unimo



Heat Pump
with high efficiency



MAYEKAWA's Refrigerators and Heat Pumps using Natural Refrigerants



NH₃/CO₂ Indirect Cooling System “NewTon”

MAYEKAWA
MYCOM

NewTon



Compound Screw Compressor for **NewTon-R,F**



Single-stage Screw Compressor for **NewTon-C**

Energy Saving

- IPM Motor-driven Semi-Hermetic Screw Compressor
- Matrix Converter for IPM Motor
- New Screw Profile for NH₃
- *Shell&Plate Heat Exchanger*

Safety

- “Indirect Cooling” method minimizing NH₃ circulation area
- Minimum NH₃ Charge:21kg(R-3000)
- *Bellows valves*

Compact

- Downsizing:24% less in weight
- Packaging for shorter installation

Support

- Remote Monitoring for Predictive Maintenance
- Maintenance Support 24hr/365day

"NewTon" Products Line-up



| Application | | Type (Capacity) | | Liquid CO ₂ supply |
|----------------|---------|----------------------------|-------------------------------------|---|
| Cold Warehouse | Frozen | R-3000 R-6000 R-8000 | (94.7kW) (189.4kW) (270.0kW) | CO ₂ supply: -32°C (in-house temp. : -25°C) |
| | Chilled | C | (237.0kW) | CO ₂ supply: -5°C (in-house temp. : -2°C) |
| Freezer | | F-300 F-600 F-800 | (70.0kW) (140.0kW) (170.0kW) | CO ₂ supply: -42°C (inside freezer : -35°C) |
| Ice Rink | | S | (185.0kW) | CO ₂ supply: -11°C |

NewTon



NewTon R-3000, NewTon F-300



NewTon C, NewTon S

【Energy saving】

▲16~41%

【Installation】

as of 2017/Jan.

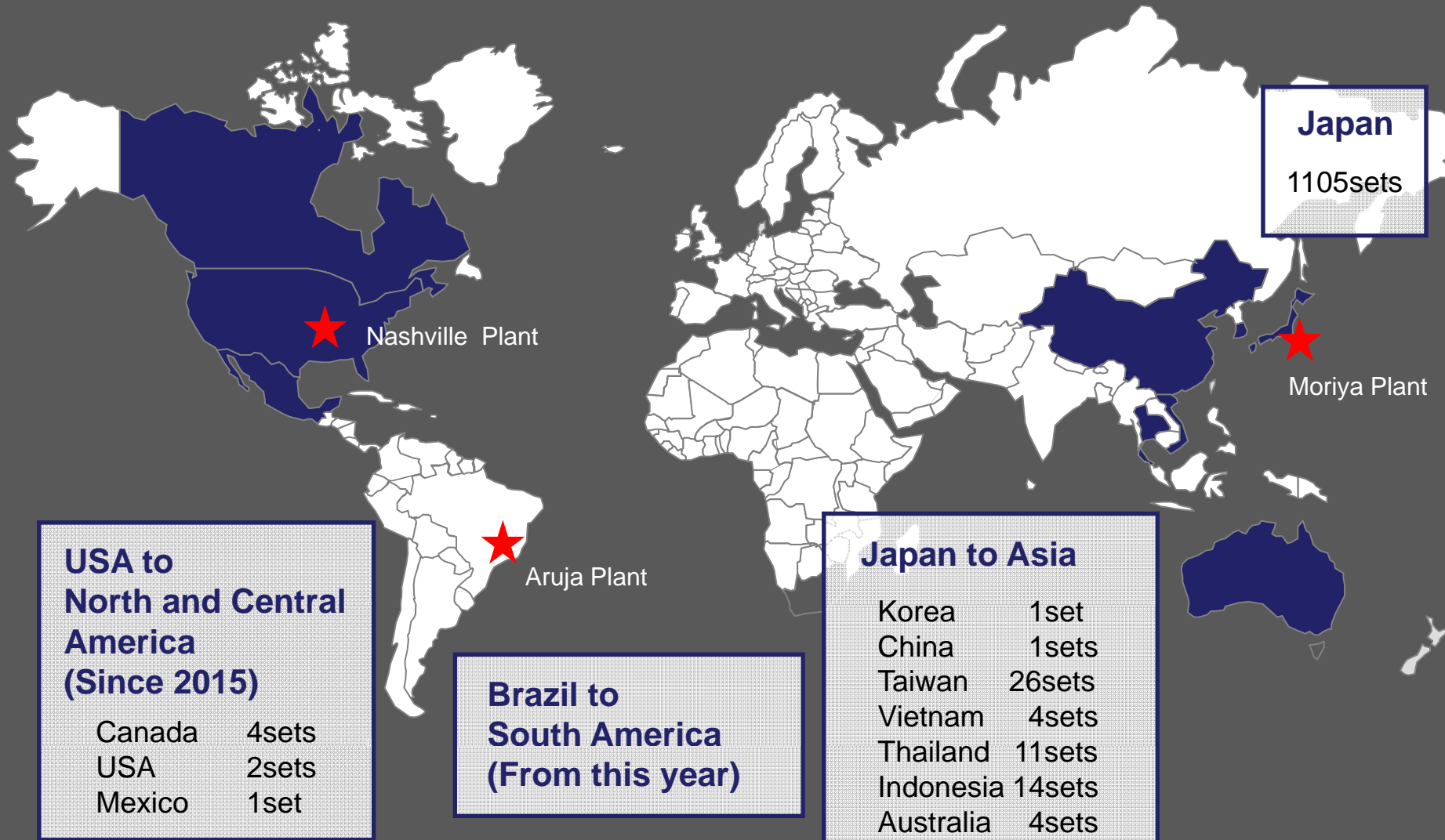
1,173sets

"NewTon" Installation



NewTon

NewTon to the World



NH₃/CO₂ Chilling Package "SIERRA"



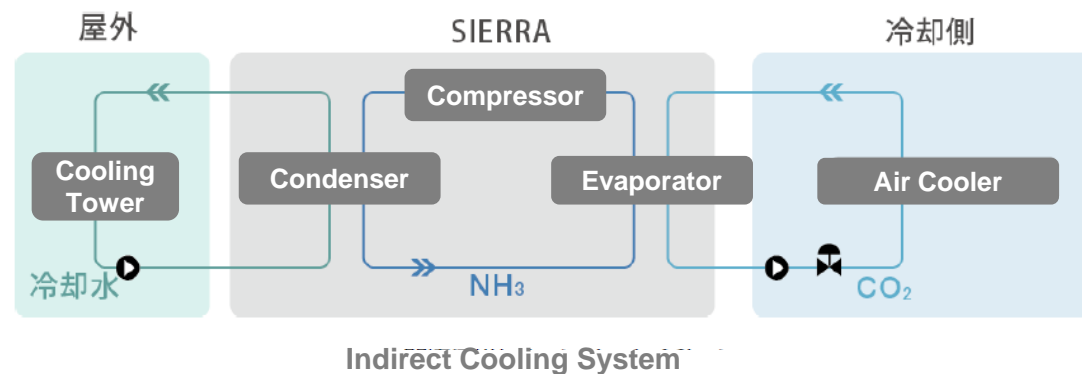
MAYEKAWA SIERRA-W Scroll NH₃/CO₂ Cooler Unit

| | |
|------------------------------------|---------------------------------|
| CO ₂ Supply Temperature | -15~+5°C |
| Legal Capacity | 4.94 RT (Refrigerating Ton) |
| Compressor Type | Semi-Hermetic Scroll Compressor |
| Nominal Power of Motor | 8.9kW (IPM Motor) |
| NH ₃ Charge | 3.5kg |

W800×L900×H1,630



Modular system up to 4 packages
(Capacity : 24~100kW)



Since May 15th, 2016

NH₃/CO₂ Cooling System "REABEL" for Small-Scale institution



REABEL



W2,000×L2,830×H2,220

Since May 15th, 2016

Energy Saving

- Semi-Hermetic Compound Reciprocating Compressor
- Capacity control with the Inverter

Safety

- "Indirect Cooling" method minimizing NH₃ circulation area
- Minimum NH₃ Charge: 18kg





| | |
|------------------------------------|---|
| CO ₂ Supply Temperature | -42 ~ -27°C |
| Legal Capacity | 9.80 RT |
| Compressor Type | Semi-Hermetic Compound Reciprocating Compressor |
| Nominal Power of Motor | 22kW |
| NH ₃ Charge | 18kg |

CO₂ Heat Pump “unimo”



Products Line-up

Food Plant, Manufacturing Plant
Hotel, Hospital, Spa, etc

| unimo ^{AW} | unimo ^{WW} | unimo ^{AWW} | “Eco Sirocco” |
|--|---|---|--|
| Air-source “Eco Cute” | Water-source “Eco Cute” | Air-source/Water-source “Eco Cute” | Water-source CO ₂ Heat Pump supplying Hot Air |
|  <p>About 700set</p> |  <p>About 200set</p> |  <p>About 50set</p> |  <p>About 100set</p> |
| Supply of Hot water 65°C~90°C | Supply of Hot water 65°C~90°C And Cold water -9°C~35°C | Supply of Hot water 65°C~90°C or Supply of Hot water 65°C~90°C And Cold water -9°C~35°C | Supply of Hot air 80°C~120°C and Cold water -9°C~35°C |

CO₂ Heat Pump Desiccant Dehumidifier "CHRIS"

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MYCOM

Combination of CO₂HP and Desiccant Dehumidifier

- Dehumidification in low temperature environment
- CO₂ Heat Pump for regeneration of desiccant material

CHRIS
[クリス]



Cargo handling yard in cold storage warehouse,
Food Plant, Manufacturing Plant, Ice Rink

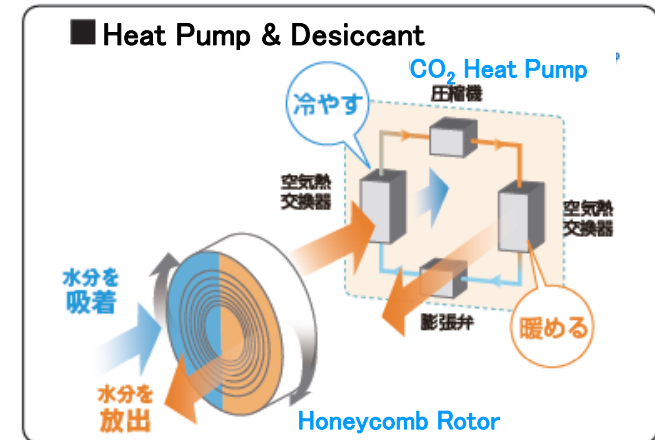
It was hazy and the visibility was not good.



Before



After



Energy saving for
[Dehumidification in low temperature environment]

Snow Melting CO₂ Heat Pump



Energy Saving

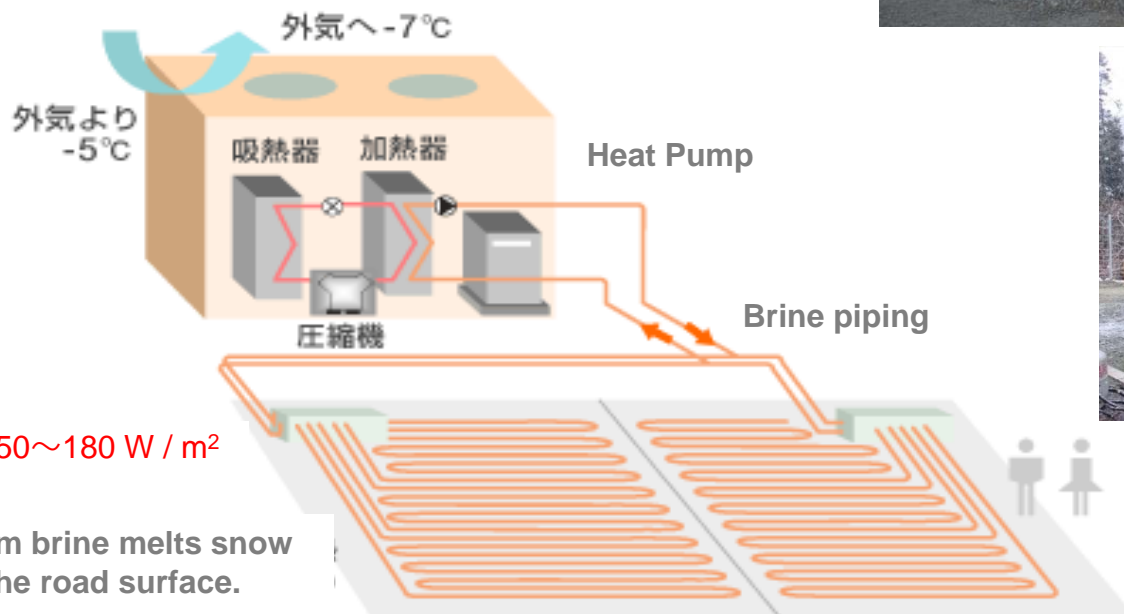
- Semi-Hermetic Reciprocating Compressor
- Energy saving compare to boilers or heaters

Safety

- CO₂: Eco-friendly and safe

Compact

- Smaller footprint for the installation



**【Installation】
more than 20set**

Air cycle refrigeration system "Pascal Air"

MAYEKAWA
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Air cycle refrigeration system

PascalAir



No air cooler
No fan motors
No defrost
Ducts easily installed

Super-low temperature Warehouse
Food Plant, Pharmaceutical Plant

■ Super-low temperature Warehouse (Bonito, Tuna fish)

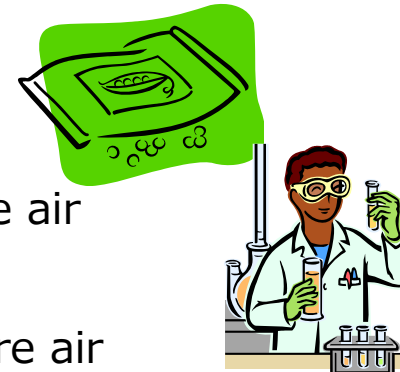
circulation of super-low temperature air
to keep in-house temperature

■ Freezer for Food

quick freezing with super-low temperature air

■ Brine Cooler

cold brine cooled by super-low temperature air

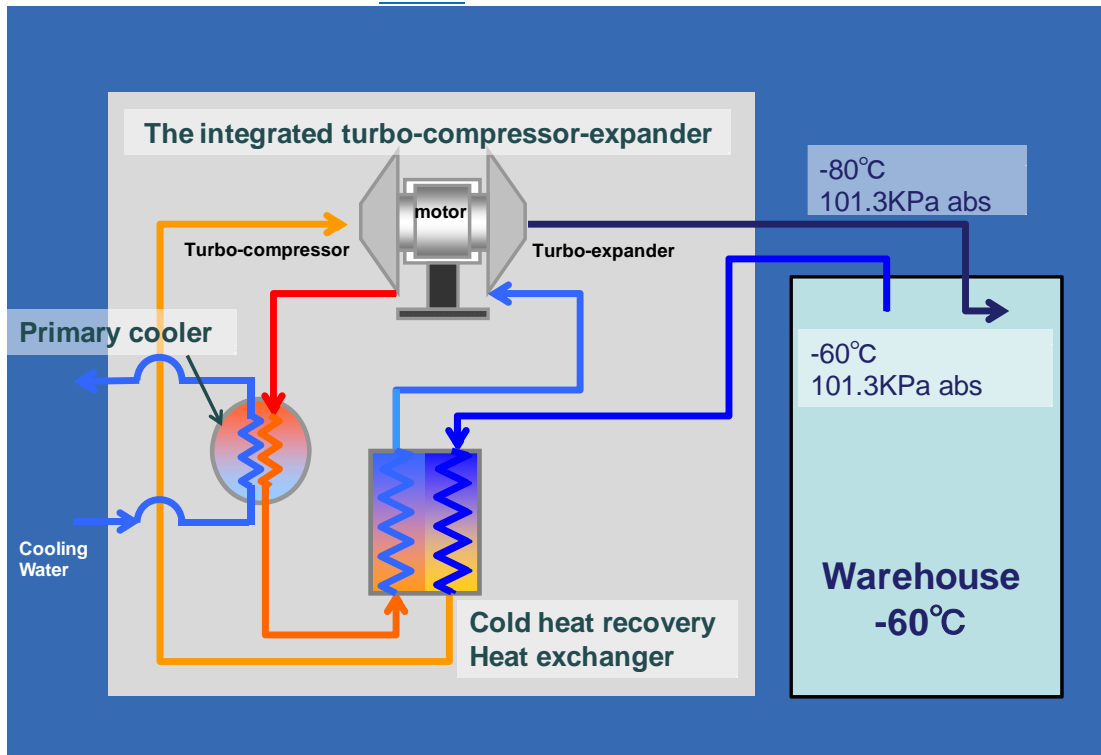


【Installation
as of 2017.03】
PAS30-R x76sets
PAS30-F x 3sets
PAS30-B x 4sets
PAS15-R x 5sets
Total 88 sets

Air cycle refrigeration system "Pascal Air"

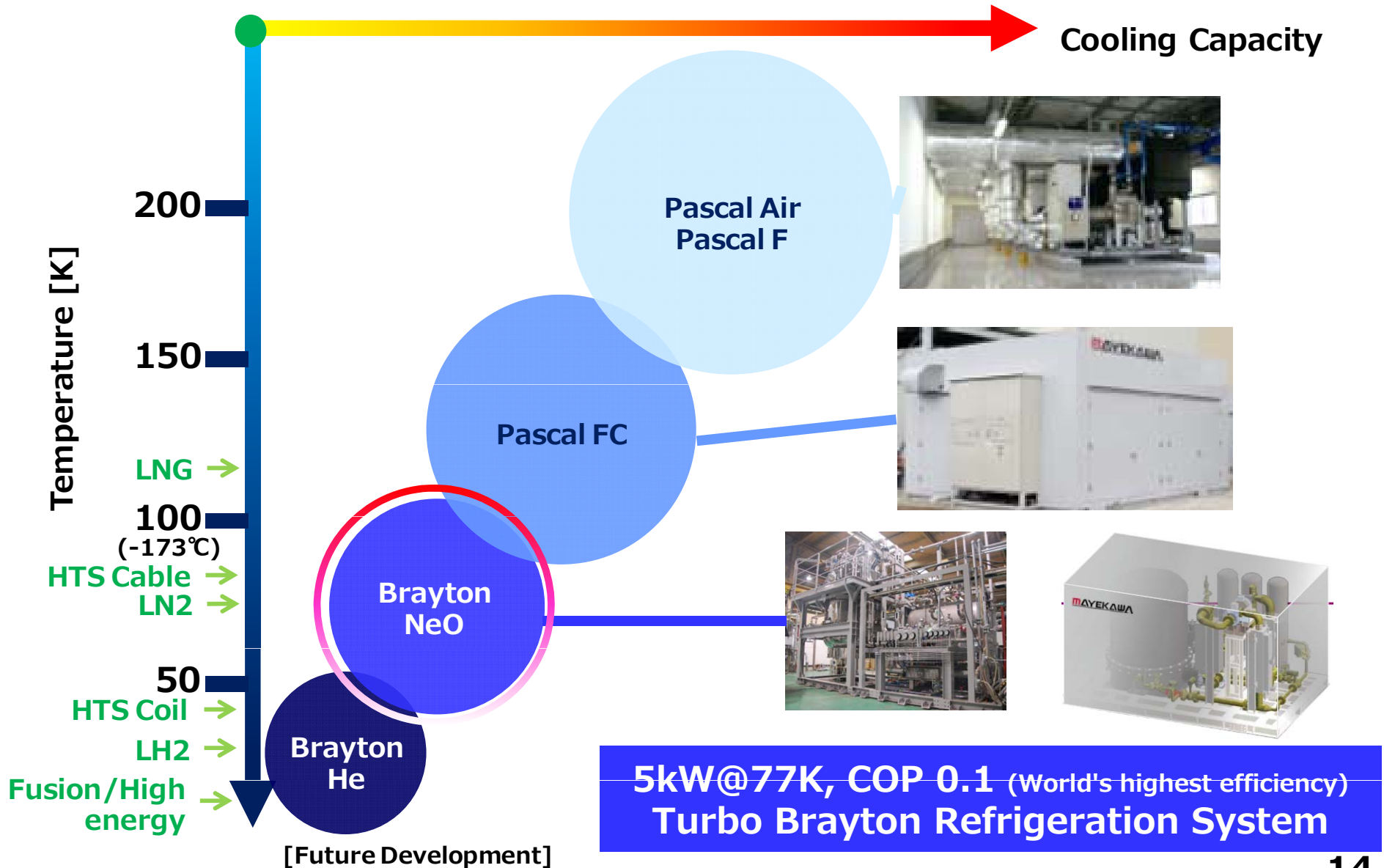
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PascalAir



- ◆ Refrigerant is "Air"
Global environment load : Zero
- ◆ 50% Energy conservation , compared with HFC23/HCFC22 cascade system
- ◆ The **safest** system for product, worker and neighborhood
- ◆ **No regulation** by the "high-pressure gas preservation law"
- ◆ No air cooler, and air duct in a room

Turbo Brayton Refrigeration Systems



**Thank you
for your attention**

MAYEKAWA

株式会社 前川製作所

Web Site of MAYEKAWA

<http://www.mayekawa.co.jp/>