



ATMO
sphere



J. Huschka - Sustainable Refrigeration in Nestlé

T. Nakama - R22 Phase-out in Nestlé Japan

Nestlé Japan Ltd.

Production Division

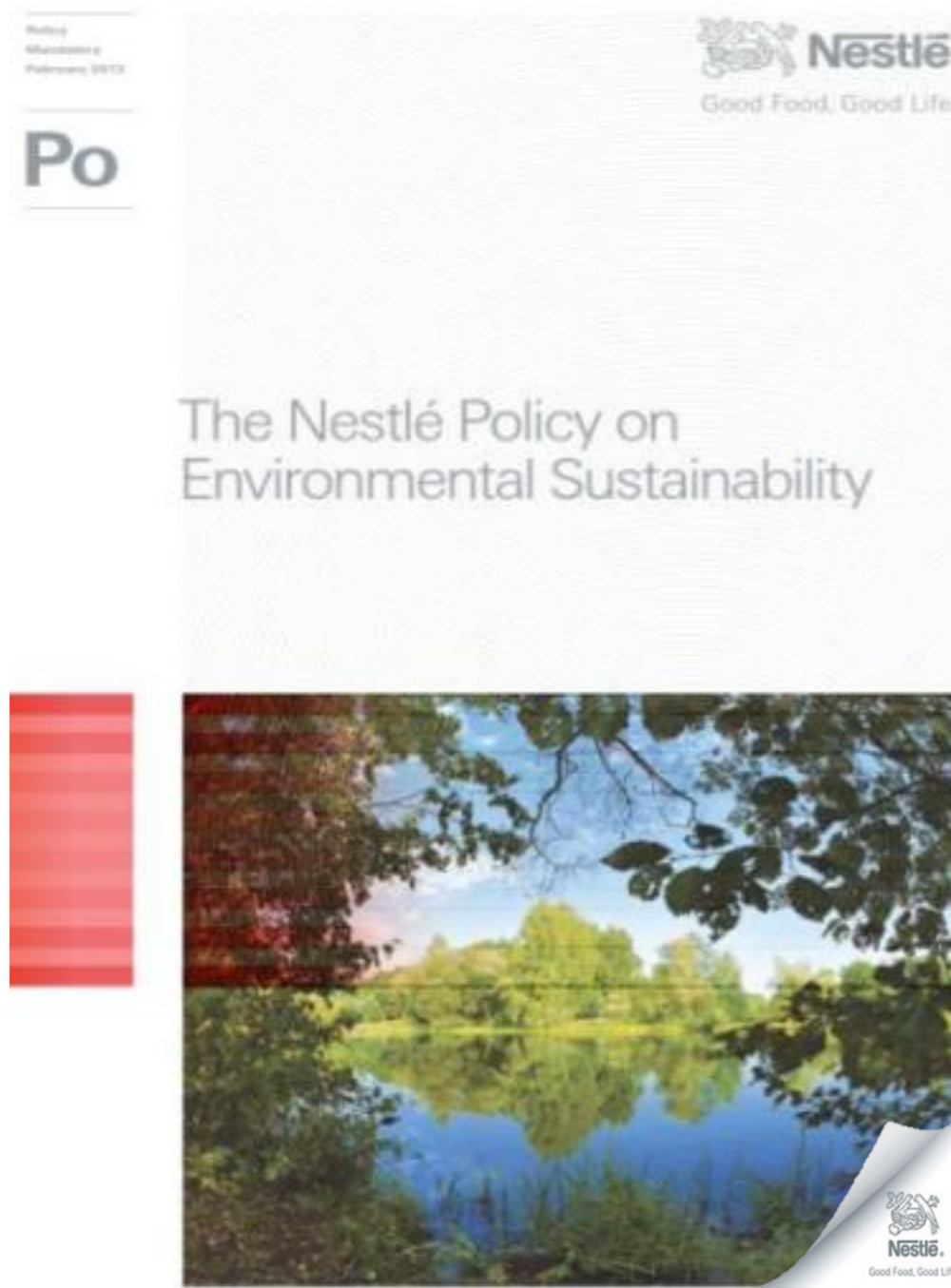
Nestlé: A global footprint

- 335,000 employees in over 150 countries



- 436 factories in 85 countries
- Over 2,000 brands

Nestlé Policy on Environmental Sustainability



3. Manufacturing

We use safe **natural refrigerant** alternatives for industrial refrigeration installations and implement new solutions to improve their performance.

5. Distribution

We support the development and use of safe and efficient **natural refrigerant** solutions for commercial applications and progressively phase out HFCs appliances.

Started in 1986 as an internal direction in manufacturing to “go natural”

Climate change leadership

Deployment of Natural Refrigerants progressing



Source CSV report 2015

Web-link: www.nestle.com/csv

Industrial Refrigeration

● represents ~90% of our refrigerant use

Our objectives

- ⊕ **By 2016** – Expand the use of natural refrigerants, which do not harm the ozone layer and have a negligible impact on climate change, in our industrial refrigeration systems.

Industrial refrigeration systems using natural refrigerants (%)



Commercial Refrigeration

Our objectives

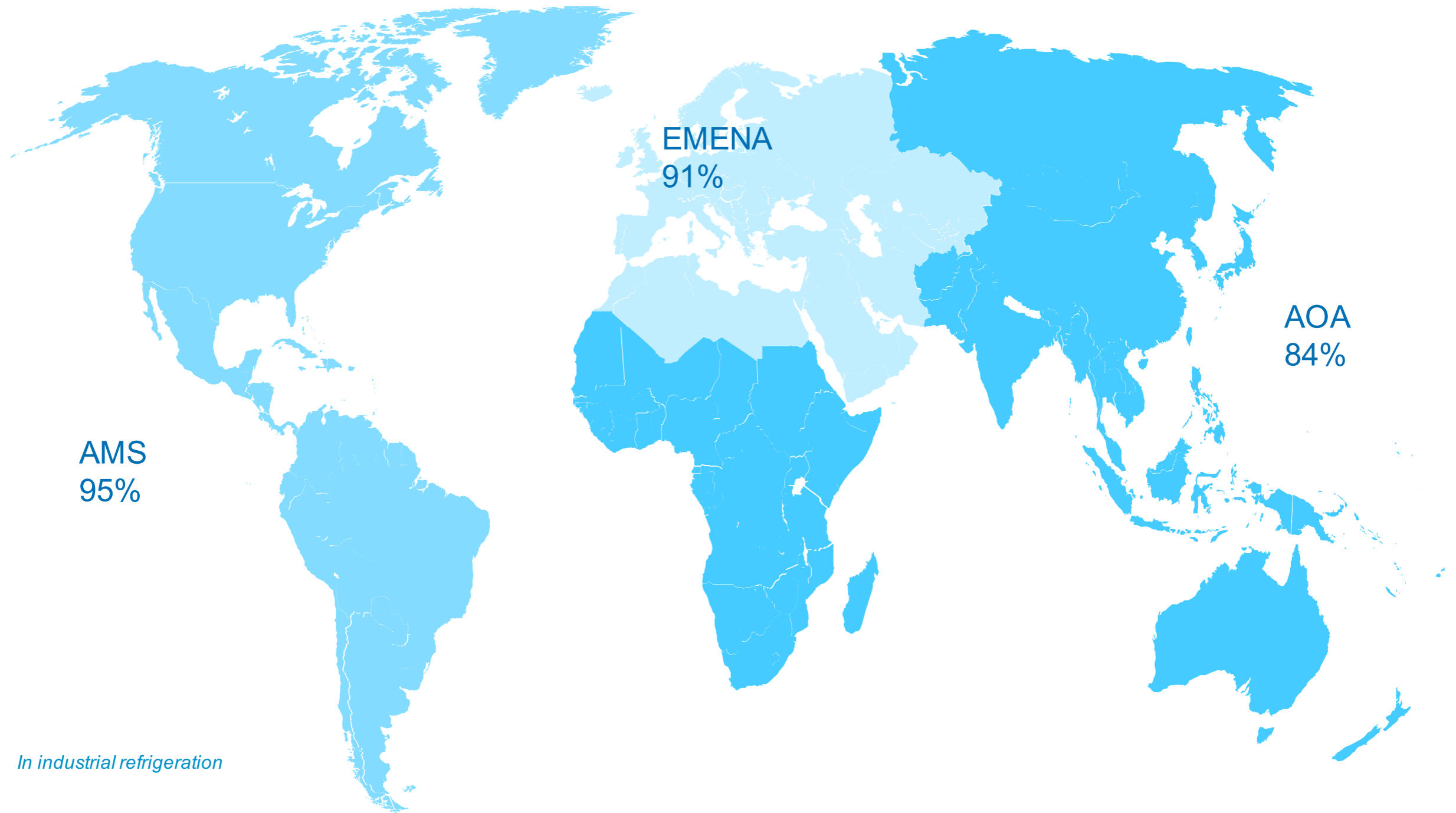
- **By 2015** – All of our new ice cream chest freezers will use natural refrigerants.
- ⊕ **By 2016** – All of our new ice cream chest, upright and island freezers will use natural refrigerants.



- ⊕ **By 2020** – All new proprietary cold beverages dispensers of Nestlé Professional will use natural refrigerants.

Refrigerants in Nestlé: above 90% Natural

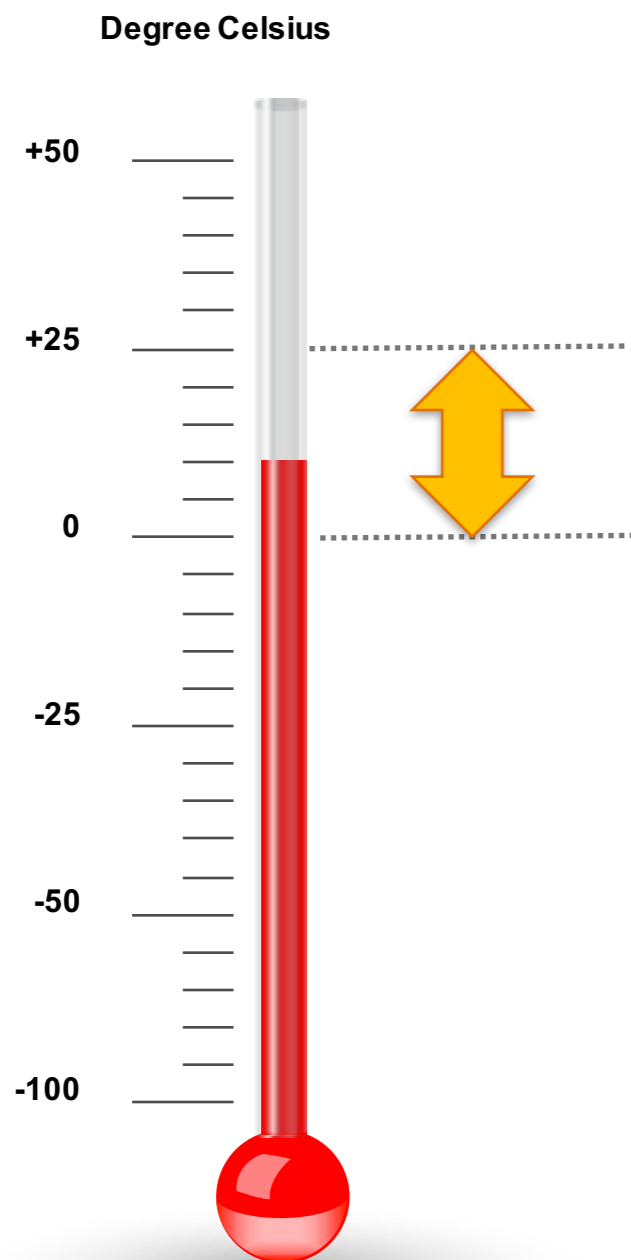
As result of our early phase-out and natural refrigerant strategy




In industrial refrigeration

Industrial Refrigeration - well advanced deployment


Cooling applications with low charge ammonia package chiller



To process or preserve food



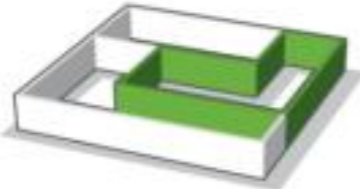
Dairy



Confectionery

0 to 10°C

Maintaining conditions in production areas



Humidity & Temperature control in all hygienic zones

All our business are requiring positive temp. cooling

Air conditioning

6 to 18°C



Buildings, offices



Data centers

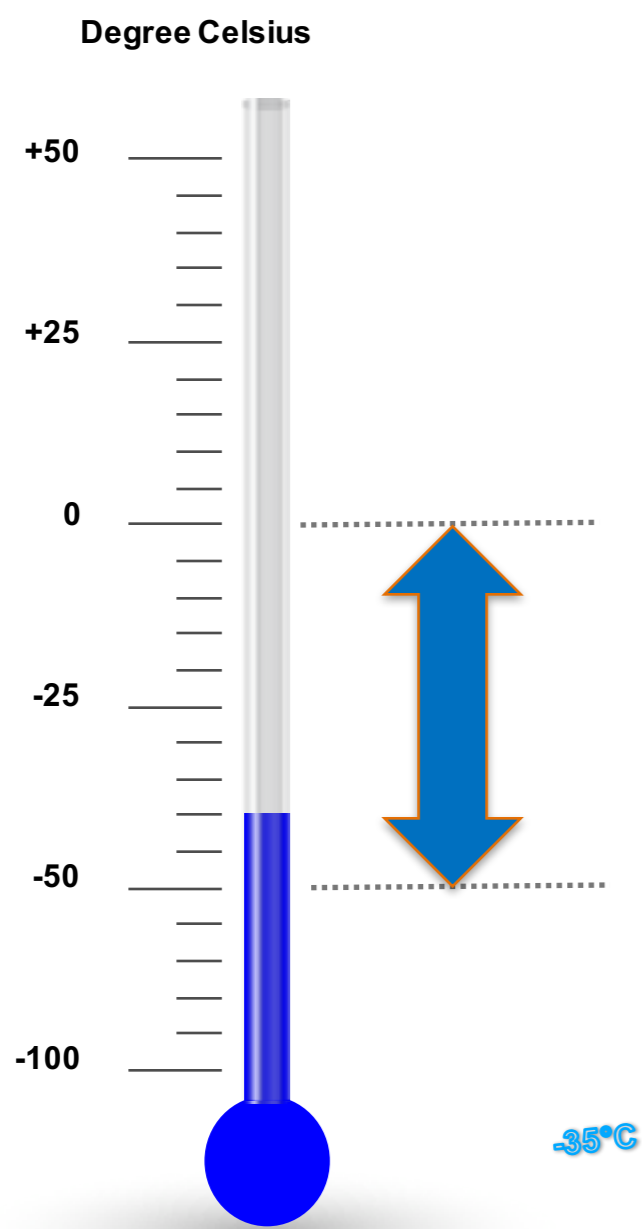


Building Good Food, Good Life



Industrial Refrigeration - well advanced deployment

Freezing applications with CO₂ / NH₃ cascade systems



Freeze dried coffee
(Premium soluble coffee)

-15 to -50°C

Ice Cream

0 to -45°C

ICE CREAM Nestlé PURINA LEANCUISINE
Nestlé PROFESSIONAL Buitoni

Cold storage of finished goods or raw materials
(DCs)

-35°C

Frozen food

0 to -45°C

Low temperature applications in manufacturing

Large complex **built-up** systems: assembled on site.



since 1992, Nestle spent CHF 289 mio
to phase out syntetic refrigerants by
natural refrigerants

208 systems phased out
33 new systems installed with natural

Nestlé Japan Ltd.

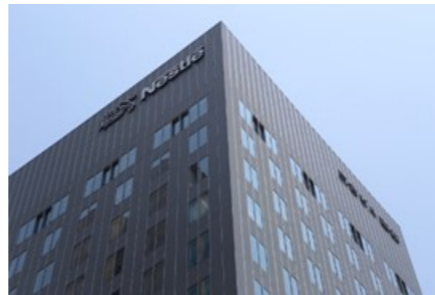
3 Factories

Start of Business: 1913
No. of Employees: 2,500



Himeji

- Regular Soluble Coffee
- Coffee concentrate for industrial use
- Eco & System refill pack



Kobe HO



Kasumigaura

- Non-Dairy Creamer (powder and liquid)
- Coffee/Beverage Mixes
- Confectionary
- RTD PET bottled coffee
- Healthcare Nutrition products



Shimada

- Regular Soluble Coffees
- RTD PET bottled coffees
- Vending



R22 Phase-out LTP Established by Nestlé Japan before 2003

together with Guidelines

| Description Factory | Installation | No. set | Capacity (1,000 kcal/h) | | Motor (kW) | Charge kg | Installed year | Year to be replaced (Unit: No./FY) | | | | | | | | | |
|---------------------------------------|---------------------------------------|------------------------------|-------------------------|-----------|---------------|--------------|-------------------|------------------------------------|------|------|------|------|------|------|------|------|--|
| | | | Installed | Ad. repl. | | | | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | |
| Himeji | Process 1 Cold Room -55 C | 4 | 2,970 | 1,880 | 2,410 | 32,000 | 71 | 50 | 1000 | 1530 | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | Process 2 | | 1,140 | 1,140 | 800 | 15,000 | 39 | | | | | | | | | | |
| | Process 3 | | 1,170 | 1,170 | 200 | 240 | 30/30 | | | | | | | | | | |
| | F.P. | | | | | | | | | | | | | | | | |
| | Culinary | | | | | | | | | | | | | | | | |
| | Process 4 | | | | | | | | | | | | | | | | |
| | Process 5 | | | | | | | | | | | | | | | | |
| | A-Block | | | | | | | | | | | | | | | | |
| | Packaging Air Conditioner | | | | | | | | | | | | | | | | |
| | Room Air Conditioner | | | | | | | | | | | | | | | | |
| | Sub Total | | | | | | | | | | | | | | | | |
| | Invest. Cost (Refrigerator + Process) | | | | | | | | | | | | | | | | |
| | Shimada | Process 1 Cold Room -12 C | 1 | 110 | 110 | 100 | 15,000 | 34 | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Process 2 | | | 1,070 | 1,070 | 400 | 400 | 30 | | | | | | | | | | |
| Process 3 | | | 400 | 400 | 300 | 3,000 | 30 | | | | | | | | | | |
| Dakin 8 C | | 1 | 140 | 140 | 45 | 70 | 75 | | | | | | | | | | |
| Yak 2 C | | 2 | 84 | 84 | 35 | 120 | 79/84 | | | | | | | | | | |
| Process 4 | | | 280 | 280 | 90 | 90 | 95 | | | | | | | | | | |
| A/F Chiller | | 1 | 28 | 28 | 8 | 12 | 95 | | | | | | | | | | |
| A-Block | | | 7 | 7 | 2 | 5 | 95 | | | | | | | | | | |
| Aroma Chamber | | 1 | 7 | 7 | 2 | 5 | 95 | | | | | | | | | | |
| Aroma Freezer | | 1 | 10 | 10 | 11 | 57 | 81 | | | | | | | | | | |
| Packaging Air Conditioner | | 15 | 99 | 99 | 203 | 225 | 72/95 | | | | | | | | | | |
| Room Air Conditioner | | 22 | 112 | 112 | 35 | 35 | 74/95 | | | | | | | | | | |
| Sub Total | | | 52 | 6,076 | 6,073 | 2,819 | 22,126 | | | | | | | | | | |
| Invest. Cost (Refrigerator + Process) | | | | | | | | | | | | | | | | | |
| Kawaguchi (Beverage) | Process 1 | After Cooler 8 C | 2 | 100 | 100 | 30 | 21 | 77 | | | | | | | | | |
| | | After Cooler 8 C | 1 | 280 | 280 | 74 | 95 | 95 | | | | | | | | | |
| | Process 2 | | 154 | 154 | 43 | 30 | 82 | | | | | | | | | | |
| | Air Conditioning (Over 1000 kcal/h) | 36 | 1,989 | 1,989 | 492 | 336 | | | | | | | | | | | |
| | Air Conditioning (Under 1000 kcal/h) | 21 | 85 | 85 | | | | | | | | | | | | | |
| | Sub Total | | 62 | 1,768 | 1,768 | 639 | 447 | | | | | | | | | | |
| | Invest. Cost (Refrigerator + Process) | | | | | | | | | | | | | | | | |
| Kawaguchi (Conf) | Process | Chiller | 3 | 1,478 | 1,478 | 400 | 281 | 91 | | | | | | | | | |
| | | Tunnel Cooler No.2 | 2 | 180 | 180 | 63 | 200 | 89 | | | | | | | | | |
| | Tunnel Cooler No.3 | 1 | 120 | 120 | 45 | 240 | 91 | | | | | | | | | | |
| | Unit Cooler | 1 | 4 | 4 | 2 | - | 90 | | | | | | | | | | |
| | Layer Cooler | 2 | 42 | 42 | 25 | - | 91 | | | | | | | | | | |
| | Air Conditioning (Over 1000 kcal/h) | 3 | 1,579 | 1,579 | 264 | 154 | | | | | | | | | | | |
| | Air Conditioning (Under 1000 kcal/h) | 10 | 37 | 37 | | | | | | | | | | | | | |
| Sub Total | | 22 | 3,418 | 3,418 | 744 | 695 | | | | | | | | | | | |
| Invest. Cost (Refrigerator + Process) | | | | | | | | | | | | | | | | | |

Contents

- Process / Equipment
- Cooling Capacity
- R22 Charge
- When to be Replaced
- Estimated Costs
- etc.

Guideline for Phase-out of R22 refrigeration units

- Content
 - 1. Phase-out of R22
 - 1) Purpose of document
 - 2) Phase-out schedule
 - 3) Responsibilities
 - 4) Removal and disposal of refrigerants
 - 2. Refrigeration unit
 - 1) Definition of refrigeration system by size
 - 2) Refrigeration system
 - 3) Chiller units
 - 4) Recommended refrigerants
 - 5) Utility temperature for chiller design
 - 6) Legal requirements for NH3 units
 - 3. Air Handling
 - 1) A/C - Outside air conditions for design
 - 2) A/C - Room conditions for design
 - 3) Types of air conditioning systems
 - 4) AHU grade and hygiene requirements: Comfort / Food / Special
 - 5) Engineering tool for AHU design

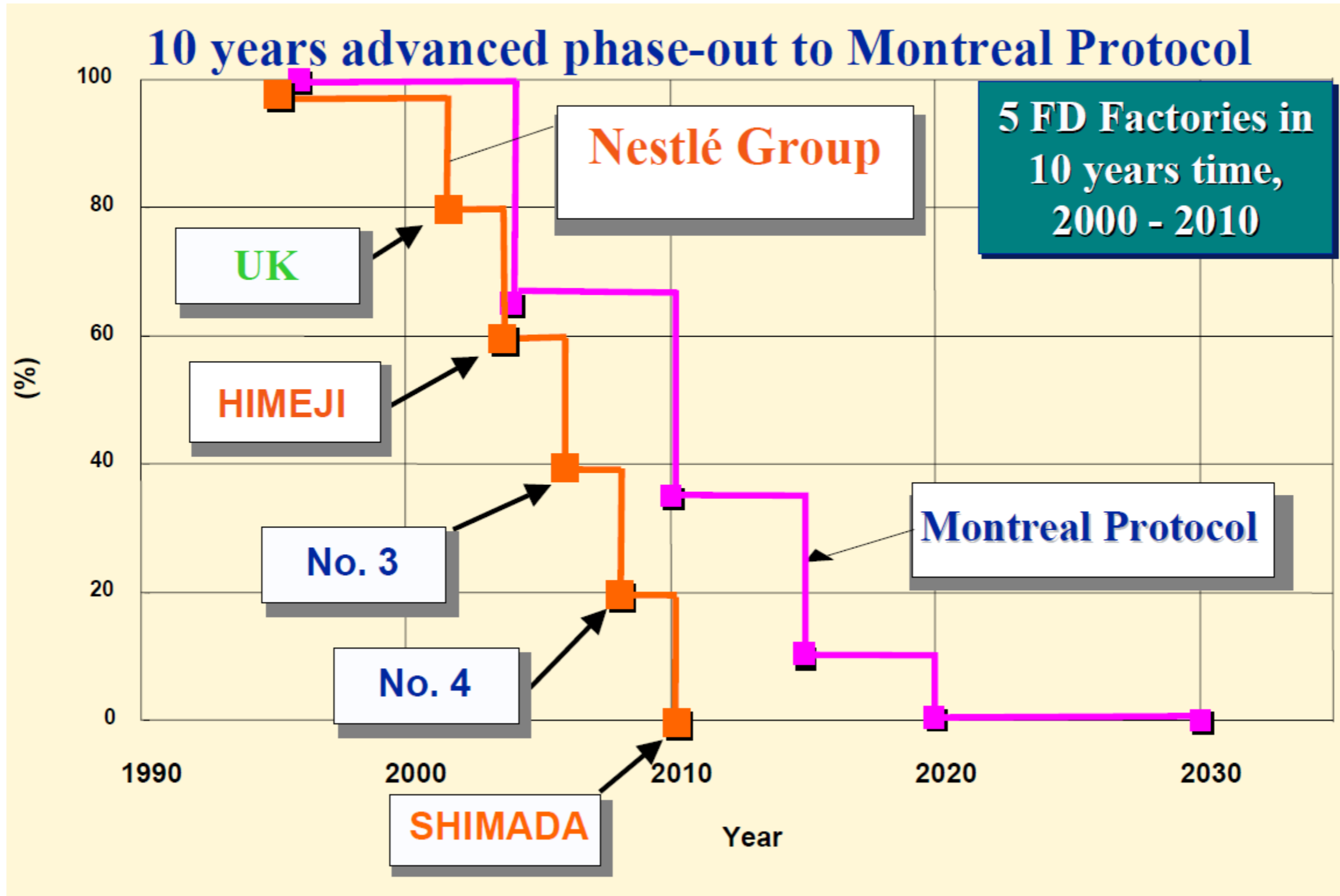
Annex:

- 1) Table – Refrigeration capacity
- 2) Unit conversion

| | |
|----------------------------------|---|
| 1. Phase-out of R22 units | |
| Purpose of this document | This is to define the R22 phase-out strategy and specify the AHU requirements in order for engineers in HO and factories to <ul style="list-style-type: none"> - have the same understanding of the strategy - take a common replacement approach of the existing refrigeration |

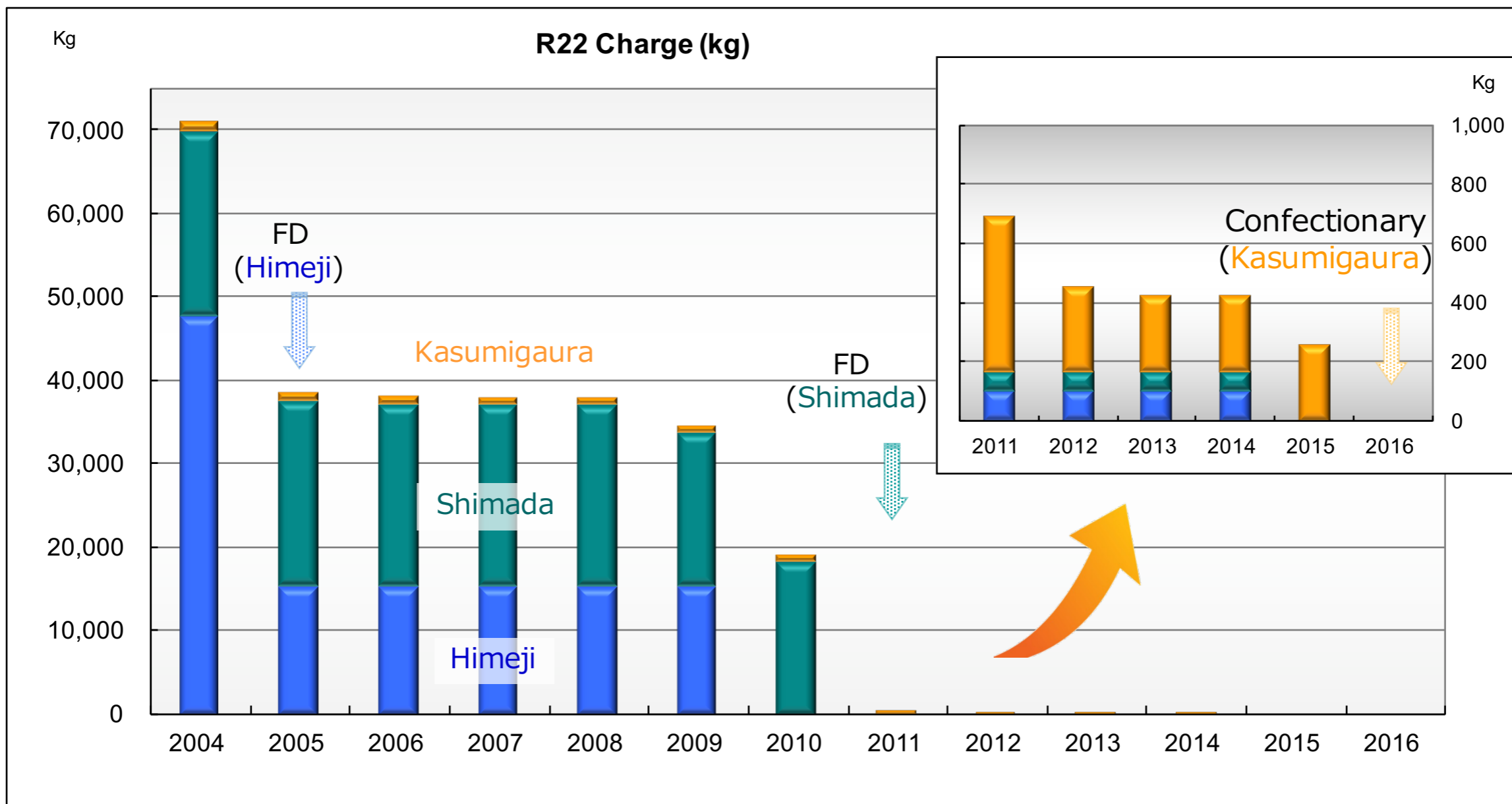
R22 Phase-out Program

For Freeze Drying Factories in the Group



HCFC R22 Phase-out in Nestlé Japan

R22 of 70 ton for industrial refrigeration in 2004 was phased out by 2016



EU: No Virgin HCFCs by 2010, and no Recycled HCFCs by 2015

Japan: No new HCFC refrigeration units by 2010, and no HCFC production by 2020

CO₂/NH₃ Cascade Refrigeration

First CO₂/NH₃ Cascade System in Japan @Himeji in 2004

- Freeze Drying Refrigeration:
Himeji (R22: 32 ton) in 2004-05
Shimada (R22: 18 ton) in 2009-10
- Installed Cooling Capacity:
Himeji 4,000kW
Shimada 2,000kW
- Energy saved: >15%
- NH₃ (3.6 ton) confined in the Refrigeration plant and CO₂ refrigerant sent to the production area



CO₂/NH₃ Refrigeration Plant



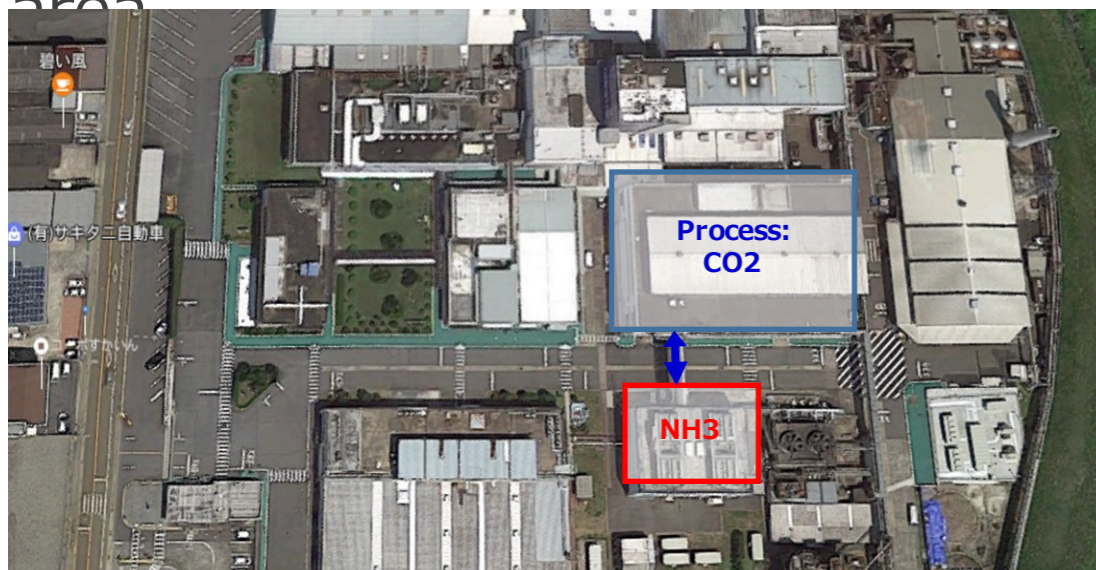
CO₂ Compressor Unit



Filter Units for CO₂ Line



Evaporative Condensers



NH3 Water Chillers

@Kasumigaura in 2015

- Old system: R22 Water Chillers (R22: 260 kg)
- New system: NH3 Water Chillers
- Chilled Water Temp: 5/11 °C
- Installed Cooling Capacity: 2,300kW
- Energy saved: >25%

No industrial refrigeration run on HCFC/HFC in Nestlé Japan



Oct 2015 Substation



Nov 2015 Chillers



Dec 2015 Substation



Dec 2015 Chillers



Jan 2016 CT/Tank



Feb 2016 Chillers



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Thank you very much!

