



ATMO
sphere

Business Case for
Natural Refrigerants

13/02/2018 – Tokyo

Why I choose CO₂ for my new cold storage?

Yoshio Ice Manufacturing and Refrigeration Co. LTD. Fukuoka Japan

President, Shigekatsu Koganemaru



Profile: Shigekatsu Koganemaru

- ▶ President of Yoshio Ice Manufacturing and Refrigeration Co,LTD, Fukuoka
- ▶ Company founded in 1935, 83years family business
- ▶ A board member of Japan Association of Refrigerated Warehouses,
Vise chairman of the Environment & Safety Committee
- ▶ Chairman of Fukuoka Refrigeration Safety Association
- ▶ Career started in 1979

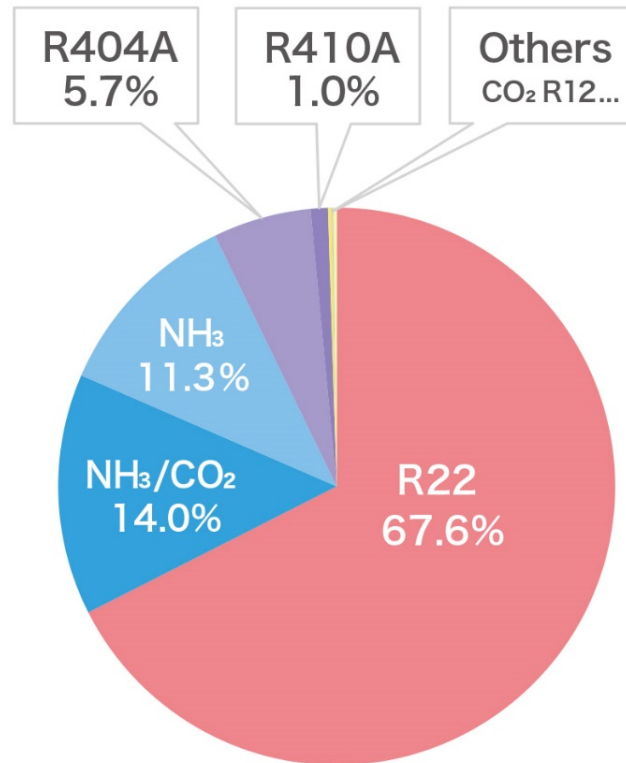


LOGISTICS CENTER



68% Cold Storage still use R22

- ▶ 68% of cold storage still use R22 (volume of cold storage: data Japan Association of Refrigerated Warehouses 2016)
- ▶ 90% of cold storage are owned by small or medium size companies
→need longer time to change R22 to new refrigerant



| | | |
|---------------------|----------------------------------|--------|
| HCFC | R22 | 67.6 % |
| Natural refrigerant | NH ₃ /CO ₂ | 14.0 % |
| Natural refrigerant | NH ₃ | 11.3 % |
| HFC | R404A | 5.7 % |
| HFC | R410A | 1.0 % |
| CFC | R502 | 0.2 % |
| Natural refrigerant | CO ₂ | 0.1 % |
| Natural refrigerant | Air | 0.1 % |
| CFC | R12 | 0.1 % |

※ Data : Japan Association of Refrigerated Warehouses 2016

Cold Storage Owners seeking new option instead of R22

- ▶ R22 no longer new option after 2020
- ▶ New option → Safety, Easy to handle, Better COP, Low Maintenance Cost
- ▶ Natural refrigerant → no F-gas regulation for the future





My experience about ammonia

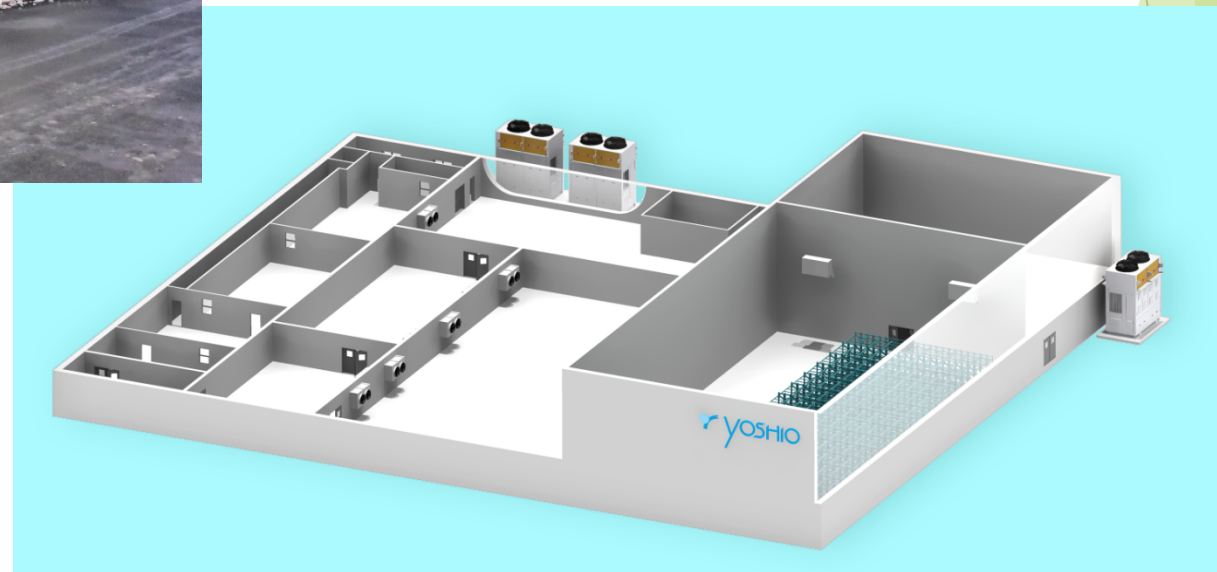
- ▶ My first job: handling refrigeration machinery
- ▶ In the 1970's: ammonia units were common
- ▶ Smell of ammonia: my bitter memory
- ▶ Experienced several ammonia accidents in my company
- ▶ Staff injured in the accident



My Choice: CO₂ unit for new project

- ▶ My Choice: Natural refrigerant, but no ammonia
- ▶ Found CO₂ unit available in Japan
- ▶ Based on experiences of Higashi-Nihon or Kumamoto earthquake, water supply recovery take longer time →no water cooled unit
- ▶ Air cooled unit necessary for my project
- ▶ Liquid CO₂ supplied to evaporators, not gas and liquid mixture supplied
- ▶ I visited Europe last year to see CO₂ system already common

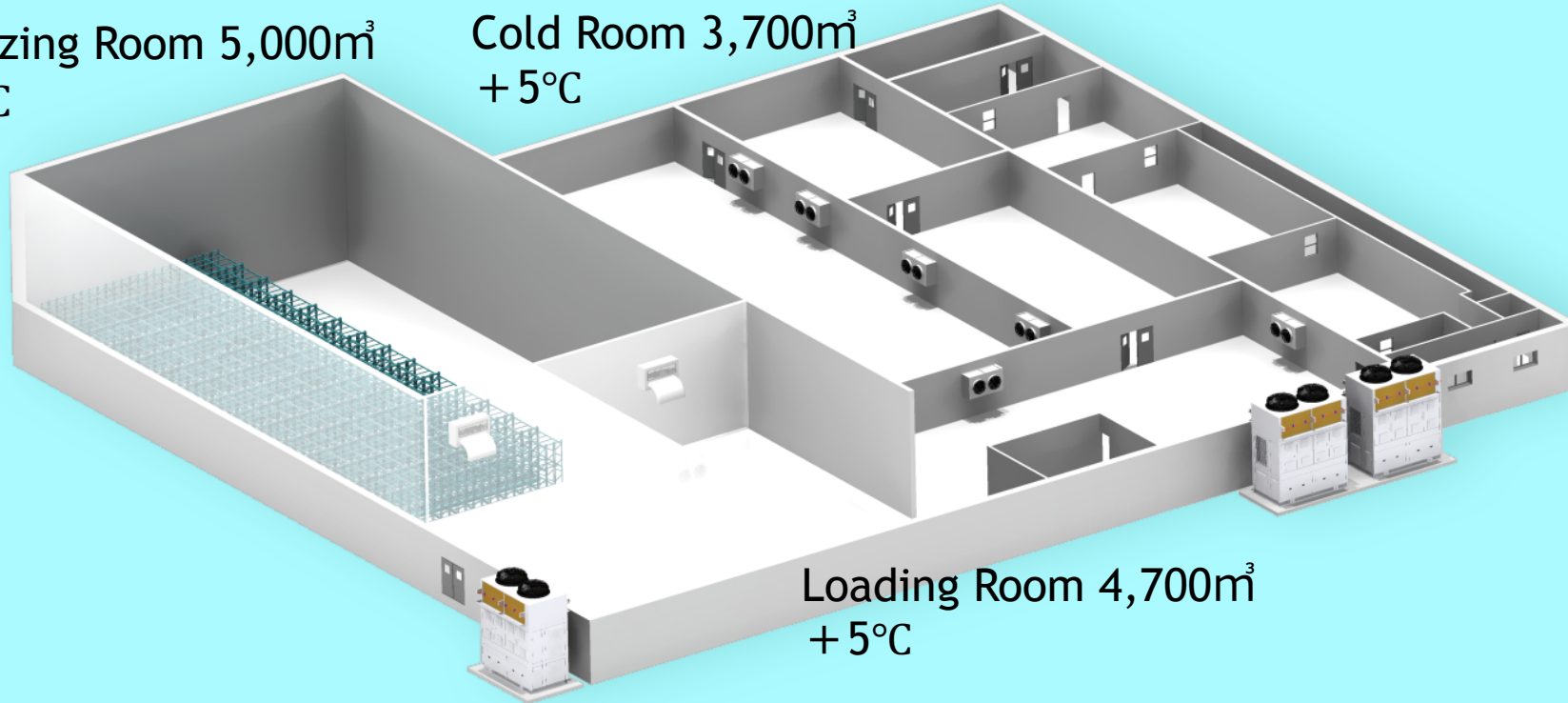
New cold storage project



New cold storage project

Freezing Room 5,000m³
-25°C

Cold Room 3,700m³
+5°C

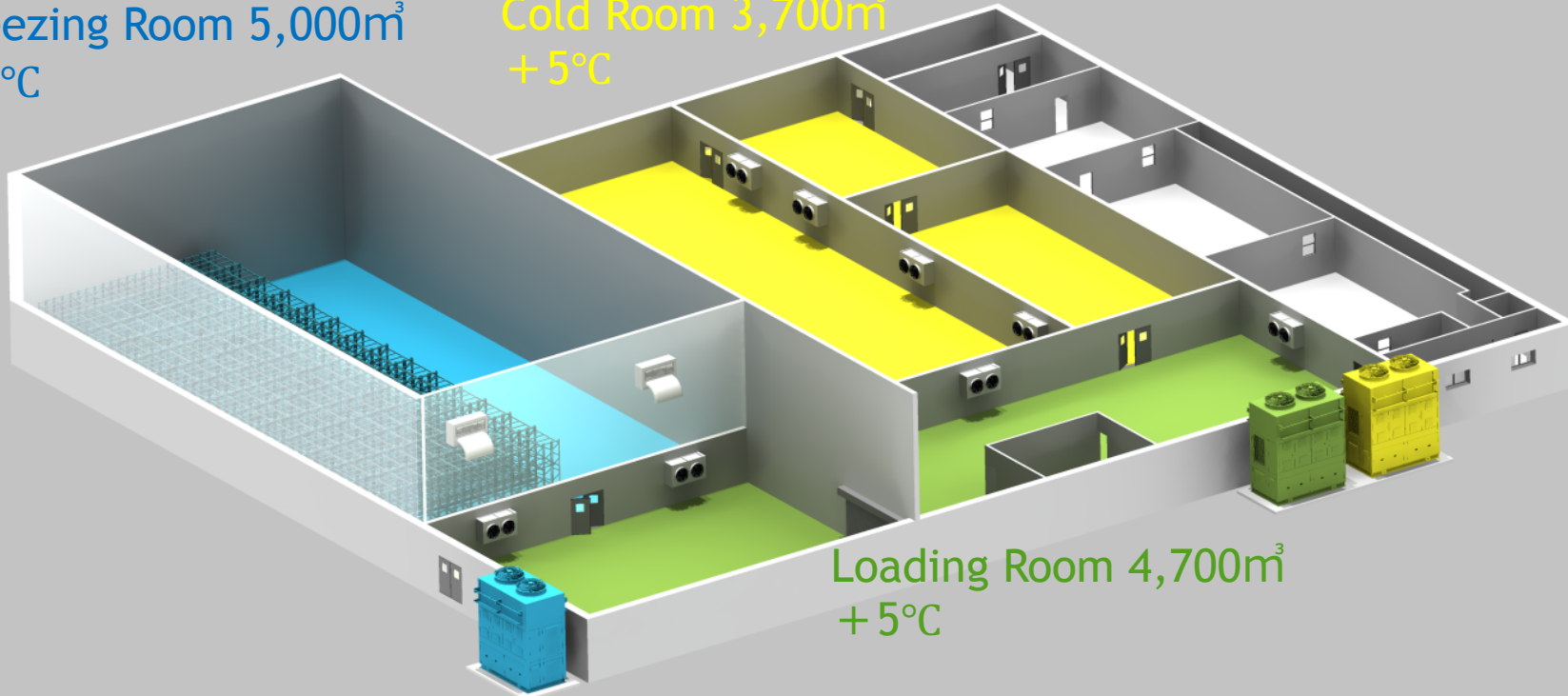


Loading Room 4,700m³
+5°C

New cold storage project

Freezing Room 5,000m³
-25°C

Cold Room 3,700m³
+5°C



Loading Room 4,700m³
+5°C

New cold storage project

Specification of the project

- ▶ Start operation in April 2018
- ▶ Freezing room 5,000m³ F-2 type 2stage 68kW 1unit
- ▶ Loading room 4,700m³ C-2 type single stage 88kW 1unit
- ▶ Cold rooms 3,700 m³ C-2 type single stage 88kW 1unit
- ▶ Pipes to evaporator made by copper
suction pipe(liquid) Φ 25.4mm discharge pipe(gas) Φ 34.9mm
- ▶ CO₂ pressure to evaporator 3.5MPa, only 35%higher puressure than R410A (2.6MPa)



CO₂ BOOSTER
SUPER GREEN



New cold storage project



Conclusion

- ▶ Cold Storage owners will accelerate shifting to natural refrigerant
- ▶ CO₂ can be one of new option for cold storage and logistic center cooling
- ▶ I will show my new storage to members of Japan Association of Refrigerated Warehouses, June 2018

