



Business Case for
Natural Refrigerants

Initiatives to Introduce Energy-Saving Natural Refrigerant Facilities

12/02/2019

TOKYO

Daisen Nyugyo Agricultural Cooperative Association





- ◆ Organization Name : Daisen Nyugyo Agricultural Cooperative Association
- ◆ Representative / Board chairman : Takao Komae
- ◆ Location : 37-1 , Kotora-machi , Tohaku-gun, Tottori Pref.
- ◆ Founded : July 21, 1946
- ◆ Number of members : Regular members /169 Associated members /739
(As of December 2017)
- ◆ Manufacturing plants :
 - ① Milk and Yogurt plant
 - ② Milk powder plant
 - ③ Ice Cream plant
 - ④ Confectionery plant



**“Every Drop of Milk is Produced with Care ”
Bringing the milk produced with farmers’ care to your table**

Our integrated system delivers
the milk produced with farmers’ care to your table.

Daisen Nyugyo is a dedicated dairy cooperative with an integrated system covering production, processing and sales. Our basic philosophy is to act fairly and openly to innovate our organization, business, and management, and to fulfill our social role and responsibilities.

We are a unique entity in Japan, being completely privately funded with one production organization and one processing plant per prefecture.





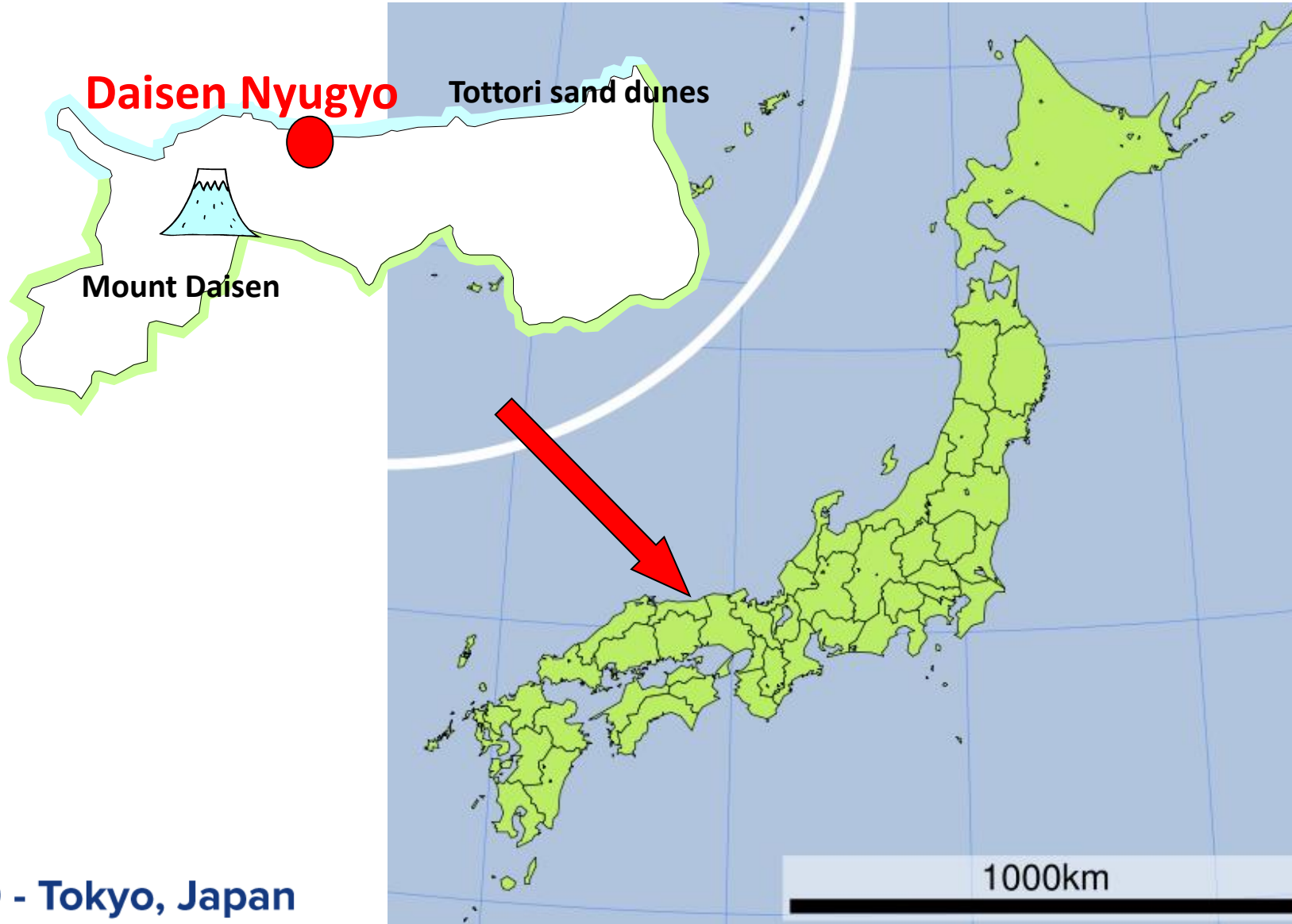
Our symbol is a white rose.

In Japan, a white rose symbolizes openness, purity, and being worthy for someone.

Starting from the production of milk that is pure and wholesome, just like a white rose, we will treat people with great care and contribute to creating healthy lifestyles for them.



Tottori Prefecture



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検定牛
比率98.5%

鳥取が17年連続1位

Tottori Prefecture had the highest rate of officially tested cows at 98.5%. Tottori has been #1 in this category for 17 consecutive years.

表2 検定牛比率が50%以上の都府県

順位	前回順位		検定農家 戸数(戸)	検定牛 頭数(頭)	1戸当たり 検定頭数 (頭)	検定農家 比率(%)	検定牛 比率(%)
1		鳥取県	109	5,692	52.2	80.1	98.5
2		福岡県	183	7,677	45.4	71.6	88.8
3	↑4位	宮崎県	206	7,992	38.8	80.5	77.6
4	↓3位	鹿児島県	130	8,159	62.8	72.2	77.0
5	↑7位	熊本県	359	21,652	60.3	61.9	72.7
6	↓5位	岡山県	173	7,309	42.2	64.3	67.7
7	↑10位	大分県	52	5,482	105.4	36.9	64.3
8	前回 61.8%	沖縄県	42	2,107	50.2	57.5	64.2
8	↓6位	東京都	25	758	30.3	52.1	64.2
10	↓8位	岩手県	417	17,246	41.4	45.0	64.1
11	↓9位	秋田県	57	2,115	37.1	52.8	63.5
12	前回 65.8%	滋賀県	26	1,448	55.7	45.6	63.0
13	〃 58.7%	愛媛県	66	2,354	35.7	56.4	58.3
14	〃 56.8%	山口県	31	1,239	40.0	50.8	56.8
15	〃 54.3%	高知県	26	1,510	58.1	40.6	53.9
16	〃 55.1%	兵庫県	124	5,544	44.7	39.5	53.8
17	〃 54.1%	群馬県	201	13,051	64.9	36.5	53.7
18	〃 56.6%	広島県	84	3,230	38.5	52.5	52.4

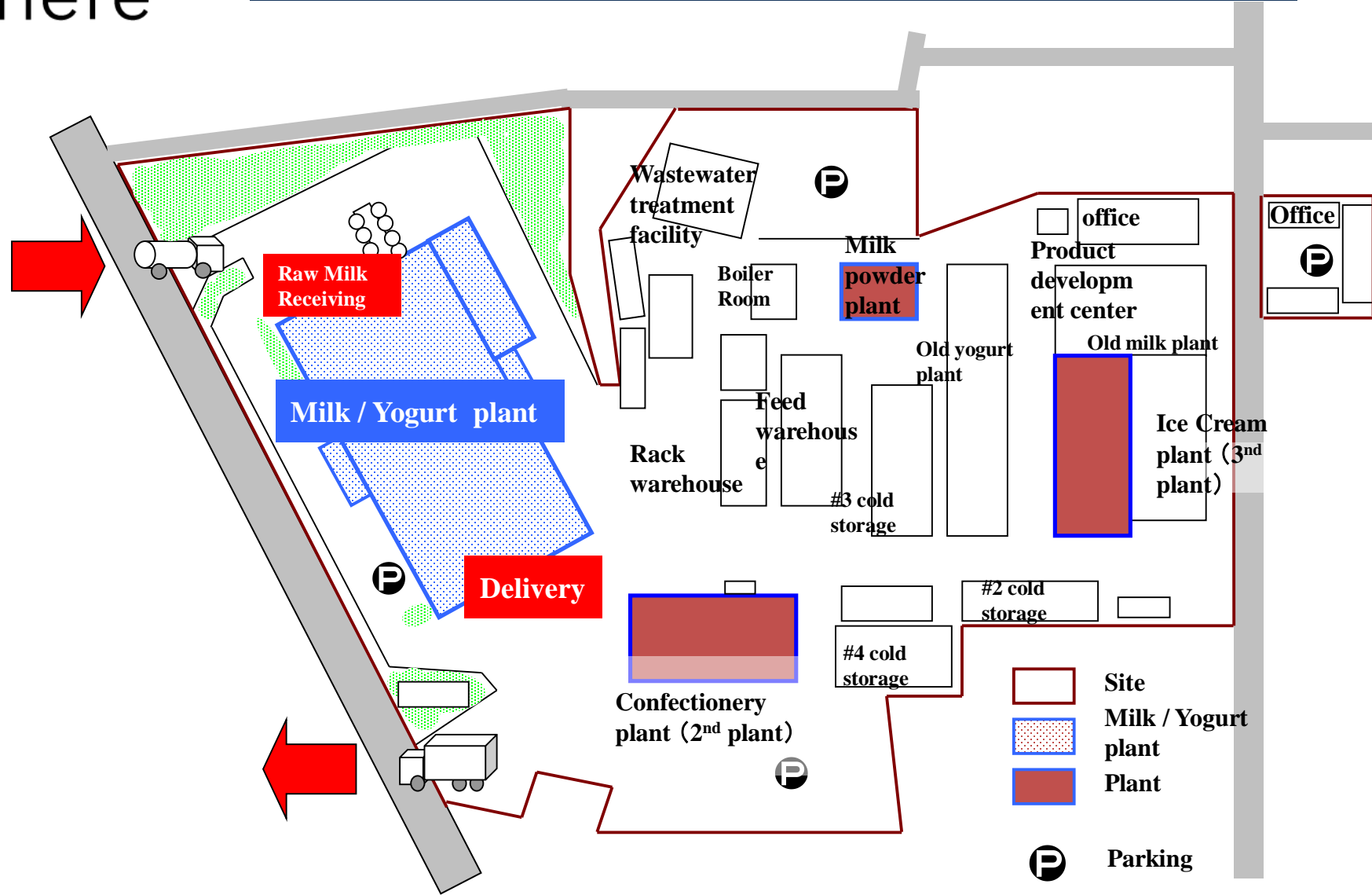
家畜改良事業団は10日、2016年度乳用牛群能力検定成績速報を発表した。16年度の検定農家比率は49.8%で前年比10.4ポイント上昇。検定牛比率は0.6ポイント低下の60.9%だった。検定牛比率が最も高かったのは鳥取県(98.5%)で17年連続1位。2位は福岡県、3位は宮崎県だった。

The herd test provides information about the production capacity per head of dairy cattle (milk quantity and quality, etc.) and will be used as a dairy farm management performance indicator going forward.

Fiscal year 2016 dairy herd capacity testing result



Site Overview



Global environmental problems



1980's The issue of ozone layer depletion became apparent

1987 Adoption of the Montreal Protocol

1988 Establishment of the Ozone Layer Protection Law

1996 Abolition of CFC

1990's The issue of global warming became apparent

1997 Adoption of the Kyoto Protocol

1998 Establishment Law for Promotion of Global Warming Countermeasures

2001 Establishment of CFC recovery / destruction law

2015 Paris Agreement

2016 Kigali revision



Environmental Initiatives



In 2003-2004 Construction of a new Milk and Yoghurt plant

- The milk industry restructuring project integrated three local operators and four plants.
- In 2003, we started construction of a new plant focused mainly on processing milk and yogurt on this site.
- Construction was completed in 2004.



1) Ability of Milk Storage

420ton

2) Manufacturing capacity

- ① Large size Paper milk cartons(1,000ml. 500ml.)
- ② Small size Paper milk cartons (200ml.)
- ③ Large milk bottles (900ml. 500ml.)
- ④ Small milk bottles(180ml.)
- ⑤ Butter
- ⑥ Bream
- ⑦ Fermented milk

22lines	7,000 units/h
2 lines	7,500 units/h
1 line	8,000 units/h
1line	24,000 units/h
2lines	400kg·800kg/batch
1 line	800ℓ/h
5 lines	6,000ℓ/h



The concept for Phase 1. is “**eliminating Fluorocarbons**”

Refrigeration equipment used in various areas in the milk plant, all uses **natural refrigerants** except for certain equipment moved from the previous plants and office air conditioners

◆ **Chilled water equipment for Process cooling**

N160 NH₃ Brine cooler 110kW 2sets

Ice on coil type ice bank 30t 2sets

◆ **Yogurt chilling equipment**

N6K NH₃ evaporative condenser unit 45kW 1set

◆ **Product cold storage**

N8K NH₃ evaporative condenser unit 55kW 2sets

◆ **Ante room and material picking room**

EK-1 NH₃ air-cooled unit 10kW 4sets

◆ **Air conditioning for production room**

Double effect absorption refrigerator 100USRT 2sets

PHASE1. Fluorocarbon Free



Chilled water equipment for Process cooling

NH₃ brine cooler

◎ Cooling capacity : 286kW 2sets

Ice bank : 30ton 2sets

Air conditioning equipment for production room

Double effect absorption refrigerator

◎ Cooling capacity : 100USRT

◎ Number : 2sets

Product cold storage / Low temperature work room

NH₃ Evaporative condensing unit

◎ Cooling capacity : 166kW 2sets

◎ Room temperature : 2°C

Anteroom

NH₃ Air cooled brine cooler

◎ Cooling capacity : 20kW

4 sets

◎ Room temperature : 5°C

Yogurt chilling equipment : NH₃ Evaporative condenser unit

◎ Cooling capacity : 111kW 1set ◎ Room temperature : 0°C

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The concept for Phase 2. was “higher efficiency”
The world is confronting a new problem: global warming. It is no longer enough simply to use natural refrigerants.

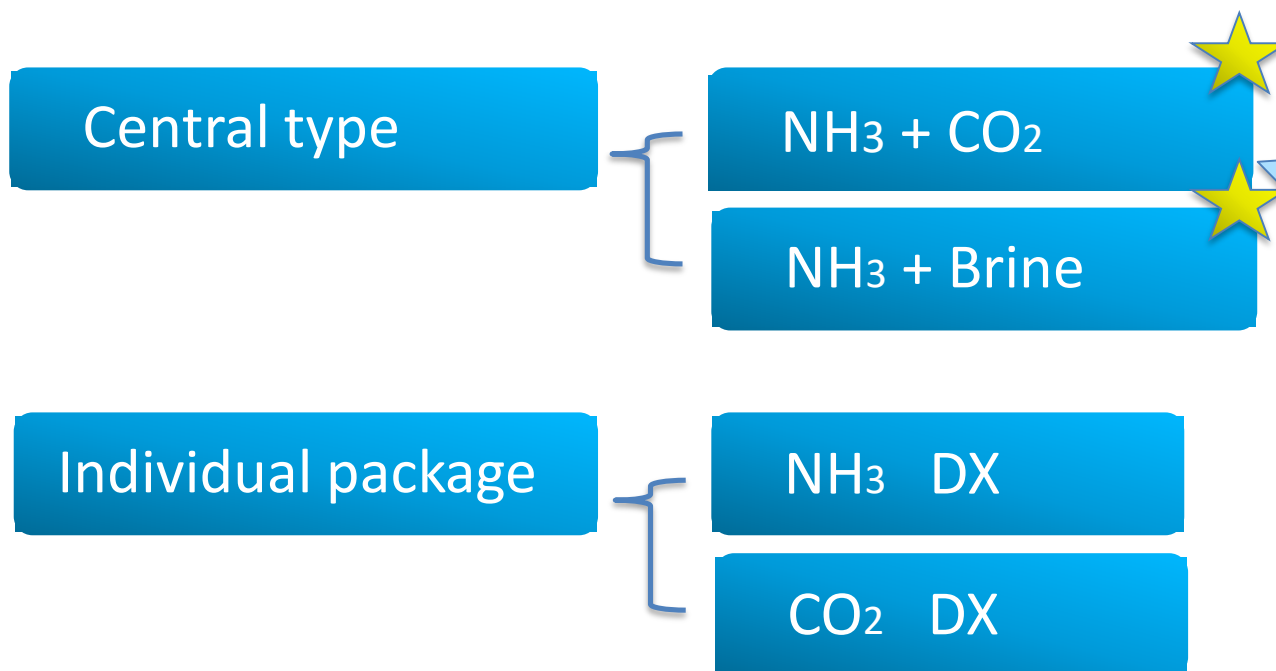
Daisen Nyugyo has started working towards its next major goal of rationalizing energy usage.

Milk plants use a very large amount of refrigeration equipment. Making this equipment more efficient is a major step towards achieving our goal.





◆ Choosing system / device



- Because there is no lubricant oil in the evaporator (cooler etc.), the efficiency of heat transfer will not drop.
- High performance in the partial load operation will be achieved by the secondary refrigerant system with cooling by multiple refrigeration packages.



No. 4 Cold Storage that used refrigerant R22 -27°C 1,100 ton
 Replaced with the highly efficient NH₃/CO₂ brine system “NewTon-F600”
 Increased capacity to keep pace with growth in demand

Reduction of Electric power consumption ※

23.4%

Reduction of CO₂ emission

53.2t-CO₂/year

※ in comparison to R404A system

< **NewTon-F600** >

Model : HFS-90L-PR40-02

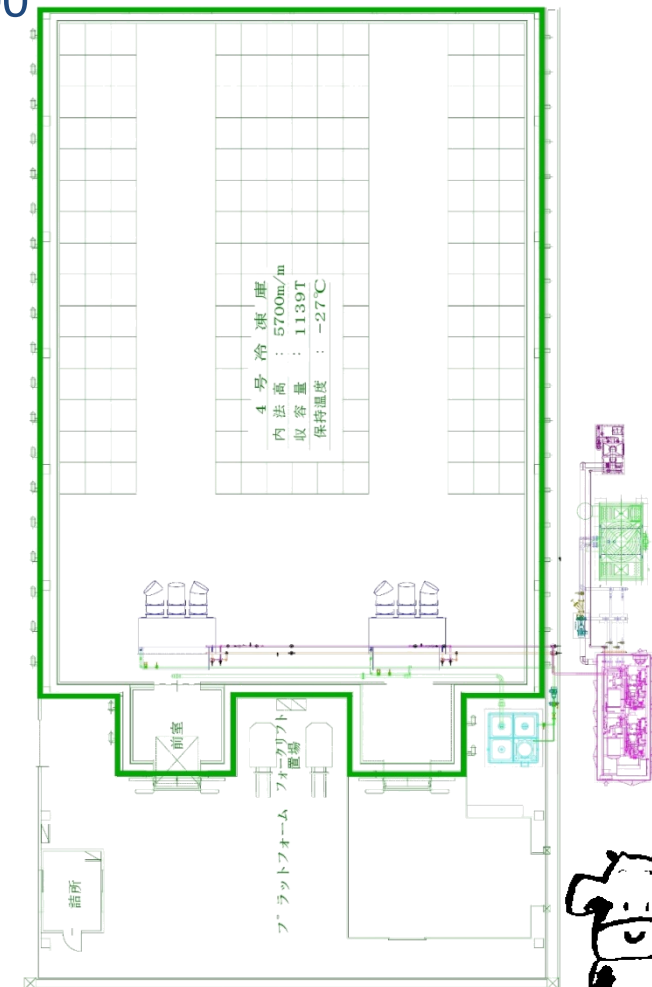
Refrigerant :

Primary: Ammonia, Secondary: CO₂(R744)

Ammonia charge : 42kg

COP : 2.01 (CO₂ : -34°C, cooling water : 32°C)

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We replaced the aging R22 brine cooler which had become inefficient, with the highly efficient NH₃ brine cooler “NewTon-i”.



Reduction of Electric power ※ consumption

18%

Reduction of CO₂ emission

121t-CO₂/year

※ in comparison to R404A system

<NewTon-i>

Model : HBS-TP-140L-NN4I-03

Refrigerant: Ammonia charge : : 60kg

COP : 1.94 (TE : -42°C, Cooling water : 32°C)





No. 3 Cold Storage, which used refrigerant R22. We replaced this with the highly efficient NH₃/CO₂ brine system “REABEL”.

Reduction of Electric power ※
consumption

33%

Reduction of CO₂ emission

196t-CO₂/year

※ in comparison to R404A system

<REABEL>

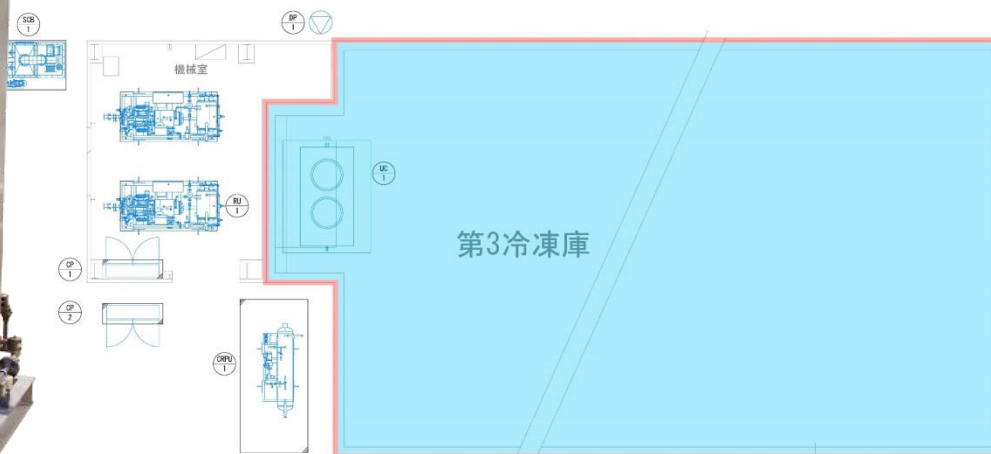
Model: RCS-22L-NN2I

Refrigerant :

Primary: Ammonia, Secondary: CO₂(R744)

Ammonia charge : 18kg

COP: 1.60 (CO₂: -37°C, Cooling water: 32°C)



PHASE 2. Ante room for Milk and Yogurt (5°C)



We replaced the aging air-cooled refrigeration system, which used ammonia refrigerant, with the highly efficient NH₃/CO₂ brine system “SIERRA-W”

Reduction of Electric power consumption ※

20%

Reduction of CO₂ emission

24t-CO₂/year

※ in comparison to R404A system

<SIERRA-W>

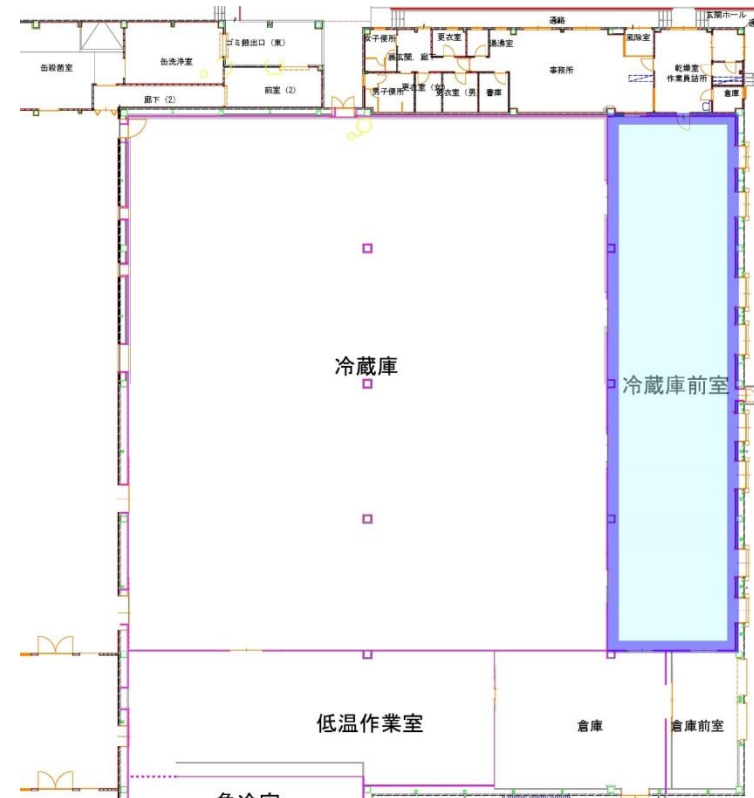
Model : MNCP-NSC15-W

Refrigerant :

Primary: Ammonia, Secondary: CO₂(R744)

Ammonia charge : 3.7kg

COP : 2.7 (CO₂ : -7°C, Cooling water : 30°C)





We will continue our initiatives for Phase 2 at Daisen Nyugyo.

We are hopeful that equipment manufacturers and engineering firms will develop even more efficient machinery and systems.

Daisen Nyugyo Agricultural Cooperative Association will continue its efforts to minimize its impact on global environment. We will act fairly and openly, starting from our production of pure, wholesome milk like a white rose as we contribute to making healthy lives for people while valuing our caring relationships with them.





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**Thank you
for listening.**



大山乳業農業協同組合

Daisen Nyugyo Agricultural Cooperative Association

