Large Scale, Central Type, Low Charge NH₃ Refrigeration Plant

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Maintaining Innovation
TECHNOLOGIES | DESIGN | CONSTRUCTION | SERVICING
Central Type, Low Charge NH₃ Refrigeration Plant

- LOW NH₃ CHARGE
- LOW ENERGY CONSUMPTION
- LOW OCCUPATIONAL RISK
- LOW DIRECT EMISSIONS
- HIGH EXPECTATIONS
How Does Low Charge NH₃ Look?
How Does Low Charge \( \text{NH}_3 \) Look?

- Lower ceiling = no sprinklers
- Evaporator air supply
- \( \text{NH}_3 \) inventory 850 kg
How Does Low Charge NH₃ Work?

Valve stations and pipelines outside building

Total NH₃ operating charge 5 kg

Unit capacity 155 kW

Cold Storage Design Innovations Award Winner

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Climate Suitable for Ambient Air Defrost?

- Ambient air defrost has been used in all parts of Australia
- Applied in minimum warehouse temperature of -30°C
- Melbourne latitude 37°, 47’S – penthouses; 2°C winter
- Perth latitude 31°, 57’S – alcoves; night temp. 9°C

Singapore coordinates: 1.3521° N, 103.8198° E
How Does Low Charge NH$_3$ Work?

The dielectric spectroscopy (capacitance) measurement method uses the difference in dielectric properties of gases and liquid.

Electronically controlled R717 injection based on refrigerant quality at evaporator exit.
How Large can a Low Charge NH₃ Plant be?

No technical limits

- Refrigerated volume 114,000 m³
- 50/50% freezer/chiller
- 13,000 m² refrigerated area
- 500/600 kW LT/HT
- 750 kg NH₃ (0.7 kg/kW)
- 10 kWh/m³*a (storage)
- 17 kWh/m³*a (50 t/day)
Refrigerated volume 5,250 m³

46/54% freezer/chiller
1,264 m² refrigerated area
45/49 kW LT/HT
Replaces ten year old HFC plant
Projected electricity cost savings $8,000/month
How Energy Efficient?

SEC (kWh/ft³)_{average\ practice} = 38.978 \times \text{storage volume} - 0.2275

**RECORDED VALUES**

- **NH}_3, single stage economized screw compressors**
- **TC CO}_2, air cooled, electric defrost**

- Tamworth
- Dongguan
- Perth
- Melbourne
- Townsville
- Yatala (blast+A/C)
- Lytton (50 t/day blast)

California Energy Commission 2008

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How Is the Market Acceptance?

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How Is the Future Likely to Be?

Smaller tubes for reduced NH₃ inventories

NH₃ DX S&T's

Factory Packaging for Mobility and Safety

304SS piping for low friction, high corrosion resistance, low leakage probability
How Is the Future Likely to Be?

Low Charge Plate Freezers

Secondary loop defrost for further NH$_3$ inventory minimization, prevention of liquid hammer, energy efficiency and better defrost efficiency
ONCE YOU GO AMMONIA YOU NEVER GO BACK

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