



Food Industry utilizes Natural Refrigerants

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Food Industry is a “Natural” Fit

Natural Refrigerants are a growing solution to replace “HFC”

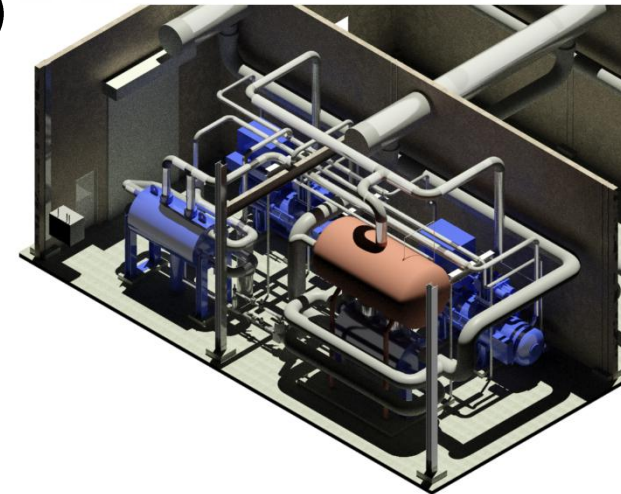
- Energy advantage over conventional “Freon” HVAC solutions on market today.
- Packaged systems becoming readily available
- New, low charge designs minimize ammonia charge
- Standardized transcritical CO2 packages being developed.
- CO2 as a volatile brine being used more.
- As market evolves, prices will decrease.

Food industry is already moving to natural refrigerants to replace “HFC”

- Already familiar with natural refrigerants
- Understand benefits
- Have staff that is comfortable with using them

1. Major food manufacturer built greenfield plant

- HVAC for 20,000 sf office 100,000sf of 75F manufacturing facility
- 520 TR 44F chilled water system
- Ammonia Chiller in machine room
 - All ammonia contained in machine room
 - 2-screw compressors (0.84 BHP / TR)
 - Evaporative condenser
 - DX economizer
 - Less than 2 lb_{nh3} / TR

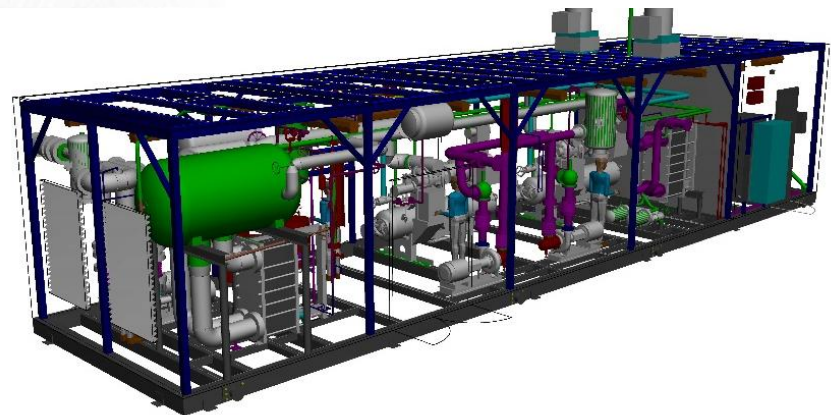


2. Major Food manufacturer R & D Center.

- Four story 80,000 sf office, 70,000 sf R&D area, numerous walk-in freezers and coolers at different temperatures.
- Committed to natural refrigerants.
- Used a 750TR ammonia chiller to provide chilled water for HVAC system.
- Used a packaged 50 TR transcritical CO₂ system to provide a -22°F suction level for the freezer walk-in coolers and a 15°F suction level for the cooler walk-in coolers.

3. Major Food Manufacturer

- Existing old “Freon” HVAC system that needed replacement.
- Existing Freon system was air cooled.
- Realized 22% overall energy efficiency gain.
- Installed a 300 TR ammonia/glycol chilled water package.
 - 2 compressors
 - Cooling tower
 - 792 lbs. of ammonia



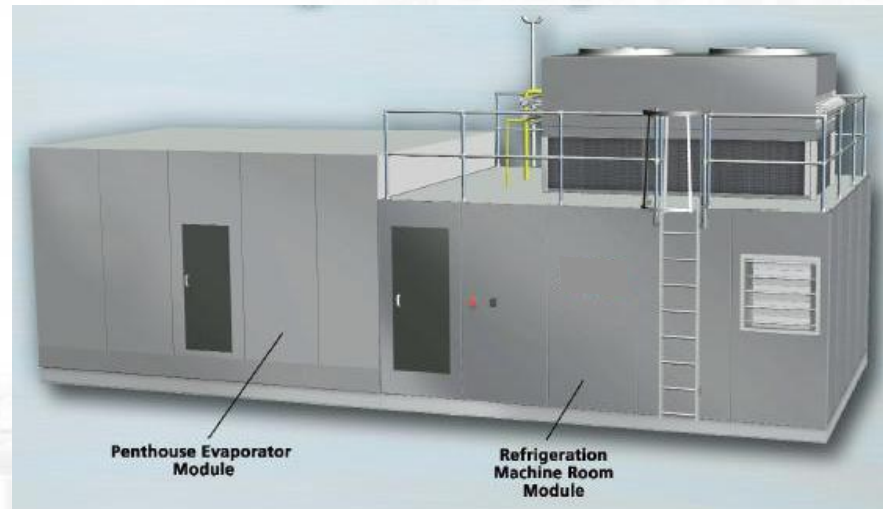
4. Major Food Distributor

- All refrigeration historically was “Freon” rack systems
- Wanted to replace Freon but didn’t want ammonia in plant.
- Utilized a CO₂/NH₃ system with all ammonia contained in machine room
- Used CO₂ as a volatile brine to provide refrigeration throughout the plant.
 - -20F system for freezers
 - 15F system for coolers and docks.

What’s the future

Distributed Refrigeration: Multiple packaged systems located at the load.

- Standard designs
- Performance tested
- Repeatable solutions
- Mass produced
- High quality
- Lower first cost
- Low charge, reduced risk
- Flexible solutions: packaged chillers, packaged air handling units, packaged machine rooms for split system.





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business case

natural refrigerants

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Thank you very much!