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Natural Refrigeration Systems @ DeCA
An End User Perspective

What is DeCA? – A supermarket chain.

The Defense Commissary Agency (DeCA) is the supermarket to the military.

- 240 stores world wide on military bases
- Cold storage and distribution facilities overseas
- \$5.5B in grocery sales
- Retail organization looking at what the future holds and planning for it

NATURAL REFRIGERATION PROJECT LOCATIONS

LOCATION

- SPANGDAHLEM GERMANY
- LACKLAND AFB (SAN ANTONIO, TX)
- NEWPORT, RI
- EDWARDS AFB, CA (MOJAVE, CA)
- MOUNTAIN HOME, ID

CLIMATE

COOL

HOT & HUMID

MARINE

HOT & DRY

MOUNTAIN



RESULTS CO2 Transcritical in Europe

- Reliable
- Energy Efficient Solution
- Meets EU F-gas regulations
- Mature Technology on the European continent
- Standard for all new DeCA installations in Europe including “south of the Alps”
- Technology should transfer to other markets.

Low Side (CO₂) of NH₃/CO₂ Cascade



- CO₂ circulated inside store
- Low temp direct expansion with compressors
- Medium temp pumped CO₂ with liquid overfeed

High Side (NH₃) of NH₃/CO₂ Cascade



- CO₂ condensed by NH₃
- Multiple low charge NH₃ compressors – about 8 lbs. NH₃ per module with 9 total modules
- NH₃ with water cooled condensers and fluid cooler

RESULTS – NH₃/CO₂ CASCADE

- Achieved “Proof of Concept”
- Achieved energy goal – kbtu/sf/year was 160 (46.7kWh) before the project and is 123.4 (36.1kWh) now – 23% reduction.
- Very low ammonia charge
- Some expected glitches in set up for a pilot project
- Lessons learned:
 - controls are critical
 - water cooling equals extra maintenance
 - heat reclaim possibility is low
 - need ammonia qualified service contractors
- Viable alternative if commercialized.

CURRENT TRANSCRITICAL PROJECTS IN THE USA

- All three sites had successful installation
- One site had issues during installation resulting from untrained installers
- For remodels, significant loads are required for system start up
- Not enough time on systems to determine energy results
preliminary results at Newport: reduction of 14% (Oct – April)
- All installations use adiabatic condenser/gas cooler
- All installations use parallel (booster) compression

ADIABATIC CONDENSER/GAS COOLER



- Standard coils with adiabatic pre-cooling media
- Runs dry during cold weather
- Objective: minimize time the system operates in transcritical mode

SUMMARY

- Viable natural refrigerant solutions are available now in the USA from a multiple equipment manufactures
- Training for installers and maintenance personnel is a critical need
- Hot climates require strategies to manage Transcritical operations and maximize efficiency



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Thank you very much!

