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June 18-19, 2014 - San Francisco

"Reducing Ammonia Charge in a Large Public Refrigerated Warehouse"

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COLMAC COIL

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Background

- Ammonia is recognized as an excellent refrigerant
  - Environmentally benign (0 ODP, 0 GWP)
  - Energy efficient
  - Low cost
  - Components widely available
- However, its toxicity makes reducing the amount required in the refrigeration system of particular importance.

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Background

- Most industrial refrigeration systems currently use pumped ammonia
  - Good evaporator performance regardless of temperature
  - Good evaporator performance over wide range in load
  - Simple to operate
- Unfortunately, pumped ammonia maximizes the amount of refrigerant in the evaporators (the part nearest people and products!)

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Background

- Direct expansion (DX) offers the following benefits:
  1. *Reduction in amount of ammonia required*
     - 30X to 50X charge reduction in evaporators
     - 4X to 5X system charge reduction
  2. *Potential for reduced regulatory burden*
     - For systems as large as 1500 to 1800 TR, ammonia charge can be kept under 10,000 lbs (4536 kg)
  3. *Improved energy efficiency*
     - Shorter (faster) defrost cycle
     - Dry suction line
  4. *Lower first cost*
     - Smaller line and vessel sizes

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Case Study

New 403,000 sq ft PRW

- Project Description:
  - Type of Facility: New Public Refrigerated Warehouse
  - Location: Midwest USA
  - Floorspace: 403,000 sq ft
  - Total Refrigeration Load: 1,007 TR
    - -10 deg F Freezer and Convertible Rooms @ 801 TR
    - +40 deg F USDA Room and Loading Dock @ 206 TR
  - Central engine room w/ economized screw compressors having thermosyphon oil cooling

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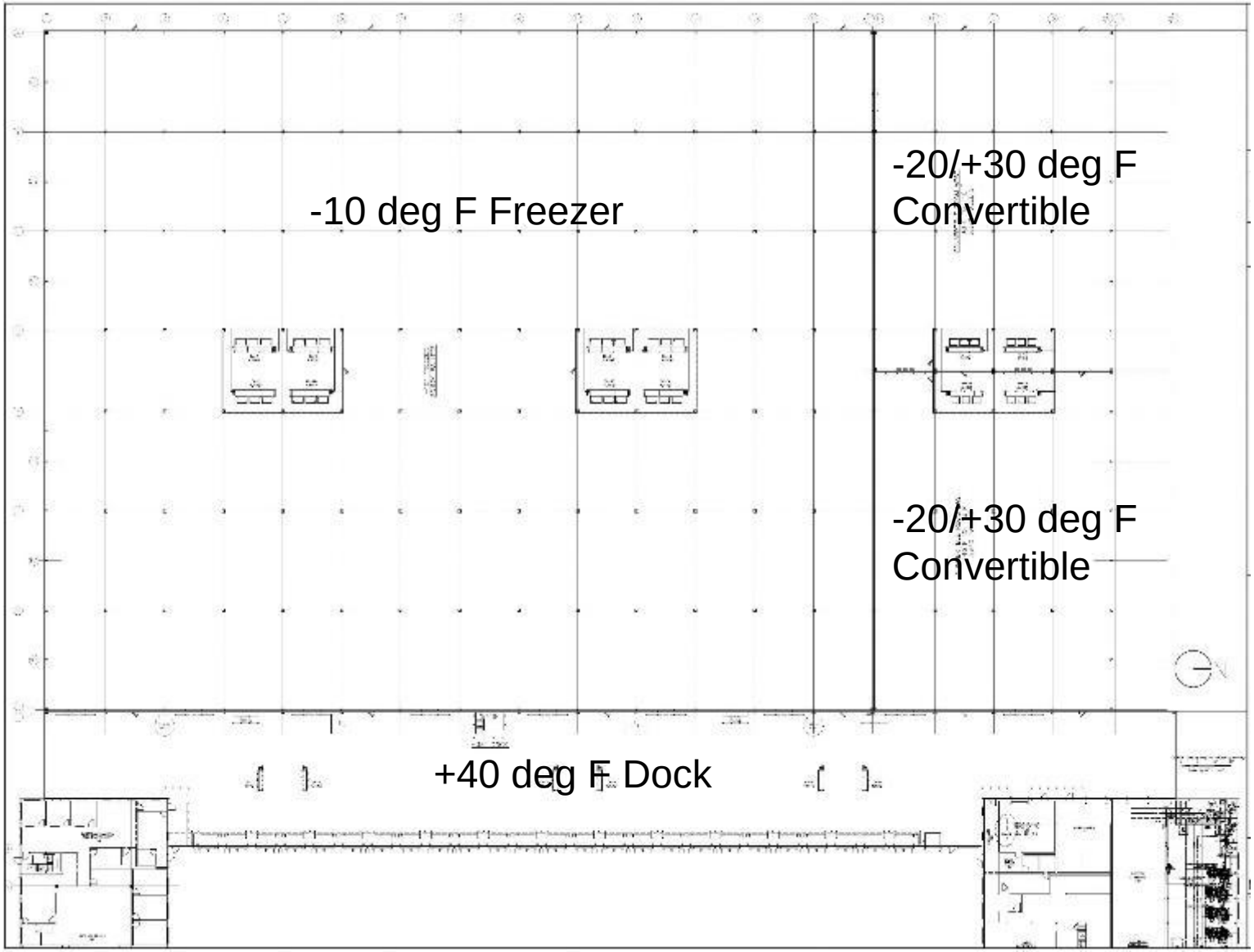

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Case Study

New 403,000 sq ft PRW

- Loading Dock

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New 403,000 sq ft PRW

- Freezer

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Case Study

New 403,000 sq ft PRW

- Penthouse Evaporator

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Case Study

New 403,000 sq ft PRW

- Results
  1. *Reduction in ammonia charge*
     - 7,300 lbs vs approx. 30,000 lbs for pumped ammonia
  2. *Reduced regulatory burden*
     - Facility will not be listed in federal National Emphasis Program (<10,000 lbs ammonia on site)
  3. *Power consumption*
     - Expected power consumption equivalent or less compared to pumped system (this TBD).
  4. *Lower first cost*
     - Installed cost approx. $200k less than estimated for pumped system

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Thank you very much!