GreenChill Advanced Refrigeration Partnership

Food Retailer Certification Standards for Advanced Refrigeration Technology

Webinar Agenda

- 2:00 - 2:20 Intro & explanation of the certification program - Keilly
- 2:20 - 2:40 Advanced refrigeration technology and GreenChill's certification standards – OEMs
- 2:40 - 3:00 Q&A

GreenChill Certification

- Sets standards for store recognition for “GreenChill Certified” advanced refrigeration technology
  - Gold Level Certification & Silver Level Certification
  - Reduced Refrigerant Charge (lbs. of refrigerant p. 1000 BTUs/hr.)
  - Low Emissions Rate
  - No Ozone-Depleting Refrigerants
  - Only allowed to use refrigerants found acceptable for retrofits by EPA’s SNAP Program
- More details at http://www.epa.gov/greenchill/certcenter.html

Gold-Level Certification

- Two ways to qualify
- Meet all the criteria under A or meet all the criteria under B
- Criteria under A are for HFC-Based Refrigeration Systems
- Criteria under B are for Refrigeration Systems using Low-GWP Refrigerants

A. HFC-Based Refrigeration Systems

- The store's refrigeration systems must use refrigerants with zero ozone-depleting potential
- The store's refrigeration systems must use refrigerants that have been found acceptable by EPA's Significant New Alternatives Policy Program (SNAP) for use in retail food refrigeration end-uses
- The store must achieve an average HFC refrigerant charge ≤ 1.25 lbs. of refrigerant per 1000 BTU/hr. total evaporator cooling load
- The store must achieve a store-wide annual emissions rate of no more than 15%

B. Refrigeration Systems using Low-GWP Refrigerants

- The store's refrigeration systems must use refrigerants with zero ozone-depleting potential
- The store's refrigeration systems must use refrigerants that have been found acceptable by EPA's Significant New Alternatives Policy Program (SNAP) for use in retail food refrigeration end-uses
- All refrigerants used in the store must have global warming potentials lower than 150

Silver-Level Certification

- One way to qualify; one set of criteria
- The store's refrigeration systems must use refrigerants with zero ozone-depleting potential
- The store's refrigeration systems must use refrigerants that have been found acceptable by EPA's Significant New Alternatives Policy Program (SNAP) for use in retail food refrigeration end-uses
- The store must achieve an average HFC refrigerant charge ≤ 1.75 lbs of refrigerant per 1000 BTU/hr. total evaporator cooling load
- The store must achieve a store-wide annual emissions rate of no more than 15%

Guidance on Meeting the Certification Criteria

- Forms will be available on line
- Step-by-step instructions for newly constructed stores and stores that have been fully operational for 12 months

Guidance on Meeting the Certification Criteria

- Applies only to a store's commercial refrigeration system
- Does not apply to the store's HVAC system (split systems or self contained).
- BTUs/hr. of the HVAC system may not be included in the refrigerant charge calculations

Guidance on Meeting the Certification Criteria

Included equipment	BTU Calc.	Refrigerant leaked	Refrigerant Stocked	Non-ozone-depleting Refrigerant	Snap approved refrigerant
Self contained Commercial refrigeration equipment	**no**	**yes**	**yes**	**yes**	**yes**
Remote commercial refrigeration equipment	**yes**	**yes**	**yes**	**yes**	**yes**
HVAC Equipment	**no**	**no**	**no**	**yes**	**yes**

Guidance on Meeting the Certification Criteria

- For the list of acceptable SNAP alternatives for retail food refrigeration see http://www.epa.gov/ozone/snap/refrigerants/lists/foodref.html

Guidance on Meeting the Certification Criteria

- The lbs. of refrigerant per 1000 BTU/hr. criteria is based upon adding the store's total remote commercial refrigeration evaporator heat load, including food merchandisers, food prep rooms, and food storage rooms
- Note: It is not the rack rating or compressor capacity, which is typically larger than the calculated load

Guidance on Meeting the Certification Criteria

- Each and every store applying for GreenChill certification must achieve an annual emissions rate of no more than 15%. The emissions rate is calculated as follows:

[(amount of refrigerant emitted over the period of one year ÷ the refrigerant stock) x 100] = % annual emissions rate

Guidance on Meeting the Certification Criteria

- The amount of refrigerant emitted over the period of one year is equal to the amount of refrigerant lost from
  - the store's self contained commercial refrigeration equipment
  - remote commercial refrigeration equipment

Guidance on Meeting the Certification Criteria

- GreenChill certification may be re-earned annually
  - store must meet the certification criteria on an annual basis
- A store that achieves certification for several years may receive “continued excellence” awards.

Guidance on Meeting the Certification Criteria

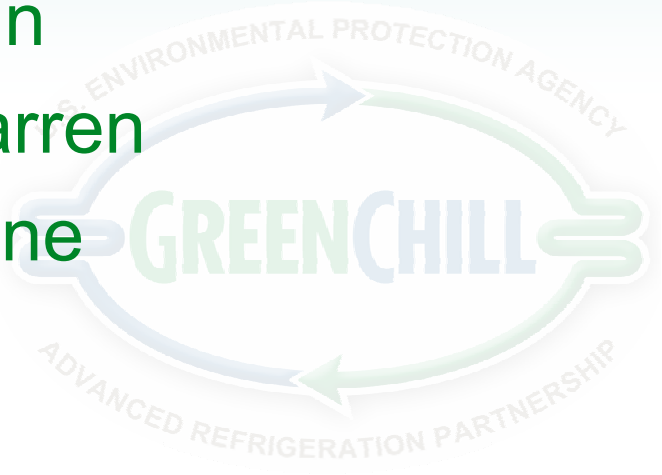
- A store that is unable to achieve the certification criteria in a particular year will lose its certification for that year
- If that store is able to meet the certification criteria in a subsequent year, it will be re-certified for that year and each of the following years that it is able to meet the criteria

Guidance on Meeting the Certification Criteria

- GreenChill reserves the right to verify the information submitted by a store for certification, including, but not limited to:
  - inspection of the store
  - requesting third party certification
  - and/or requesting copies of store records related to the certification criteria

Special Thanks!

- Special thanks to the GreenChill partners who helped develop this program:
  - Jon Perry – Farm Fresh / Supervalu
  - Scott Martin – Hill Phoenix
  - Steve Hagler – Hussmann
  - Buzz Schaeffer – Hussmann
  - Travis Lumpkin – Kysor Warren
  - Bruce Hierlmeier – Zero Zone



Special Thanks!

- Special thanks also to the following people who contributed their time and effort to this undertaking:
  - Bella Maranion – U.S. E.P.A.
  - Dave Godwin – U.S. E.P.A.
  - Julius Banks – U.S. E.P.A.
  - Cliff Timko – Giant Eagle
  - David Hinde – Hill Phoenix
  - Dick Bienvenu – Hussmann
  - Mark Westphal – Zero Zone

For More Info

- **Keilly Witman**

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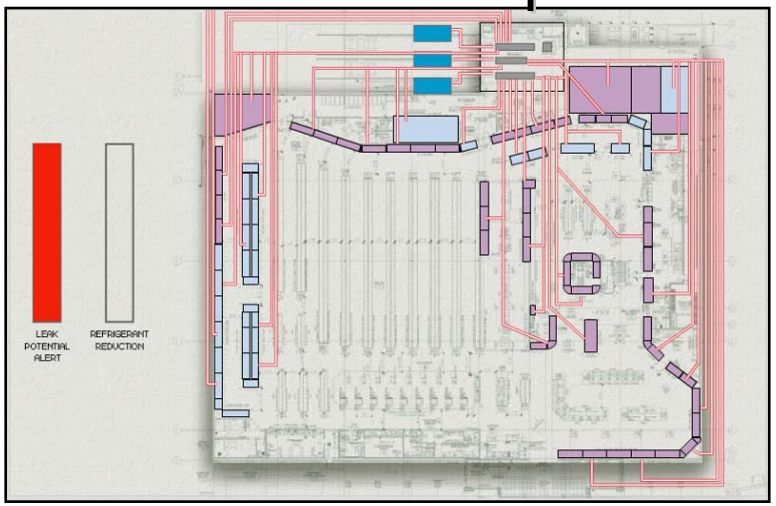
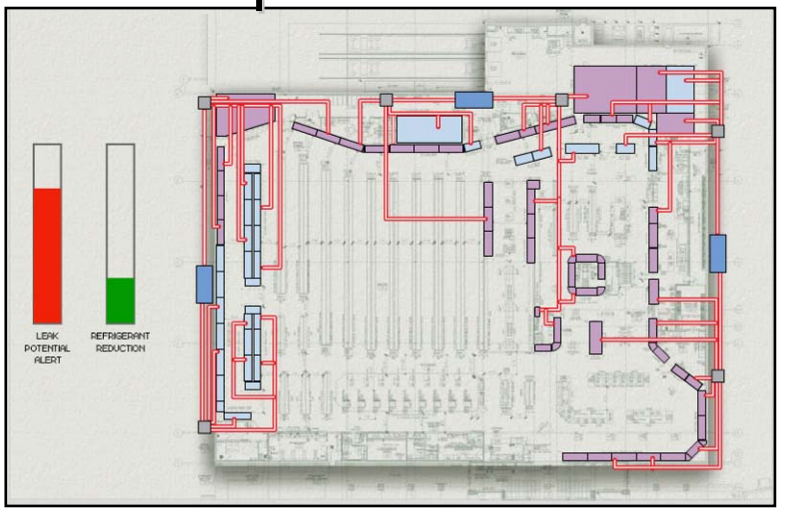
Advanced Refrigeration Technologies from Hill PHOENIX

Design Impact on Refrigerant Requirements

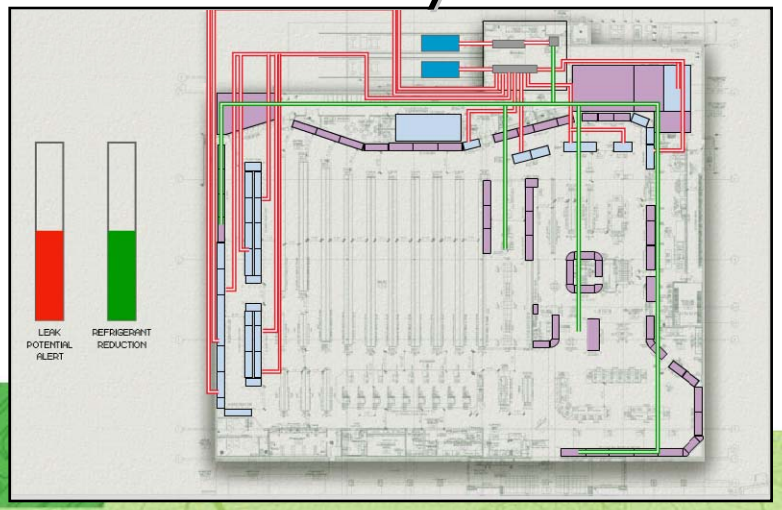
Current Direct Expansion



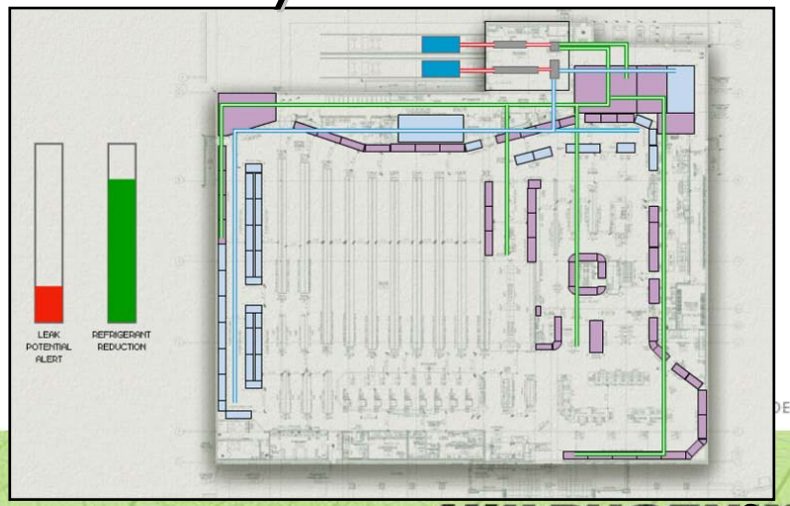
Direct Expansion Distributed



MT Secondary/LT DX

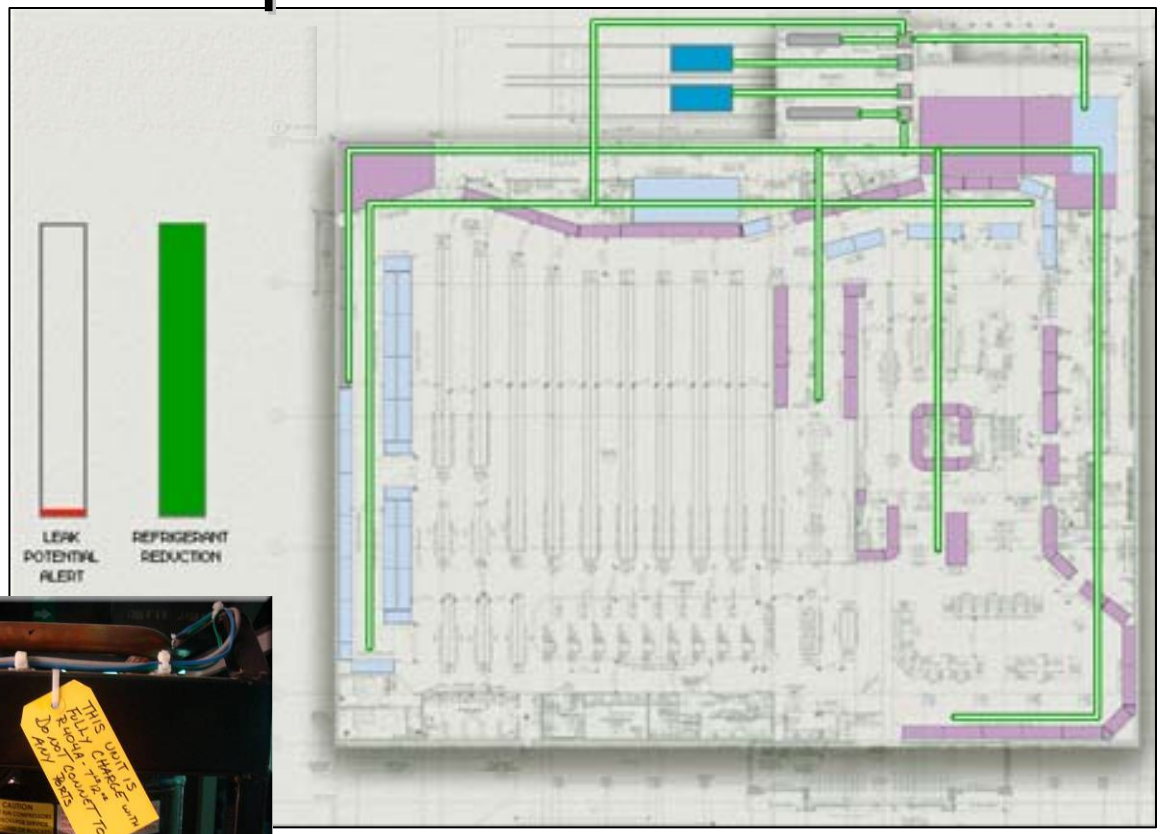


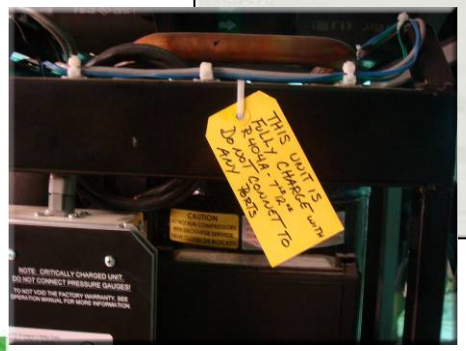
MT Secondary/LT CO2 Secondary



Design Impact on Refrigerant Requirements

Compact Chiller MT and LT



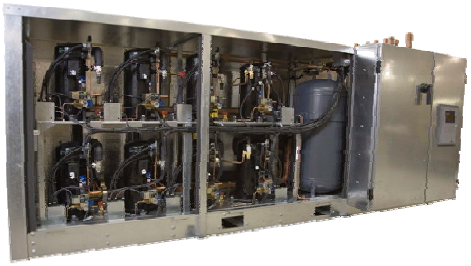


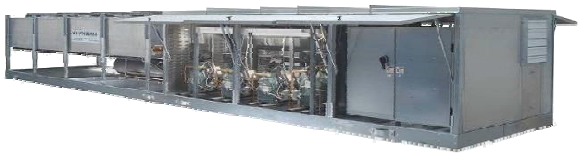
Distributed Systems

- Locate multiple systems closer to refrigerated loads
- Reductions in copper piping, refrigerant charge, and leak rates

PARA TEMP

INVIRO PAC™





WEATHER PAC™

Second Nature MT

- Medium-Temperature Secondary Coolant System
- Circulates propylene glycol in sales area through ABS piping network
- Refrigerant confined to mechanical room
- 60-80% charge reduction
- Up to 90% reduction with modular water-cooled condensers

SNMT
Med Temp
Secondary Systems

SNPS
Medium Temp
Pump Stations

Second Nature LT Secondary

- Low-Temperature Carbon-Dioxide Secondary Coolant System
- CO2 pumped through sales area
- Primary refrigerant confined to mech. room
- 60-80% HFC charge reduction
- Up to 90% reduction with modular water-cooled condensers

SNLT2

Low Temp Secondary CO_2

Second Nature LT CO2 DX Cascade

- Low-Temperature Carbon-Dioxide Direct Expansion Cascade System
- CO2 piping in sales area
- EEVs on evaporators
- Primary refrigerant confined to mechanical room
- 60-80% HFC charge reduction
- Up to 90% reduction with modular water-cooled condensers

SNLTX2
Low Temp
CO_2 Cascade

Second Nature Compact Chiller

- Secondary Coolant System
- Primary system is modular ultra-low-charge: Less than 120 lbs. for typical MT system
- Reliable scroll compressors close-coupled to heat exchanger
- 95% charge reduction
- Ultra-low leak rate
- Pre-charged from factory

SNPS
Medium Temp Pump Stations

SNCC
Compact Chiller

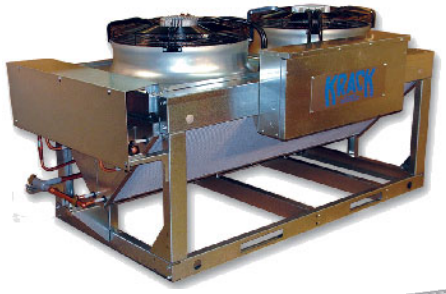
How Hussmann Protocol High Efficiency Systems can Help You Achieve GreenChill Certification

Buzz Schaeffer
Principle Engineer Refrigeration

How Protocol HE distributed systems can help you achieve GreenChill silver or gold certification:

Protocol systems are a great alternative to traditional racks in protecting the environment and achieving Greenchill certification. Thousands of supermarkets worldwide have chosen distributed systems to meet their environmental goals related to refrigerant reduction **without an energy penalty**.

- Compared to traditional back room parallel rack systems, Protocol systems generally use **50 – 80% less refrigerant**, depending on condensing method used
- New technology: Applying air cooled **microchannel condensers** can **reduce the charge in the condenser by 75 – 90%** and virtually eliminate leaks associated with traditional tube and fin condensers.
- Leak rates with Protocol systems are generally reduced by up to 85%.
  - So, a traditional rack system may leak 25-30% per year
  - Protocol systems normally have a **leak rate of 4 to 10%**



← New Microchannel Condenser

How Protocol HE distributed systems can help you achieve GreenChill silver or gold certification:

- Why is the Protocol leak rate reduction so dramatic
  - In the unlikely event of a leak, the maximum potential refrigerant loss would be **80 to 275 lbs. of refrigerant**; compared to 1,200 to 1800 lbs. in a traditional rack
  - Lower leak rate on a smaller charge
  - Less vibration with scroll compressors
  - Pre-bent piping in Protocol systems is **engineered to dampen and eliminate vibration** and reduce joints
  - Elimination of traditional circuits with significantly smaller loop piping
  - There is **50 – 75% less field refrigerant piping** and braze joints
  - Elimination or reduction of leak points like EPR valves
  - Slower leaks are detected more quickly with Protocol systems
- Protocol systems work equally well in reducing charge and leaks in both medium **and low temperature applications**

How Protocol HE distributed systems can help you achieve GreenChill silver or gold certification:

- Excellent **energy efficiency** with Protocol systems, usually **5% better** than most traditional DX rack systems due to **tight suction groupings** and proximity to the evaporator load
- **Significant maintenance reduction** vs. traditional reciprocating systems
  - Fewer moving parts to fail
- Certification levels with Protocol systems
  - Well applied **air cooled** Protocol system – **silver** certification
  - Air cooled Protocol system with **microchannel condensers** – **gold or silver** certification
  - **Water cooled** Protocol system – **gold** certification
- Conclusion
  - With Protocol distributed systems you can achieve either level of certification
  - Reduced charge / leak rate / maintenance / LT & MT solution
  - Reduces energy vs. other alternitives
  - **Additional environmental impact of reduced building steel / elimination of motor room and other materials**

Advanced Refrigeration Technology

GreenChill Store Certification Program

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Integrity – Customer Service – Stewardship - Teamwork

KYSOR // WARREN

Refrigerated Systems

- **Multi-compressor solutions**
- **Mechanical & electrical centers**
- **Remote condensers and unit coolers**

Refrigerated Display Cases

- **Frozen Food**
- **Bakery**
- **Deli**
- **Specialty Area**
- **Produce**
- **Dairy**
- **Meat**
- **Floral**

ART Qualifying Products

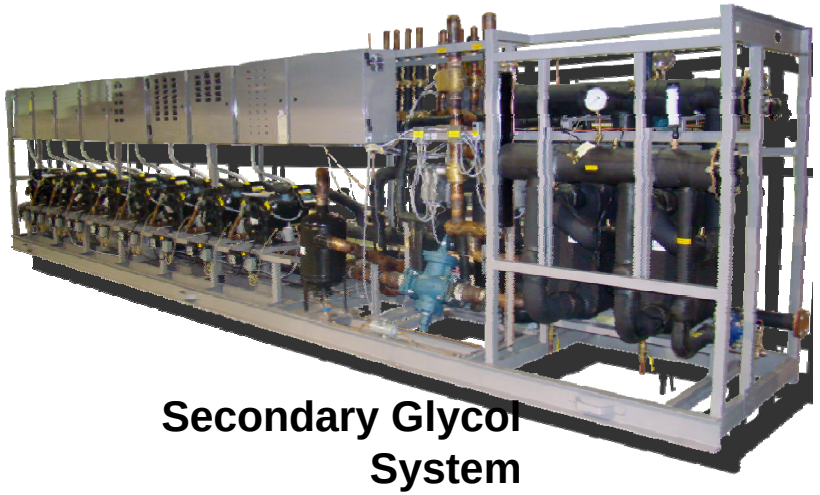
Compact Scroll System

Weather Pack

Distributed Scroll Pack

Distributed Scroll System

Glycol Pumping Station



Secondary Glycol System

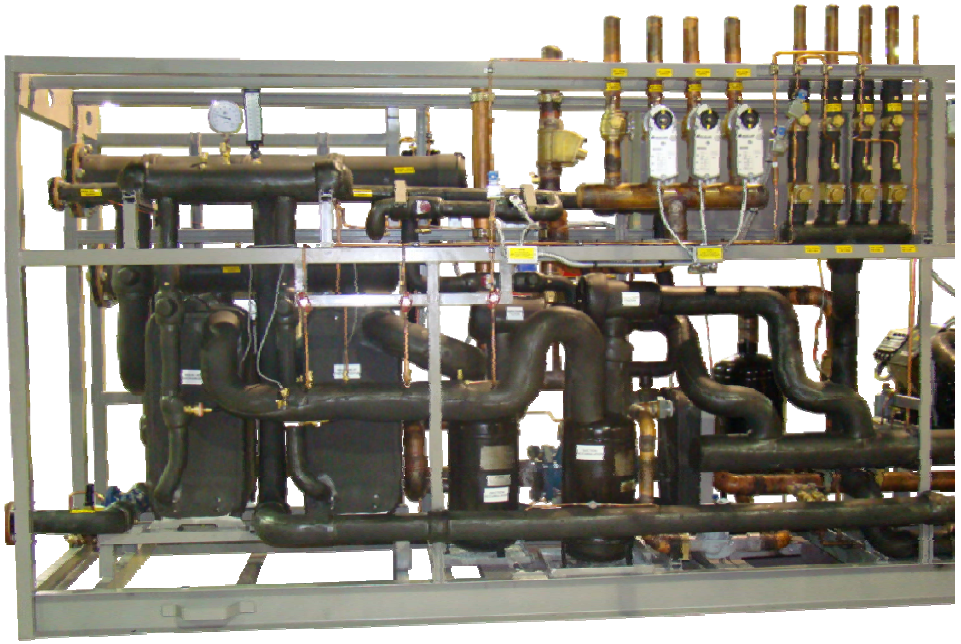
Distributed Scroll Pack (DSP)

- Average charge reduction per system > 85%*
- Reduce overall store charge > 40%*
- Significant reduction in refrigerant leak potential
- Energy saving features such as:
  - Digital Scroll Technology
  - Variable Speed Condenser Fans

* Comparisons against typical centralized systems

Secondary Glycol Systems

- Average charge reduction per MT system > 65%
- Reduce overall store charge > 50%
- Couple with optimized DX LT or Distributed LT
- Great combination for potential Gold-Level Certification



* Comparisons against typical centralized systems

Future Systems

Natural Solutions

CO_2

- Cascade LT & MT design
- Combination design maintains primary refrigerant charge in back motor room
- Significant leak reduction potential of primary refrigerant
- Advanced technology great for applying for Gold-Level Certification

* Comparisons against typical centralized systems