HEATCRAFT™
Worldwide Refrigeration

# $NH_3/CO_2$ Refrigeration System

## Sales Brochure

KYSOR/WARREN®

# About Kysor/Warren

Kysor/Warren, a brand of Heatcraft Worldwide Refrigeration, has been creating solutions with customers for over 125 years. Built on a tradition of excellence, we are proud of our commercial refrigeration products, services and commitment to our customers. Heatcraft creates solutions that help customers achieve their goals for sustainability and profitability, while competing in today's changing commercial refrigeration marketplace.

We provide unparalleled customer service and are on the leading edge of technology in the manufacture of frozen and medium temp display merchandisers, mechanical refrigeration systems and remote mechanical and electrical houses.

Our core values are fundamental to our success, building relationships and creating solutions for our customers. These values define who we are and set us apart from our competition.

## $NH_3/CO_2$ Refrigeration System

Kysor/Warren $NH_3/CO_2$ cascade refrigeration system provides the ultimate solution for sustainable refrigeration system design. This system provides an HFC-free supermarket refrigeration solution while providing significant lifecycle cost savings for retailers.

### Kysor/Warren $NH_3/CO_2$ Cascade Refrigeration Systems Benefits:

- Completely HFC-free system (uses only $NH_3$ and $CO_2$)
- Naturally occurring refrigerants
  - $CO_2$ ozone depletion potential (ODP) of 0 & global warming potential (GWP) of 1
  - $NH_3$ ozone depletion potential (ODP) of 0 & global warming potential (GWP) of 0
  - For comparison, R-404A (common HFC refrigerant) has GWP of approximately 3800
- $NH_3$ and $CO_2$ are both very well established refrigerants
- Most energy efficient refrigeration system design available
- $NH_3$ charge of only 1lb per ton of refrigeration vs typical industry charge of 4 lbs per ton of refrigeration

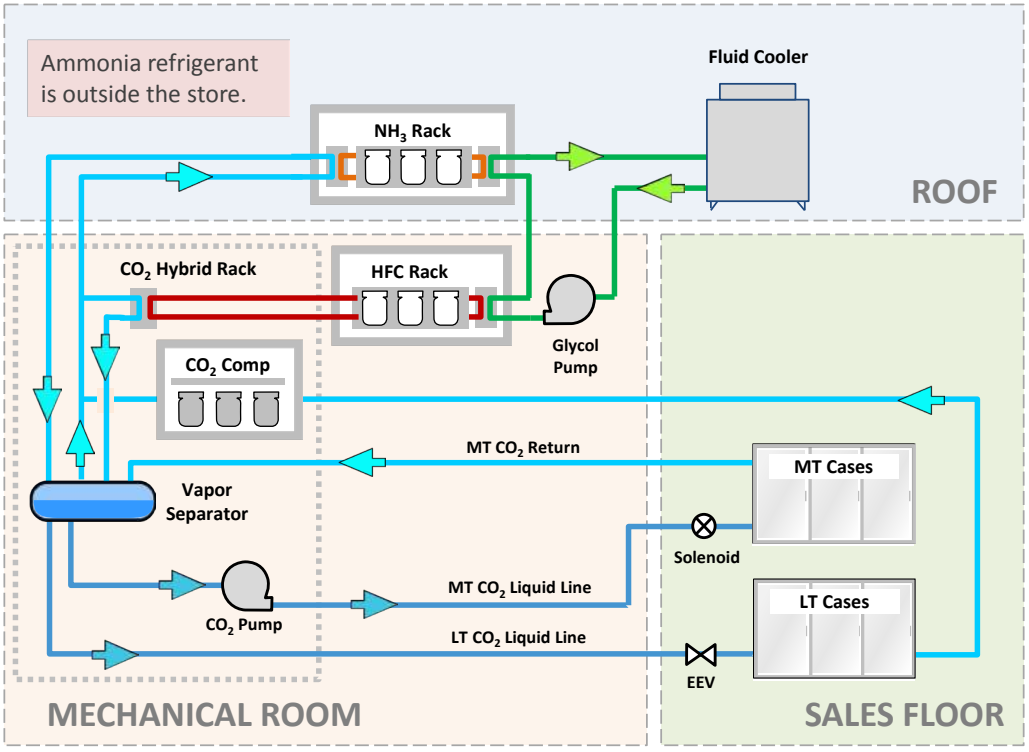
### Kysor/Warren Advantages:

- Commitment to innovation and quality
- Proven history with $CO_2$ cascade and liquid overfeed systems
- Extensive qualification and testing protocols

## Typical Performance vs. Traditional HFC System

| | TRADITIONAL HFC | $NH_3/CO_2$ |
|---|---|---|
| **GLOBAL WARMING IMPACT** | Baseline | ↓99% |
| **ENERGY COST** | Baseline | ↓15% - 23% |

## System Layout




## System Operation

The Kysor/Warren $NH_3/CO_2$ refrigeration system is a completely HFC-free refrigeration system designed to provide superior performance for food retail applications.

In this system, liquid carbon dioxide is distributed throughout the store to provide cooling to each refrigerated case or walk-in box. Medium temperature cases are supplied with Carbon Dioxide ($CO_2$) refrigerant by a liquid overfeed pump. Low temperature cases are serviced by a cascade vapor compression cycle to enable the cases to operate at the appropriate temperatures. Upon leaving the cases, the $CO_2$ refrigerant is taken to the primary Ammonia ($NH_3$) Cooling system. The $CO_2$ is then chilled by the primary $NH_3$ system via a brazed plate heat exchanger (BPHX) inside the $NH_3$ system enclosure.

In the $NH_3$ portion of the system, the ammonia is completely contained within a mechanical enclosure. No ammonia is found outside this self-contained package. Heat is rejected to an evaporative water/glycol cooler to obtain very high levels of efficiency. It also ensures that $NH_3$ refrigerant does not leave the enclosure. This design allows the charge of $NH_3$ refrigerant to be substantially reduced—thus allowing the system to fall below regulatory thresholds for enhanced monitoring or reporting. In the very unlikely event of a system leak, the ammonia refrigerant is contained and absorbed in water (to a harmless concentration level) to ensure a safe environment.

## Design

| STANDARD FEATURES | OPTIONS |
|---|---|
| ▪ Evaporative fluid cooler<br>▪ Leak detection and purge ventilation<br>▪ Automatic oil recovery<br>▪ Self-contained NH3 rack package | ▪ Ammonia diffusion system<br>▪ Emergency pressure control system<br>▪ Heat reclaim |

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5201 Transport Blvd · Columbus, GA 31907
Phone: 800.866.5596 · Fax: 770.568.1514

*www.kysorwarren.com*

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ENERGY STAR

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