



# $NH_3 / CO_2$ 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<sub>3</sub>/CO<sub>2</sub> Refrigeration System

Kysor/Warren NH<sub>3</sub>/CO<sub>2</sub> 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<sub>3</sub>/CO<sub>2</sub> Cascade Refrigeration Systems Benefits:

- Completely HFC-free system (uses only NH<sub>3</sub> and CO<sub>2</sub>)
- Naturally occurring refrigerants
  - CO<sub>2</sub> ozone depletion potential (ODP) of 0 & global warming potential (GWP) of 1
  - NH<sub>3</sub> 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<sub>3</sub> and CO<sub>2</sub> are both very well established refrigerants
- Most energy efficient refrigeration system design available
- NH<sub>3</sub> charge of only 1lb per ton of refrigeration vs typical industry charge of 4 lbs per ton of refrigeration



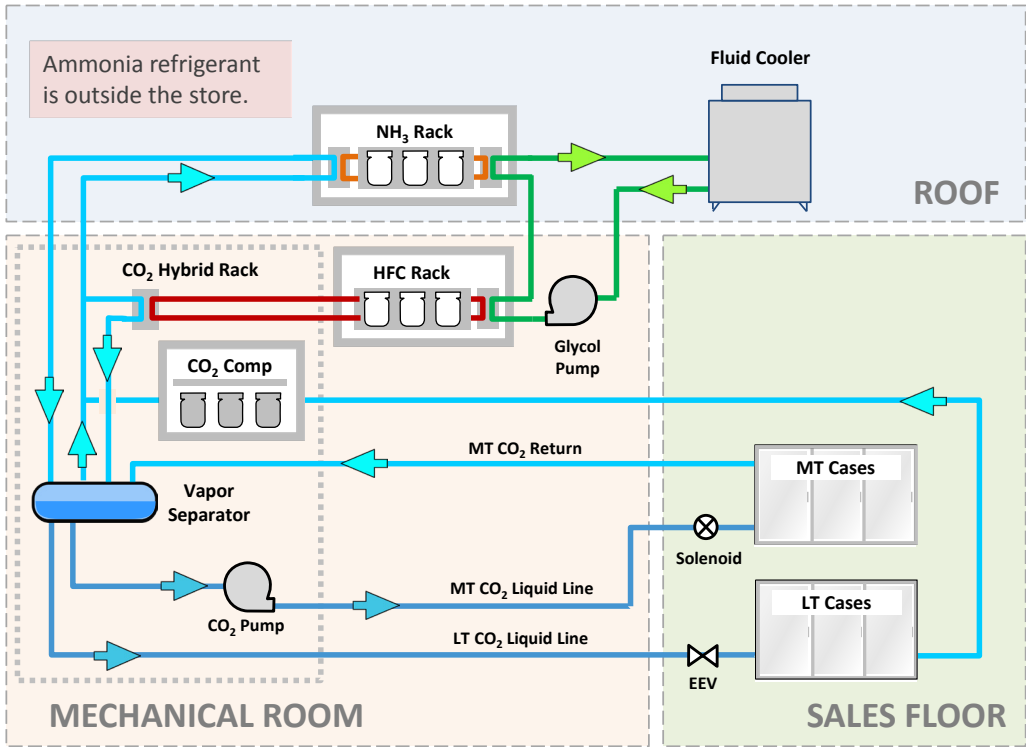
Kysor/Warren Advantages:

- Commitment to innovation and quality
- Proven history with CO<sub>2</sub> cascade and liquid overfeed systems
- Extensive qualification and testing protocols

Typical Performance vs. Traditional HFC System

	TRADITIONAL HFC	NH <sub>3</sub> /CO <sub>2</sub>
GLOBAL WARMING IMPACT	Baseline	↓99%
ENERGY COST	Baseline	↓15% - 23%

System Layout



System Operation

The Kysor/Warren NH<sub>3</sub>/CO<sub>2</sub> 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<sub>2</sub>) 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<sub>2</sub> refrigerant is taken to the primary Ammonia (NH<sub>3</sub>) Cooling system. The CO<sub>2</sub> is then chilled by the primary NH<sub>3</sub> system via a brazed plate heat exchanger (BPHX) inside the NH<sub>3</sub> system enclosure.

In the NH<sub>3</sub> 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<sub>3</sub> refrigerant does not leave the enclosure. This design allows the charge of NH<sub>3</sub> 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
<ul style="list-style-type: none"><li>■ Evaporative fluid cooler</li><li>■ Leak detection and purge ventilation</li><li>■ Automatic oil recovery</li><li>■ Self-contained NH3 rack package</li></ul>	<ul style="list-style-type: none"><li>■ Ammonia diffusion system</li><li>■ Emergency pressure control system</li><li>■ Heat reclaim</li></ul>



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