

INTRODUCTION

Refrigeration complexities abound



Retailers face increasingly difficult decisions when selecting a refrigeration architecture:

- Transition to refrigerants with lower global warming potential (GWP)
- Maintenance and servicing concerns
- Total cost of ownership (TCO)



[1]

COMMERCIAL REFRIGERATION

HFC phasedown drives system changes



Traditional centralized direct expansion (DX) refrigeration system challenges:

- Large refrigerant charges
- High-GWP hydrofluorocarbon (HFC) refrigerants
- Prone to leaks

Distributed refrigeration alternatives are emerging:

- Smaller refrigerant charges
- Lower-GWP refrigerants
- Wider application flexibility

Sustainability is becoming a higher priority:

- Increasing regulatory mandates
- Corporate sustainability goals
- Reduce total equivalent warming impact (TEWI)



Evaluating new refrigerant alternatives



Refrigerant choices must be evaluated on both their GWP rating and potential operational impacts.

Natural refrigerants CO₂ (R-744) and propane (R-290):

- Deliver the lowest possible GWP ratings
- Introduce potential complexities and design limitations
- High operating pressure (R-744) and flammability (R-290)

Emerging alternatives:

- **A1** (non-flammable) hydrofluoroolefin (HFO) blend R-513A — delivers excellent performance characteristics, much lower GWP (573) and zero flammability.
- **A2L** (mildly flammable) refrigerants — with approval on the horizon, these will offer GWP levels below 150.
 - Emerson is already qualifying equipment to use A2Ls.



SOLUTION: COPELAND™ SCROLL BOOSTER

Balancing sustainability, serviceability and flexibility

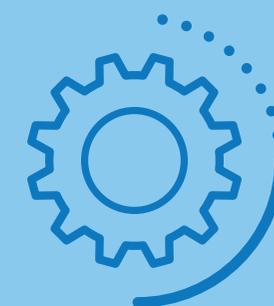


The Copeland scroll booster architecture emerged out of industry-wide collaboration among Emerson, Hussmann and Chemours at The Helix Innovation Center. It is designed to elevate refrigeration performance while meeting retailers' operating objectives:

- Uses R-513A for both low- (LT) and medium-temperature (MT) refrigeration
- Provides an efficient and environmentally friendly alternative to large centralized systems
- Scales from small, low-charge condensing units to larger distributed racks charged with several hundred pounds of refrigerant

Architecture highlights:

- Straightforward and serviceable design offers the familiarity of using an A1 refrigerant
- Produces significantly lower discharge temperatures and compression ratios
- Additional system cooling measures not required
- Minimizes mechanical load on LT compressors
- Delivers significant overall net system efficiency gains



BENEFITS

Wide industry potential and appeal



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The Copeland scroll booster's combination of a low-pressure, low-GWP refrigerant and a simple, distributed architecture fills an urgent need within the broader food retail market. Its benefits check many key boxes on the list of modern supermarket refrigeration priorities:

- Lower-GWP, A1 refrigerant (e.g., R-513A)
- Reduced refrigerant charge
- Lower leak rates due to lower-pressure system
- Lower utility costs
- System familiarity with technicians and end users
- Low TCO from lower annual energy consumption and lifecycle climate performance (LCCP)
- Secure remote facility monitoring capabilities

Future-forward refrigerant compatibility:

- Enables retrofit to A2L refrigerants when they are potentially approved for use (with mitigation measures)
- Supports the transition to even lower-GWP refrigerants, if needed
- Provides assurance of long-term system viability

