

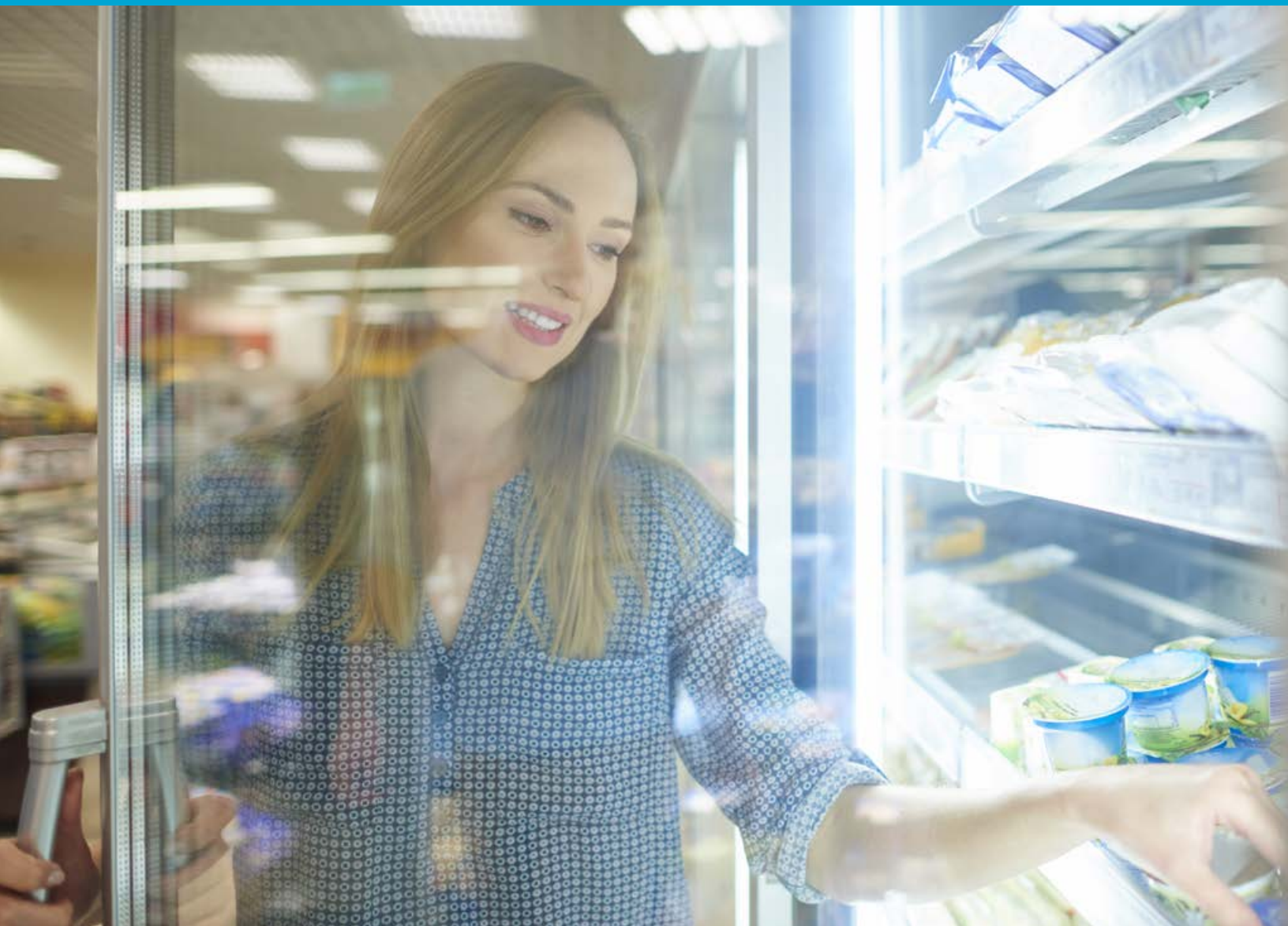


Copeland™ Variable Speed Reciprocating Hermetic Compressors for Refrigeration

Fractional horsepower R-290 units offer superior energy efficiency for commercial refrigeration applications



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For nearly a decade, original equipment manufacturers (OEMs) in the commercial refrigeration space have faced increasingly stringent energy requirements. In particular, the medium- and low-temperature, stand-alone coolers and freezers commonly used in restaurants, convenience stores (C-stores) and small-format food retailers have been key targets of the Department of Energy's (DOE) energy-efficiency standards.

While the industry expects that the DOE will soon be proposing its next phase-down in energy reductions for these applications — which are likely to take effect in 2024 — many OEMs are also seeking a competitive edge by offering equipment that achieves ENERGY STAR® certification.

To meet previous energy-efficiency requirements, commercial refrigeration OEMs may have already implemented a variety of design enhancements, including:

- a. Door and unit insulation improvements
- b. LED lighting
- c. Higher-efficiency condensing units
- d. Electronically commutated motors (ECMs) for evaporator fans
- e. R-290 refrigerant for 20% efficiency improvements in fixed-capacity compressors (per Emerson test labs compared to R-404A)
- f. Evaporative condensate trays
- g. Smart unit controllers

Considering all the measures that OEMs have taken, there are very few design options remaining to achieve the required energy reductions for meeting future DOE regulations. OEMs seeking measurable improvements will need to explore the leading edge in high-efficiency compression technology.

The Copeland™ variable speed reciprocating hermetic compressor line was designed specifically for this purpose.

Superior energy efficiency and refrigeration performance

Copeland variable speed reciprocating hermetic compressors are designed to deliver significant efficiency and performance improvements for commercial refrigeration OEMs. This low-profile, variable speed solution is comprised of two components:

1. **Copeland variable speed reciprocating hermetic compressor** — available in ranges from 1/8 to 7/8 HP; featuring a brushless permanent magnet (BPM) motor vs. a standard induction motor
2. **Variable speed (VS) drive with a smart controller** — includes serial, frequency and drop-in modes; drop-in mode serves as the system controller



The breadth of the Copeland variable speed reciprocating hermetic compressor line gives system design engineers a variety of compressor options with which to achieve significant energy efficiency improvements for refrigeration equipment of varying types/sizes. Per Emerson's internal testing, variable speed

Supporting a wide range of applications and industries

In addition to traditional applications — including medium- and low-temperature, stand-alone coolers and freezers — low-profile Copeland variable speed reciprocating hermetic compressors can be used in a variety of commercial refrigeration applications, including:

- Medium- and low-temperature refrigerators and freezers, including ultra-low temperature (ULT) freezers
- Island cases
- Display cases
- Ice machines
- Food prep tables
- Medical equipment
- Process chillers

The need for highly reliable, energy-efficient compressors extends well beyond commercial refrigeration. OEMs in the environmental life sciences, medical and pharmaceutical industries can also benefit from the high efficiency and reliable performance of the Copeland variable speed reciprocating hermetic compressor line. We are helping these OEMs meet their energy efficiency goals and even achieve ENERGY STAR certification in their core applications:

- Ultra-low-temperature freezers
- Medium- and low-temperature refrigerators and freezers
- Compact and upright refrigerators and freezers



capabilities combined with smart controls deliver energy and performance improvements that far exceed fixed-capacity options, including:

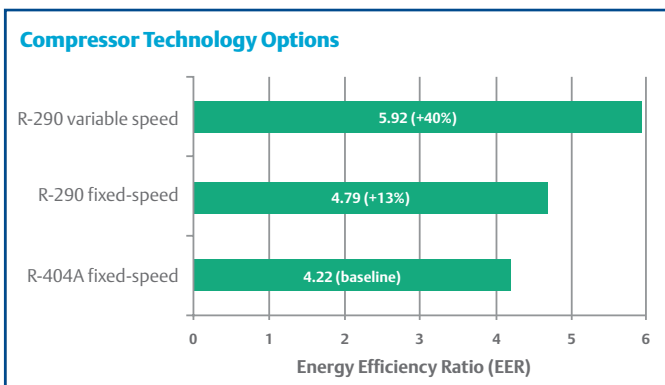
- Increased system energy efficiency by 13% (compared to a high-efficiency, fixed speed, R-290 compressor)
- Reduced compressor cycling by 90%
- Lowered compression ratios by 43%

For your customers, this simply means faster pull-downs to setpoint temperatures, more precise temperature holding, less wear and tear on system components — and lower energy bills.

And by utilizing the natural refrigerant R-290 with an ultra-low global warming potential (GWP) of 3, OEMs can offer their customers a refrigeration option that meets some of the most stringent refrigerant and energy efficiency regulations to date, such as:

- Potential impending DOE 2024 standard
- California Air Resources Board (CARB)
- Potential Environmental Protection Agency (EPA) refrigerant requirements
- ENERGY STAR certification

When comparing the performance of R-290 to R-404A in fixed and variable speed compressors, you can see that the variable speed option offers far superior annual energy efficiency ratio (EER) ratings.



In Emerson test labs, we've confirmed that end users could significantly reduce annual energy costs by switching from an R-404A system with a fixed compressor to one that utilizes a Copeland variable speed reciprocating hermetic compressor.

Benefits to OEMs and end users

1. Regulatory compliance

- Potential impending DOE 2024 energy reductions
- EPA refrigerant requirements
- CARB commercial refrigeration standards

2. Improved energy efficiency

- Less on/off cycling
- Low amp gradual compressor motor startup
- 13% improvement over high-efficiency, fixed speed, R-290 compressor

3. Improved performance and accuracy

- Tight temperature control
- Fast temperature pull-downs and recovery
- Precise humidity control
- Extra capacity during extreme hot or cold weather
- Low noise operation

4. Improved reliability

- Protection and proactive prevention of compressor failure using inverters
- Ability to handle voltage fluctuations
- Reduces number of start-stops

5. Operational advantages

- SKU reduction simplifies service
- Increased application versatility
- Temperature precision helps reduce food spoilage

We'll help you meet DOE 2024 and beyond

The DOE's estimated timeline for the next phase-down in commercial refrigeration equipment energy consumption is 2024. If current equipment does not meet DOE requirements, most OEMs will soon need to make plans to integrate new component solutions into their next design cycle to achieve mandated energy reductions.

The Copeland variable speed reciprocating hermetic compressor delivers the energy-efficiency levels that will allow your refrigeration units to meet the upcoming DOE requirements, while giving your customers the reliability and performance improvements they'll need to succeed.

Emerson has the design and testing resources to help guide you through this transition. We'll help you to meet the next round of DOE efficiency standards — and beyond — and achieve the ENERGY STAR certification to differentiate you from your competitors.

