

The Champ

5 Years Since its Introduction the PrimeLINE® Unit Leads



Only the Olympic decathlon winner earns the distinction, “World’s Greatest Athlete.”

A grueling and highly competitive test of strength, endurance and skill, the decathlon challenges participants to perform at their best in 10 events. Only the strongest, nimblest, toughest and best all-around performer wins.

Such is the case with Carrier Transicold’s PrimeLINE container refrigeration unit. By nearly all measures it is best-in-class, leading the industry as the champion all-around performer in a field of “wannabes.”

Smart fleets select the PrimeLINE unit for its winning refrigeration performance and its energy efficiency. Five years after its introduction, PrimeLINE is still the pacesetter, while others lag behind.

Energy Efficiency



Since its introduction, the PrimeLINE unit has left others in the dust as the most energy efficient container refrigeration unit ever offered. Today, the PrimeLINE unit still commands a lead where it matters most.

“To understand energy efficiency in container refrigeration systems, you must consider both part-load and full-load performance,” said Kartik Kumar, director of marketing and strategic planning, Global Container Refrigeration. “Full-load performance is the most demanding part of the refrigeration process and always consumes the most power.

“No refrigeration unit on the market today provides full-load performance as energy efficiently as PrimeLINE. Anyone can deliver efficient part-load performance, when the refrigeration system is essentially coasting, but when you take the voyage in its entirety of full-load and part-load performance, the PrimeLINE unit wins.”

The PrimeLINE unit’s efficiency is attributed, primarily, to its significantly advanced digital scroll compressor – the only one on the market designed for R-134a in a container application. Exceptional efficiency results from its digital modulation (unloading), which minimizes energy usage, and its vapor injection system, which delivers more cooling capacity.

Capacity



“Refrigeration performance is where the PrimeLINE unit truly excels,” said Kumar. “Compare PrimeLINE’s specifications to any other R-134a unit on the market – none deliver more cooling power than PrimeLINE.”

Additionally, the PrimeLINE unit’s best-in-class deep frozen capacity among R-134a units provides cooling down

to -31°F (-35°C), made possible, in part, by its electronic expansion valve.

“Some competitors tout low power consumption as a smoke screen to mask their inferior cooling capacity, which doesn’t match up,” Kumar said. “The PrimeLINE unit delivers powerful refrigeration capacity plus energy efficiency.”

Pulldown



“The sooner that perishable cargo reaches the temperature setpoint, the better it will be for its overall quality, shelf life, sugar content and weight,” said Jim Taeckens, Carrier Transicold senior product manager.

The PrimeLINE delivers best-in-class pulldown – as much as 30 percent better than some units and about 10 percent better than its nearest competitor. Also the PrimeLINE unit achieves pulldown more energy efficiently than its competitors.

“The PrimeLINE unit easily bests all contenders when it comes to pulldown,” Taeckens said. “Its powerful hot-load pulldown capability is one of the leading reasons it’s a favored unit among the banana trade.”

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The Cham

Temperature Control



“If there was just one thing that all container systems were good at, you would expect it to be the ability to precisely control temperature,” said Taeckens. “After all, isn’t this their main function?”

But temperature management for a diverse range of cargoes being transported through all latitudes of climate is anything but simple.

“Here again is another area where the PrimeLINE unit excels,” Taeckens said, noting that the unit’s electronic expansion valve and Micro-Link® 3 control software work together to manage stable temperatures within tolerances as narrow as +/- 0.25°C.

“Other systems struggle with temperature control,” Taeckens said. “We’ve seen some newer systems that purport to deliver a high level of control, but in test situations the tolerance has been shown to be +/- 1.5°C, which customers tell us is simply unacceptable.

The ability to heat is not always a first consideration when choosing a refrigeration system. With PrimeLINE units, an all-electric heating system provides efficient, quick heating when necessary, as opposed to hot-gas heating systems, which tend to be less effective in the coldest ambient conditions when heating is most needed.

“Customers looking for superb temperature management will always choose the PrimeLINE unit,” Taeckens said. “This is one of those cases where Carrier Transicold’s more than 40 years of leadership in container refrigeration results in the most accurate temperature control performance.”

“The PrimeLINE unit has been a solid performer,” said Ryusuke Kimura, senior vice president – Global Reefer Management, MOL Liner Ltd. “Its reliability has helped us hold the line on our maintenance budgets.”

Airflow



Airflow is another area where the PrimeLINE unit commands undisputed leadership. With its aerospace inspired fan designed for optimized performance, the PrimeLINE unit is the only container refrigeration unit capable of providing airflow of 5,440 cubic meters per hour, cycling cool air the entire 40-foot container length to help minimize and eliminate potential hot spots.

“That’s 8 to 11 percent better than other units on the market,” said Taeckens, adding, “The more cool air circulating around the cargo maintaining its temperature, the better it is for the cargo, helping to prevent decay and loss of moisture and weight.”

TCO, M&R, ETC!



As a system, PrimeLINE also performs consistently, making it one of the most respected units in terms of reliability. This is critically important to protecting cargo, whether it’s a \$10,000 load of bananas or \$1 million worth of pharmaceuticals.

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“TCO combines acquisition cost, energy costs and M&R over the life of the unit,” said Taeckens. “As fuel prices have risen, energy has become the main contributor to the TCO of a container refrigeration unit. Only 10 years ago, acquisition cost was the largest part of TCO at around 57 percent, and energy’s share was about 28 percent, with maintenance and repair costs accounting for about 15 percent. Today’s fuel prices put energy costs at about two thirds of the TCO.”

Carrier’s more than 40 years of experience in container refrigeration also pays off in terms of the PrimeLINE unit’s rugged design to help hold the line on maintenance costs. For example, Carrier’s time-tested and patented eight-step electro-coating process, or E-coating, protects condenser coils against corrosion from salt, water and air, and degradation by UV light. The compressor and receiver have aluminized coatings for corrosion resistance.

Additionally, the PrimeLINE unit is supported by Carrier’s global network of nearly 430 Authorized Service Centers in every major and developing port.

“An investment in PrimeLINE technology is an investment in low-TCO – both in terms of efficiency and M&R,” Taeckens said. “And that can save significantly over the life of a unit – as much as 13 to 47 percent.”

V for Victory ... and Versatility



Several additional factors help to further distance the PrimeLINE unit from the field, providing even greater versatility.

For example, with the addition of a humidity sensor, the PrimeLINE unit delivers dehumidification capability down to 50 percent, without breaking a sweat on energy consumption.

In customer tests, the PrimeLINE unit has demonstrated that it not only attains low humidity levels, but it maintains them consistently,” Kumar said. “Competitive units struggle to attain dehumidification setpoints, with wide variances once they reach the lowest levels they can go.

The PrimeLINE unit’s excellent energy performance can be further boosted with the addition of the optional QUEST power-saving mode. Where conventional refrigeration systems

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Power Factor - Know the Facts!

control the supply air temperature, QUEST mode uses software controls to maintain the actual temperature of the commodity, reducing system runtime and saving energy in the process.

Additionally, PrimeLINE units can be equipped with eAutoFresh™ automatic fresh air ventilation, which saves energy by ventilating only “on demand” rather than constantly, as occurs with manual ventilation methods.

Just as PrimeLINE units circle the world in service to shipping lines of all sizes, they also run circles around the competition when it comes to the challenges that are most meaningful to our customers. By every important measure, the PrimeLINE unit is the reigning champion of the high seas.

DEFINING A CHAMPION PERFORMER

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| Exceptional Energy Efficiency | ✓ |
| Best-in-Class Capacity | ✓ |
| Deep Frozen Performance to -31°F (-35°C) | ✓ |
| Best-in-Class Pulldown | ✓ |
| Best-in-Class Temperature Control to +/-0.25°C | ✓ |
| Efficient Electric Heating | ✓ |
| Best-in-Class Airflow | ✓ |
| Total Cost of Ownership | ✓ |
| M&R Reliability | ✓ |
| Best-in-Class Durability and Corrosion-Resistance | ✓ |
| 430 Authorized Service Centers | ✓ |
| Best-in-Class Dehumidification Option | ✓ |
| QUEST Power-Saving Mode | ✓ |
| Automatic Fresh Air Ventilation | ✓ |



The term “power factor” has recently been tossed about by some container refrigeration system manufacturers when discussing refrigeration unit energy performance, and it seems to be creating some confusion within the market.

“Power factor is not the same as energy efficiency, and the two should not be lumped together,” said Kartik Kumar, director of marketing and strategic planning, Global Container Refrigeration.

“The power factor is a ratio of kilowatts to kilovolt amperes,” explained Suresh Duraisamy, Carrier Transicold senior product manager. “As such, power factor is something that changes based on variables such as load conditions.

“From an engineering perspective, the PrimeLINE unit’s power factors are appropriate for its design, but this is not a measure that we would compare against other units – our own or competitors – because it’s somewhat meaningless,” Duraisamy said.

“In simple terms,” he explained, “it’s like comparing the energy spent in climbing a 10-foot wall by going vertically up a 10-foot ladder, versus climbing a 15-foot ladder on an incline. The identical result is achieved, and the energy required is the same. The ladder represents the power factor, and for purposes of this example its size is of no consequence.”

“Moreover,” Kumar added, “we’ve seen competitors claiming their refrigeration systems have the highest power factor, but some of these claims are based on part-load operation, rather than a full range of load conditions.”

“Interestingly, some claim that their power factors allow more reefers to be used on a vessel or terminal, but they have ignored the kilowatt limitations of typical electric generators,” Duraisamy said. “This creates hypothetical, but unrealistic or wholly impossible scenarios.”

“When making decisions about container refrigeration systems, customers need to consider energy consumption based on real-world operations,” Kumar explained. “There is no single-number answer to what makes a great container refrigeration unit. Customers need to consider the full range of criteria, including refrigeration performance.”