

# Naturally *Efficient*

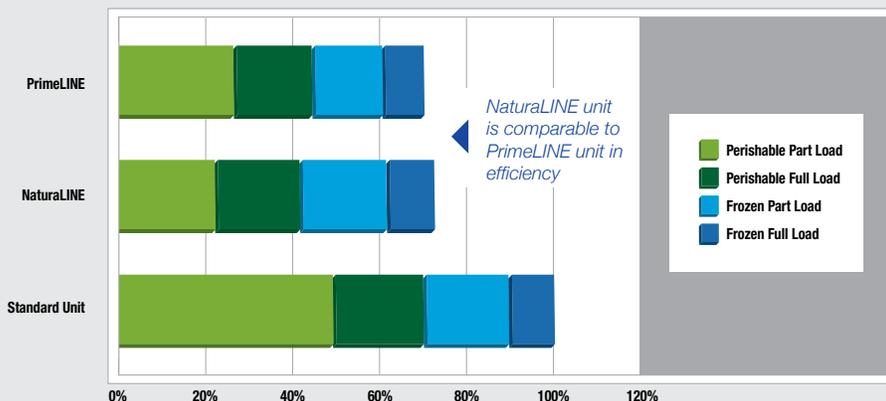


With a global warming potential of 1, the natural refrigerant carbon dioxide (CO<sub>2</sub>) provides a highly compelling case for environmental sustainability. To fulfill its potential for marine container applications, CO<sub>2</sub> refrigerant-based systems need to be highly efficient.

Carrier's NaturaLINE<sup>®</sup> unit takes advantage of CO<sub>2</sub>'s unique thermodynamic characteristics, coupled with innovative technologies, to achieve a system that consumes significantly less power than traditional units in the global fleet, while reducing indirect carbon emissions in the process. The NaturaLINE unit also offers the full refrigeration capacity that shipping lines have come to expect of their container refrigeration units.

## Efficiency Advantage

On the whole, the NaturaLINE unit's power consumption is comparable to the low levels on which Carrier Transcold's PrimeLINE<sup>®</sup> unit has built its legacy of efficiency. *(Continued)*



## Power Consumption Comparison

*The NaturaLINE unit's power consumption over a full range of conditions – part load and full load, carrying frozen and perishable goods – is comparable to Carrier Transcold's PrimeLINE unit, and well below the most common unit in the global fleet.*

*(Source: Carrier Corporation)*



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Whether temperatures are being maintained at 14 degrees Celsius (57 degrees Fahrenheit) for bananas, or 1 degree C (34 degrees F) for other fruits, perishable cargo presents the most demanding conditions for refrigeration units. Systems need to run near continuously to offset heat generated by the cargo and to chill fresh air drawn in for ventilation. The NaturaLINE unit excels when carrying perishable commodities, requiring *even less* power than the PrimeLINE unit, thanks to its higher efficiency under part-load conditions.

## Understanding Part-Load Conditions

The NaturaLINE unit's outstanding efficiency with perishables under part-load conditions is significant. Part-load conditions generally occur when ambient temperatures are below 31 degrees C (88 degrees F) – in other words, the vast majority of the time in which refrigerated containers are typically in transit.

A multi-year study by a global shipping company demonstrated that containers transit through this range nearly 85 percent of the time. This means that over the most typically encountered range of ambients, the NaturaLINE unit provides among the lowest power consumption for perishable cargo refrigeration.

The operating performance of every refrigerant varies based on ambient temperature, and CO<sub>2</sub> is no exception. While the NaturaLINE unit achieves its best efficiencies when ambient conditions are below 27 degrees C, its performance under all operating parameters, weighted for real-world shipping conditions, ranks it among the most efficient units available on the market today.

In short, shipping lines seeking sustainable solutions, which can also lower their energy requirements, should look first to the naturally efficient NaturaLINE unit.

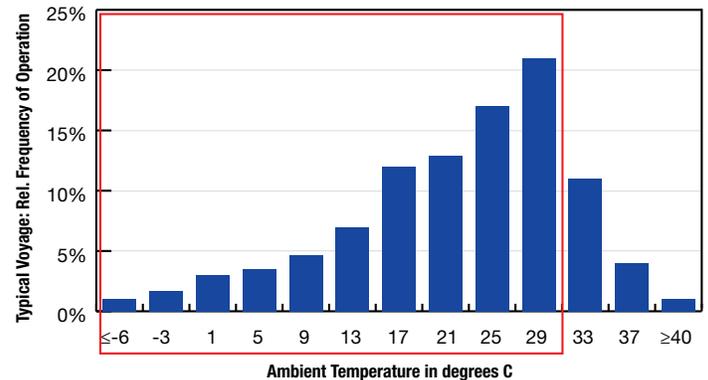


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When carrying perishables, the NaturaLINE unit requires **EVEN LESS** power than the PrimeLINE unit.

### Typical Ambient Temperatures for Refrigerated Containers



*The majority of the time containers are in transit, ambient temperatures are below 31 degrees C, where the NaturaLINE unit's efficiency is optimal for perishable loads. At ambient temperatures above 31 degrees C, refrigeration performance is not affected, allowing the NaturaLINE unit to perform within the full operating envelope of a standard unit.*

(Source: UNEP, RTOC Assessment Report 2014)

### CO<sub>2</sub> (R-744) REFRIGERANT FUNDAMENTALS

- Power consumption comparable to Carrier's best-selling unit
- Excellent efficiency, especially for part-load perishable cargo
- ASHRAE 34 and ISO 817 safety classification A1, nonflammable and nontoxic
- U.S. EPA-approved for transport applications and unaffected by phasedowns, F-gas Regulations and Kigali Amendment to the Montreal Protocol
- No refrigerant tax
- No intermediate refrigerant step needed
- Familiar controls and maintenance
- Global support from Carrier

# NaturaLINE®