

A Refrigeration System that's "On Track" for the Future



Vector™ Units Chill New Generation of Refrigerated Boxcars for Union Pacific Railroad

Carrier Transicold's Vector™ refrigeration units are helping Union Pacific Railroad to significantly improve its refrigerated capabilities for existing and new customers for the 2020s and beyond. Installed on newly engineered 64-foot refrigerated boxcars, the Vector units deliver exceptional refrigeration performance and operational efficiency, while requiring substantially less maintenance than traditional refrigeration systems, all made possible by a unique electric refrigeration system architecture.

Carrier Transicold Solution

The Vector system already had a track record of success with Union Pacific, having been installed on many of its traditional refrigerated cars. However, Union Pacific took nothing for granted when planning its new railcar design.

"When Union Pacific decided to modernize its refrigerated rail service, we applied some out-of-the-boxcar thinking, creating special challenges," said the initiative's leader, Louis Oborny, Jr., manager of mechanical engineering, Union Pacific. "The refrigeration unit was one important piece of a comprehensive, integrated project, as everything about the traditional refrigerated car was being examined to achieve an optimized design specification."

"In a multi-year project, we tested refrigeration units under a variety of operating parameters to understand how the systems worked and the performance delivered," Oborny said. "The mechanical engineering team even disassembled all the refrigeration units to see the differences."

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The Vector platform achieves goals for high performance and reduced maintenance.



Location:
Omaha, Nebraska, USA

Customer:
Union Pacific Railroad, one of America's most recognized companies, connecting 23 states in the western two thirds of the country by rail.

Fleet:
7,600 locomotives and 53,000 railcars, including 3,000 refrigerated boxcars.

Objectives:
Provide a more efficient, thermally sound refrigerated boxcar to serve existing customers and help develop refrigerated services connecting new markets.

Decision Drivers:
Refrigeration performance, fuel efficiency, cost control, future focused.

Carrier Transicold Equipment:
Vector single-temperature refrigeration units with E-Drive™ all-electric refrigeration technology, each equipped with a TRU-mount solar panel, external temperature display, ultrasonic fuel-level sensor and differential fuel flow meter.

Special Challenges:
Carrier Transicold provided airflow analysis to help Union Pacific achieve performance goals for its new-generation refrigerated boxcars.

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Following evaluation by a third-party engineering firm, Vector single-temperature units were chosen to help Union Pacific achieve its goals, which included highly reliable refrigeration performance and low total cost of ownership.

The Vector platform is distinct from other refrigeration systems in that it is driven electrically rather than mechanically. The power source is a high-performance generator coupled to its diesel engine. Known as E-Drive technology, this all-electric architecture has the unique ability to turn on and off individual components, such as the electric scroll compressor and fans. It powers what it needs to run only when needed, so components run fewer hours and last longer. Additionally, the E-Drive architecture eliminates many components found in traditional mechanical refrigeration systems, further reducing maintenance requirements.

Durability is also important to Union Pacific, as refrigeration units are expected to be used for at least 10 years before being replaced on boxcars, which are designed for 50 years of service.

“Not only is the Vector better in terms of fuel efficiency and maintenance, it also provides us the capability to use other power sources, such as solar and battery.”

— Louis Oborny, Jr., Manager of Mechanical Engineering, Union Pacific Railroad



Optimized for Opportunities

In developing the new railcar, Union Pacific fabricated prototypes at its car shop in DeSoto, Missouri. Walls, insulation density, paint reflectivity, flooring, and door seals were optimized, resulting in a boxcar with significantly better thermal performance, according to Oborny.

Oborny said that optimizing airflow throughout the railcar was also key, and for that, Union Pacific’s Omaha-based Carrier Transicold dealer, Midlands Carrier Transicold (MCT), called upon engineers from Carrier Transicold to visit the car shop for testing and analysis. Collaboratively, they improved the design of the overhead plenum that distributes cold air from the refrigeration unit at the front of the boxcar to achieve 30% to 40% better airflow and elimination of hot spots.

“Having optimal airflow was one of the biggest things to address,” Oborny said. “You can have the best insulated car and refrigeration system, but it won’t matter if your airflow isn’t evenly reaching all the perishables inside.”

Although perishable freight such as potatoes and onions have been a staple for rail service, Union Pacific says that the improved temperature uniformity within its modern refrigerated railcar can benefit more than 60 temperature-sensitive commodities that they previously would not haul, such as lettuce, carrots, bananas and strawberries.

“Putting improved reefers into service opens up new opportunities for our Marketing and Sales team,” Oborny said. “With the ability to transport a wider variety of food safely, we’re looking at tapping into new markets we’ve not been able to serve in the past.”

Oborny said that Union Pacific is evaluating other ways in which the Vector unit’s E-Drive technology may help it to further reduce diesel consumption, saying, “Not only is the Vector better in terms of fuel efficiency and maintenance, it also provides us the capability to use other power sources, such as solar and battery.”

Clearly Carrier Transicold’s Vector unit and Union Pacific are on the right track for the future.



The large cargo capacity of a 64-foot refrigerated railcar makes it a highly efficient means of transporting large volumes across the country. Those long trips require reliable and consistent temperature control for optimum results.



Union Pacific’s refrigeration system specifications for its new boxcars include a bright external LED temperature display (above) and a TRU-mount solar panel to charge the Vector unit battery, which also supports telematics functions. An ultrasonic sensor in the 435-gallon fuel tank and a differential fuel flow meter enable diesel fuel levels and consumption to be remotely monitored and analyzed.



Midlands Carrier Transicold provides turnkey installation of Vector units for Union Pacific.