

After seven years, the California Air Resources Board (CARB) requires further emissions reductions for the engine class for units operating there. In response, Carrier Transicold is developing an optional engine emissions system (EES) for the 2013 Tier 4 PowerLINE models, designed to achieve compliance with CARB's ultra-low diesel emissions standard known as ULETRU. Tier 4 PowerLINE units will need to be fitted with the EES option by the end of the seventh year, if they are to remain in use in California.

## Current PowerLINE Model Line-up

### 2013 Tier 4 Compliant

- RG15 Clip - ecoFORWARD\*
- UG15 Undermount - ecoFORWARD‡

### Tier 4i Export

- RG 15 Clip\*
- UG15 Undermount‡

*FuelWise*

**Standard**

**Optional**

\* Integral fuel tank for the 2013 Tier 4 model is 120 gal. (454 liter), and 130 gal. (492 liter) for the Tier 4i model.

‡ Integral fuel tank: 68 gal. (257 liter); Options: 50 gallon (189 liter), 80 gallon (303 liter).

## Export Model Performance

The highly successful Tier 4i PowerLINE models have proven themselves to be workhorses of the industry.

The Tier 4i generation of PowerLINE units brought significant emissions improvements when they succeeded the earlier Tier 2 platform early in 2008. Later that year, the dual-speed feature, known today as FuelWise, was introduced and over the last several years became the most popular option for PowerLINE units.

"Fuel savings of about 27 percent are achievable with the Tier 4i units that leverage FuelWise option," said Mahajan, "Although that's less than our 2013 Tier 4 units with built-in FuelWise functionality, it's still quite significant."

"Therefore, for customers outside of the U.S. and Canada who continue to purchase Tier 4i units, we highly recommend specifying the FuelWise option," Mahajan said.

While actual fuel consumption and commensurate greenhouse gas reductions will depend on real-world conditions, such as cargo and the refrigeration unit is used, important benefits can be achieved with both the new high efficiency Tier 4 models with built-in FuelWise functionality and Tier 4i models with the FuelWise option.

"Regardless of which Carrier Transicold solution our customers choose for a particular region and its emissions standards, they will find that we offer a unit and solution where the investment in fuel-savings technology will result in a relatively short payback period," Mahajan added.

Whether included standard with the 2013 Tier 4 units or chosen as an option on Tier 4i export models, the FuelWise option achieves fuel efficiency by enabling the generator set to run at two speeds: 1800 rpm corresponding to 60 Hz, and 1500 rpm corresponding to 50 Hz.

"Once the engine slows down, the fuel savings begin," said Dave Smith, program manager.

"The original FuelWise option used with the Tier 4i models automatically switched the engine to 1500 rpm after the initial startup period," Smith explained. "In our Tier 4 models with built-in FuelWise functionality the generator set runs at 1500 rpm preferentially with the controller determining when to switch speeds, thus maximizing fuel savings while delivering requisite power and voltage for refrigeration unit operation."

Previously Carrier Transicold tested fuel consumption of Tier 4i PowerLINE units using commodities such as bananas, mangoes and melons at typical refrigerated setpoints. On average, fuel consumption was reduced by 26 to 28 percent using the FuelWise option. The permanent magnet generator of the new Tier 4 models with built-in FuelWise delivers a fuel efficiency boost of approximately 6 percent compared to Tier 4i compliant PowerLINE units fitted with FuelWise option.

"By reducing fuel consumption, distances traveled on a tank are extended and carbon footprint is reduced," Smith added. "Given the cost of diesel fuel and customer interest in environmentally sound choices, we always recommend the FuelWise option for Tier 4i units."

