

PowerLINE® Generator Sets

Do More Using Less in 2013

Do more. Consume less.

That's the essence of Carrier's innovative new PowerLINE® generator sets. For 2013, they have been enhanced with ecoFORWARD™ technologies, resulting in a platform capable of reducing fuel usage by one third compared to prior standard units.

Available now, the new PowerLINE models will enable shipping operations to do more – for example, transport refrigerated cargoes further over land – while using less fuel and reducing greenhouse gas emissions. And PowerLINE units achieve this while staying compliant with EPA Tier 4 diesel emissions standards.

"With diesel fuel prices trending upward again, the new platform will help shippers meet these challenges," said Charu Mahajan, Carrier Transicold generator set business manager. "North American customers will also be assured compliance with EPA and California Air Resources Board (CARB) emissions regulations."

New PowerLINE generator sets even weigh less – about 14 kg (30 lbs) less – than the models they succeed, helping to lighten the transit load.

Improving on the Industry Standard

A benchmark for the industry, PowerLINE diesel-powered generator sets provide uninterrupted power to operate 460-volt ISO container refrigeration systems when

Carrier Transicold's PowerLINE® generator sets, like the RG unit shown, reduce fuel usage by one third compared to previous models and offer compliance with 2013 EPA Tier 4 emissions requirements.

used over land in intermodal applications. They are available in the RG model that clips onto the front of a refrigerated container and the UG model that mounts underneath a container chassis.

The new 2013 models introduce:

- Standard implementation of enhanced FuelWise™ functionality, a fuel-saving technology that automatically switches the generator set between two speeds via a simple black box controller.
- A new ultra high-efficiency permanent magnet generator (PMG) that pushes efficiency well beyond conventional generators.
- An optional engine emissions system for compliance with the ultra-low emissions standard of the California Air Resources Board (CARB).*

Common to PowerLINE systems with ecoFORWARD technologies is a familiar 2.2-liter diesel engine based on Carrier Transicold's current engine line with its well-accepted speed sensor and electronic governor, enhancements introduced in 2008.

"Providing customers with a familiar, reliable engine was key," Mahajan said. "This helps our customers, who do not have to learn, operate and deal with complex new engine technology in the field. Equally important for our customers was to improve fuel economy for lower total operating costs."

* CARB verification in process.



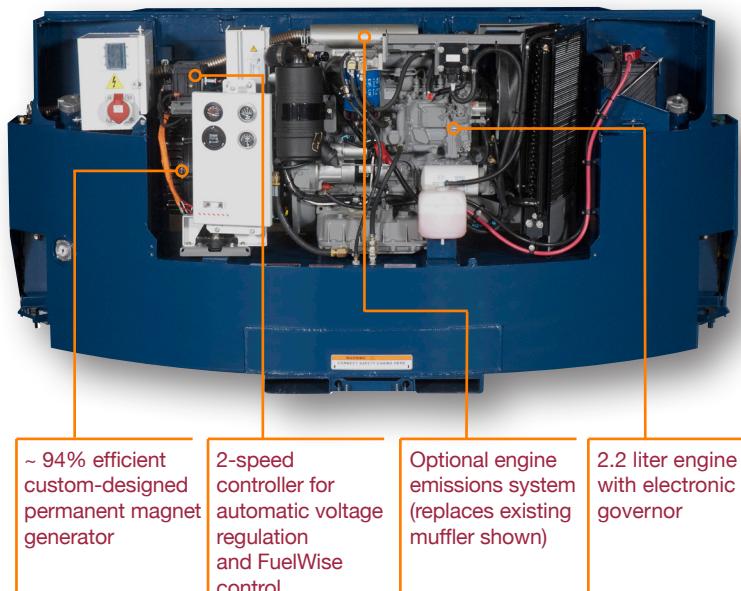
The Fuel Efficiency Boost

Although actual fuel consumption depends on varying ambient conditions, cargo and the specific refrigeration unit used, Carrier's testing shows fuel savings from 32 to 34 percent are possible in test situations at 38°C (100°F) ambient, resulting in relatively short payback periods.

With diesel fuel prices hovering around US \$4.00 per gal., a fleet of 250 new model PowerLINE generator sets each operating an average 2,000 hours in the U.S., may save an average in excess of \$300,000 per year. The savings comes from standardization of FuelWise functionality combined with increased efficiency of the ultra high efficiency generator, or PMG.

FuelWise is a proven dual-speed capability that was introduced as an option in 2008. FuelWise alone improves fuel efficiency by 26 to 28 percent. In the 2013 PowerLINE models, efficiency gets boosted by at least 6 percent more through use of the 15 kW custom-designed PMG. Unlike conventional generators, the PMG provides approximately 94 percent efficiency, reducing the engine power required while contributing to the overall 32 to 34 percent greater fuel efficiency of the generator set.

"In developing the suite of ecoFORWARD technologies, Carrier took a holistic view of the system to achieve emissions compliance and incorporate refinements resulting in a significant overall performance boost," said Mahajan. "Even more importantly we did this in a way that minimizes operational complexity for customers, maintaining a Carrier tradition of providing a rugged, reliable and easy-to-use genset. In short, the generator sets do much more, while consuming less."



ContainerLINE

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Achieving Emissions Compliance

With High-performance PowerLINE

Performance improvements from the application of ecoFORWARD technologies means 20 percent less engine power is required, which puts the PowerLINE engine within the scope of EPA's Tier 4 standard for non-highway engines rated at 8 to 19 kW (11 to 25 horsepower).

Under the EPA regulation, particulate emissions must not exceed 0.4 g/kWh and NOx and hydrocarbons cannot exceed 7.5 g/kWh. PowerLINE units not only achieve this, but also offer greenhouse gas reductions of up to 34 percent relative to previous standard units, as carbon footprint is commensurate to fuel consumption.

Carrier's new emission system option is designed to reduce emissions well beyond EPA Tier 4 requirements for the engine class and to provide compliance with CARB's ultra-low diesel emission requirement, which is mandated after seven years for units operating in or through California.*

"Make no mistake, units from the 2013 platform are CARB compliant upon purchase and for seven years thereafter without further modification," Mahajan clarified. For continued use in California, the emissions system option can be added to PowerLINE units after their seventh year of use.

* CARB verification in process.



Carrier Transicold helps improve transport and shipping temperature control with a complete line of equipment for refrigerated trucks, trailers and containers. Carrier Transicold is a part of UTC Climate, Controls & Security, a unit of United Technologies Corp., a leading provider to the aerospace and building systems industries worldwide.

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