

Sustainable TRU unit solutions comply with emission standards while delivering better performance and double-digit fuel economy improvements

By Doug Lenz, Thermo King

The clock is ticking down to implementation of Environmental Protection Agency (EPA) Tier 4 Final emission standards for non-road diesel engines in the less than 50 horsepower classification. The standards, which take effect Jan. 1, 2013, cover transport refrigeration unit (TRU) engines, including those used in the 25-50 horsepower range historically used on refrigerated trailers.

Refrigerated fleet operators and large grocery chains with sustainability initiatives are assessing the impact of the new EPA regulations and the continuing California Air Resources Board (CARB) standards on their operations for 2013 and beyond.

The EPA regulations for greater than 25 but less than 50 horsepower TRU engines require reductions of about 90 percent in particulate matter (PM) and 37 percent in nitrogen oxide (NOx) emissions from the interim standards that have been in effect since 2008. In addition all TRU engines, regardless of horsepower, need to comply with new not-to-exceed (NTE) PM and NOx limits at elevations of 5,500 feet. Previous standards were based on emissions at sea level.

EPA Tier 4 Final standards

Horsepower	NOx limit Until 1-1-13	NOx limit After 1-1-13	PM limit Until 1-1-13	PM limit After 1-1-13 inc. NTE at 5,500 ft
25- ≤50*	7.5 ppm	4.7 ppm (-37%)	0.30 ppm	0.03 ppm (-90%)
<25	7.5 ppm	7.5 ppm	0.40 ppm	0.40 ppm

*CARB requirements align with Tier 4 Final standards Ultra-Low-Emission Transport Refrigeration Unit In-Use Performance Standards (ULETRU) at this horsepower range.

While the EPA regulations do not affect equipment that is already in service, fleets operating on California highways also must comply with current CARB regulations requiring that haulers replace or upgrade refrigeration unit diesel engines that are more than seven years old. The significant restrictions on PM that CARB rules require make it difficult for operators to comply without installing Level 3 Diesel Particulate Filters (DPFs) or using electric standby technologies and practices.

Using technologies similar to those used by tractor-engine manufacturers to meet emission standards imposed over the last decade, original equipment manufacturers are improving TRU performance while also reducing the environmental footprint of TRU engines. All manufacturers are expected to have their fully compliant products available for customer deliveries by the Jan. 1, 2013, implementation date.

For example, Thermo King, a manufacturer of temperature control systems for a variety of mobile applications and a brand of Ingersoll Rand, is introducing new product offerings that will help refrigerated fleet operators and grocery chains comply with EPA and CARB requirements and achieve their sustainability goals.

TRU manufacturers develop EPA- and CARB-compliant units

The new Thermo King Precedent™ family of transport refrigeration units use leading-edge technologies and new system architectures to enable factory-standard units to meet all requirements without use of a DPF.

For the Precedent series, Thermo King developed not only a compliant solution but one that provides significant improvement in environmental sustainability, fuel efficiency, reliability and uptime and total lifecycle costs.

TRU manufacturers had a critical strategic decision to make after the EPA Tier 4 Final standards were released. They could modify and update current designs to add features that would enable their products to meet the new requirements. Or, they could create new products that both meet the emission requirements and offer substantial customer value.

With the Precedent line, Thermo King offers customers a range of fully compliant choices that also provides significantly better performance, double-digit fuel economy improvements and high levels of reliability and uptime.

For example, the new Thermo King Precedent C-600 single-temperature TRU uses a new architecture with mechanical direct injection and other advanced features to deliver performance levels comparable to previous generation 25-plus horsepower engines in a sub-25 horsepower package. Because it provides similar capacity with less horsepower, these units need only meet the EPA standards already in place for engines of 25

horsepower or less, along with the new, more rigorous requirement for PM emissions at altitudes above 5,500 feet.

The standard Precedent C-600 meets all EPA Tier 4 Final requirements for the life of the engine and CARB requirements up to seven years. It has been fully certified by both the EPA and CARB after extensive testing conducted in mid-2012. In fact, those tests showed levels of NOx and PM well below the EPA Tier 4 Final standards.

Precedent S-600 is only fully certified 25+ HP engine

Thermo King was the first original equipment manufacturer to develop and certify a fully compliant 25-plus horsepower TRU engine for customers wanting to comply with both Tier 4 Final and CARB standards and to be “evergreen” for CARB. The new S-600 was exceeded both EPA Tier 4 Final and CARB NOx and PM standards by a substantial margin in mid-2012 certification testing.

The standard S-600 product is a single-temperature unit that meets all EPA Tier 4 final requirements and CARB requirements and is “evergreen” under the CARB regulations because it meets the more stringent Ultra-Low-Emission Transport Refrigeration Unit In-Use Performance Standards (ULETRU). Evergreen engines can continue to operate in California beyond the seven-year window without a DPF retrofit or engine swap.

The multi-temperature Precedent S-600m is the third offering in the Precedent family. The Precedent S-600m is the first greater-than-25 horsepower, multi-temperature TRU designed to meet both EPA and CARB requirements in its standard configuration and to be evergreen under CARB regulations, since it also meets ULETRU standards.

Like the Precedent S-600 engine, the S-600m engine features a totally new architecture, designed from the ground up to deliver superior performance, lower total lifecycle costs, greater reliability and double-digit improvements in fuel economy, all while exceeding emission requirements for non-road engines in the greater-than-25 horsepower category. These benefits make the Precedent S-600m the ideal choice for refrigerated fleet operators and large grocery retailers with sustainability initiatives, who may require a higher level of operational performance and multi-temperature capabilities to meet their customers’ needs.

All three TRUs in the Thermo King Precedent family offer their users the best of all worlds. They not only provide significant environmental performance improvements by

reducing carbon, nitrogen oxide and particulate matter emissions, they offer best-in-class performance and reliability along with double-digit improvements in fuel efficiency.

Fleet operators need to plan ahead

As 2012 draws to a close, refrigerated fleet operators are putting the final touches on their equipment-acquisition plans for 2013 and beyond. Some are encountering the effects of a surge in reefer demand, which may affect the availability, scheduling, pricing and delivery of new equipment. These factors could have an even greater impact on operators later in 2013 if economic recovery accelerates, driving increases in traffic and demand for new reefers to replace aging stock.

The EPA regulations let manufacturers sell their existing inventories of equipment that meets the Tier 4 Interim standards during a short transition period. Some operators may choose to purchase these units, especially those that tend to turn over equipment frequently. Operators with longer replacement cycles will usually find that being early adopters of new, more fuel-efficient technologies will provide the best return on investment over time.

As they develop their plans for the next few years, many fleet operators find it beneficial to discuss their requirements with original equipment manufacturers of TRUs or their authorized dealers.

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