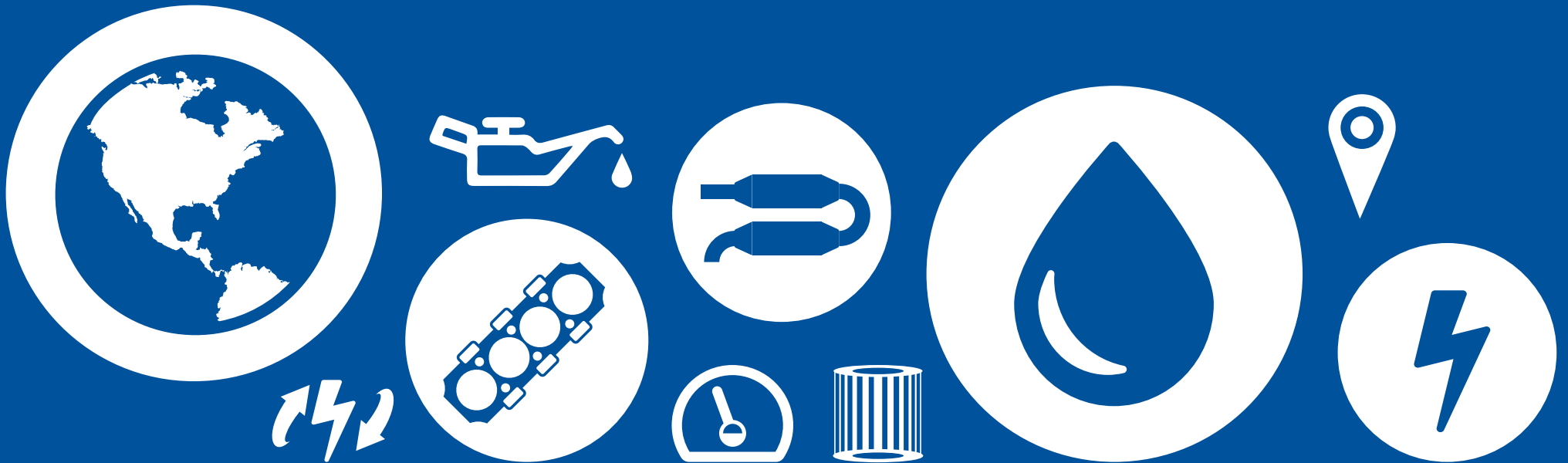


Rental market focus: what you need to know about **U.S. EPA Tier 4 Final**



Introduction

Tier 4 Final emission standards were introduced in 2014 and 2015 (depending on engine output and application) and for many rental companies, it still feels like a huge step into the unknown.

Here at Perkins, we talk regularly to rental business operators like you who have shared your concerns for what lies ahead, from increases in the purchase price of new technology, to confusion over how it might affect your machines' uptime, maintenance and servicing – and, above all, your bottom line.

While there's no immediate pressure on fleets to upgrade, emission standards are a fact of life – and it's important you don't ignore them.

This exclusive series of Perkins eBooks aims to show you that Tier 4 isn't as complex as you might think. By educating yourself on the new standards, you'll be a step ahead of the competition when the needs of your rental customers change.

FAST FACT

Since emissions standards came into existence, the U.S. has enacted four different "tiers" of emission standards.



FAST FACT

Tier 4 Final emission standards were introduced in 2014 and 2015 and Perkins has developed the technologies to meet them.



What exactly is Tier 4 Final – and how did we get to this point?

It's easy for a busy rental company focusing on getting a good return on its investments to defer changing emission standards. Now's the time to catch up, because there's no hiding from the fact that the latest standards will affect what you do with your fleet over the next few years.

Since emission standards came into existence, the U.S. has enacted four different tiers; Tier 4 is split into Tier 4 Interim transitional standards and Tier 4 Final emission standards.

One of the most significant milestones was the introduction of Tier 4 Interim, including (but not limited to) application to all diesel engines rated 175 hp (130 kW) and above. This required manufacturers of diesel engines, along with Original Equipment Manufacturers (OEMs), to drastically reduce emissions of particulate matter (PM) and/or oxides of nitrogen (NOx) as well as regulating hydrocarbon (HC) and carbon monoxide emissions.

Tier 4 Interim, which was followed by the more stringent Tier 4 Final, also introduced changes to the way engines were tested, with more challenging testing cycles and operating environments added to demonstrate real-world conditions.

Under Tier 4, different power ranges had different targets imposed on them – at different dates. For engines above 75 hp (56 kW), 2011's Tier 4 Interim required a significant reduction in PM, while Tier 4 Final, which followed in 2014 and 2015, required a significant reduction in NOx. For engines less than 25 hp (19 kW) the new testing cycles and operating conditions were included in 2013, but emission standards were largely maintained. Also in 2013, engines of 25-75 hp (19-56 kW) had to significantly reduce PM from 0.3 to 0.03g/kW-hr, with NOx and hydrocarbon levels maintained.

The **U.S.** has followed U.S. EPA Tiers 1, 2, 3, 4 Interim and 4 Final

View our *emissions through the years* infographic
<http://bit.ly/epaEmissionsTTY>

Why are emission standards important?

Creating a cleaner environment

Greenhouse gas (GHG) accumulation in the atmosphere is a concern for many in both the public and private sectors because of the potential for these gases to affect climate patterns.

Perkins supports intelligent, responsible public policies that address climate issues and we are a leader in the development and deployment of innovations that assist in reducing GHG emissions. Tier 4 Final standards created new challenges for engine manufacturers and we stepped up to the task.

We're constantly investing in emission-reduction technologies and are committed to the development of advanced engine solutions that capture and store GHG emissions. We'll continue to contribute to global efforts designed to reduce GHG emissions.



90%


FAST FACT

The latest Tier 4 Final standards require manufacturers to reduce engine NOx and PM by 90 percent compared to Tier 1 emissions standards.



“Local work sites in a growing number of areas have begun to require Tier 4 technology with respect to at least a portion of the equipment used on the site, meaning rental operators will likely have little choice but to move towards replacement or retrofitting fleets in those areas.”

James Waite, corporate and commercial equipment leasing attorney, writing for *Rental Management Magazine*.



How do Tier 4 Final standards affect engines?

The latest emissions standards – Tier 4 Final – require engine manufacturers to reduce the NOx and PM produced by an engine by 90 percent compared with Tier 1 emissions standards.

By any measure, it was a huge change. That's why Perkins spent the past decade developing innovative new technologies that not only help our customers run engines that produce fewer emissions, but also provide improved performance and fuel efficiency, dependable power and a lifetime of low costs. Our technologies are also flexible enough to be integrated into applications without the need for radical design changes.

Here's a useful breakdown of what technologies we offer, what they do and what the additional benefits are:

- **Cooled exhaust gas recirculation (EGR):** an aftertreatment technology that reduces NOx emissions. By recirculating exhaust gases into the engine's cylinders, a percentage of the air is replaced by CO₂. This lowers the combustion temperature which, in turn, reduces the amount of NOx formed. Having EGR means you can use a smaller selective catalytic reduction (SCR) system and your diesel exhaust fluid (DEF) consumption will be reduced.
- **Diesel particulate filter (DPF):** this captures a high percentage of particulates during normal engine operation. The DPF uses a process called regeneration to burn off and eliminate these trapped particulates, drastically reducing the amount released into the atmosphere.
- **Selective catalytic reduction (SCR):** a highly effective technology for reducing NOx emissions. The process reduces NOx to water and nitrogen, using diesel exhaust fluid. DEF is stored on the SCR catalyst and the reactions take place as the DEF passes through the dosed SCR system.

“Rental companies have a huge responsibility to ensure they understand Tier 4. Emission standards aren't going to go away.”

Corey Berry, rental account manager

- **Diesel exhaust fluid (DEF):** used in a SCR system to reduce NOx levels by more than 90 percent before they exit the exhaust pipe. Our products that utilize SCR are designed to require the minimum amount of DEF to meet their emission targets. The benefits for operators are simple – less DEF means lower running costs.

- **Diesel oxidation catalyst (DOC):** an aftertreatment technology that converts hydrocarbons in carbon dioxide and water. Use of a DOC also helps passive regeneration in the DPF and reduces the size of the SCR system and DEF consumption.

- **High pressure common rail fuel system:** is used in many of our engines to reduce particulates and optimize fuel consumption.

- **Turbocharging:** our turbocharging solutions, including wastegate and series turbocharging, focus on getting more power and torque from the engine, again improving performance and efficiency.

Our engine technologies allow customers to meet Tier 4 Final emissions standards in a flexible and cost-effective way, while maintaining machine reliability and productivity.

 **4.5m**

FAST FACT

The number of active engine owners that we support around the world.



Perkins products are constantly evolving as we invest in – and develop – new technologies that help our customers meet the latest emission standards.



What does Tier 4 Final mean for rental houses?

At Perkins, we've conducted a lot of research, both formally and informally, with people in the rental business and we know you're concerned about the impact Tier 4 Final standards could have on your bottom line.

But the future is far from gloomy. What follows is a short list of how the latest emission standards will impact rental businesses, along with a few reasons why the future is brighter than you might think. In fact, there are some exciting opportunities for rental houses that are prepared to take the lead on Tier 4 Final.



Cost of new Tier 4 Final technology

Running a successful rental business comes down to deciding which combination of machines is going to be most profitable. So it is, understandably, a cause for concern among businesses that Tier 4 Final requires the use of new, more expensive technology. But there's no getting away from it. Whether you transition slowly, or all at once, it's a case of when, rather than if, you provide more machines that meet Tier 4 Final standards in your fleet.

National rental companies will need to make the transition quickly. That's because national customers who are taking on large infrastructure jobs paid for by government will often be required to use lower emission equipment.

By taking a lead on Tier 4 Final, your business will be in the best position to support the growing number of projects that will require this level of emission control while maintaining your profitability.



Additional maintenance requirements

The majority of Tier 4 Final technologies will require more maintenance, which means rental houses and their end users will need to follow guidelines now that they didn't have to before.

SCR systems, for example, will require the operator to refill the DEF tank. Quality control here is absolutely essential. Operators will need to understand the shelf-life, storage temperature and containment requirements of their DEF. Sunlight and extreme temperatures can accelerate its decay. Find out more at www.perkins.com/DEF

A DPF, meanwhile, requires regeneration at various intervals, although in most cases on Perkins engines this can occur without any intervention or impact on the operator. On the face of it, rental companies may fear that extra maintenance and regeneration means more downtime, which may be a difficult case to sell to customers. However, Perkins technologies have been developed to minimize downtime and provide extended service intervals, so they will continue to offer excellent uptime and a lifetime of low cost.



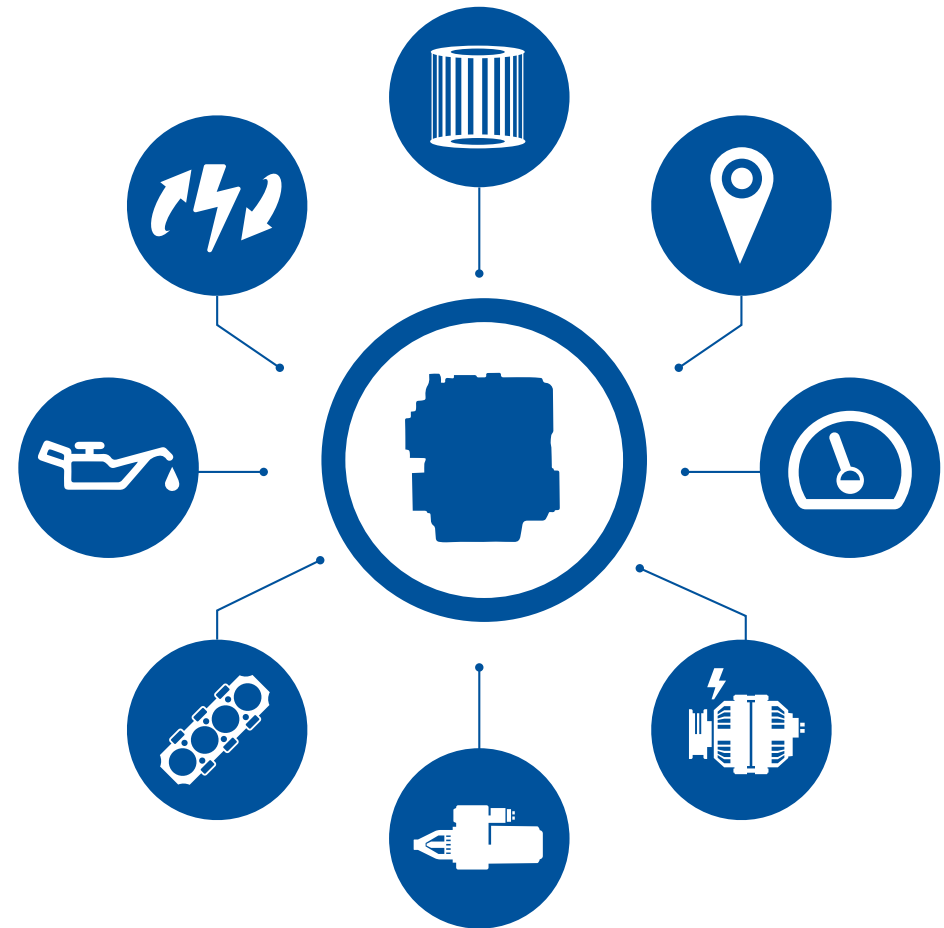
Operators may use and abuse the new technologies

Educating end users on how to operate and maintain machines with Tier 4 Final technology properly is absolutely essential. And the best way to do that is to be sure the whole of your workforce understands it.

While it's technically the operator's responsibility to know and understand the proper operation of a machine, rental houses have a dual responsibility to make sure their customers are fully informed. By making sure everyone in your business understands Tier 4 Final, you'll be able to provide market-leading customer service in this changing marketplace.

Misuse of systems by careless or poorly informed operators can result in expensive repairs for a rental house, and may even prompt you to take legal action.

At Perkins, we recommend you work closely with every customer to ensure they know how to operate their machine safely, how to get the best performance from it, and how to properly maintain any Tier 4 Final technology that is integrated. By doing so, you'll be a step ahead of the competition when demand for Tier 4 Final machines – as it is sure to do – grows across all areas of rental, from construction and industrial, to electric power and beyond.



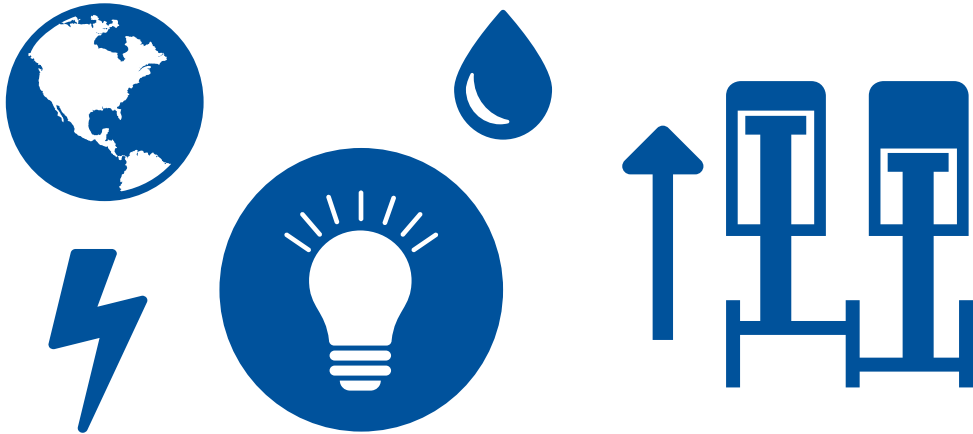
⌚ 24 hours

FAST FACT

We are able to get replacement parts to our rental customers in North America in under 24 hours.

Reach out to Perkins:

Our business has the technical knowhow and ongoing emissions expertise to help rental companies integrate Tier 4 Final technology into their fleet. Contact your nearest distributor to find out more.



Power Great Lakes Inc.

1465 Hamilton Parkway,
Wood Dale
IL 60191
USA
web: www.powergreatlakes.com
tel: 1.630.350.9400

Perkins Pacific Inc.

6100 South 6th Way
Ridgefield
Washington 98642
USA
web: www.perkinspacific.com
tel: 1.877.877.3311

Perkins Power Corp.

55 Industrial Loop
North Orange Park
Florida 32073
USA
web: www.perkinspower.com
tel: 1.800.223.3225

Asia

Singapore

14 Tractor Road
Singapore 627973
Tel: +65 6828 7469
Fax: +65 6828 7414

China

20/F Lei Shing International Plaza,
1319 West Yan'an Road,
Shanghai 200050
China
Tel: 86 21 22160774
Fax: 86 21 52136624

India

Floor 6, Tower 'B' Prestige Shantiniketan,
The Business Precinct,
Whitefield Main Road
Bangalore 560048
India
Email: IPSD_India@perkins.com

Americas

North America

1600 W Kingsbury St
Seguin
Texas 78155, USA
Tel: +1 830 386 2600

South America

Rua Alexandre Dumas
1711 Edifício Birmann 11 4 Andar
CEP 04717-004 São Paulo - SP
Brasil
Tel: +55 11 2109 2038
Fax: +55 11 2109 2089



Europe, Middle East and Africa
Perkins Engines Company Limited
Peterborough PE1 5FQ
United Kingdom
Telephone +44 (0)1733 583000