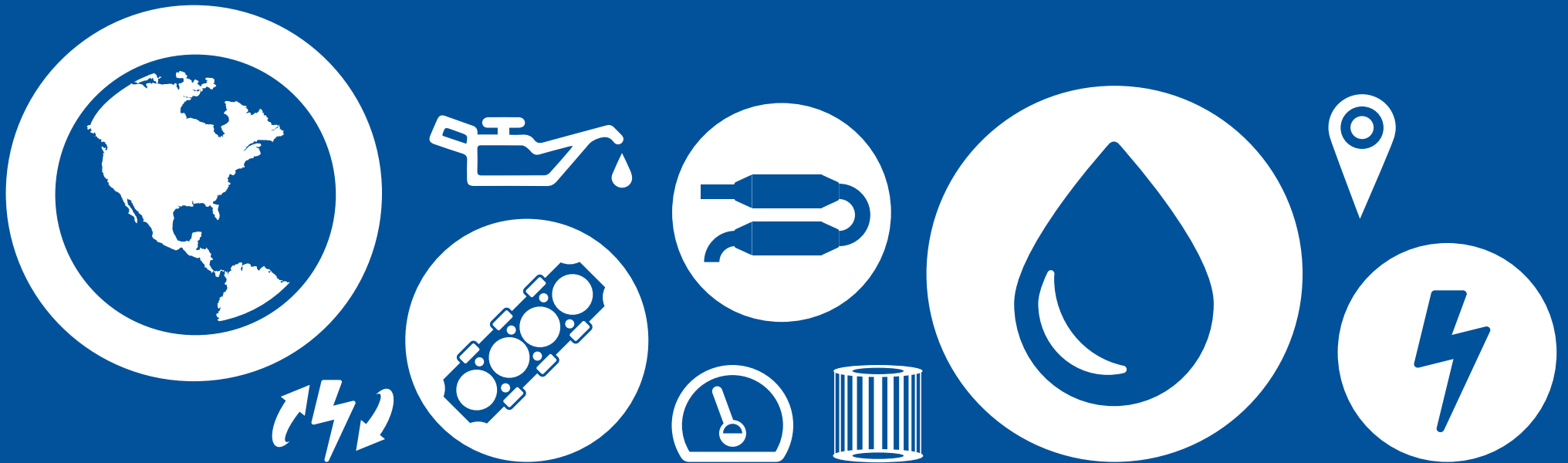


Rental market focus: what you need to know about **EU Stage IV**



Introduction

EU Stage IV emission standards were introduced in 2014 (depending on engine output and application) and with Stage V standards being considered for the future, for many rental companies, it still feels like a 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 Stage IV 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

The EU has been subject to four levels of emission standards so far – and we will meet Stage V by 2019/2020.



FAST FACT

Perkins has powered more than 2,000 machine types from more than 500 engine models, which have run more than 400 million hours.



What exactly is Stage IV – and how did we get to this point?

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 EU has enacted five different Stages including Stage IIIA and Stage IIIB, though not all Stages applied to every power range.

One of the most significant milestones was the introduction of Stage IIIB, including (but not limited to) application to all diesel engines in the power range 37 to 560 kW. This required manufacturers of diesel engines, along with Original Equipment Manufacturers (OEMs), to reduce emissions of particulate matter (PM) and/or oxides of nitrogen (NOx) as well as regulating hydrocarbon (HC) and carbon monoxide (CO) emissions. Stage IIIB, which was followed by the more stringent Stage IV, also introduced changes to the way engines were tested, with more challenging test cycles and operating environments added to more closely represent real-world conditions.

The required emission levels vary according to power range. Stage IIIB required a substantial reduction in PM and was implemented in 2011, 2012 and 2013 progressively covering the power range 560 kW down to 37 kW in three steps. Stage IIIB also reduced NOx in the power range 560 kW down to 56 kW. Stage IV, which followed in 2014 for engines in the range 560 kW down to 56 kW, reduced the NOx further to a very low value leading to the wide-spread use of Selective Catalytic Reduction (SCR) over this power range. Stage IIIB and IV do not apply for constant speed engine applications such as generator sets which remain at Stage IIIA.

When Stage V is introduced from 2019 it is anticipated that a very low PM limit will extend all the way down from 560 kW to 19 kW and this power range will additionally be subject to a new Particle Number (PN) limit driving the use of Diesel Particulate Filters (DPFs) where they are not already used. Diesel engines with a power of less than 19 kW or greater than 560 kW will be regulated in the EU for the first time from Stage V.

A close-up, high-angle photograph of a diesel engine's turbocharger. The polished, metallic turbine housing is highly reflective, showing multiple highlights and reflections of the surrounding environment. The complex, curved shape of the housing is prominent, and the background is dark and out of focus, emphasizing the mechanical detail of the turbocharger.

Europe has followed EU Stages I, II, IIIA, IIIB and IV, with Stage V anticipated from 2019

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



How do Stage IV standards affect engines?

The latest emissions standards – Stage IV – require engine manufacturers to reduce the NOx and PM produced by an engine by more than 90 percent compared with Stage I 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):** EGR works by recirculating a proportion of the engine's exhaust gas back into the engine's cylinders. EGR reduces the peak in-cylinder temperatures that form NOx. Having EGR provides a number of benefits including the requirement for a smaller selective catalytic reduction (SCR) system and reduced diesel exhaust fluid (DEF) consumption.
- **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, reducing the amount released into the atmosphere.
- **Selective catalytic reduction (SCR):** a technology for reducing NOx emissions. The process converts NOx to water and nitrogen, using diesel exhaust fluid. DEF is stored on the SCR catalyst and the reactions take place as NOx passes through the dosed SCR system.

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

Corey Berry, rental account manager

- **Diesel exhaust fluid (DEF):** engines above 56 kW will have to use SCR to reduce NOx, and need Diesel Exhaust Fluid (DEF) for the system to work. It helps to reduce NOx levels by more than 90 percent before they exit the exhaust pipe. Our products 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. For our 1200 Series engines using SCR, the amount of DEF required is within the range of 3-4 percent of the diesel consumed. For our 854 range of engines that use SCR, the amount is around 3-5 percent. Customers can use any commercial DEF that meets the ISO 22241 specification in our SCR-equipped engines. You can buy it from a variety of retail locations, such as on-highway truck fuelling stations or automotive parts stores, or arrange for bulk delivery from fuel distributors or DEF producers.

- **Diesel oxidation catalyst (DOC):** an aftertreatment technology that converts hydrocarbons into 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 optimise 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. Turbocharging increases the amount of oxygen in the combustion cycle. This allows a greater amount of fuel to be burned, which results in increased power and torque from your engine. Perkins core engines are designed to withstand the new power levels that turbocharging can achieve.

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



Perkins products are constantly evolving as we invest in – and develop – new technologies that achieve higher power from smaller engines. This provides customers with better fuel consumption and more torque, while meeting the latest emission standards.



4.5m

FAST FACT

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



What does Stage IV 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 Stage IV standards could have on your operations.

But the future is far from gloomy. There's no getting away from the fact that the latest emission standards will impact on rental businesses, but there are also significant opportunities for rental houses that are prepared to take the lead on Stage IV.



Cost factors

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 Stage IV requires the use of new, more expensive technology. You can't avoid it though. Whether you transition slowly, or all at once, it's a case of when, rather than if, you provide more machines that meet Stage IV 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 Stage IV, 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.



New operational requirements

The new regulations are going to mean engines above 56 kW using DEF (diesel engine fluid) additives. There are bound to be issues around how DEF is supplied – should rental houses take the initiative and supply it, or will they leave it to the operators? And who will make sure it's used properly?

Quality control here is absolutely essential. Operators will need to understand the fluid's shelf-life, storage temperature and containment requirements. Sunlight and extreme temperatures can accelerate its decay. Find out more at www.perkins.com/DEF

Rental companies may be fearful that filling up with DEF and controlling regeneration will mean more downtime, which may be a difficult case to sell to customers. However, Perkins technologies have been developed to minimise downtime so they will continue to offer excellent uptime and a lifetime of low cost.

Then there may be concerns around engines fitted with a DPF (diesel particulate filter). Most machines powered by Perkins engines won't need any regeneration intervention by the operator. However, it is possible that in extremely cold climates or when a machine is doing very light work, regeneration of the DPF may be needed at various intervals. So for rental houses, providing the operator with information about the DPF or regular monitoring of the engine could be sensible strategies.



Tapping in to the benefits of new technology

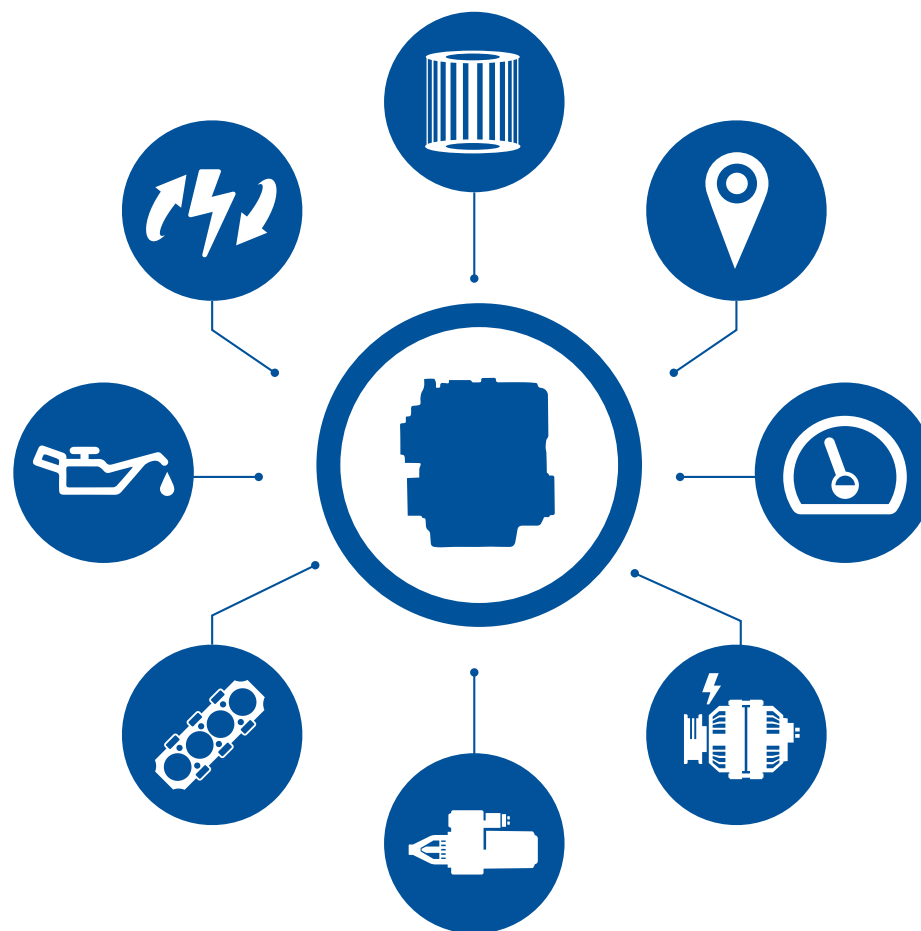
On a really positive note, the new technology means new engines will be easier to integrate into your fleet. Electronic control systems mean modern engines can talk to other machine components – enabling things like joystick control. This makes machines more intuitive and safer. The equipment is easier to use, so it can be handled by less experienced operators.

Sophisticated telemetry transmitting data from the engines means closer tracking of how the engine is being operated. Rental companies will be able to build intelligence into their systems, for instance to monitor faults or the incorrect use of DEF.



Our supporting role

A number of rental houses maintain their own fleets, and we know how important this is to you. Here at Perkins, we are determined to support you in the best way we can – whether it be through our Platinum Protection cover, through our training school, by supplying the best and most up-to-date manuals, or with our world-beating genuine parts supply service.



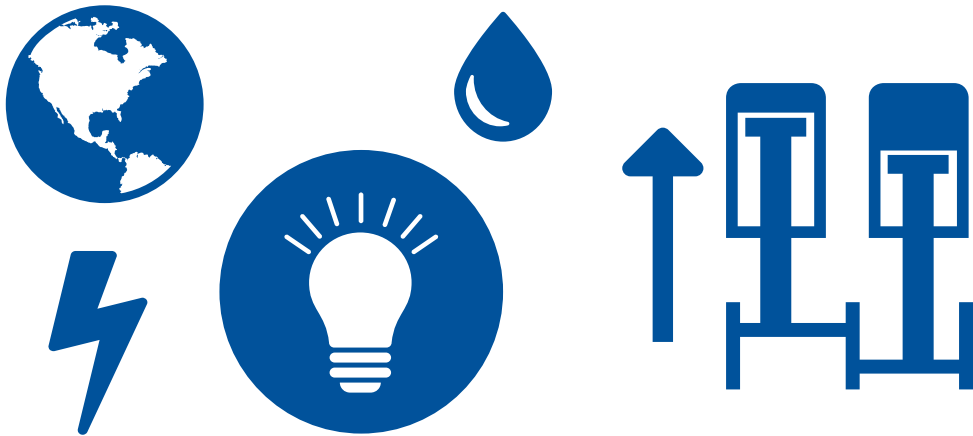
⌚ 24 hours

FAST FACT

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

Reach out to Perkins:

Our business has the technical know-how and ongoing emissions expertise to help rental companies integrate Stage IV machines into their fleet. We can also help you to adapt your working practices to minimise operator disruption and maximise your investments. Contact your nearest distributor to find out more.



Perkins distributor locator

Need help finding a Perkins
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<http://distributorlocator.perkins.com/>

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