

Engine manufacturer Volvo Penta develops new solutions in anticipation of forthcoming European emissions legislation.



Volvo Penta's D13 engine is one of the most competitive Stage IV /Tier 4 Final engines; the company now focuses on creating a smooth transition to Stage V in Europe.

After the successful launch of Volvo Penta's innovative Stage IV-compliant engines in 2014, the division is now looking to move into new territory ahead of Stage V regulations. It is expected that the European Commission will legislate for an increased reduction in emissions in all off-road diesel engines, which is expected to come into force in 2019.

While current regulations limit the overall mass of particle emissions, Stage V will also affect the number of particles emitted. The European Commission made its proposals in September 2014, on the basis that tighter controls would be needed on diesel exhaust emissions, in order to better protect the public's health and the environment.

Giorgio Paris, head of Volvo Penta's industrial segment globally, says the company is looking forward to offering enhanced solutions that will benefit customers and environmental issues.

"Europe is leading the way on global emissions targets, and Volvo Penta is excited to be at the forefront of developing new technologies," he said.

"As a leader in supplying engines for the industrial market and with more than a century of experience in leading innovative developments, we continually strive to offer the best solutions for our customers, while also taking our environmental responsibilities very seriously."

Progressive controls

European Commission controls on the discharge of nitrous oxide (NO_x) and particulate matter (PM) for off-road diesel engines were first adopted in 1997 under Directive 97/68/EC.

The legislation has been amended many times since, to reach the current Stage IV level, which limits emissions of NO_x to 0.4 g/kWh. Emissions of particulate matter – soot – is also currently limited to 0.025 g/kWh. Stage IV regulations are applicable to non-road mobile machinery (NRMM) with engines ranging from 19-560kW.

The European Commission's proposals for Stage V would place more stringent controls on emissions and widen the scope of applicability.

- Stage V regulations are expected to reduce particle mass limits to 0.015 g/kWh and particle numbers to $1 \times 10_{12}/\text{kWh}$.
- They will be applicable to all non-road mobile machinery.
- Regulations have not yet been ratified by the EU, but are expected to come into force in 2019.
- The USA's Environment Protection Agency (EPA) has not released proposals for further controls, but their Tier 4 regulations ran parallel to the EU's Stage IV, and it is believed that the EPA may adopt further controls in line with EU Stage V.

Solutions

When the final Stage IV/Tier 4 regulations came into force, Volvo Penta improved its selective catalytic reduction (SCR) technology in its engines. With SCR technology, AdBlue™ is injected into the exhaust line and reacts with NOx in the catalytic converter to turn the harmful compound into nitrogen and water. Light exhaust gas recirculation (light EGR) also reduces NOx by lowering the peak combustion temperature.

New emissions controls for Stage V will see Volvo Penta adopting further solutions to limit gaseous and soot discharge. As part of the Volvo Group, the segment has a wide range of knowledge and experience upon which to draw, for its applications.

Paris adds: "We will design a system that will make the transition from today's emissions controls to new regulations as smooth as possible, that minimizes the need to redesign the engine installation.

"Members of the Volvo Group are already using several technical solutions capable of meeting upcoming Stage V regulations, and so Volvo Penta already has access to proven technology."

As a global market leader in off-road engine manufacture and supply, Volvo Penta prides itself in having a continuous dialogue with customers to assess their needs and wishes, and to continually pursue innovative, durable and cost-effective objectives.

Leveraging technical knowledge

The standard range of offering engines from 5 to 16-liter, from 105-565kW, will stay the same. New solutions on how to adapt existing engines to conform to Stage V regulations, will utilize the latest technology prior to implementation in 2019. This means the engine program will be consistent, from Stage II to Stage V, which is hugely beneficial for the OEMs.

"In developing our Stage V solution, our approach, as always, will be to achieve the highest level of reliability and fuel-efficiency for our customers," says Johan Carlsson, Volvo Penta's senior vice president of planning, product development and purchasing. "We will leverage technical knowledge from across the Volvo Group and adapt it for Volvo Penta's customers."

In using SCR technology and AdBlue™ for Stage IV, Volvo Penta engines did not require the use of a diesel particulate filter (DPF). DPFs are used in on-road vehicles – from the Volvo Group as a whole - and some off-road applications. With more stringent emissions for Stage V there will be a DPF as part of the solution for Volvo Penta.

Carlsson says: "For Stage IV, we have met the requirements in the most efficient way by maximizing uptime and keeping the solution as simple as possible. Our knowledge gained from the Volvo Group, and with our continuing pursuit of fuel-efficiency, we anticipate fuels costs to decline. We will be ready for Stage V, and our customers will see the best outcomes from our long-standing expertise."

Volvo Penta will exhibit at Bauma from April 11th – 17th and can be found at Booth C4.327.