

Load & Haul Stage V engine technology



Proven Stage V engine technology for underground mining

At Sandvik, we are continuously developing our loaders and trucks. We are committed to offering low-emission equipment with state-of-the-art power sources for underground mines.

During the years that have passed, equipment and engine technology have taken huge leaps in reducing particulate emis-

sions. With our expertise and collaborative networks, we are delivering a Stage V engine by Volvo Penta for loaders and trucks, in which the engine and equipment work as one.

Achieved through continuous research and development and tens of thousands of operating hours in active underground

mines around the world, the technology meets or exceeds the stringent demands of the harsh environment and its applicable requirements.

Stage V engines are optionally available for selected Sandvik loaders and trucks in areas where ultra-low sulfur fuel and low-ash engine oil is available.



Reduced emissions

Regulation development for non-road diesel engines, power range 130–560 kW

The most significant benefit of the Stage V engine is the reduced amount of particulate matter in the diesel exhaust, which helps improve air quality underground. The Stage V engine delivers the best in class ventilation rates with the goal being to lower ventilation costs.

Passive regeneration

Reduction of diesel particles in Stage V engines with power range 130–560 kW is based on having Diesel Particulate Filter (DPF) technology as part of the engine’s after-treatment system. Stage V engines from Volvo Penta utilize passive DPF regeneration which takes place during normal equipment operation. The

exhaust temperature is maintained at an optimum level at all times while the filter is regenerated. Passive regeneration is most efficient in a temperature range of 250–450 °C, which usually matches with the normal engine work cycle. This means that in normal operating conditions, there is no need to stop the equipment or manually start the regeneration. These actions are aimed to minimize equipment downtime.

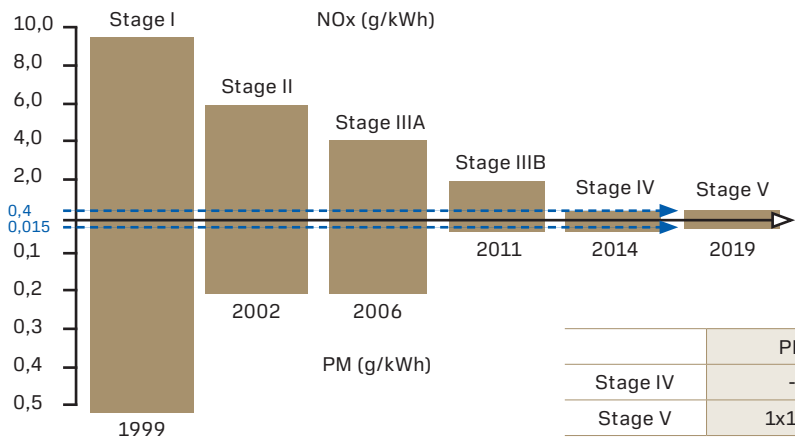
Selective catalytic reduction

The exhaust after treatment contains a Selective Catalytic Reduction system (SCR), which uses diesel exhaust fluid to reduce emissions of nitrogen oxide. The SCR, with the DPF, reduces emissions without sacrificing performance or fuel efficiency.

HVO100, renewable fuel for minimal emissions

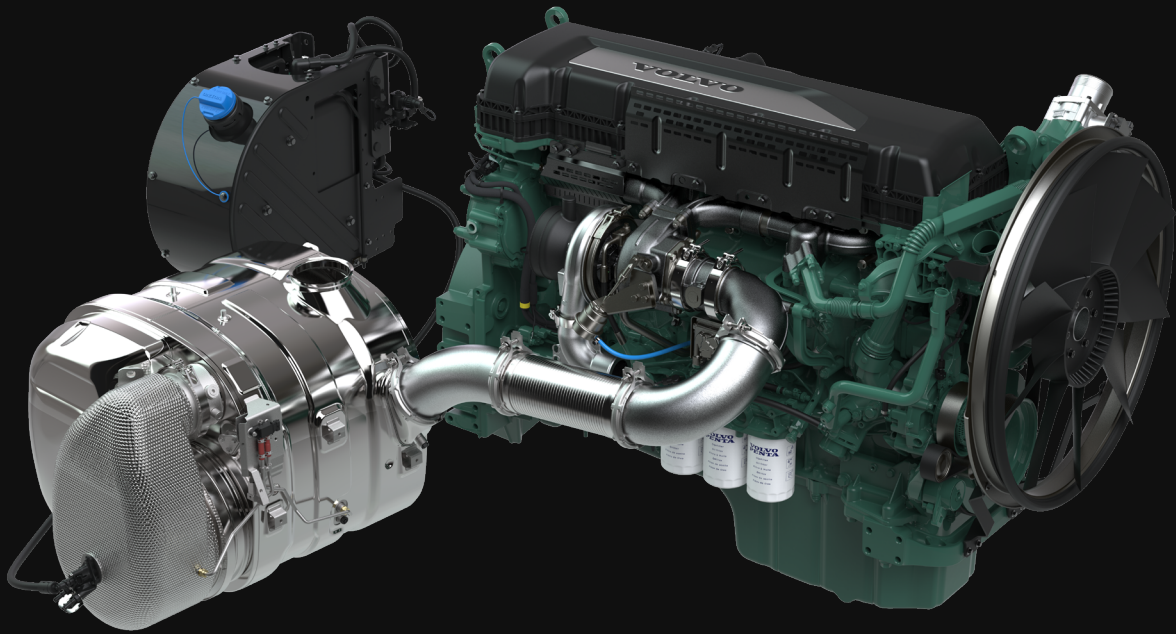
To achieve minimal emissions, all Sandvik loaders and trucks with Stage V engines are compatible with HVO100, hydrotreated vegetable oil based fuel. HVO100 is a stable, high-quality fuel, meeting EN 15940 standard and it can lower fossil CO₂ emissions by up to 90%, depending on the feedstock. HVO100 is treated as diesel fuel and it works in exactly the same way in terms of service and installation. It can be used alone or blended, and doesn’t require any additional service or maintenance tasks.

25
times less particle mass than in Stage II engine emissions



	PN	PM (g/kWh)	NOx (g/kWh)
Stage IV	-	0,025	0,40
Stage V	1x10 ¹²	0,015	0,40

Designed for underground performance



Developed in collaboration with Volvo Penta, the Stage V engine and Sandvik equipment work together to maintain productivity and reliability in the most challenging environments. Both the engine and the equipment come with proven track records from previous design solutions for underground use. Without any compromise between

the latest engine technology or the performance level of the equipment, the Stage V engine provides the same power output as the Stage IV / Tier 4f. Increased wiring protection, including a braided armour wiring harness, improves reliability. Further, all electrical hardware is specially designed for demanding conditions with corrosion, heat and water

resistance. The exhaust aftertreatment system design fits perfectly in place in the equipment frame, allowing us to keep the main dimensions and weights unchanged.

During the equipment lifetime, engines are available from Sandvik Parts & Service aftermarket support.



High availability

1000

times fewer particles per cm^3 than
in Stage II engine emissions

Up to

3%

reduced fuel consumption
compared to lower Stages*

*Test results are to be considered as results reached under certain controlled test conditions. These test results should not be treated as specifications and Sandvik does not guarantee, warranty or represent the outcome of test results in any or all circumstances.

Modulating engine brake

Volvo Penta Stage V engines <560 kW are equipped with a modulating engine brake. This enables the operator to adjust the braking power for better downhill speed control. Additionally, it minimizes brake and transmission overheating and brake wear. The modulating engine brake and passive regeneration contribute to high uptime.

Reduced oil consumption

With Volvo Penta Stage V, the engine oil change interval is tailored in Sandvik applications to match underground mining conditions, and stretched

from previous 250 to 500 hours. This decreases oil consumption and increases equipment availability.

Reduced fuel consumption

The Stage V loaders and trucks are capable of operating with up to 3% reduced fuel consumption compared to the lower Stages, reducing total costs of ownership. The fuel and DEF (diesel exhaust fluid) tanks enable continuous operation for a full working shift without the need to stop and refuel. An optionally available Wiggins fast-filling system reduces fueling time by up to 80 % and eliminates fuel and oil spills.

Built-in fire safety

To mitigate fire risks relating to high temperatures, Sandvik loaders and trucks are carefully designed, specifically keeping in mind tough underground mining conditions.

Our built-in fire prevention solutions include:

- Hot and cold side design for the engine area
- Separation of main hydraulics from the hot engine area
- Double-wall exhaust pipe and shielding on the exhaust system
- Turbocharger covers
- Overcurrent protection and covering on electrics
- Fire-resistant materials and components
- Circuit breakers in the operator's compartment

In addition to careful design, correct equipment use and maintenance practices have crucial importance for fire safety.



Protect your equipment with Eclipse®

To further reduce the risks associated with fire, the Eclipse® Fire Suppression System (FSS) works as an ideal backup. Eclipse® FSS from Sandvik can be factory-installed and is a sustainable choice, as it is the world's first fluorine-free fire suppression liquid for mobile equipment.

Safety first

Statistics from mobile equipment fires reveal the following critical steps for successfully suppressing devastating fires without reliance on operator intervention:

1. Automatic detection and activation

Early control of a fire is critical, as most large fires start out small and unnoticed

2. Automatic engine shutdown

Isolation of equipment power is key to interrupting the fuel supply feeding the fire

3. Extended discharge time

Liquid-agent fire suppression seals in flammable vapours and cools superheated surfaces to prevent re-ignition

All Eclipse® FSS feature fully automated activation and engine shutdown as standard features.

