Scania’s new generation V8 – the technology behind this major step forward

The range of improvements that Scania’s new generation V8 engine delivers represents a step change in the benefits it brings to customers. A major improvement in fuel saving, a reduction in overall weight, lower costs for maintenance and repair, and increased uptime are all attributes that every truck owner values.

Behind this major move forward is the additional fine-tuning of Scania’s modular-based, 16-litre engine platform, along with the smart application of advanced technology. Reducing diesel fuel consumption by 7 to 10 percent is remarkable, and highly welcome at a time when margins are tight and fuel usage a key focus area.

This new generation engine is based around the same engine block and base configuration as its predecessor, but that’s where the similarities end. The most significant change is that the exhaust gas collectors now run separately up to the turbo, the turbine side being directly fed from two directions from the respective cylinder banks. The system is known as a Rotated Twin Scroll FGT turbo.

The fact the engine uses Selective Catalytic Reduction (SCR) for the after-treatment of exhaust gases means that the engine now has a fixed geometry turbo unit that is more robust and lighter than a variable turbo. The turbo is now mounted directly on the engine block, between the cylinder banks, giving it a stable and vibration-proof operating environment.

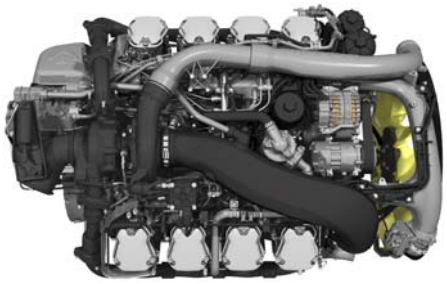
Straighter intake and higher pressure

Major changes have also been made to the induction and injection processes. The air intake is now straighter and the fuel distribution system is a so-called single rail variety, with simpler draw through a central high pressure pipe and longer distribution pipes that also provide better access during servicing. The maximum pressure for the fuel distribution system is now lower at 1800 bar, due to the use of SCR technology for after-treatment.

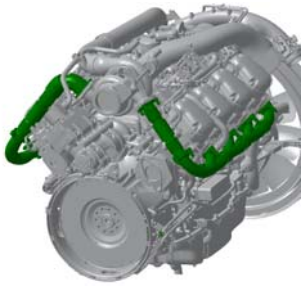
Once the fuel arrives in the cylinders via the newly developed injection system, helped by an XPI high-pressure pump that has just two pistons, increased compression and a maximum cylinder pressure as high as 210 bar are applied – important features for reduced fuel consumption.

Lower internal friction

The cylinder head, the pistons, the piston bolts, the crankcase and crankshaft, as well all the bearings have been reworked to provide better sealing and reducefriction. These changes have taken place within the context of Scania's modular system for cylinder units, meaning that most of the parts are shared with Scania's other engine platforms.



Scania's latest generation of Euro 6 V8 engine comes in four different power levels. A complete overhaul and the use of new technology has reduced fuel consumption by 7 to 10 percent.



Scania's new generation V8 relies on a robust fixed geometry turbo (FGT) in which the exhaust gas turbo is fed from two directions (a system known as rotated twin scroll) via the green-marked exhaust gas collectors for each cylinder bank.

Efficient aftertreatment

The Euro 6 engine uses a compact and completely integrated exhaust silencer that manages after-treatment. It contains an oxidisation catalyst, an AdBlue mixer, two particle filters featuring short filters and asymmetrical walls for reduced back pressure, three parallel SCR catalysts, and three ammonia slip catalysts. Despite all this, the entire unit is only 630 millimetres wide and doesn't take away valuable space from features such as the tanks on the side of the frame.

"Using SCR only for after-treatment provides us with a number of advantages," says Roger Olsson, Chief Engineer for Scania V8. "One obvious difference is that even fewer and lighter components are required. This, in turn, makes it easier to optimise for the lowest possible fuel consumption, due to there being fewer parameters and components to take into account. And the change to a turbo unit with fixed geometry from the previous variable turbo provides increased efficiency, due to reduced gas-exchange losses."

Smart components

Internal improvements through factors such as reduced friction, higher compression, and improved gas exchange account for about two percent of the reduction in fuel consumption. A further important aspect is that the engine is fitted with components and auxiliary systems that reduce energy consumption – called parasitic losses – by switching off when they don't need to be operating, and instead adapt themselves to whatever the present energy requirements happen to be. The new generation engine gets by extremely well with a quiet, two-cylinder XPI fuel pump, which weighs less and requires less energy to operate.

Another smart component is the oil pump. A thermostat controls whether the oil goes directly to sensitive parts during a cold start or, when the right working temperature has been reached, via the oil cooler. The thermostat means oil pressure builds up faster when the vehicle is started, and a higher oil temperature can be maintained than previously, reducing friction and fuel consumption. The oil pump's flow can be varied through an oil jet that affects a pressure-sensitive valve. This means that the oil pump provides the right pressure and flow whatever the revs, rather than delivering an unnecessarily high oil pressure (which burns fuel) at high revs.

The engine's cooling system operates along similar principles. With an advanced thermostatic monitoring system and a variable-capacity water pump, the engine is able to maintain a working temperature that is several degrees warmer than the previous generation was able to do to without the risk of overheating. The higher working temperature contributes to reduced fuel consumption by reducing friction.

One auxiliary system that also follows the principle of requirement-driven operation is the compressor, which supplies the braking system with compressed air. It is now mounted at the rear of the engine directly on top of the flywheel housing and the simplified drive system (the fuel pump is driven in a similar way), combined with the automatic shut-off function that operates when no additional air is required together contribute 0.5 percent of the reduced fuel consumption.

A breakdown of fuel consumption

Customers who choose the new V8 engine can look forward to everything from lower noise levels (such as transmission noise) to the right kind of sound in term of the legendary rumble. Add to that lower weight, simplified maintenance, and more robust construction, and it becomes obvious that the new generation represents a major step forward when it comes to real customer value. But what about the reduced fuel consumption? How is it even possible to achieve a reduction in fuel consumption such as the promised 7 to 10 percent?

"If you split up the contributions that different aspects make, then it all falls naturally into place," says Olson. "Everything that was thoroughly tested in theoretical and practical assessments prior to launching in 2017 has been franked in performance in the last three years. We have such extensive and longstanding experience with our V8s that we know exactly where different measures and investments will provide the best returns in terms of fuel savings for customers. In rough terms, it looks like this:"

1. Internal changes involving increased compression, higher cylinder pressure, reduced friction and so on. Contributes 1.5-2 percent.
2. The shift from EGR/SCR to SCR only and a fixed geometry turbo provides higher efficiency and maintains exhaust temperatures so that requirements for raising the temperature are reduced. Contributes about 1.5 percent.
3. The new aftertreatment system provides improved AdBlue vaporisation performance, optimised aftertreatment of substrates, and less pressure loss. Contributes around 1.5 percent.
4. The new disengageable auxiliary systems contribute 1.5 to 2 percent for customers with normal, representative driving patterns.
5. Last but not least, customers also receive the benefits of all the aerodynamic changes that initially came with Scania's new truck generation. These contribute roughly 2 percent for typical long-distance customers.

"When you add it all together, it means that most customers, regardless of their application, should normally be able to reduce their fuel bills by seven percent or more – and in many cases without even needing to factor in the wins from the aerodynamics in the new truck generation cab design," says Olson.