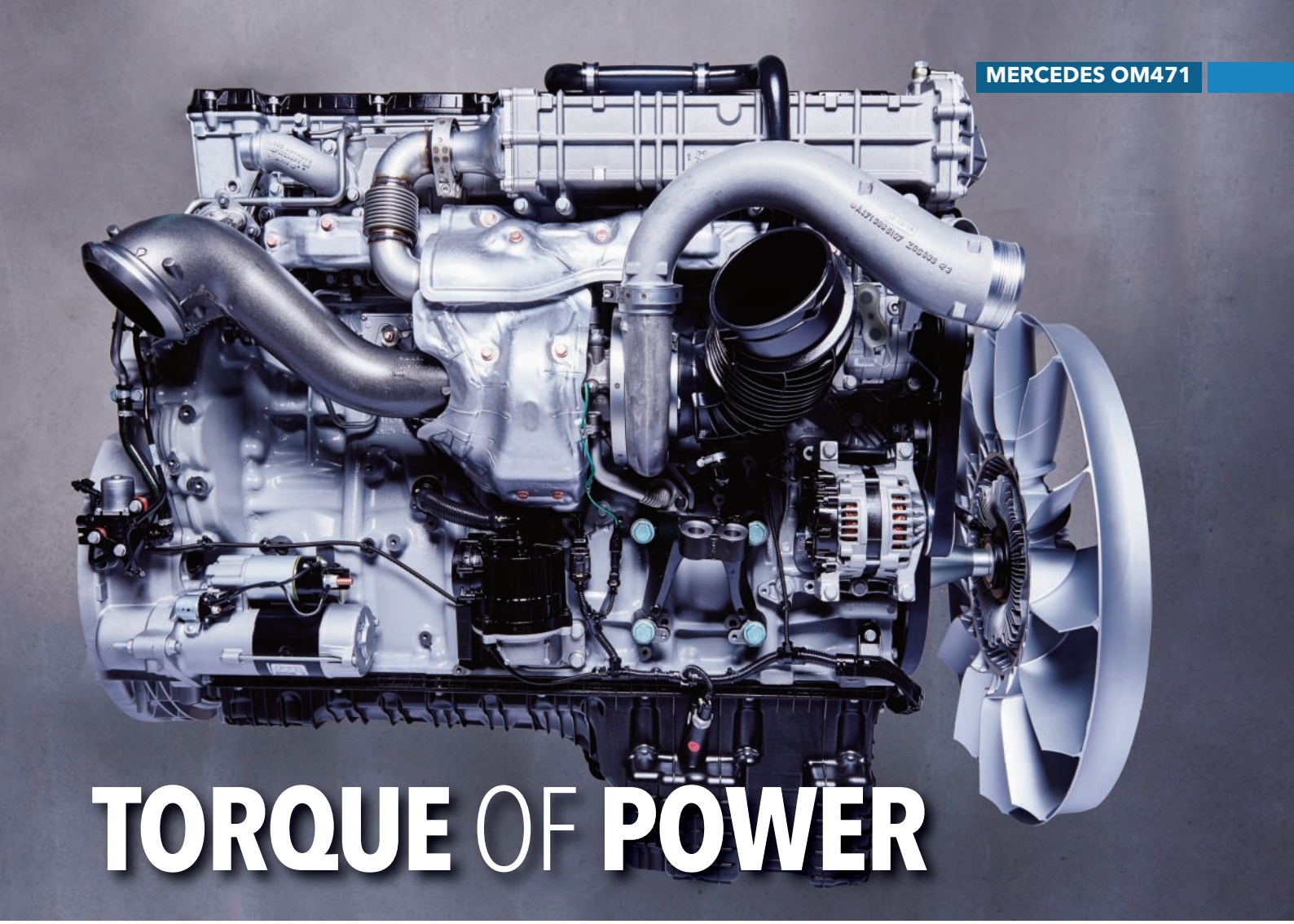


# TORQUE OF POWER

**Continuing to push the boundaries, Mercedes-Benz has revealed substantial revisions to one of its mainstream engines, the OM471. Ian Norwell reports from Slovenia**

One fine day, the badge on the door of heavy trucks might designate torque available, instead of bhp. Because, if you want a single measure of a vehicle's driveability, torque – and how it is delivered – is now the better guide.

Despite successive European emissions regulations, the march of fuel economy has been impressive – and that is certainly the case with Mercedes-Benz's oil motors (OM). Its OM471 straight six, 12.8-litre engine, which powers the Actros range, is a case in point. "From its Euro 5 introduction in Q4 2011, through to this revised version, the fuel improvement has been 13%," says Vincent Angellier, head of product marketing for Mercedes-Benz Trucks.

That's quite a statistic, and two landmarks on the way – Euro 6 and Mercedes' introduction of PPC (predictive powertrain control) – have both delivered fuel boosts. The former was a surprise, the latter not. However, each brought a 5% fuel prize and this latest revision squeezes a further 3%.

PPC, and other manufacturers' versions of the same idea, initially looked like a gimmick, but our test in the spring of 2013 put any naysayers back in their box. On the 62km section of the A6 between Gründstadt and Kaiserslautern (round trip), even the succession of long climbs did not depress a 9.6% fuel improvement with PPC engaged. Yes, that was 9.6%. So this and other evidence makes Angellier's claim more than believable.

## NO STONE UNTURNED

Transmissions play a big part, but what specifically has Daimler done to its OM471 to deliver the additional 3%? Well, the devil is in the detail and there's lots of that. A second generation of its X-Pulse common rail injection, with a pressure booster in the injector, gives "unrestricted flexibility for modelling the injection system". And pressures continue to climb. Maximum rail pressure has been increased from 900 to 1,160bar (29%), giving injection pressures up to 2,700bar.

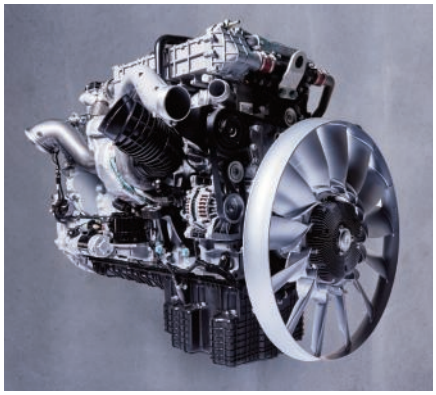
The sheer robustness that a modern engine requires to survive comes, in part, from the refined use of CGI (compacted graphite iron) in blocks, heads and elsewhere.

The injection nozzle remains an eight-hole affair, but the geometry of the piston bowl has been modified, and the compression ratio lifted from 17.3:1 to 18.3:1.

Acknowledging that exhaust gas recirculation (EGR) is a technology Mercedes would rather not use, this engine's recirculation rate has been reduced. This adds up to efficiency gains across the entire range of engine mapping, and brings another win on fuel. And with a torque curve retreating yet further left across the classic graph,

***"From its Euro 5 introduction in Q4 2011, through to this revised version at Euro 6, the collective fuel consumption improvement achieved has been 13%"***

*Vincent Angellier*



best fuel is now won at even lower engine speeds.

That said, as in three dimensional snooker, there are always other, less desirable consequences of any action. In this instance, untreated NOx emissions rise in response. This is countered by a higher-efficiency SCR (selective catalytic reduction) unit, and Daimler says the unavoidable resulting rise in AdBlue consumption – now back to Euro 5 levels, at around 5% – is a fair trade for diesel with which it and truck operators will be happy.

Meanwhile, the old VTG (variable turbine geometry) turbo has been dumped in the name of reliability and simplicity. Now, an asymmetric turbocharger ensures faster build up of charge pressure, driven by exhaust gases from cylinders four to six, without any detour. Exhaust gases from cylinders one to three are then bled off for EGR. That's smart. The writing is certainly on the wall for waste gases.

## IN-HOUSE ENGINEERING

Daimler's turbocharger suppliers will be looking elsewhere for business, too. The new one was developed by Mercedes-Benz, and is manufactured at the Mannheim engine plant. "An in-house turbocharger ensures customised adaptation to the requirements of the OM471," explains Angellier. "Very tight production tolerances are a guarantee for supreme quality and durability."

He's not being haughty, but it looks like the peripherals suppliers need to up their game, too, if they are not to fall by this tougher QA wayside. With tighter than ever control of the entire combustion process, some devices are ending up in the skips at the back of the Wörth factory. For example, Daimler has dispensed with the boost pressure control, EGR sensor and EGR control in this engine.

Most importantly though, torque available has morphed. Although the maximum output and peak torque figures remain nominally unchanged, the curves in the lowest rev range rise far more sharply, giving quite different performance characteristics.

These engines already muster at least 2,000Nm of torque at just under 800 rpm. Depending on the output rating, close to peak torque is now already on tap between 800 and 950 rpm.

But there are more tweaks here, too. The variants delivering 421, 449 and 476bhp are complemented by three 'top torque' versions. With these engines, an extra 200Nm of torque is on tap whenever top gear is engaged. This cuts shift frequency and, in combination with a longer rear axle ratio, increases road speed without hitting fuel economy.

More spec for customers to think about, and even more pressure for the truck salesman – sorry, transport solutions executive – to get right.

## On the road test

Can a difference seriously be felt on the road between this and the previous generation OM471 engine? The path from Ljubljana to Piran, on the Slovenian coast, was as many other European roads: in better condition than here at home, and with plenty of long climbs and descents. With the technical briefing still ringing in my ears, I was on the lookout for one significant characteristic: how low can she go? By that I mean how does the increased torque at lower rpm impact hills? And likewise, what influence does it have on shifting strategies and climbing ability.

In my Actros 1848 4x2, at 40 tonnes, it certainly felt like it was there. On uniform climbs, there seemed to be a point at which the descent of the needle across the face of the rev counter slowed as it went through the 1,000 rpm mark – although the grade had not changed.

Obviously, under full control of the PowerShift 3 box and with PPC engaged, I was effectively bearing witness to the machine's progress, not really driving. But the climbing ability was there, as was the usual confident descent. When settled in, I simply set the cruise speed at 80kph, with an allowance for a +9kph over-speed and a -7kph under-speed. Adaptive cruise and its predictive twin then led the orchestra of automated gear shifting and retardation as the topography demanded. The scenery was nice, too.

This is an important engine. The OM471 appears not just in the Actros, but also the Antos distribution and Arocs construction truck ranges. The impact will be widespread, and the first trucks with this revised power plant left the Karlsruhe factory on 1 October 2015.