

Breathing easy

The travails of Euro 6 may appear passed, but clean-up legislation never stops. Cummins' Peter Williams and Ricardo's Andrew Banks drew delegates' attention to what's next. Ian Norwell reports

The ongoing meltdown at Volkswagen is a timely reminder that emissions legislation is to be taken seriously. Industry eavesdroppers have, for some time, heard rumblings over the way testing protocols might be viewed by some development engineers as a 'plastic' affair open to manipulation. However, the arrival even of Euro 5 was accompanied by an unwritten gypsy's warning from the US EPA (Environmental Protection Agency) that fines for non-compliance would be catastrophic.

And so it has come to pass. That a motor maker has been caught cheating is a shock. That it was VW is astounding. In any event, it's an abrupt klaxon blast in the ear for any engineers who might be tempted to bend the rules. The message is crystal clear: they are not plastic; they are cast iron, and ill-advised torsion won't be tolerated.

As for heavy-duty diesels, Euro 6 is widely accepted as the toughest of emissions legislations yet – with many describing it as several bridges further than anything before. However, Peter Williams, product environmental management director at Cummins, told IRTE Conference delegates that no further NOx and particulates emissions cuts are expected. This is not only because they are now at minuscule levels, but also due to the fact that the equipment required to measure Euro '6C' is barely available.

EURO 6C AND OBD

Indeed, it was the lack of sufficiently sophisticated technology that led to the agreement between engine makers and legislators that Euro 6 would arrive in three phases – A, B and C – running up to an all-vehicle inclusion on 1 January 2017. This will be of little moment to fleet buyers, as the

vehicles they buy will 'naturally' be compliant. But OEMs and loose engine suppliers, such as Cummins, have it in sharp focus. Cummins supplies truck and bus engines to several OEMs, most notably in the UK to DAF in its LF and lighter CF series, designed and built at the Leyland plant.

That said, Williams told conference that legislators looking for further emissions cuts – the next target is confirmed as CO₂ – would do better to focus on removing older trucks and buses. "It would deliver far greater improvements, in terms of air quality, if some of the ageing fleet were taken off the road," he said, "Euro 7, or anything like it, would not be needed if early Euro 2, 3 and 4 vehicles were taken out of service."

Illustrating his point, he reminded delegates that the average service life for a city bus is now some 14 years – which takes us back a long way in terms of emissions technology. That said, retrospective legislation can have a profound effect on operators, not least because the second and ensuing lives of commercial vehicles represent vital parts of the transport economy.

Meanwhile, Williams revealed that the latest versions of Cummins ISB four- and six-cylinder truck and bus engines have already been upgraded to meet and exceed the final Euro 6C, along with its much more demanding OBD (on-board diagnostics) requirements.

These 4.5- and 6.7-litre engines also offer elevated torque and horsepower – although they have not yet followed the trend to downsizing,

retaining their existing swept volumes. Watch this space.

Meanwhile, from one viewpoint, making CO₂ the next target should cause little alarm, unless levels are punitive or unrealistic. The gas is so directly linked to diesel consumption that market forces are already pushing levels downwards. However, Andrew Banks, chief engineer at Ricardo's HDD (heavy-duty diesel) engine division, explained that legislators are moving away from an engine-only approach.

CARBON DIOXIDE

While NOx and particulates cuts have been achieved through repackaged and after-treated engine designs, tailpipe CO₂ – for which read 'fuel economy' – is influenced by an acknowledged raft

of factors. Those include aerodynamics, tyre husbandry, driving style, transmission choice, axle alignment, drivetrain oils and weather conditions – and suppliers in these sectors are all innovating away to cut CO₂.

Nevertheless, Banks confirmed that engines still have a lot more CO₂ reduction to offer. He told delegates: "We are well advanced with our four-year CO2RE project

and a very wide range of technologies is being exploited in the hunt for CO₂ reductions," he told delegates. Indeed, with 16 partners that include heavy-duty vehicle makers, tier 1 and SME suppliers, universities and the EC's joint research centre – all coordinated by Volvo – CO2RE covers a broad church and should deliver the goods.

The consortium's target is to cut fuel

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consumption by 15% from a Euro 5 baseline. And while it's true that Euro 6 has already handed the industry a healthy improvement on a plate (contrary to expectations five years ago), additional technology being developed demonstrates that the engine has indeed still got a lot more to give up. Chief contenders in the race include waste heat recovery (WHR), to deliver electrification of peripherals, although this is being examined under a separate project.

Beyond that, Banks confirmed that the practice of making engines eat their own waste, via EGR (exhaust gas recirculation), is widely regarded as a stop-gap technology. Hats off to Iveco then, which tipped any form of EGR out of the window when it went to Euro 6. "Higher efficiency SCR [selective catalytic reduction] has a big contribution to make, and at lower exhaust temperatures," said Banks. And he added that we should expect a low flow resistance DPF (diesel particulate filter) and SCR equipment to be packaged into a single efficient structure in the not too distant future.

CO2RE is also going for downspeeding via VVA (variable valve actuation), and dual-stage turbocharging, using Volvo's D13 engine as a base. Other big names are in the frame, too. Daimler's OM936LA, a punchy 7.7-litre unit (Actros 240–350bhp), is also being used as the base for a friction-reduction project.

Under full load, Ricardo calculates the share of friction losses in the Daimler unit as 49% from the reciprocating group, 7% the crankshaft, 6% valve train, a chunky 27% from the fuel pump and 11% from auxiliaries. All are under the microscope, and phase two of CO2RE will look at DLC (diamond-like carbon) nano-composite coatings.

Truck engine makers tend to offer only inscrutable smiles when quizzed about this technology. Its contribution to cutting friction throughout the drivetrain has yet to be exploited. But while pistons, rings, liners, valve gear and cylinder bores may be the obvious candidates for treatment, all surfaces that impact, roll or slide need their own coatings to achieve optimum performance.

It's very clear that there are several slippery savings still hiding away in even the most sophisticated of Euro 6 engines. They will all go towards cutting CO₂ down to size. ■



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