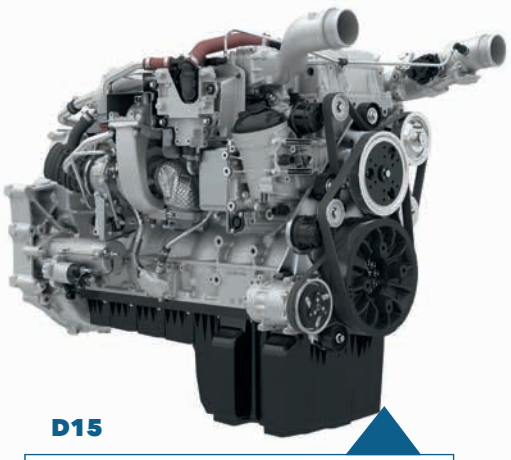


Horses for courses

Lucy Radley asks three OEMs for their take on an age-old question: when it comes to fuel efficiency, is it better to overtax a small engine or underutilise a large one? Or should we now be approaching this subject differently?

The dilemmas presented by engine specification, particularly when it comes to dimensioning, have long been the subject of debate. But as new technologies develop and operational constraints change over time, it's reasonable to wonder whether the best approaches to this have changed too.

Decarbonisation targets, judged on VECTO scores (The Vehicle Energy Consumption Calculation Tool – see also pp17-18), are at the forefront of the mind of Volvo's head of product, John Comer, and that feeds directly into fuel efficiency. "Manufacturers have until 2025 to reduce their CO_2 emissions by 15%, so it's a key driver to look at every part of the vehicle and optimise it. The benefit for customers is that CO_2 and fuel are directly linked." Every litre of diesel burnt produces around 2.63kg of CO_2. "More carbon-efficient vehicles are better for the environment and the bottom line."

This means being prepared to think about engines differently. After all, Volvo's best engine for fuel efficiency is its turbo-compounding D13K, as found in the I-Save. This uses kinetic energy recovery, along with other measures such as a uniquely shaped piston head, driveline software, and is coupled to a rear axle with a shallower ratio.

"I think in the future the power badge won't mean so much," Comer contends. "Our 493bhp I-Save produces much more torque than a 532bhp regular D13 engine." Indeed, in Volvo's flagship tractor, the FH, there isn't an engine option below 13 litres. There is, of course, the larger D16, but even Comer admits "that isn't renowned for fuel economy", instead being aimed more at heavy haulage applications.

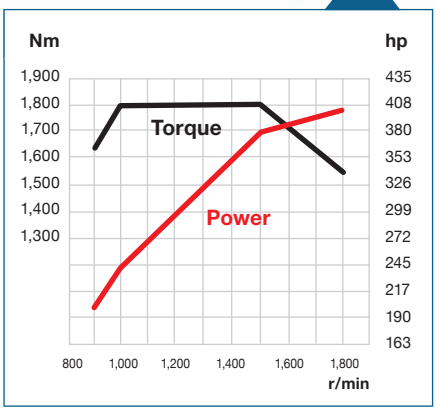
In the smaller-cabbed FM, there is the overlapping choice of an 11-litre engine at 424 and 454bhp, or a 13-litre at 414 and 454bhp. But Volvo itself pushes the D13 as being optimal in tractor units, the 11-litre being aimed at the 8x4 market where payload is key – the D11 is 150kg lighter.

Since the introduction of the I-Save in 2019, there are signs that operators are getting used to looking at torque where new technologies are being used. In 2017/18, 493bhp engines were around 70% of Volvo FH sales. Today the balance between the 493bhp and the 454 are equal, at around 40% each, due to I-Save technology delivering both performance and fuel savings.

DRIVELINE CONTEXT

But Comer is clear. "For us now, it's not about the engine, it's about the total efficiency of the truck, and getting that right means you burn less fuel."

Nick Handy, MAN's head of product management, doesn't think over- or under-speccing the engine alone is as valid an approach as it once was – if it ever was. "It's not just the engine, it's the driveline," he emphasises. "You can up-spec the engine size, but if you put the incorrect differential in, it'll be drinking fuel, as opposed to a smaller engine with the right diff ratio."

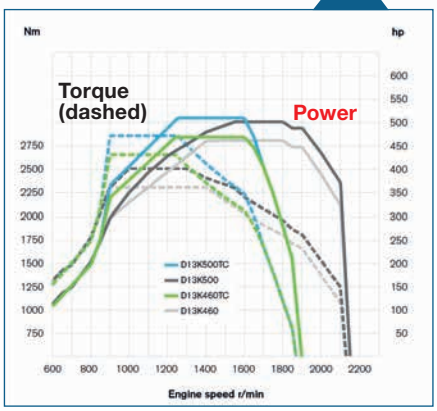


"The engine isn't just a thing in isolation," Handy continues. "It goes through a very technical automated transmission, then if you've got things like our EfficientCruise that's reading the road 3km in front of you and ensuring you're in the optimum position for the load and topography." It's about the technology, the complete package – not forgetting aerodynamics.

As for the importance of horsepower, he points out that it's the torque, the rotational power of the wheels against the road, doing the actual work. Adjusting the engine speed can give a good torque value at a lower horsepower, and "a nice flat torque curve as well," Handy adds. "Peak torque that comes in at low speed, then remains as flat as possible across the rev range is what you really want for fuel consumption."

Cubic capacity of an engine can be

D13K



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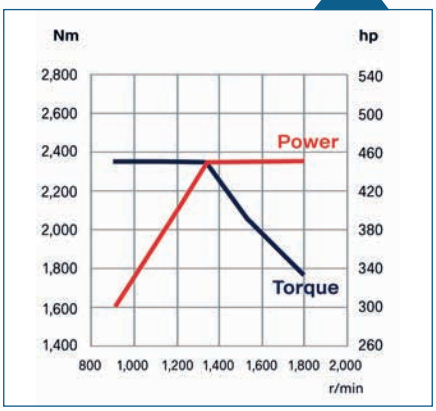

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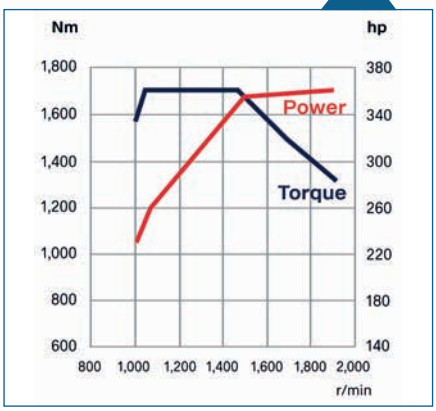

another red herring. These days physical size isn't everything – MAN's current D15 engine being a case in point. A 9-litre unit, with 325, 355 and 395bhp options generating 1,600, 1,700 and 1,800Nm of torque respectively, it replaced the D20. That had a 10.5-litre displacement and was available at 316 and 355bhp, generating 1,600 and 1,800Nm, but it was also 230kg heavier.

Finally, software has a role to play, allowing that torque to be used more effectively. "We've got a new programme called MAN TorqueAdaption. In full EfficiencyPlus mode, it will limit the available torque based on the load and requirement," Handy reveals. "So when the drivers put their feet down, it's not necessarily going to full torque and using fuel." Again, that's due to electronics at work, rather than engine size.

"I think when you look at efficiency it's more than just the engine, it's the complete package," Handy says in summation. "And the package can be as much software these days as it is hardware. Not forgetting tyre spec too – we're seeing more and more variation in that now when we're putting together vehicle configurations, with EU labelling."

CHOOSING WELL

In response to the initial question, Phil Rootham, head of pre-sales technical at Scania, replies: "Correctly dimensioning engines has always been where we want to get to, with every vehicle. We look at how the vehicle will be used, what the drivers are for the customer, and how we then tailor the offer to suit that. On the technical side, one part of it is the desire for better journey times; another is around achieving optimal fuel consumption.

"Once you start to build the puzzle as to 'what do I want to do, where, and how quickly', then we can start to plot the differences and understand what the variables are," he continues. "That then plays into how you alter differential ratios, vehicle speeds and so on. It's complex, but my view has always been that we should present all the information as cleanly as possible."

Modern high torque/low revving engines need to work hard to ensure aftertreatment systems work effectively, because they need heat generation (see also pp10-12). "If heat isn't generated while working, separate steps are needed, none of which are good for fuel consumption," Rootham reminds us. "So that's where the balance is. Potentially fractionally over-dimensioning to have a positive effect on journey times, driveability and driver acceptance, has tended to be where Scania typically sits."

In other words, it's all about understanding the customer's operation and its operational priorities, to improve its opportunity to make revenue from the vehicle. Given the biggest driver from the OEM's perspective is now decarbonisation, happily this lines up with the CO_2 reduction agenda. This means technical improvements like reducing drag within the engine, and operational improvements such as aerodynamics, are all playing into both sides of the balance.

"So the right approach to answering the question is: how do we make something work as efficiently as possible within that operation, while also being aware what the various drivers are," Rootham concludes. "Remember, we're broader in what we do with vehicles now," he adds. "The reason there's so many 6x2 tractors on the road isn't because they're all running at 44 tonnes, it's that we want the flexibility to be able to do that. And for that there is a price to pay." TE