MAHLE
Powertrain

INSPIRED ENGINEERING

FACING THE PERFECT STORM

Simon Williams
LEADER OF RDE DEVELOPMENT

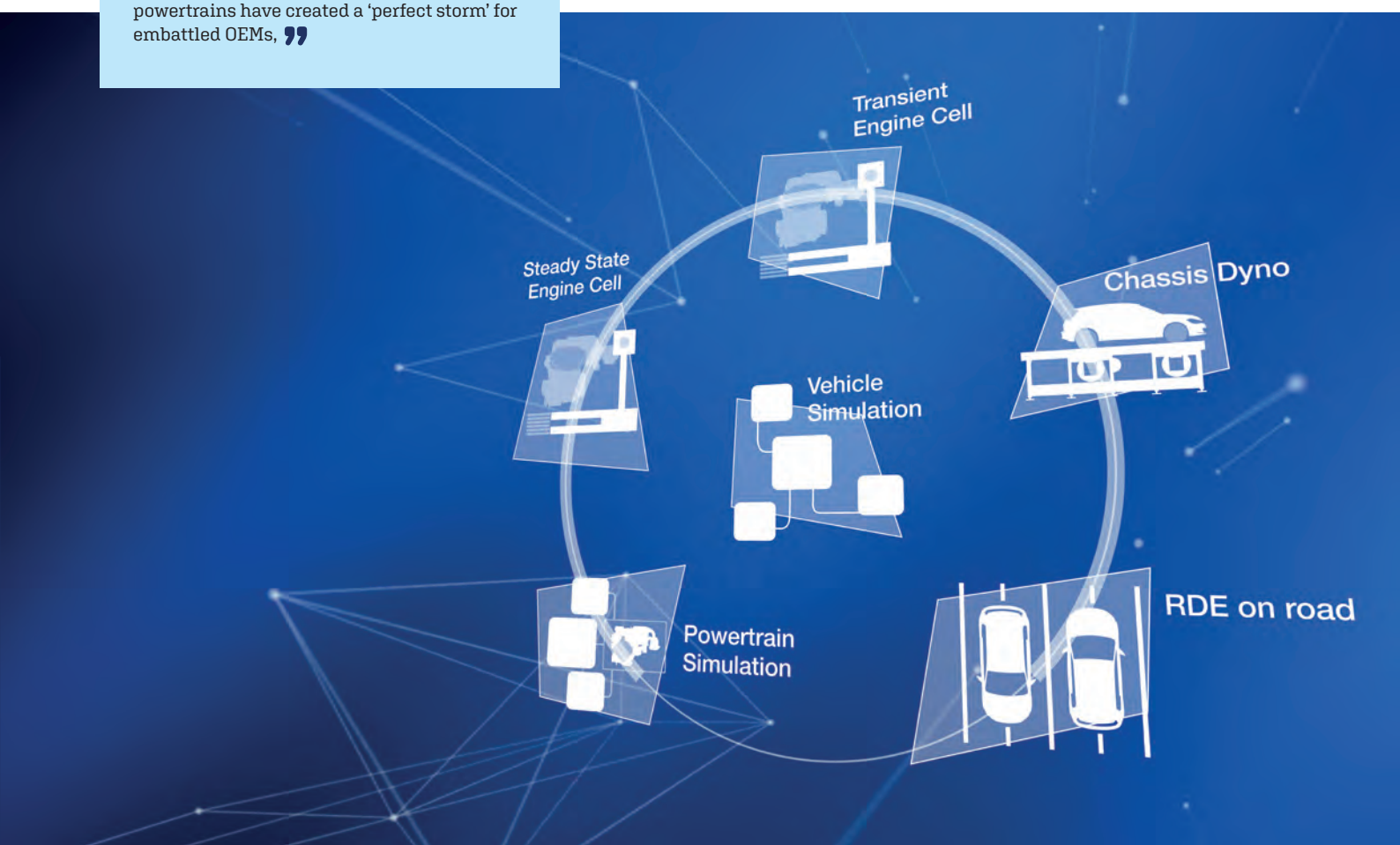
“While the incoming RDE laws are being enacted on a global basis, emissions legislation is being introduced by regional governments – or even city-by-city in some circumstances.

Additional to this, the politicisation of emissions and the increasing complexity of powertrains have created a ‘perfect storm’ for embattled OEMs,”

Introduction

EU legislators have recently made dramatic changes in the way that the emissions and fuel efficiency of new vehicles are measured. With more powertrain choices now available on the market, the new test regimes are designed to give car buyers better information about the real-world performance of new models and simultaneously help improve inner city air pollution.

This duo of new tests, known as the Worldwide Harmonised Light Vehicle Test Procedure (WLTP) and Real Driving Emissions (RDE), has already caused much debate among automotive engineers. However, according to Simon Williams of MAHLE Powertrain, the full extent of these challenges has not yet been fully understood by many OEMs.

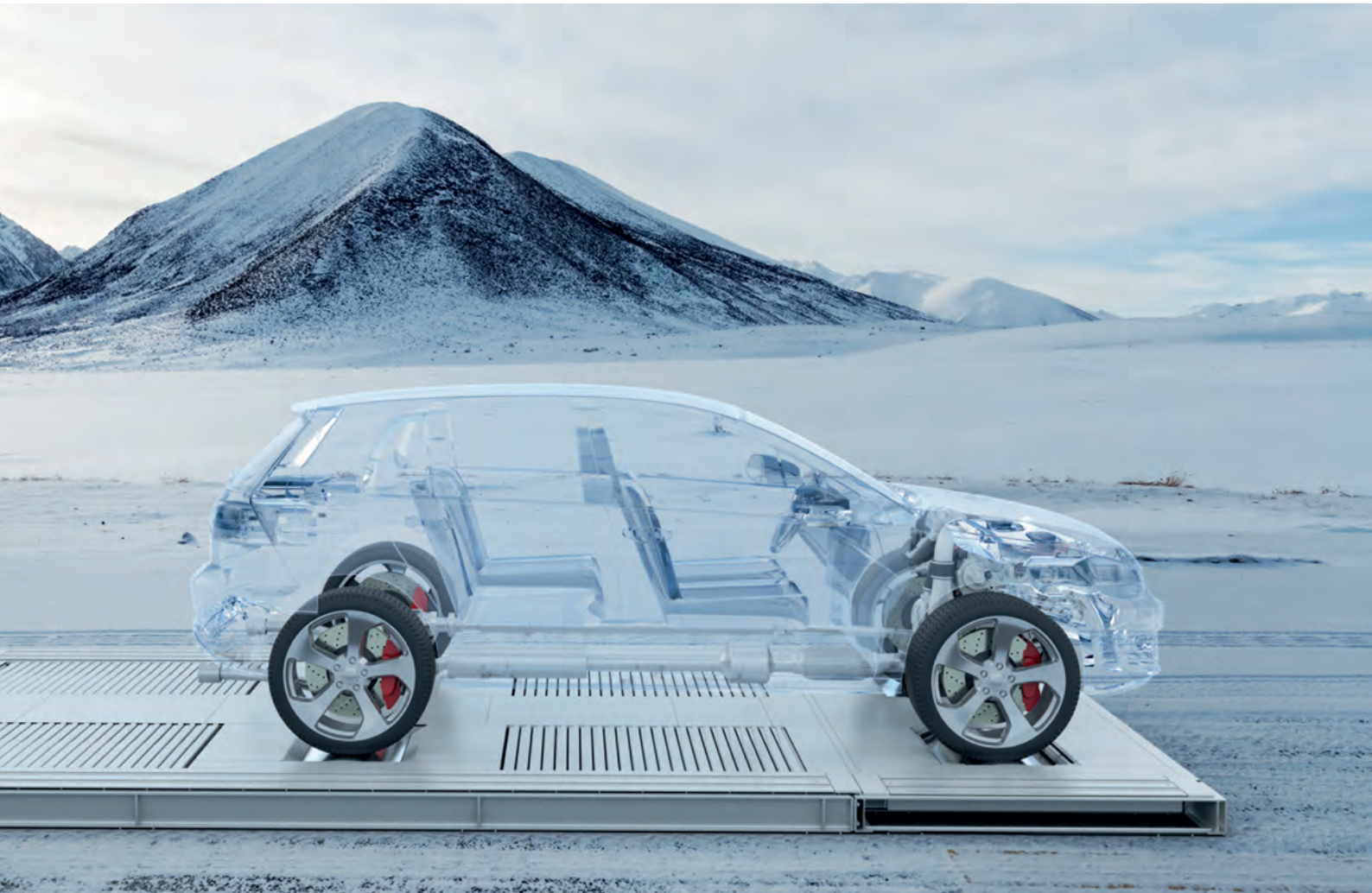


Simulation is the way forward for RDE capable powertrains

Given the competing demands of RDE and WLTP, MAHLE believes that the well-established testing procedure for powertrains has required a significant shift in focus. While road-based RDE testing has become a staple of emissions testing in recent years, MAHLE Powertrain's team based at Northampton believes that the added time and cost of attempting to capture rigorous, consistent data using on-road testing is no longer viable.

Williams explains: "Whilst the proven test stages of simulation, steady state and transient engine test bench, chassis dyno and RDE on road are well understood, we think this is an inefficient model to develop tomorrow's powertrains. Given the huge complexity of the new testing regimes, juxtaposed with the commercial realities of vehicle manufacturing, a return to the laboratory is inevitable. It is now necessary to consider the implications of RDE throughout every stage of the development process."

Having backed up this assertion with an £8m investment in simulation technology at Northampton, MAHLE's new facility enables hybrid simulation and emissions assessment earlier in the development programme and will reduce the timescales of typical powertrain development projects.



Simulation made simple

MAHLE's sophisticated vehicle simulation solution has been developed over many years, utilising several novel technologies to provide powertrain engineers with RDE-ready engines in shorter timeframes than was previously thought possible.

Comprising three key test axes – vehicle, driver and route – the initial simulation provides an early assessment of RDE boundary conditions, integration with 1D performance simulation, and creates an RDE testing program to implement across all development phases. "This crucial first stage of testing allows engineers to optimise their transmission and hybrid strategy before any hardware is available."

The vehicle element of the simulation covers base model, hybrid simulation, gearbox simulation, vehicle variant and engine after treatment. The driver axis covers defensive, normal and aggressive modes, whilst numerous digitised RDE routes can be used to simulate varying traffic conditions, topographies and road layouts.

Williams said: "The big attraction to this approach is our ability to link simulation routes to real-world scenarios. This enables validation between simulation and the real-world by using 'live' routes that have been digitised."

Open Now, the RDE Centre comprises Weiss altitude and environmental simulation technology, a 4WD chassis dyno and HORIBA emissions testing technology, including its MEXA-ONE and CVS-ONE systems together with a STARS-VETS test automation system.

A new test and development philosophy

MAHLE's forward looking investment into both test and development technology underpins its unique approach to squaring the RDE / WLTP circle for vehicle manufacturers. Having considered the pros and cons of road-based testing, the powertrain specialist has reached a pragmatic viewpoint; while 'RDE on Road' has gained credibility among emissions test agencies in recent years, its future as the primary assessment method is limited.

Williams concludes: "Given the considerable momentum now behind emissions testing on a global, regional and local level, compliance will only become more onerous and important to manufacturers, who will be seeking to reduce the duration and increase the robustness of this costly stage of powertrain development.

Finally, while much of the media comment is currently focused on electric, hybrid and autonomous vehicles, this is not the complete solution to the world's transport needs. The internal combustion engine may be out of favour, but it still has a considerable contribution to make, even while the relative environmental performance of gasoline, diesel, hybrid and pure EV engines is still mired in poor data analysis and flawed interpretation.

Vehicle manufacturers are facing a set of unenviable pressures on their businesses as the world moves from fossil fuel as its primary energy source - the transition from ICE to EV will present numerous challenges. However, that important period of change can be made less risky by utilising a powertrain development partner that is able to adopt an informed, commercial and flexible strategy on the OEM's behalf.

THE MAHLE GROUP HAS A PROUD HERITAGE IN AUTOMOTIVE ENGINEERING DATING BACK TO THE 1920s.

Its highly trained people provide the innovation and technical insights that drive many of the world's best known automotive brands. MAHLE Powertrain has been a key part of this global business since 2005.

This paper highlights the unique culture at MAHLE Powertrain's Northampton facility, which represents the pinnacle of internal combustion engine development and testing.

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