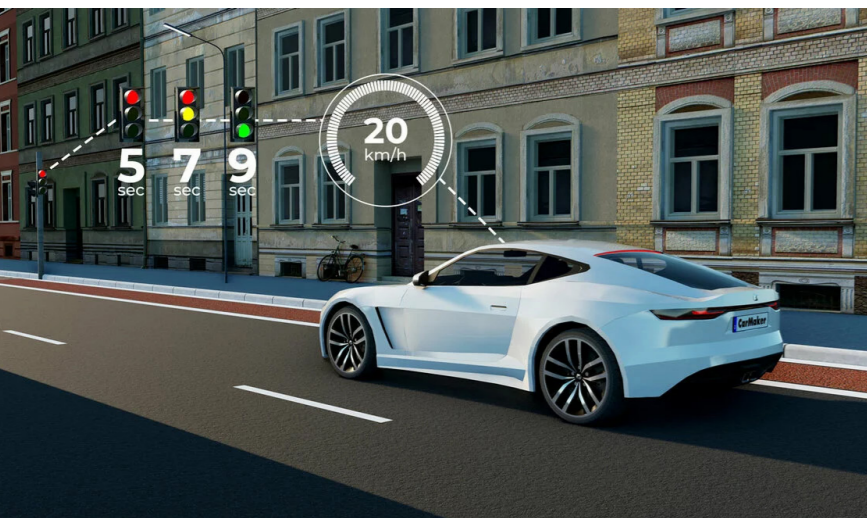


## **System-Driven Development and Testing of Powertrains**

Early integration of virtual and real powertrain systems  
into a complete vehicle environment





### Software-defined powertrains (electric, smart, connected)

Vehicles of the next generation are electrified and mainly defined by their software. The complex software of connected powertrains can be calibrated and tested early on for various virtual prototypes by integrating it into the simulation software CarMaker.

### Powertrain concept development

Virtual test driving enables to predict the full vehicle performance. Vehicle dynamics, energy and fuel efficiency as well as driveability are part of the decisive criteria. With virtual prototypes, powertrain concepts can be used and compared on different vehicle chassis.



### Real driving emissions and energy efficiency

The use of virtual prototypes ensures early calibration and testing for different powertrain layouts (HEV and EVs), driving modes and vehicle models on test beds. In addition, combustion engines can be hybridized virtually (e.g. virtual P2 transmission module) to analyze the impact on emissions and efficiency in real-world driving scenarios.



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Virtual



Real

CM

Simulation

xCU HIL

Engine/motor test bed

Powertrain test bed

Chassis dynamometer

### Vertical integration

The consistent use of a simulation and test environment allows to carry out development, testing and optimization over the entire development cycle on full vehicle level.

The virtual prototype can be enhanced with more detailed virtual component models or real components as development progresses. Test criteria and scenarios defined at the beginning can be reused throughout the entire development process.

## Your benefits at a glance



**Future-ready test systems**  
Meet future vehicle integration requirements



**Cost reduction**  
Moving tests from road to the lab and office



**Front-loading**  
Early vehicle integration



**Time saving**  
Fast and flexible adaptation and reproduction of test scenarios



**Vertical integration**  
Simulation at every stage of the development process



**Efficiency enhancement**  
Seamless reusability of models and test scenarios

More information





IPG Automotive provides optimal, tailored simulation and test solutions for the development and testing of ADAS, autonomous vehicle, Powertrain and Vehicle Dynamics functions as well as subsequent system releases and homologations.

Using virtual prototypes in the simulation software CarMaker enables automated and reproducible system and component tests in realistic scenarios. Excellent scalability enables quick software development and testing iteration cycles, while highly precise vehicle models and sensor models guarantee correlation to the real world.

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