# MORPHEE HEAVY DUTY VEHICULE SIMULATION ON ENGINE TEST BED
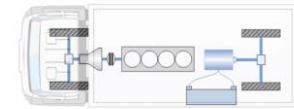
AUTOMATION



**Parallel hybrid**

**MathWorks Partner**
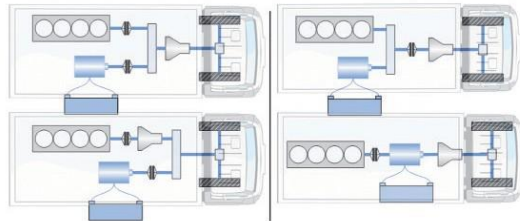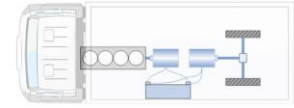
**Serial hybrid**

**Parallel hybrid dissociated on the two final drive**



**»Reduce your costs and time of engine development by performing the vehicle tests on engine test bed.**

FEV offers a MORPHEE application which enables to simulate the automotive vehicle dynamics and its driver in real-time on the engine test bed. This application enables to accurately reproduce the certification procedure for vehicle test bed directly on the engine test bed. Thus, it accelerates the engine development by reducing the need to wait for the availability of the vehicle prototype.

› Available for Conventional and Hybrid Electric Vehicles
› Reproduction of the vehicle dynamics directly on the engine test bed
› Reduced operating costs as compared to vehicle test bed
› Customizable models, calculation algorithms and test procedures
› Numerous standard test procedures available
› Automatic calculation of pollutant emissions for gaseous pollutants during the test

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» Reduce your costs and time of engine development by performing the vehicle tests on engine test bed.
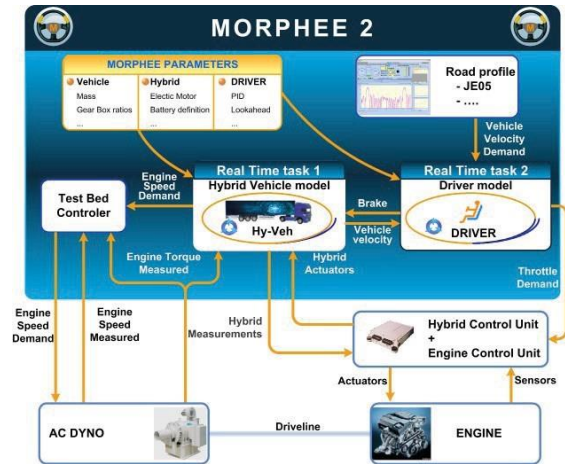


## Technical Data

| Simulated elements | |
|---|---|
| Driver | Controls the pedals position (accelerator, clutch and brake) and the gear switching management for manual gear box. |
| Standard | Real-time driver 10 to 100 Hz control based on PI approach |
| Look Ahead | Real-time driver 10 Hz control integrating anticipation on vehicle velocity demand and feed forward term |
| Vehicle | Simulate the vehicle dynamic |
| Conventional | Real-time models 500 Hz to 1 kHz, for vehicle with manual or automatic gearbox |
| Hybrid Electric Vehicle | Real-time models 500 Hz to 1 kHz, for Serial Parrallel hybrid architectures |
| Gear box | Simulate the gear box |
| Manual Gear Box | Real-time model 500 Hz to 1 kHz with clutch slip modeling |
| Automatic gear Box | Real-time model 500 Hz to 1 kHz with torque converter and lockup clutch slip modeling integrating gear switching control. |
| Electric motor | Two models to simulate the Electric motor and the SSG. Real-time model 100 Hz |
| Battery | Real-time model 100 Hz |
| **Function modes** | |
| Road Load Simulation / Accelerator pedal | Manual control of the accelerator pedal. Manual or automatic gear control. |
| Road Load Simulation / Vehicle velocity | Manual control of vehicle velocity demand. Accelerator pedal controlled by simulation. Manual or automatic gear control. |
| Dynamics tests | Execution of timed tests either with fixed gear or with automatic gear shifting |
| **Test procedures (Add-in)** | |
| European | WHVC |
| Japanese | JE05 |
| Performance | 1,000 m from rest, 0-100 km/h, … |
| Customizable | Test procedure defined by the user |
| **Emission calculations (Add-in)** | |
| Mass [g] and Specific [g/km] emissions from raw exhaust gas | NOx, CO, CO2, HC, CH4 and NMHC on test procedures, calculations according to ISO16183 and UNECE R49 rev 4 and Japan Blue Book Edition 2011 Regulation |
| Mass [g] and Specific [g/km] emissions from diluted exhaust gas | NOx, CO, CO2, HC, CH4 and NMHC on test procedures, calculations according to UNECE R49 rev4 and Japan Blue Book Edition 2011 Regulation. |