

DYNA4 Advanced Powertrain

Analysis of Various Drivetrain Configurations
in Hybrid, Electric and Conventional Vehicles



Applications

DYNA4 Advanced Powertrain contains the components necessary to configure various drivetrain topologies for:

- Hybrid electric vehicles from micro to full hybrid
- Electric vehicles
- Conventional powertrains

It can be used throughout all development phases: from conceptual function design on the desktop computer (MIL, SIL) to operating tests in real time with hardware-in-the-loop systems (HIL). Typical applications include:

- Simulation of driving performance and fuel/energy consumption
- Function development and testing of hybrid vehicle control units
 - Torque coordination
 - Engine start/stop function
 - Regenerative braking
 - Function degradation (e.g. in the case of battery overheating)
- Analysis and optimization of operating strategies for component durability, efficiency, dynamics drivability and reduced emissions
- Energy and thermal management
 - Intelligent alternator control
 - Voltage stability analysis
 - Electric load deactivation
 - Voltage balancing between the modules in the battery stack
 - Energy balance analysis of the entire vehicle, from battery state of charge to friction losses
 - Analysis of component heat-up
 - Predictive energy management

DYNA4 Concept

DYNA4 Framework

Flexible framework for transparent model and data management, documentation, automation, reporting and visualization supports your simulation and test processes efficiently.

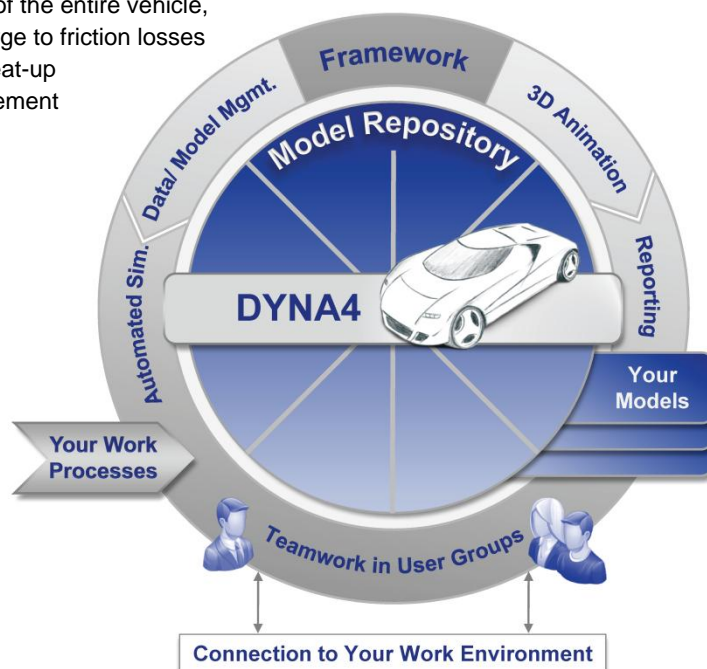
- Consistent management of models, data, simulation scenarios and results in every process step
- Provides useful tools for automated simulation and visualization
- Allows flexible adaptation to your work processes
- Interfaces for test automation, version control systems and MBS simulation tools.
- HIL platform-independent, supports all major platforms

DYNA4 Model Repository

The DYNA4 Model Repository provides a clearly laid out user environment to administrate and parameterize your own simulation models as well as the included TESIS DYNAware model library.

The Repository is open for the seamless integration of your models (e.g. batteries, Soft HCU or other specialized models) into DYNA4, thus enabling you to benefit from all process-supporting Framework functions.

Read more about the Framework and additionally available models in the separate DYNA4 Framework flyer.

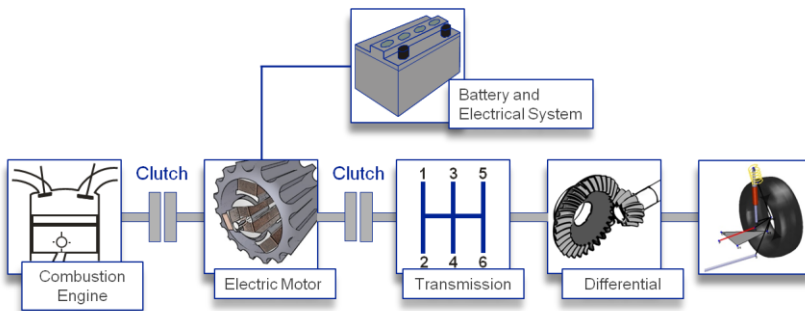


Model Features at a Glance

Mechanical components

With the mechanical components from our Simulink library you can build arbitrary powertrain topologies.

- Internal combustion engine
- Manual and automatic transmission
- Double clutch transmission
- Clutch
- Torque converter
- Differential
- Rigid and elastic shafts
- Generic pinion gear

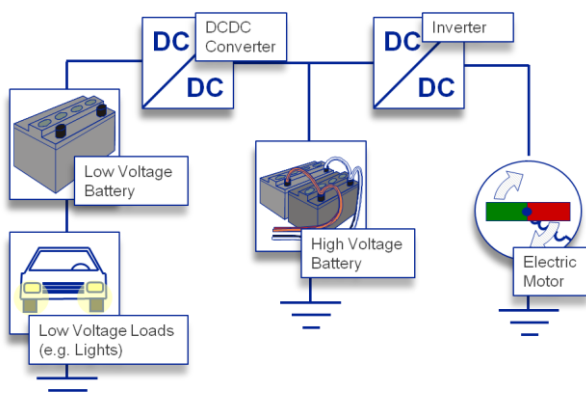


Electric components

Use the electric components to build arbitrary power supply topologies, e.g. with two voltage levels for hybrid vehicles. For many components, different levels of detail are available.

- Electric motors and inverters
- Batteries
- DC/DC converters
- Switches
- Electric loads

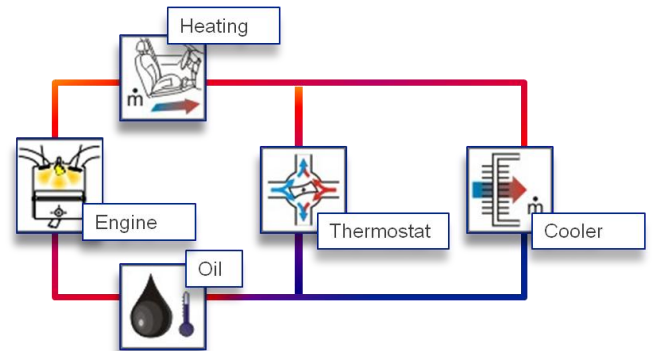
You can optimize the energy management by analyzing the voltage drops and currents at each component. The temperature characteristics of the electric components can also be taken into account.



Thermal components

Detailed investigation of thermal effects due to the bypass circuit model with a thermostat and heat exchanger.

Consider the thermal behavior of electric motors and inverters in detail.



Scenario catalog

DYNA4 Advanced Powertrain comprises a robust driver model for longitudinal dynamics as well as all standard driving cycles for consumption and driving performance:

- European, Japanese and US consumption test cycles (NEDC, 10-15 Mode, FTP-75)
 - All established driving performance tests (0-100km/h, 0-60 mph, 80-120 km/h, etc.)
 - Various possibilities for gear selection
- Extend and customize the scenarios according to your needs, e.g. by user-defined velocity profiles from measurements.

Vehicle concept examples including operating strategies

- Full and Mild Parallel Hybrids
- Battery-Powered Electric Vehicles
- Plug-In Hybrids

Parameterization

- Easily available physical parameters and characteristics
- Powerful parameter estimation algorithms for the battery parameters (based on dynamic measurements of the battery)

Your Benefits

Speed up your innovation process

- Ready-to-use examples
- Comparison of different variants
- Automation tools reduce routine jobs

Easier decision making

- Customizable visualization of results
- Powerful post-processing

Technical safety

- Project and data management for more reproducibility and traceability.
- Solid professional software based on thorough modeling and real-time expertise
- Successfully employed in numerous projects

Cost reduction

- Use the same model throughout the control unit development process and focus on your applications.
- Reduction of prototype costs through early testing on the PC

Flexibility

- Open model structure in Matlab/Simulink
- Smooth integration of own models and application-specific adjustments
- Choice of hardware platform

Investment protection

TESIS DYNAware is your independent partner for the simulation of the entire vehicle

Engineering and Consulting

We offer tailored consulting and engineering services to create an efficient simulation solution, comprising your models, work processes and functional requirements. Extensive knowledge from previous projects provides the basis, e.g.:

- Integration of models and simulation tools into a simulation environment for driving performance and energy consumption
- Consulting for application and validation of the powertrain and chassis control systems
- Requirements management, design and function specification of the entire vehicle system
- Engineering services for calculation of driving performance and fuel consumption, design of electric and hybrid powertrains
- Process consulting, e.g. fleet consumption monitoring, CO₂ Conformity-of-Production (COP)
- Modeling of multi-body-systems, 1D thermodynamics, hydraulics, fluid dynamics

Read more in our customer project reports on our website: www.thesis-dynaware.com/customers

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