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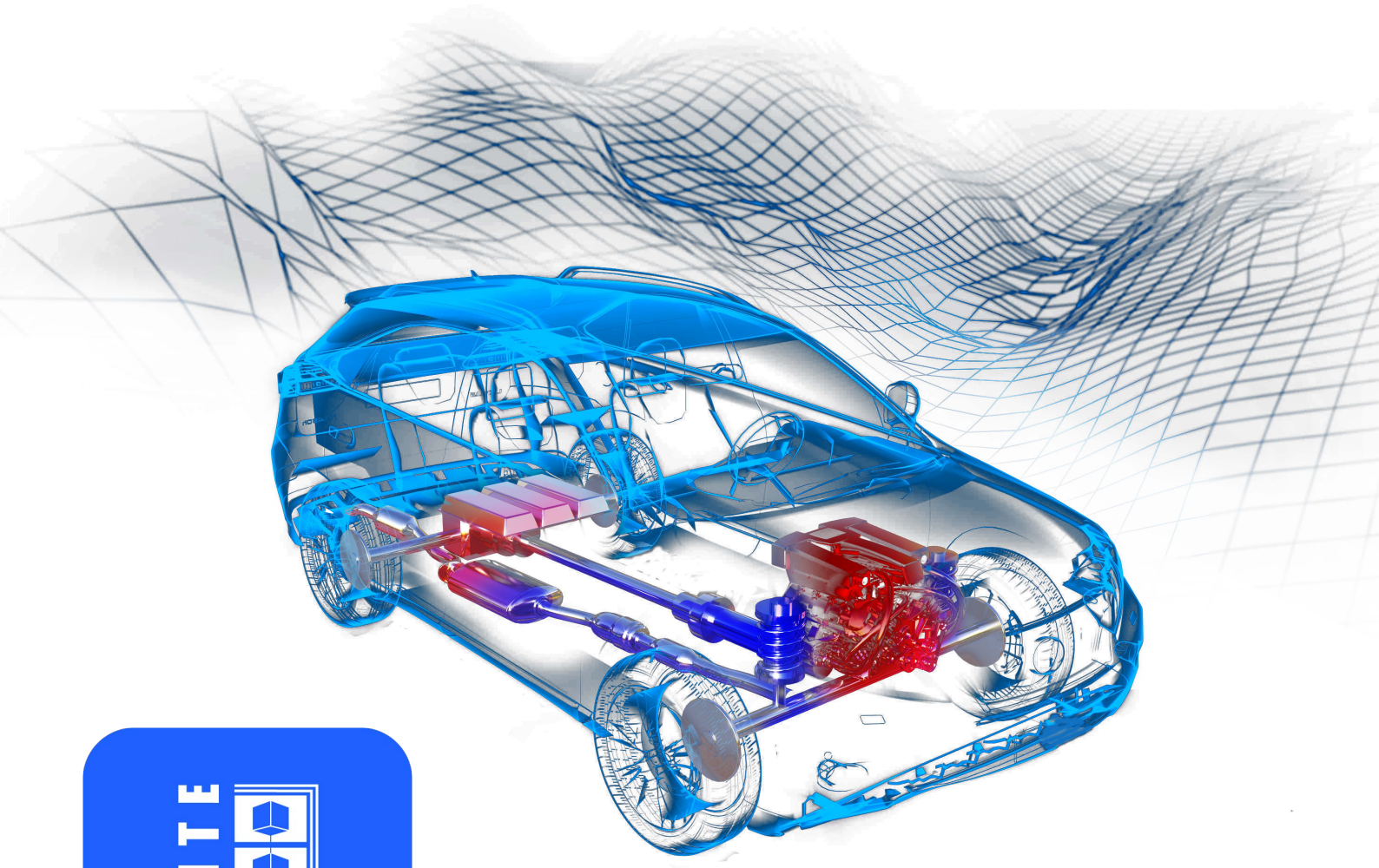

IGNITE

COMPLETE VEHICLE SYSTEM MODELLING AND SIMULATION

www.realis-simulation.com/products/ignite

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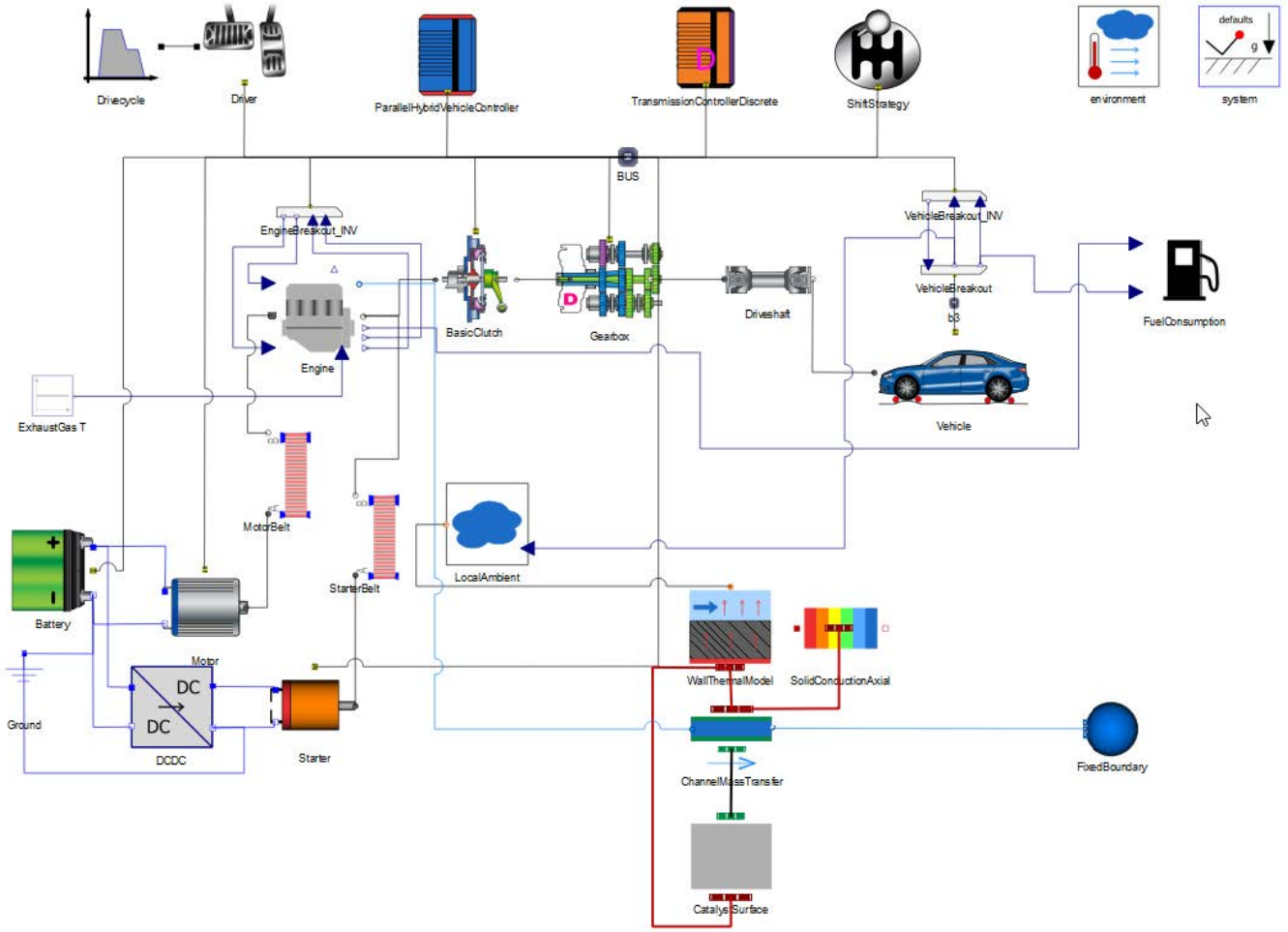
What is IGNITE?

IGNITE is a physics-based system simulation package focused on complete vehicle system modelling and simulation. With a comprehensive suite of multi-domain system “building blocks”, users can quickly and accurately model complete conventional, hybrid-electric, full electric and novel vehicle architectures. Faster than real-time execution speed and easy simulation control, the toolset provides quick analysis of vehicle performance, fuel economy and aftertreatment emissions from concept through to detailed design verification.

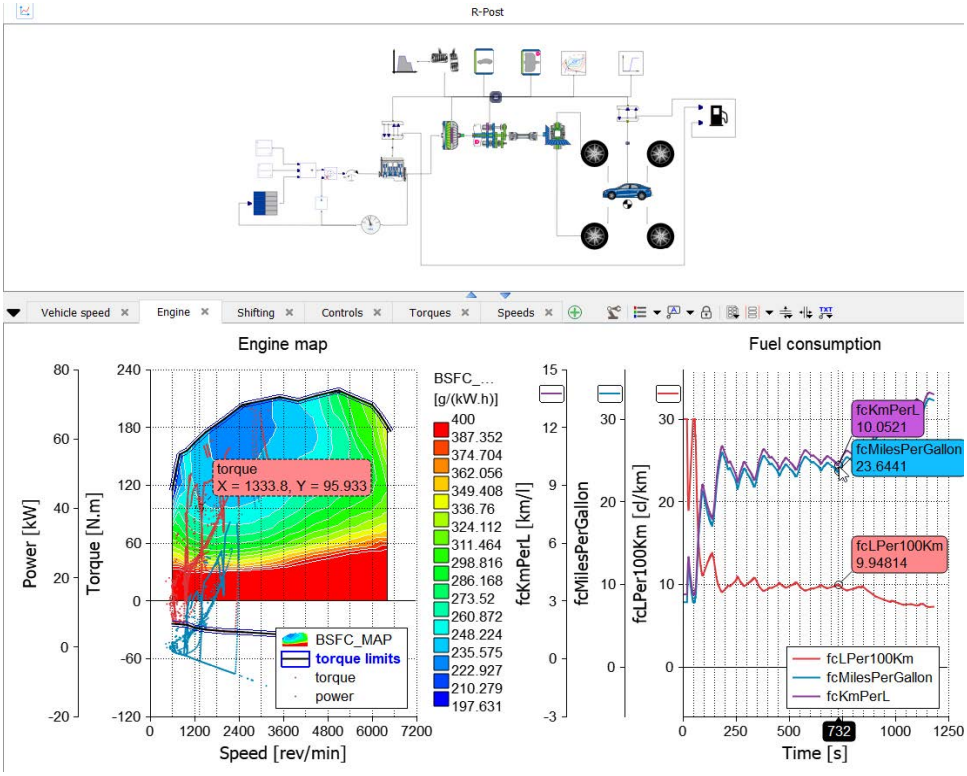


Key features

- Modern analysis environment for model building and simulation
- Application specific models covering conventional, hybrid/electric architectures, and common exhaust aftertreatment systems
- Direct coupling with WAVE/WAVE-RT
- Co-simulation with MATLAB/Simulink
- Functional Mock-up Interface (FMI) support
- Rapid, consistent model construction using proprietary or user-defined library elements
- Capable of distributed runs on multiple CPUs or High Performance Clusters
- Robust and faster than real-time simulation
- Direct integration of the fast and powerful Modelica compiler/solver
- Results visualization and analysis in an intelligent postprocessing tool R-Post

Complete vehicle system modelling

IGNITE provides systems-level modelling of all major vehicle sub-systems. The state of the art modelling libraries provide comprehensive models of the engine, transmission, driveline, vehicle, electrical, controls, thermal management and exhaust aftertreatment.

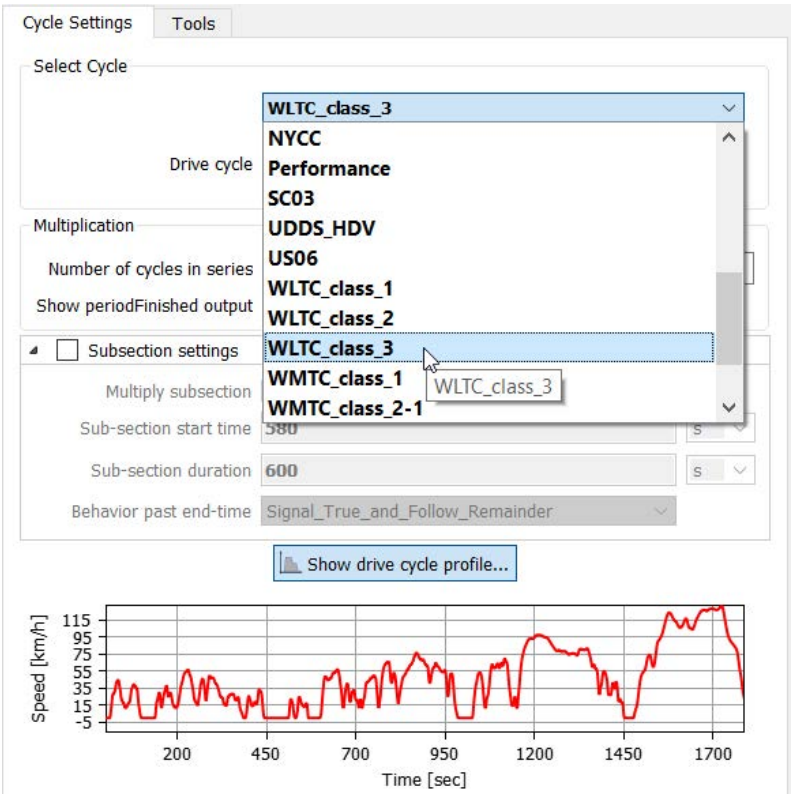


- Modelling libraries created using Modelica language as the ideal choice for plant modelling applied in powertrain, aftertreatment and driveability domains
- Flexible model configuration and component fidelity
- Drag-n-drop component interaction
- Embedded split screen for easy navigation through modelling context documentation while setting up the models

Drive-cycle simulation

IGNITE is used extensively for simulating full vehicle system models over standard and user-defined drive cycles. Included driver models and vehicle system controllers, combined with faster than real-time simulation, make IGNITE perfectly suited for full length drive-cycle simulation.

- Typical driveline simulation up to 500+ times faster than real-time
- Optimised catalyst models for drive cycle simulations with speeds from 1.5x to 0.7x real-time
- Flexible simulation control, e.g. time-out option and conditional termination
- Support for fuel economy regression of hybrid architectures
- Results updated at real-time, suitable for demanding simulation runs
- R-Post plotting and 3-D animations
- Python scripting API for automated simulation workflows



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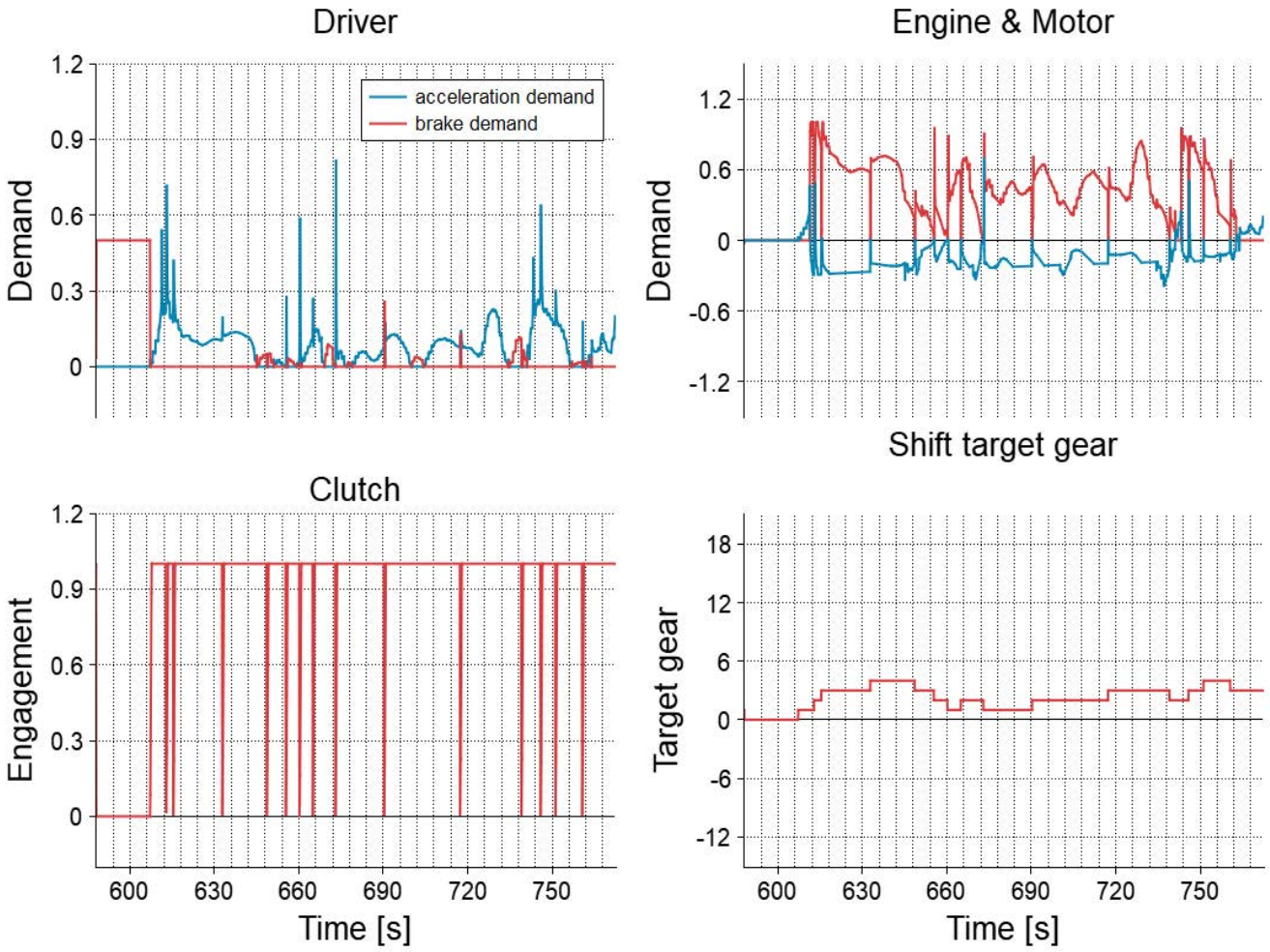
Performance, fuel economy and emissions aftertreatment

IGNITE predicts fuel consumption and tailpipe emissions of a vehicle system over a specified operational cycle, as well as vehicle performance characteristics such as acceleration, gradeability and top speed. These capabilities enable users to explore the impact that various technologies and controls, such as hybridisation, have on vehicle performance, fuel economy and produced emissions.

- Longitudinal vehicle model including grade and pitch
- Independent throttle and brake control for vehicle performance manoeuvres
- Experimental and predictive fuel map modelling
- Direct coupling with WAVE and WAVE-RT for detailed engine modelling
- Co-simulation with MATLAB/Simulink for controls development
- Tyre slip models
- Simulation of varying terrain and elevation
- Transmission efficiencies at all operating points can be easily exported from SABR to quickly access drive cycle energy consumption
- Shift and torque converter lock-up strategy
- Vehicle launch control models

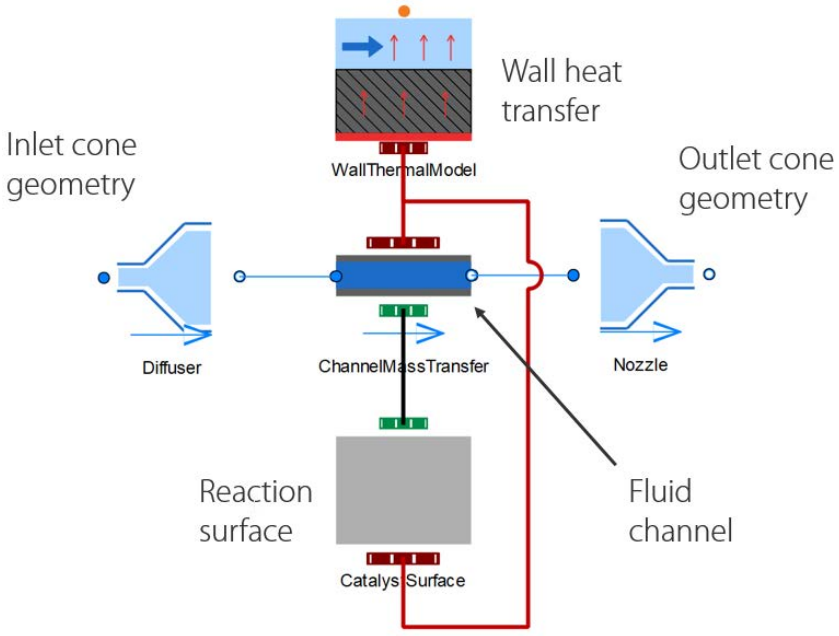


Emissions aftertreatment systems modelling

IGNITE contains a comprehensive library of 1-D emissions aftertreatment models. It enables users to predict the tailpipe emissions of various engine exhaust system configurations. Hence it also helps to evaluate the impact of the vehicle-level control on the desired emission reduction. The simulation time for predicting vehicle tailpipe emissions for a single simulation experiment is typically completed in about 20 minutes over the WLTC cycle corresponding to 30 mins (1800 sec), faster than real-time.

The Modelica library contains a comprehensive suite of 1-D emission aftertreatment models:

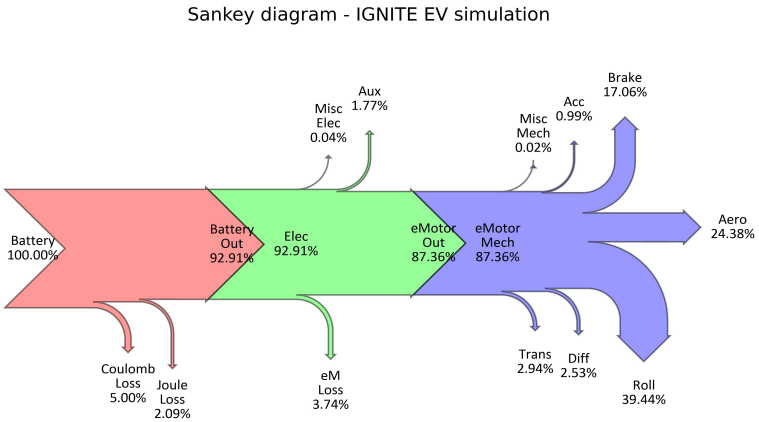
- Catalytic converters
- Particle filters
- Heat transfer including ambient boundary conditions
- Exhaust fluid and materials
- Secondary air intake and catalyst heat up
- Link to the powertrain library for drive cycle simulations
- Exhaust thermal modelling
- Drive cycle aftertreatment modelling



Mission profile and energy flow analysis

IGNITE results can be used to generate mission profiles which are the input for the component design by other Realis or 3rd party CAE tools, or to process detailed vehicle system energy flow analysis, quantifying the energy lost and recovered within each key sub-system in the vehicle system.

- Powertrain component mission profiles
- Energy audit throughout the entire driveline
- Cycle dependent dissipated power analysis
- Analyse energy flows within complex hybrid-electric systems
- Customisation using simple Python scripting



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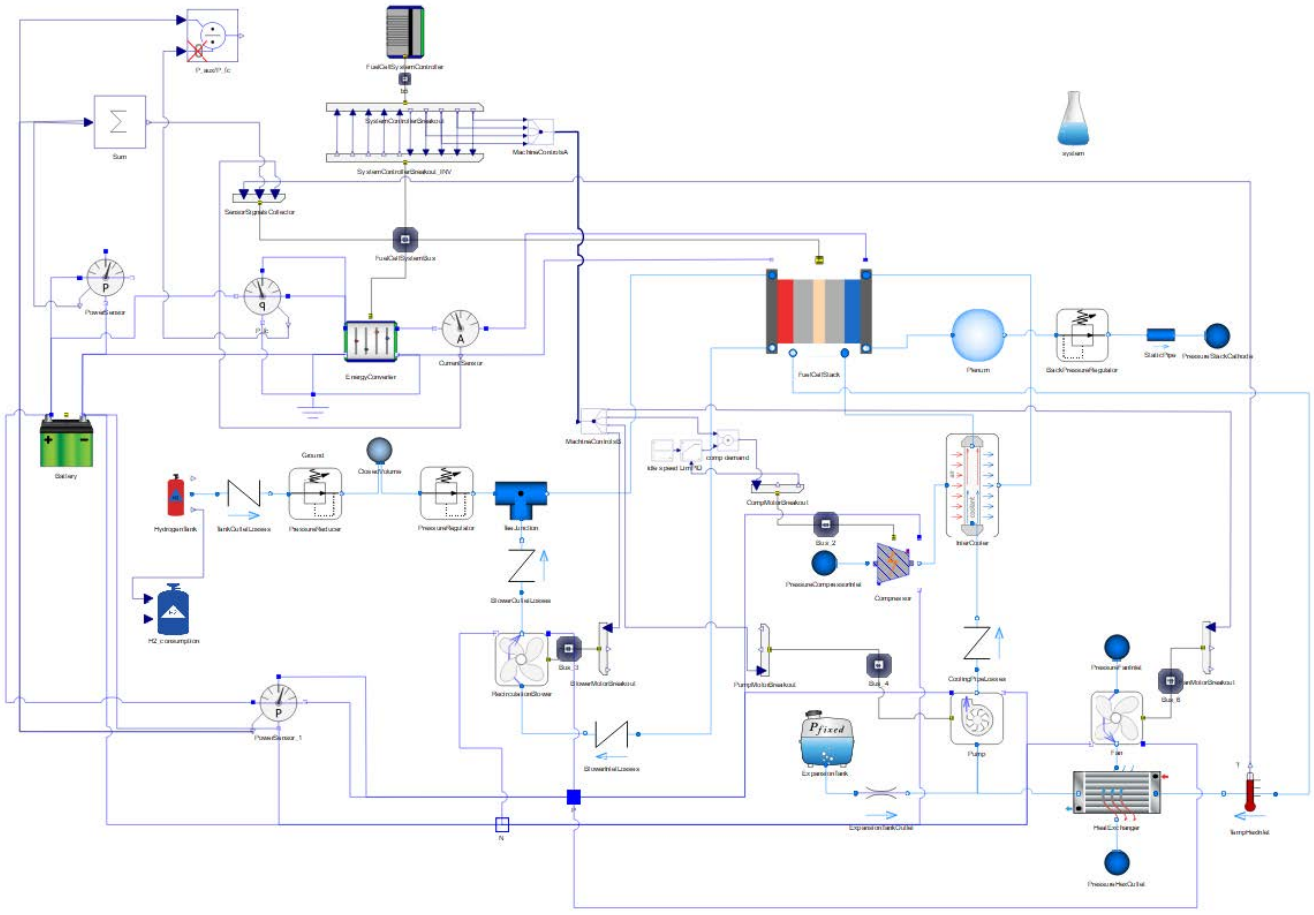
Fuel cell library

IGNITE is capable of modelling fuel cell systems; allowing quick investigation of different control strategies for the balance of plant. Using a Fuel Cell Systems library, the user can quickly investigate different control strategies, including humidity control, cooling and specification of ancillaries especially the sizing the components to give the required performance. The easy to use toolset provides engineers with the capability to tackle the challenge of balancing the fuel cell stack, without requiring specific fuel cell expertise and knowledge.



The Modelica library contains all the components relevant to the fuel cell systems modelling for typical fuel cell electric vehicle simulations:

- Cathode side - compressor, intercooler, humidifier
- Anode side - hydrogen tank, recirculation blow, pressure control valves
- Thermal - pumps, heat exchangers and thermostat
- Controllers and sensors
- Fluid media (hydrogen, water, glycol, air)

Bespoke user model development and expert systems consultancy

The Realis team is available to provide specific user systems modelling and functional support as a customised service or as part of a wider simulation project. Our team provides expert consultancy advice in developing systems models and component selection to maximise the toolset capabilities, to improve efficiency and reduce carbon emissions.

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