



EXHAUST EMISSIONS MODELLING Systems Engineering

SIMULATING EXHAUST SYSTEM SCENERIOS IN REAL-TIME

In today's market with increasing emissions regulations aiming at a net zero future, OEMs and manufacturers are under increasing pressure to reduce tailpipe emissions from Internal Combustion powertrains and demonstrate the durability of exhaust systems that use catalytic converters.

The design challenge is finding the balance between fuel economy, vehicle performance and selection of the right exhaust after treatment components to reduce tailpipe emissions in line with new regulations.

MEETING THE DESIGN CHALLENGE OF BALANCING VEHICLE PERFORMANCE AND REDUCING TAILPIPE EMISSIONS

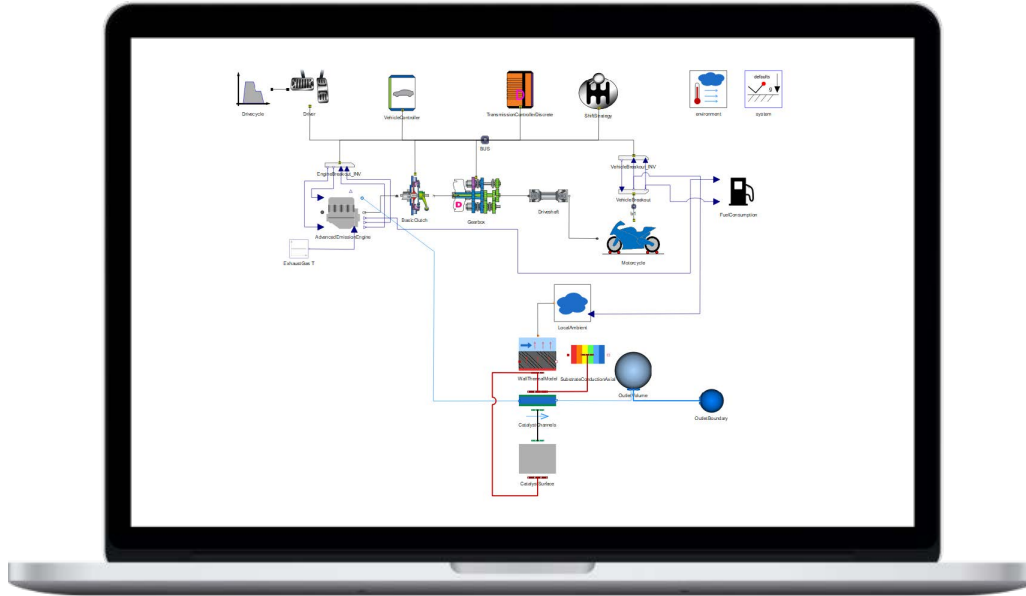
In the early stages of development, physical prototype modelling is expensive requiring virtual simulation tools to answer many of the 'What ifs' before committing to a given design path.

Drive cycle simulation is at the heart of exhaust emissions system design. This includes analysing the effect of different control strategies on catalyst behaviour, predicting the thermal boundary conditions for the components and reducing the fuel economy penalty of lower emissions.

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The toolset provides the capability to predict exhaust emissions using 1D simulation. This includes analysing complex models of catalyst honeycombs with surface chemical reactions, defining exhaust boundary conditions and mapping heat transfer models in the system. Coupled with a powertrain library, the exhaust system performance can be predicted across a complete drive cycle with analysis of exhaust materials and the thermal operating conditions over the life of the catalyst.

Exhaust analysis consists of 2 packages coupling combustion / emissions data with after treatment systems modelling :

IGNITE, a complete physics based aftertreatment simulation package. With a library system of building blocks, the user can quickly and accurately model complete exhaust systems, analysing data around emissions, performance and efficiency.

WAVE-RT, a 1D fluid dynamics tool provides engine performance and emissions data to the after treatment system model.

Separately, **RINGPAK**, a 2D simulation pack predicts piston ring dynamics affecting transient oil consumption and emissions.

KEY BENEFITS

Easy to use and configure toolset

Allows investigation of exhaust systems without specific catalytic converter expertise

Modelica based component library

Building blocks including catalytic converter systems with fluid channel and wall heat transfer models

Balancing different treatment strategies

Simulates the balance of vehicle performance with fuel economy and lower emissions

Reduced development time and costs

Fast model set up and rapid simulation times reducing need for physical prototype builds

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Interested in learning more? Our experts are ready to discuss your current challenges and work with you to find the optimal solution.

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