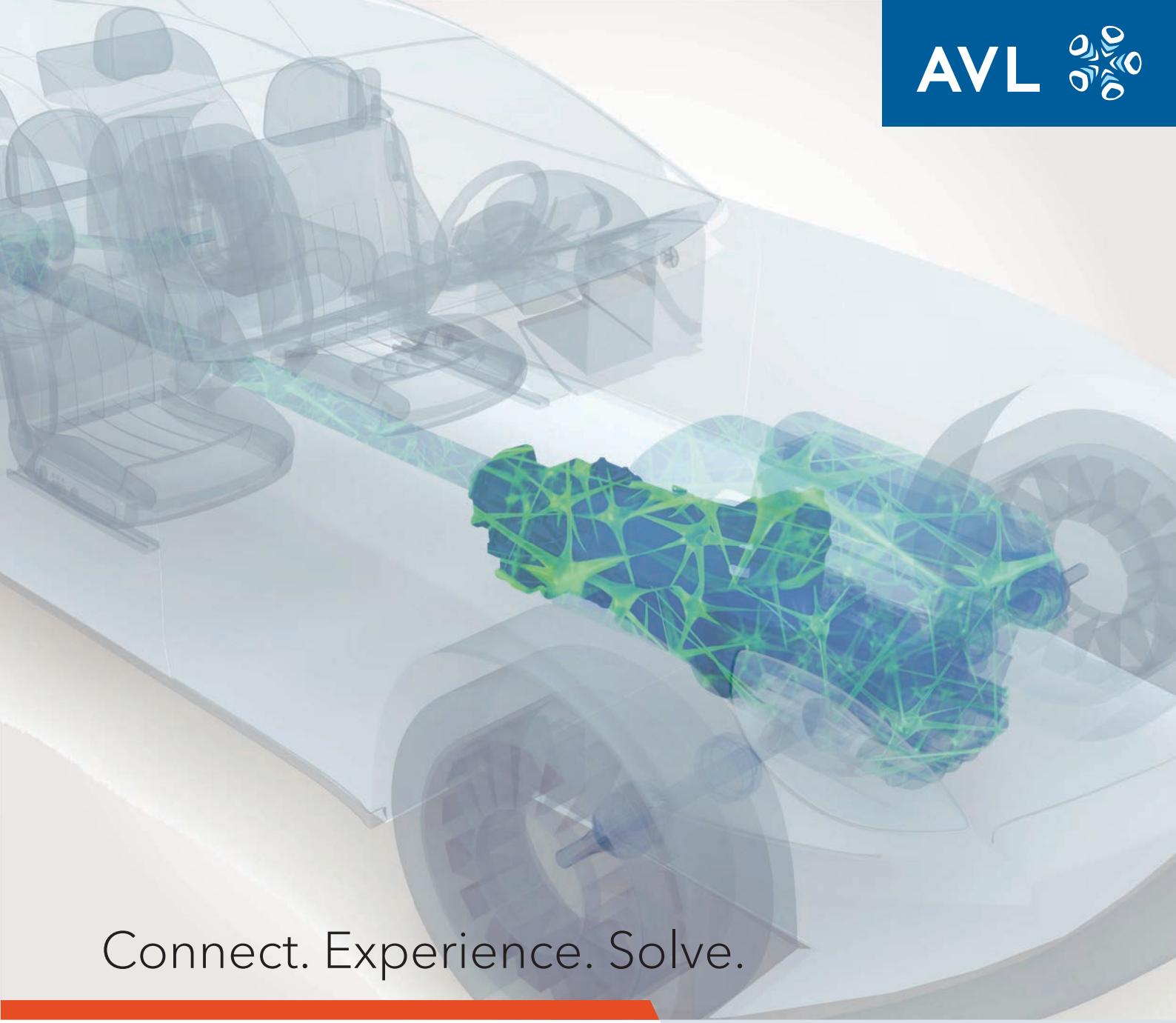


Connect. Experience. Solve.

AVL Advanced Simulation Technologies University Partnership Program

AVL Advanced Simulation Technologies (AVL AST) is supporting research and teaching activities in academia by offering its unique AVL AST University Partnership Program (UPP), addressed to Universities, Technical Universities, Universities of Applied Sciences, Technical Colleges and Technical High Schools.

Within the frame of the University Partnership Program, AVL AST provides access to its comprehensive set of outstanding simulation solutions. For the UPP partners this offers the opportunity to use the latest simulation technology of the world's largest independent company for the development, simulation and testing of powertrain systems for scientific research and educational purposes.

Participation in the AVL AST University Partnership Program enables the education of students at the highest possible standards based on AVL AST's simulation tools. Participation in the UPP also offers the opportunity to students and young researchers to efficiently perform their research work on engine, powertrain and vehicle related component and system level analysis and optimization.

Levels of Partnership

Within the University Partnership Program, AVL AST provides up to 30 licenses per product for teaching and non-commercial research. Basic and expert trainings are offered at special rates. Provided that a basic training course is attended, e-mail support of up to 10 hours is given free of charge for each software product. Tailored to match specific teaching and research needs, AVL AST offers different partnership levels. For the first license period, automatically Level 3 is valid. Six weeks before the license period ends, deliverables provided by the institute are evaluated and based on them the next year's partnership level is defined.

LEVEL 3 – PLATINUM PARTNERSHIP

Deliverable / AVL AST:
- Up to 30 full licenses per product at an annual license fee of € 0 per product

Deliverable / Institute (minimum 3 options):
- Mentioning the use of AVL AST software in the annual institute report
- More than 2 papers on conferences / in journals per year acknowledging the use of AVL AST software
- Offering courses / seminars for industry including AVL AST members to present
- Collaboration in R&D projects
- Providing R&D results obtained with or to be built in AVL AST software
- Internet link to AVL web-site

LEVEL 2 – GOLD PARTNERSHIP

Deliverable / AVL AST:
- Up to 5 full licenses per product with 90% discount on the annual license fee

Deliverable / Institute (minimum 3 options):
- Mentioning the use of AVL AST software in the annual institute report
- Minimum 2 papers on conferences / in journals per year acknowledging the use of AVL AST software
- Internet link to AVL web-site or collaboration with AVL AST in research projects

LEVEL 1 – SILVER PARTNERSHIP

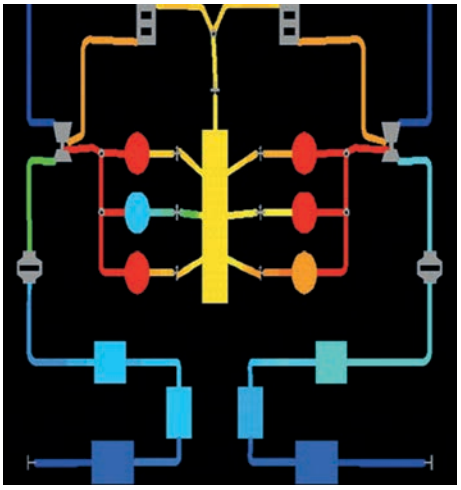
Deliverable / AVL AST:
- 1 full license per product with 80% discount on the annual license fee

Deliverable / Institute (minimum 3 options):
- Mentioning the use of AVL AST software in the annual institute report
- Minimum 1 paper on conferences / in journals per year acknowledging the use of AVL AST software
- Internet link to AVL web-site or collaboration with AVL AST in research projects

AST Software Tools

The software suite offered within the AVL AST University Partnership Program reflects AVL's unique experience in the areas of engine and powertrain engineering. The software development in close interaction with leading academic institutions and the automotive industry has resulted in the dedicated engineering tools AVL BOOST, AVL CRUISE, AVL CRUISE M, AVL EXCITE, AVL FIRE® and Model.CONNECT™ which have successfully proven to cover major aspects of engine, powertrain and vehicle related simulation tasks.

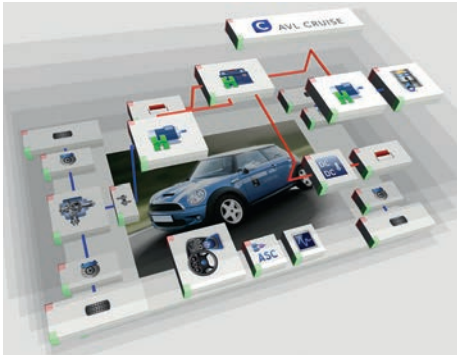
AVL BOOST



AVL BOOST - Thermodynamic Cycle Calculation, High Pressure Hydraulics and Acoustic Simulation

AVL BOOST offers leading technology for the 1D simulation of gas-exchange, combustion, fuel injection, duct acoustic and aftertreatment processes. It supports the design and performance optimization of all possible types of internal combustion engines at both component and system level with consistent models from concept to testing. Outstanding models for gas-phase and heterogeneous surface chemical reactions, particle loading and regeneration processes fully support the optimization of aftertreatment devices. AVL BOOST also enables the simulation of high-pressure injection systems of diesel, gasoline or alternative fuel engines based on a 1D fluid flow model and a 2D representation of mechanical parts. Moreover, it offers both non-linear (time domain) and linear (frequency domain) approaches for the simulation of transmission losses, linear and A-weighted sound pressure levels, free field and in-duct acoustics, intake and/or exhaust orifice noise.

AVL CRUISE



AVL CRUISE - Vehicle System Simulation

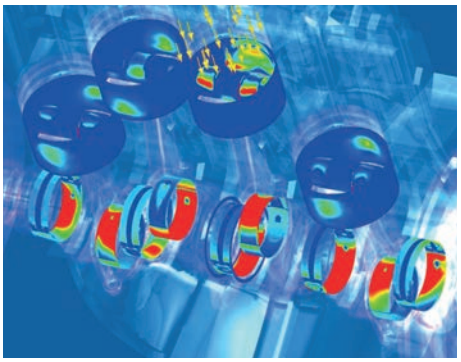
AVL CRUISE efficiently solves everyday tasks with respect to finding the right balance between fuel economy, emissions, vehicle performance and drive quality throughout all development phases, from concept planning through to testing. The flexibility to model any kind of powertrain configuration, from conventional and hybrid to the most innovative ones, is extended with open interfaces to leading 3rd party simulation products and real-time validation platforms. An advanced sub-system integration concept and consistent data and model management make AVL CRUISE the tool of choice of an ever increasing number of OEMs and Tiers, who establish it as the vehicle simulation platform on a corporate level.

AVL CRUISE M

AVL CRUISE M - Multi-disciplinary System Simulation

The vehicle system simulation platform AVL CRUISE M is designed for model based system development, seamlessly integrating high-quality, realtime-capable sub-system models from engine, driveline, 1D fluid flow, aftertreatment, electrical and control system domains. The efficient numerical solver, tailored for efficient multi-physics vehicle system simulation is combined with a highly flexible, multi detail level modelling approach, open to 3rd party tools and interface standards (FMI). This allows the re-use of CRUISE M sub-system and overall vehicle models anywhere in the powertrain development process, from traditional fuel efficiency, performance and emissions analysis in the office through to validation and calibration on real-time HiL and test systems.

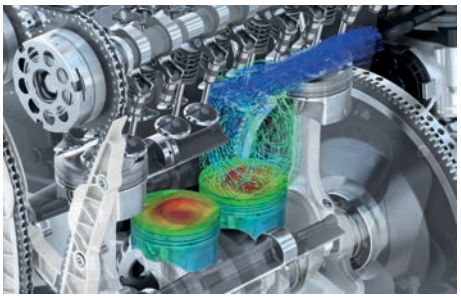
AVL EXCITE



AVL EXCITE – Durability and NVH of Power Units and Drivelines

Using advanced modelling techniques, AVL EXCITE calculates the dynamics, strength, vibration and acoustics of combustion engines, transmissions, conventional and electrified powertrains and drivelines under real operating conditions. Sophisticated models for lubricated sliding contacts (slider bearings, piston and piston ring / liner contact) support the design analysis of these engine components by enabling the detailed investigation of key functions such as friction, wear, performance and durability. Different modelling levels for single components, subsystems and entire systems help the engineer to use an optimum balance of model depth in terms of required accuracy for the application target and the modelling and simulation effort.

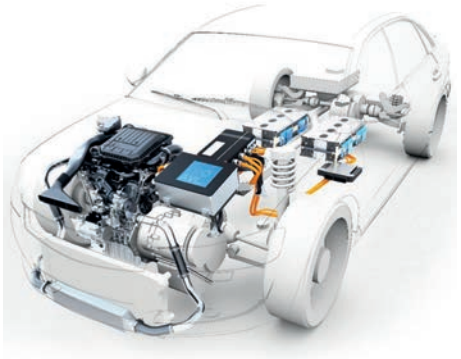
AVL FIRE®



AVL FIRE® - CFD for Engines

AVL FIRE® is a powerful multi-purpose 3D CFD software with a particular focus on and strength in handling fluid flow applications related to internal combustion engines and powertrains. The tool reflects the latest achievements with regard to grid generation and solver technology, physical and chemical models. AVL FIRE®'s technological leadership with respect to modeling fuel injection, air/fuel mixture preparation, wallfilm, ignition, flame propagation and pollutant formation is recognized worldwide. In recent years, significant achievements have also been made in establishing simulation models for electrified powertrains.

Model.CONNECT™



Model.CONNECT™ - Enrich your Reality

Model.CONNECT™ empowers the implementation of model-based development, closing the gap between virtual and real worlds. It contains the advanced execution engine ICOS (Independent CO-Simulation) and ACORTA (Advanced Co-Simulation Methods for Real-Time Application), which enable handling of the complex interaction between virtual and real components adopting advanced coupling algorithms. Model. CONNECT™ offers unique solver techniques for linking models with different time-domains (multi-rate) and minimizing coupling errors, and fully supports the common interface standard FMI for model exchange and co-simulation. Customized wrappers empower the coupling of multiple simulation tools for various domains, such as e.g. AVL CRUISE, AMESim, MATLAB, ECS Kuli, Dymola, MSC Adams, etc.

CONTACT:

AVL Advanced Simulation Technologies
AVL List GmbH, Hans-List-Platz 1, A-8020 Graz, Austria
E-mail: ast_upp@avl.com, Webpage: www.avl.com