

REALIS



VECTIS

EXPERT 3D CFD SOLUTION FOR MODERN INTERNAL COMBUSTION ENGINES

www.realis-simulation.com/products/vectis

contact@realis-simulation.com

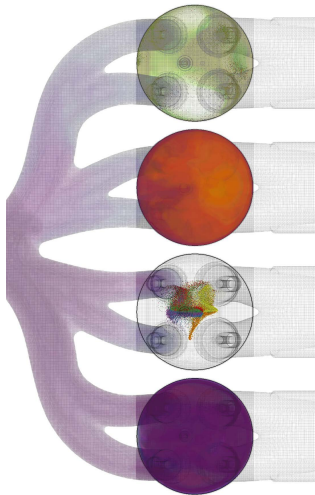


What is VECTIS?

VECTIS is a comprehensive CFD software solution empowering Internal Combustion Engine (ICE) designers to tackle their most pressing challenges. Our goal is to provide you with the tools you need to develop more efficient and environmentally friendly powertrains. With VECTIS, you will enjoy a seamless and intuitive experience from start to finish when developing engines for any applications in motorcycle, light-duty, heavy duty, off-road, marine, power generation, aerospace and other industries.

Key features

For two-stroke, four-stroke, rotary, single or multi-cylinder simulations our pre-processing suite simplifies your workflow, allowing you to focus on what matters most – achieving exceptional results.

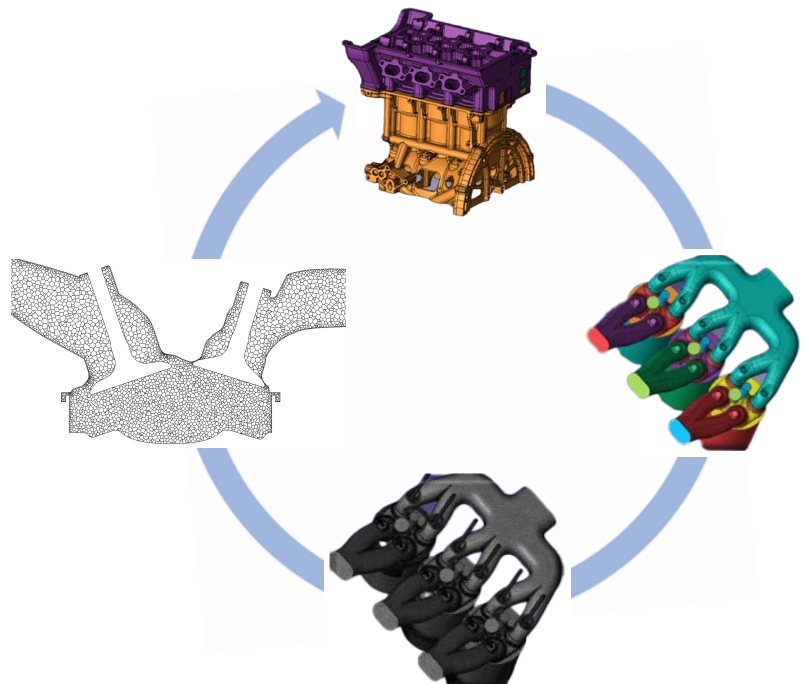


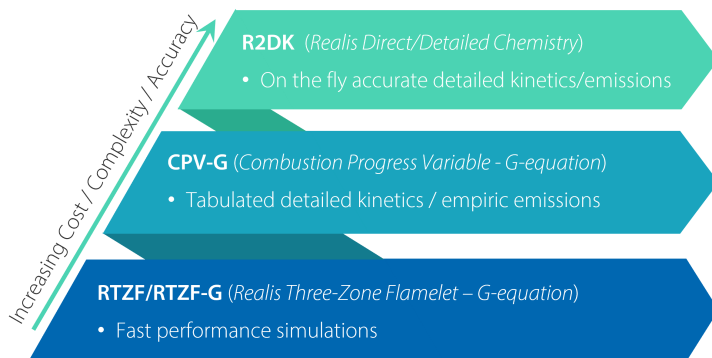
- Our software features cutting edge kinetics, combustion and emissions models specifically tailored for e-fuels, synthetic and non-carbon fuels. This enables you to stay at the forefront of innovation and create greener powertrain solutions
- The uniqueness of VECTIS lies not only in the accurate modelling capabilities and optimised workflows, but also in our commitment to providing personalised support and assistance
- We understand that each customer journey is unique, which is why we offer custom model implementation, tailored workflow development and dedicated support. Our goal is to help you maximise the benefits of virtual product development while minimising costs
- Join the ranks of industry leaders who have already embraced VECTIS to revolutionise their engineering workflows. Together, lets take your engineering efforts to new heights with VECTIS

Rapid automated meshing of moving boundary conditions

At the heart of every 3D CFD modelling lies the process of spatial discretization. This is typically a time-consuming area of modelling and one which impacts most the accuracy of the simulations. VECTIS provides capabilities helping users model space and motion accurately and quickly :

- Rapid import, repair and pre-processing for ICE simulations of CAD geometries and STL surface meshes
- Class-leading fully automated fast Cartesian, Tetrahedral and Polyhedral grid generation
- Multi-domain and sub-domain handling including unique Full Arbitrary Grid Interface (AGI) for non-conformal grid interfaces
- Realis Arbitrary Dynamic Mesh Cut-cell (ADMC) Finite Volume Method delivering accurate automated mesh generation without distortion or remeshing on any type of grid
- Ability to work seamlessly with third party grid generation tools through CFD General Notation System (CGNS) interface

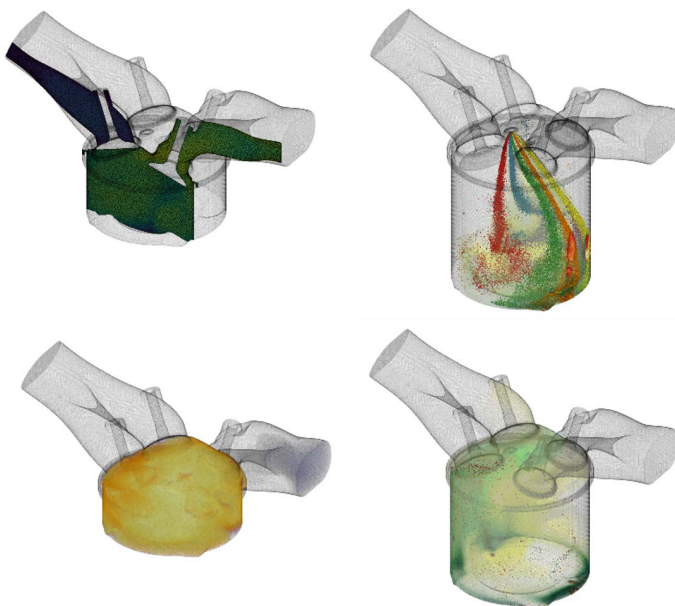




Accurate solvers and physics models for in-cylinder combustion

Internal Combustion Engine analysis sets challenges in a number of areas of multiscale computational modelling. These include the requirement for intricate complex geometry motion modelling to accurately resolve chemical kinetics. VECTIS addresses these areas by providing novel models and methods that deliver outstanding accuracy within a computational time appropriate for engineering design tasks :

- Multi-domain fluid/solid coupled solver utilizing Realis's generalized SIMPLE algorithm with full flow/turbulence coupling for accurate resolution of complex flows
- Advanced RANS and LES turbulence models including Realis Turbulence Scale Adapted (TSA) and Time Scale Bounded (TSB) RANS models improving in-cylinder turbulence resolution
- Unique accurate face to face tracking Lagrangian solver for complex multi-component and multi-fluid sprays modelling
- Accurate multi-component and multi-fluid wall-film solver delivering enhanced accuracy on moving boundaries, such as valves and pistons
- Realis Fidelity Cascade approach based on a combination of Realis Two-Zone Flamelet (RTZF) combustion model, advanced level-set for flame tracking, Combustion Progress Variable (CPV) tabulated kinetics approach and Realis Detailed Direct Kinetics
- R2DK combustion models enabling fast workflows for all types of analysis from performance to detailed kinetics emissions and abnormal combustion
- Detailed spark-ignition models based on Realis Dynamic Discrete Particle Ignition Kernel (DDPIK) flame kernel evolution approach

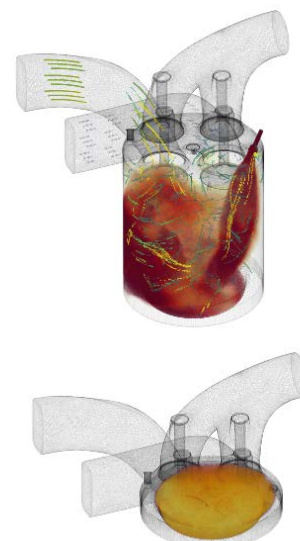


Predicted spray, wall-film formation and combustion in a gasoline DI engine

Complex simulation data acquisition with user-friendly post-processing

Configurable data acquisition from simulations and versatile user-friendly post-processing is paramount for collection and management of complex data simulations. VECTIS makes the task of instrumenting simulations and analysing the data simple through :

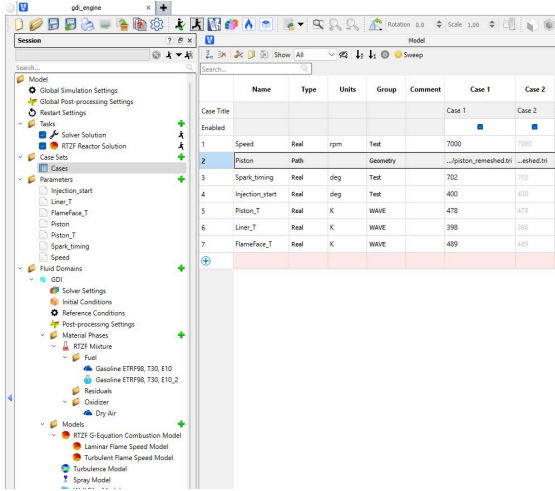
- Point, Surface and Volume data acquisition sensors with fully configurable access to flow, spray and combustion variables
- Tailored surface sensors for spray analysis and post-processing
- Versatile toolbox for management and manipulation of 3D post-processing files
- R-Post – a fast 1D/2D plotting solution with a powerful Python® interface
- R-Viewer – a powerful parallel 3D post-processor with advanced R-Desk scripting and Python capabilities
- Export of 3D data to portable formats allowing analysis in third-party software



Injection and flame propagation in an H2 DI engine

Efficient workflow analysis across complete simulation processes

The value added by 3D CFD analysis is derived not only from the accuracy of the simulations, but also from the efficiency of the simulation workflows. Realis 3D CFD solutions put engineers in control and help them accelerate the complete simulation process and drive down the costs of the analysis. We enable you to :

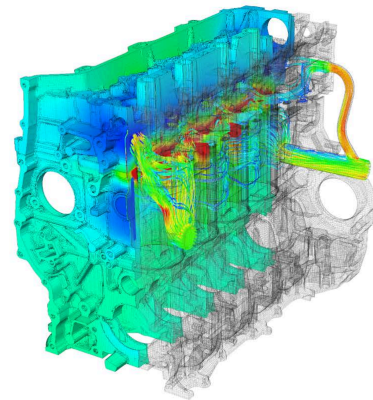


- Build fully automated workflows covering the complete simulation from geometry preprocessing to the analysis of results with Python® and R-Desk scripting
- Create parametrised models and simulations, easily generating and tracking simulations of multiple configurations with a single source parameter table
- Easily analyse and compare outcomes of parametric simulations in a single simple and powerful post-processing environment
- Powerful User-Programmable Routines (UPR) interface allowing easy access to core solver data
- Construct seamless 1D/3D CFD integrations with Realis WAVE or other (GT-Power®) third party 1D CFD tools

Thermal management of engine and vehicle systems

New hybrid and clean fuel systems place more rigorous demands on thermal management. The ability to quickly and automatically create new meshes enables fast, accurate Conjugate Heat Transfer (CHT) analysis to identify and optimise thermally critical locations.

- Extensive surface geometry pre-processing tools including Boolean functions
- Large detailed meshes created automatically
- Prediction of boiling and resulting heat transfer
- Easy set-up of component models, such as fans, turbines and radiators
- Fully energy coupled Conjugate Heat Transfer (CHT) solver
- Extended thermal data post processing as well as option for direct export of CFD results for use in Finite Element (FE) analysis tools such as Realis FEARCE-Vulcan



CHT analysis of 4-cylinder Diesel engine

Bespoke user model development and expert systems consultancy

At Realis, we understand that each customer is unique and we are offering a close partnership helping our customers build tailored solutions and processes reflecting their workflows and maximizing efficiency of their CAE process. We put our customers in the centre of decision making by offering :

- Direct interaction with product and development teams through customer driven product development
- Bespoke model development and rapid enhancement development based on customer feedback
- Early access to requested features through customized versions
- Dedicated and tailored support, customized interactive training
- Tailored licensing solutions
- Process and model building consulting services