Easy5

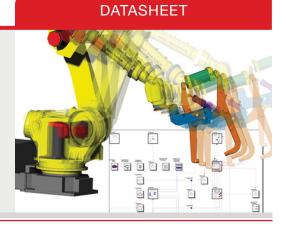## Engineering Productivity through Advanced Multi-Domain Modeling and Simulation

Easy5

Easy5 is a graphics-based software tool used to model, simulate, and design multi-domain dynamic systems characterized by differential, difference, and algebraic equations. The systems that can be analyzed using Easy5 include mechanical, electrical, hydraulic, pneumatic, thermal, gas dynamics, powertrain, vehicle dynamics, digital/analog control systems and much more.

Models may be assembled graphically from special pre-built, ready-to-use multi-domain system-level blocks such as valves, actuators, heat exchangers, gears, clutches, engines, pneumatics, flight dynamics, and many more, or from primitive functional blocks, such as summers, dividers, lead-lag filters, and integrators. The building blocks are packaged in easily accessible application libraries. Users can also create custom libraries for reuse and sharing across the enterprise. An open architecture provides an interface to a broad set of software and hardware tools used in computer-aided engineering (CAE), including Adams®, MSC Nastran®, Simulink®, and other CAE software tools.

Modeling

The Easy5 interface is developed using Qt and has intuitive point and click interface that has Windows look and feel on Unix systems as well. The interface is designed to let the users build even complex models with ease and to maintain multiple libraries and components for reuse. It uses dockable or floating windows and tool bars and has the ability to easily cut and paste data from Windows applications like Excel into Easy5.

Analysis

Easy5 analysis program provides you with the capability to perform a set of linear and nonlinear analyses on the same executable model.

Nonlinear analysis options include the capability to perform dynamic behavior and steady state analyses on the system model.

Easy5 can also generate a linear approximation of a nonlinear model to provide insight into the stability and performance of the nonlinear system at various operating points. The variety of linear analysis tools available include:

- Transfer function analysis: Permits you to calculate the poles, zeros, leading coefficient and frequency response between any two points in your system model

- Root locus analysis: Provides you with the capability to determine the locus of the system model eigen values as a function of any system variable.

- Eigen value sensitivity analysis: Measures the sensitivity of system eigen values to changes in a user specified system parameter

- Stability margins analysis: Calculates the maximum and minimum values for user specified parameters which maintain system stability

- Linear model generation analysis: Used to calculate complete linear model and also compute the eigen vectors of the linear model.

Capabilities

- Assemble models easily from hundreds of pre-built system components
- Easy to use schematic based system-level modeling, simulation and analysis
- Complete system virtual prototyping by linking Easy5 to other MSC applications
- 64-bit support for Windows and Linux
- Integration with MSC SimManager for easy sharing of models and results (Windows only)
- Customizable libraries of components
- Easy to use GUI with Windows style functionalities
- Integration with other CAE software packages like Adams®, Nastran® and Simulink®

Benefits

- Asses complex multi-domain systems quickly and accurately
- Improve products early in the design process
- Understand problems and design countermeasures effectively
- Reduce CAE cost with shareable libraries
- Improve CAE effectiveness by integrating with other tools

MSC Software®

Easy5 Libraries

Libraries are a repository for storing, managing, and sharing components. Libraries are either Easy5-provided component libraries or user-defined component libraries. They provide a single source from which to manage components and include a built-in configuration control system. This powerful feature allows libraries (and components) to be developed and shared among users.

The following libraries are available for use with Easy5:

General Purpose Library

This is the most widely used library and contains blocks that are general in nature and used across a broad spectrum of applications. This library is always included with Easy5.

Interactive Simulation Library

This library contains blocks that be used to run an interactive simulation. Using the components of this library, users can perform a simulation in an interactive mode during which model data can be changed and plots displayed as the simulation progresses. Interactive simulation is useful because you can monitor results and change input parameters while the simulation is running and stop it, if the results are undesirable.

Aerospace Vehicle Library

This application library contains blocks of system level components for flight body dynamics, aerodynamics, control systems, and more. Example application include: sizing of control surfaces; fuel burn assessment; failure analysis; the study of aircraft dynamics, stability and control under different flight conditions; and many others.

The following application specific libraries can be purchased for added capabilities:

Gas Dynamics Library

The Gas Dynamics Library is a collection of components designed to model compressible gas systems, including pneumatic systems, environmental control systems, and gas transmission. The transient forms of the energy and mass conservation equations are modeled, with gas composition allowed to vary throughout a system.

Thermal Hydraulic Library

The Thermal Hydraulic Library consists of a set of Advanced Easy5 components specifically designed to model the transient and steady-state behavior of hydraulic liquid/mechanical systems, including transient thermal energy effects and heat transfer. Sample problems that can be solved include:
- Compressible fluid problems like cavitation, water hammer transients
- Fluid viscosity degradation, multiple viscosity fluids
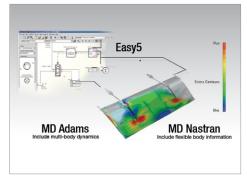- Complex valves and actuators

MultiPhase Fluid Library

The MultiPhase Fluid Library is a group of Easy5 components specifically designed to model the transient and steady-state behavior of multiphase fluid systems.
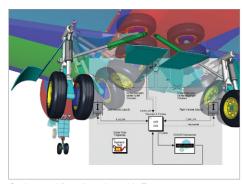
Third-Party Libraries

In addition to the above, the following are available as third-party libraries from Ricardo, Inc.
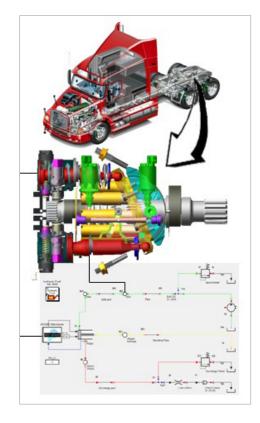- Ricardo Powertrain Library
- Ricardo Fuel Cell Library
- Ricardo Electric Systems Library
- Ricardo Engine Library

Integration of Adams and Nastran with Easy5

Go beyond fit to function with Easy5