FLOWNEX®

SIMULATION ENVIRONMENT

MODULES & MATRIX BROCHURE

CORE MODULES

The Flownex® core modules include all components that expand the primary functions of Flownex® Simulation Environment (SE).

FLOWNEX® SE BASIC THERMAL FLUID

This is the basic Flownex® configuration with steady state solver only. This module includes the ability to simulate both liquids and gasses, adiabatic flows, as well as flows with basic heat transfer. The flow component models included in the basic version are reservoirs, pipes, ducts, pumps, fans, compressors, turbines, heat exchangers, valves and orifices. This configuration also includes numerous visualisation components, graphs, text outputs, result layers, data logging, and Excel result exports, as well as the ability to create compound components.

ADVANCED FLUID THERMAL

This configuration includes advanced features such as gas mixtures, homogeneous two-phase flow, coupled convective and conductive heat transfer through solid structures as well as a special library of rotating components used in the design of turbomachinery. It also includes combustion modelling, Script elements for custom functionality and the built-in Excel workbook component.

DESIGN & ANALYSIS

This configuration includes advanced analysis features such as the designer routine, optimisation routines, and stochastic routines used in probabilistic analyses (Sensitivity Analyses, Parametric Studies). This capability can be applied to any libraries and on both steady state and transient solver modules.

TRANSIENT

The dynamic (transient solver) simulation add-on module of Flownex® includes the following:

- The ability to start simulations from either steady-state or specified initial conditions;
- Open loop events can be specified at different time steps (time varying or fixed variables, switching system controllers on or off); and
- Graph values of multiple parameters over time on the screen whilst solving.

LIBRARY MODULES

The Flownex® Library Modules include components which expand the component libraries available to model integrated networks in Flownex® SE.

NUCLEAR

ASME NQA-1-2008 compliant Nuclear reactor models such as the Pebble Bed Reactor and Advanced Reactor are included with this module as well as a RELAP link, enabling Flownex® to perform co-simulation with RELAP-5.

MACHINE LEARNING

The Machine Learning Module configuration enables users to generate a Reduced Order Model (ROM) of a Flownex® network in the form of an FMU (Functional Mock-up Unit) containing a Neural Network. The built-in machine learning algorithm trains the Neural Network using Sensitivity Analysis data and therefore also requires the Design and Analysis Module.

CONTROL

The Control library configuration includes analog components (controllers, filters, inputs and outputs IO, math functions, switches), digital components (counters, IO's, logic, switchers, and timers), and converters (analog to digital, digital to analog, integer to double). The Flownex® OPC client is used to set up communication of Flownex® inputs and results to and from tags in an OPC-standard server.

ELECTRICAL

The Electrical library configuration allows the user to simulate and solve balanced three-phase electrical networks/systems coupled with flow networks. Simulated electrical networks can include capacitors, impedance loads, induction motors, inductors, resistors, transformers, voltage sources and breakers.

INTEGRATION MODULES

The Flownex® Integration modules allow users to easily integrate and cosimulate with partner and 3rd party software inside or outside of Flownex®.

EXTENDIBILITY

The user extendibility module allows users to write their own libraries consisting of components, editors, links, and solvers, that interface seamlessly with Flownex®. These user extendable libraries can then interact with any existing or future Flownex® libraries such as the transient solver or design and analysis modules, for example.

API MODULE

The Flownex® automation Application Programming Interface (API) module provides the functionality to co-simulate between Flownex® and leading simulation software such as ANSYS Fluent, Mechanical, Caesar II pipe stress analysis software, Matlab & Simulink, LabVIEW and Mathcad.

The module also allows Flownex® to integrate with and be automated by other applications or programming environments. Typically this includes python scripts, C# applications and any other application that allows user coding.

MODULES MATRIX