AMESim

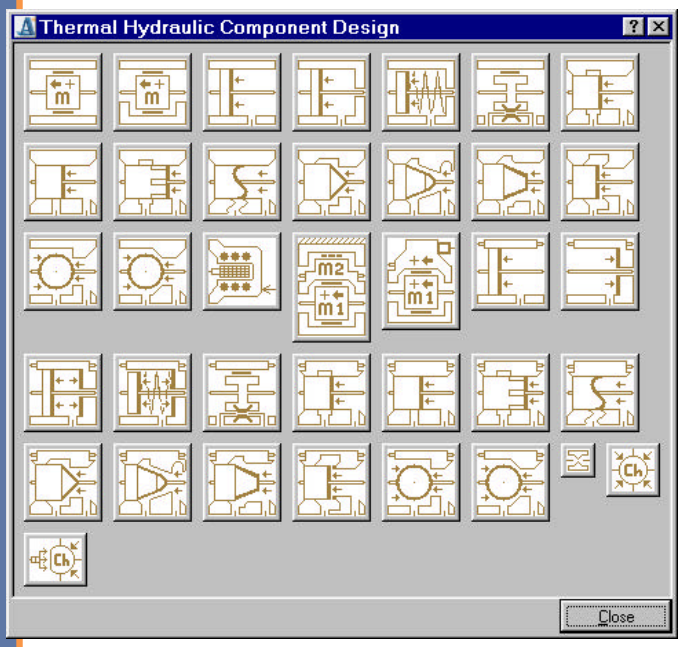
LIBRARIES – THERMAL HYDRAULIC COMPONENT DESIGN

KEY POINTS

- Steady-state and transient simulation.
- Graphical interface enables you to create new designs quickly.
- State-of-the-art theory. Easy parameters filling from manufacturers' experiments or data from technical drawings.
- Recognizable technological icons facilitating direct model correlation with technical drawings.
- Full multi-domain compatibility for total system analysis with study of energetic couplings.
- Complex modeling without writing a single line of code thanks to a Basic Element approach.
- Build and save your own models for easy reuse.
- Sensitivity analysis and size optimization.
- Time domain and frequency analysis for vibration modes characterization (eigenvalues, modal shapes, transfer functions).
- Matlab®/Simulink® interface for control design.
- Direct integration of your own C and Fortran code.
- Fully compatible with other AMESim libraries.

Overview

The AMESim® Thermal Hydraulic Component Design library is an incredibly powerful and unique tool including the basic building blocks of any thermal hydro-mechanical component. This library can be viewed as an engineering language able to model hydraulic components in which variations of fluid temperature have a great influence on the overall behavior. Components used in applications such as high-pressure fuel injection, hydraulic and fuel aeronautical systems, cooling system piston are good application examples of this library. Since the models are component-based, interpretation of the model layout is straightforward and intuitive.



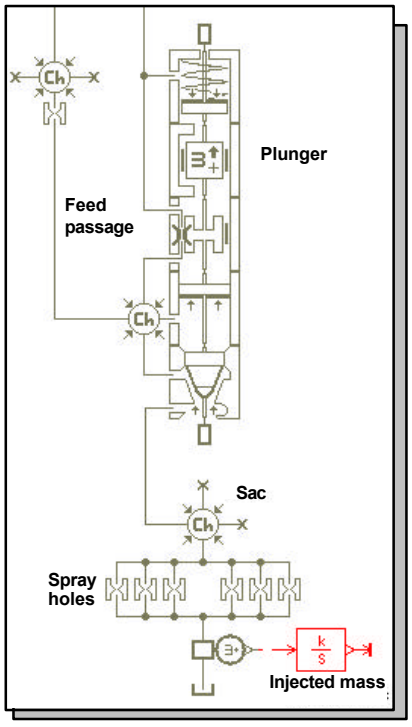
Benefits

For engineering systems in the automotive, off-highway, aerospace or industrial arenas, a main stumbling block is the diversity of hydraulic components.
Designed and developed by our expert engineers, the AMESim Thermal Hydraulic Component Design library (THCD) handles this diversity by using a subdivision that enables you to build the greatest number of engineering system models from the smallest number of icons and models. We could describe those as technological units since each element is a tangible object for an engineer. With most THCD models, you could almost go to the engineering store, collect the corresponding physical objects and use them to make a component.

Features

The AMESim Thermal Hydraulic Component Design library enables you to rapidly design, analyze and optimize any kind of hydraulic component in which variations of fluid temperature have a great influence. This library facilitates a large number of capabilities such as:

- All standard technology groups included (spool, conical poppet, ball poppet, piston, vane and others).
- Ability to model components in detail taking into account:
  - Dynamics of the moving bodies.
  - Influence of oil compressibility.
  - Limitations and saturations.
  - Flow rate induced by pressure difference.
  - Enthalpy flow rate.
  - Variation in the cross section.
  - Variation in the hydraulic diameter.
  - Variation in the flow coefficient.
  - Volume variation.
  - Flow rate induced by movement.
  - Friction and leakages.
  - Hydraulic forces.
  - Flow forces.
- Calculation of all the required variables (mass, enthalpy and heat flow rates, pressures, temperature, cross section, valve lift, volume…), accessible during or after simulation.
- Rigorous handling of fluid thermal-hydraulic properties function of working pressure and temperature (density, volumetric expansion, diffusivity, viscosity), mass, momentum and energy conservation.



Part of a simplified high-pressure fuel injector model built with the AMESim Thermal Hydraulic Component Design library.

THCD model families

- Single mass with friction and end-stops.
- Double masses with friction and end-stops.
- Solenoid.
- Orifice.
- Volume with compressibility.
- Volume with compressibility and heat exchange.
- A large set of thermal hydraulic component functions with fixed or moving body:
  - Piston.
  - Piston with spring.
  - Viscous frictions and leakages.
  - Spool with annular orifice.
  - Spool with orifice hole.
  - Spool with slot orifices.
  - Spool with custom orifice.
  - Poppet with sharp edge seat.
  - Poppet with conical seat.
  - Poppet with no seat.
  - Poppet with plain seat.
  - Ball poppet with sharp edge seat.
  - Ball poppet with conical seat.

Requirements

The AMESim Thermal Hydraulic Component Design library runs on Unix®, Linux® platforms and Pentium® -based PCs.

The AMESim Thermal Hydraulic library is required.

The AMESim Thermal library is recommended.

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