MODELING & SIMULATION PLATFORM FOR SYSTEMS ENGINEERING

AMESim

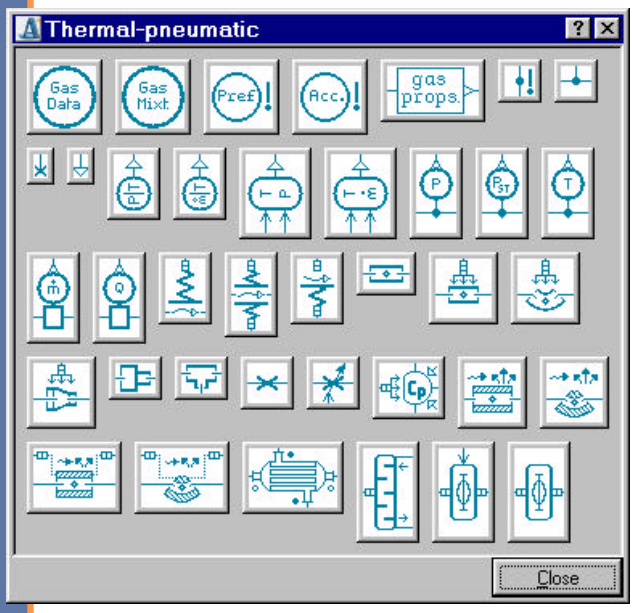
LIBRARIES – THERMAL PNEUMATIC

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 identification 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-Pneumatic Library includes a set of components which allows you to easily model and analyze the evolution of temperatures, pressures and mass flow rates in pneumatic networks.
Based on a transient heat transfer approach, this library is used to model thermal phenomena in gases and study thermal evolution in these gases when submitted to different kinds of heat sources. Typical applications are exhaust systems, HVAC, gaseous fuel, environmental control systems, gas transportation, suspension or heat exchange. This library can be used as stand-alone or complete the other AMESim libraries.

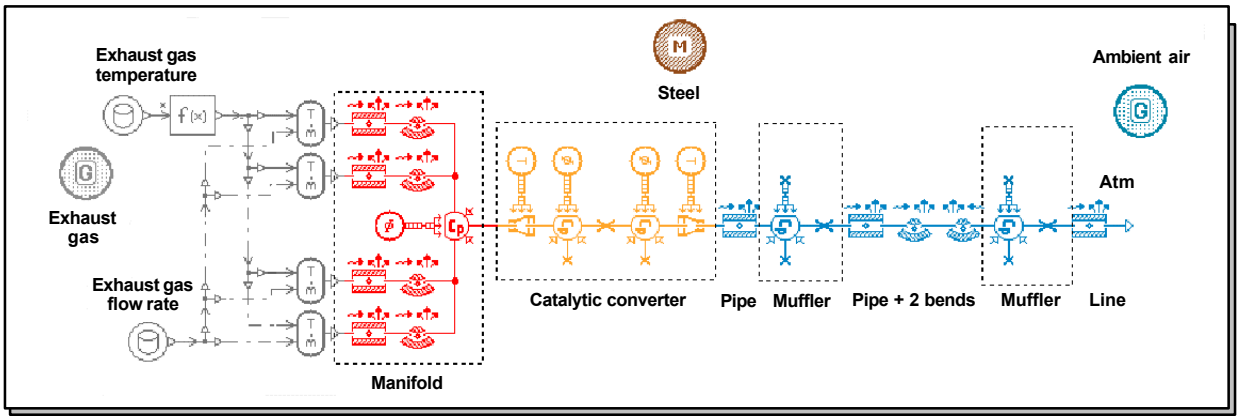


Benefits

Fully compatible and complementary to the AMESim Pneumatic, Pneumatic Component Design and Thermal libraries, the AMESim Thermal-Pneumatic library offers a ready-to-use solution for the design of pneumatic system including external thermal exchanges.

The AMESim user interface gives you the ability to design a network with minimum effort and maximum flexibility. Recognizable technological icons facilitate both the understanding of the simulation model and the direct observation of the evolution of all the required variables.

As a result, you cut down on the number of prototypes, and reduce both the development cost and time to market.



A simplified exhaust system model in which temperatures and exhaust back pressures are evaluated.

Features

The Thermal-Pneumatic library offers a large number of capabilities such as:

- Model, analyze and design any type of network.
- Build systems without network size limitations.
- Model single piping runs, branches, tree networks, loops and/or combinations.
- Accept user-specified thermal heat transfer correlations to override built-in values.
- Proceed to steady-state and transient.
- Perfect or semi-perfect gas assumption with rigorous handling of gas properties, mass momentum and energy conservation.
- One or more fluids in one system model.
- Facilities enabling to add your own gases.
- Gas mixture.
- Sonic and subsonic flow in orifices.
- 3 levels of assumption for the flow coefficient (constant, Perry, ISO6358).
- Free/Forced convection exchange as a function of Grashof/Reynolds and Prandtl number.
- Gas/wall or wall/wall radiation exchange.
- Severe non-linearities and discontinuities are seamlessly handled.
- Calculation of all the required variables (mass and enthalpy flow rates, pressures, temperatures, heat exchange…), accessible during or after computation.
- Modular heat exchanger models.

Thermal Pneumatic models

- Thermal-pneumatic gas properties.
- Gas mixture.
- Atmospheric pressure conditions.
- Gas properties sensor.
- Absolute to relative pressure conversion node.
- Node, plug.
- Atmospheric pressure & temperature source.
- Ideal & modulated flow and pressure source.
- Total and static pressure sensor.
- Temperature, mass/volumetric flow sensor.
- Internal/external free or forced convection.
- Pipe with/without external heat exchange.
- Bend with external heat exchange.
- Expansion/contraction with heat exchange.
- T-junction.
- Fixed and modulated orifice.
- Volume with compressibility.
- Global pipe, bent pipe including convection and radiation with wall.
- Gas-liquid heat exchanger component.
- Half thermal-pneumatic heat exchanger.
- Flux calculation between two half exchangers.
- Exchanger flux calculation.

Requirements

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

The AMESim Thermal library is required.

The AMESim Pneumatic library is recommended.

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