

AMESim

LIBRARIES – COOLING SYSTEM

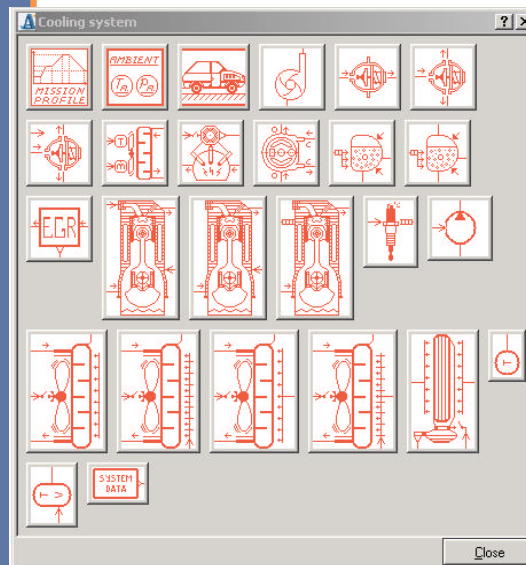
KEY POINTS

- 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 or Fortran code.
- Fully compatible with other AMESim libraries.

Overview

The aim of the engine cooling system is to provide sufficient cooling of the oil and engine metal masses under uphill, full load or high ambient temperature conditions. During warm-up, a zero-flow allows the engine to heat up by itself, thereby limiting thermal losses. By improving these aspects, one can achieve an optimum compromise between important engine requirements (low fuel consumption, extended engine life and reduced gas emissions) and high performance.

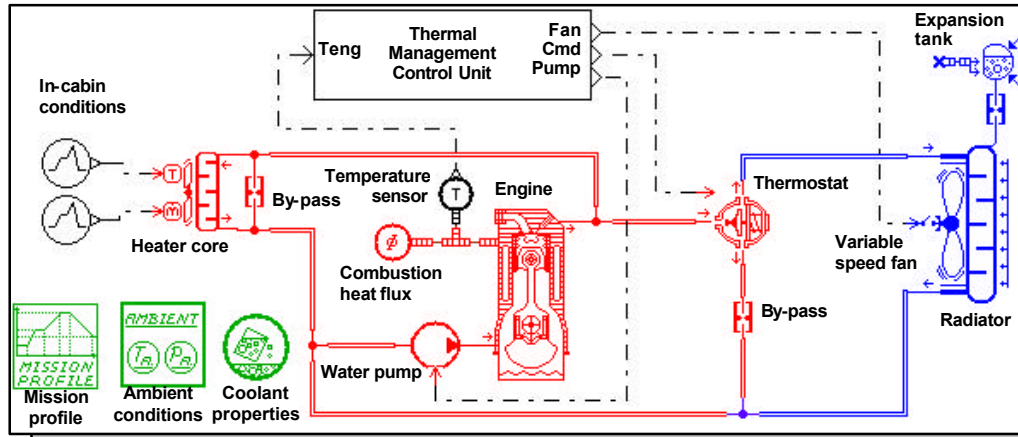
Fully dedicated to the design of thermal engine cooling systems, the AMESim® Cooling System library is made of over 60 models of various complexity levels. Based on a transient heat transfer approach, this library is used to model thermal phenomena in the coolant (energy transport, convection), heat transfer through exchangers and study the thermal evolution in the cooling circuit.



Benefits

The user-friendly AMESim Cooling System library helps you to efficiently develop new design concepts. Thanks to a large collection of components, this library gives you the ability to find answers for the optimal development of cooling systems whatever the operating point studied. As a result, you cut down on the number of prototypes, reduce the development cost and finally the time to market.

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



Example of a simplified cooling system model capable of managing and optimizing engine temperature.

Features

By connecting together components from 2 AMESim libraries, namely Cooling System and Thermal-Hydraulic, it is possible to study the thermal transient and steady state behavior of the engine cooling system while investigating:

- The sizing of influential components (heater core, radiator and fan, thermostat...).
- The influence of the thermostat technology (oscillations, thermal effects).
- Cavitation at the pump inlet.
- The response of the system for given engine operating points or standard mission profiles (evolution of flow rates and temperatures in the system...).
- The effect of a brutal stop (temperature peaks, flow rates in the expansion tank).
- The pump and thermostat control.
- The influence of the heater core, the EGR and oil/coolant heat exchangers and the immersion heaters (position, thermal impact...).
- The time needed for the engine to reach its operating temperature after a cold start by modeling in detail all the engine internal thermal exchanges using the AMESim Thermal library.

Cooling System models

- Mission profile, ambient conditions data.
- Vehicle characteristics data and engine rotary speed calculation.
- Centrifugal pump.
- 2 and 3 ways thermostat.
- Heater component.
- Immersion heater and alternator.
- Oil-coolant heat exchanger.
- Expansion tank.
- Expansion tank with pneumatic port.
- Exhaust Gas Recirculation (EGR) heat exchanger.
- Engine component with EGR.
- Engine component (no EGR port).
- Radiator.
- Radiator with modulated air velocity.
- Radiator with prescribed air velocity.
- Radiator with prescribed and modulated air velocity.
- Condenser and Compressor system.
- Ambient temperature source.
- Ambient temperature and air velocity source.
- Characteristic data of the cooling system.

Requirements

The AMESim Cooling System 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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