

TIL MOBILE AIR CONDITIONING (AC) LIBRARY

Model Library for Mobile Air Conditioning and Thermal Management



DRIVE INNOVATION IN MOBILE THERMAL SYSTEMS THROUGH SIMULATION

The TIL Mobile Air Conditioning (AC) Library is a powerful and flexible library for steady-state and transient simulations of thermodynamic components and systems with a focus on mobile air conditioning systems. It combines the TIL Base Library and specific models for mobile AC systems like cabins and detailed heat exchangers, empowering you to design and optimize mobile thermal systems with high accuracy and simulation speed. Whether you're simulating individual components or complex, multi-layered systems, the TIL Mobile AC Library provides flexibility, transparency, and adaptability to create your own systems. Many years of experience from a wide variety of service and research projects in simulation, testing, and software development is incorporated into the TIL Mobile AC Library.

SPECIFIC MODELS AND ADVANTAGES

The TIL Mobile AC Library comprises the TIL Base library and add-ons that focus on mobile air conditioning systems. The add-on libraries provide additional models for:

Car, coach and train cabin

- Cabin models enable energy balancing of a vehicle's air volume, walls, windows, and built-in components
- Consideration of internal and external thermal effects, air conveyance separated in fresh and circulated air as well as moisture ratio
- Calculation of passenger influence, e.g., water production, and human comfort level (PMV/PPD)
- Drive cycles and environmental conditions are available for transient simulations

Detailed Multiple Port Extruded Tube (MPET) heat exchanger

- User-specific configuration of layers and flow pattern
- Multi-dimensional discretization of the refrigerant + air flow
- Optional receiver model for e.g. condensers with subcooling
- Optional inhomogeneous air-side temperatures and mass flow rates

Internal heat exchanger

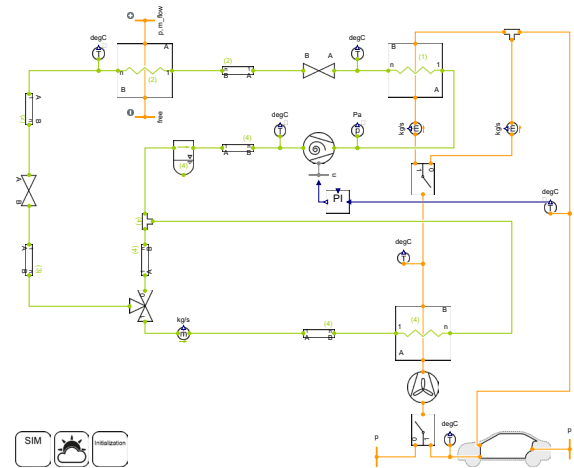
- Tube and tube model
- User-friendly interface for easy specification of IHX geometry

Steady state heat exchangers using a Number of Transfer Units (NTU) method

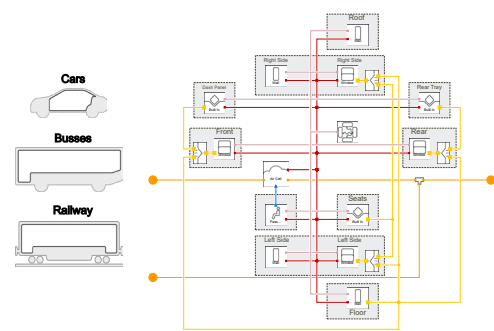
- Allow extremely fast steady state simulations
- User-friendly parameterization via one overall heat transfer value, a fixed pinch point temperature difference or a defined transferred heat flow rate

Ready-to-use examples of common mobile AC cycles with various refrigerants

- Including R744 and R1234yf refrigeration cycles
- Reversible heat pump systems
- Cabin pull-down



Automotive reversible heat pump cycle WITH R744



Basic structure of the cabin models for cars, coach and trains

APPLICATION

The models and systems are particularly useful for the following purposes:

- Modeling of complete automotive refrigeration cycles
- Transient and steady state parameter studies, e.g. geometry and refrigerant charge
- Integration into multi-domain scenarios (e.g., vehicle models) and real-time capabilities/ HiL

KEY BENEFITS

- Fast and accurate simulations
- Flexible and user-friendly model architecture
- Customizable and extensible components
- Proven in industrial and academic environments

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