

Modeling the Effects of Energy Efficient Glazing on Cabin Thermal Energy & Vehicle Efficiency

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Abstract

Automotive manufacturers are continually seeking to improve overall vehicle efficiency, one particular area of high energy consumption is the vehicle's HVAC system which can have a significant impact on fuel economy or range in electrically powered vehicles. Presented in this paper is the work undertaken to understand the ability to model an automotive cabin for a luxury SUV in the Modelica environment including how energy efficient glazing can be modelled to determine improvements in heating or cooling efficiency at extreme ambient temperatures which will have an effect on fuel economy.

The effect of air conditioning systems on fuel economy are typically not measured on cycle therefore the real world effect on energy consumption should be quantified. The whole vehicle model and its sub-systems including the cabin and HVAC models are built using the Dymola (DYnamic MOdelling LABoratory) multi-domain physical systems engineering tool, the modelling approach to each subsystem will be discussed in this paper. The air conditioning system model has been created using 1d thermo-fluid physical models. The cabin has been modelled as a multi-zone 1d thermo-fluid model with layering effects.