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## Simulation of the Interior Cabin Warm-Up & Cool Down using CFD



In a passenger vehicle it is essential the ventilation system is designed to deliver air at the correct flow and temperature levels to keep the occupants comfortable. To create such an environment it is essential the climate control system is designed correctly to meet the demands of cooling and warming up of the cabin. To be able to design such systems with shortened vehicle programme times and reduced number of early physical prototypes, virtual simulations are required. The simulations must be able to predict accurately the flow and thermal behaviour through the ventilation system and into the vehicle interior. It is essential the cabin performance is accurately simulated to enable a prediction of the occupant's thermal comfort to be assessed. To develop these designs Jaguar Land Rover employs CFD techniques to deliver the final cabin thermal performance. CFD methods offer a credible alternative to physical testing. Through CAE detailed designs can be analysed more thoroughly than by physical means. This allows more robust products to be designed and meets the requirement to deliver products more quickly to align with programme timings.

In this paper CFD techniques are employed using the code STAR-CCM+. The design parameters and methods employed to achieve full cabin warm-up and cool down will be discussed. The work will also predict the full transient warm-up and A/C pulldown in the interior of the vehicle. The simulated results will be compared against test data for validation purposes. The results will highlight the ability of virtual methods to predict the complex thermal cabin performance in the vehicle. The simulations provide the foundations for a full cabin comfort model.

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**Industries:**

[Ground Transportation](#)<sup>[2]</sup>

**Products:**

[STAR-CCM+®](#)<sup>[3]</sup>

**Conference:**

[STAR Global Conference 2014](#)<sup>[4]</sup>

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