

Simulation and Optimization of Climate Control in the Driver's Cab of Rail Vehicles

Graduate



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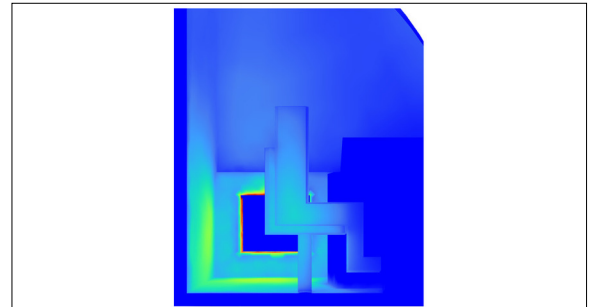
Simon Schmid

Initial Situation: In rail vehicles, various heating systems are used to control the climate in the driver's cab. Conventional methods primarily focus on regulating the ambient air temperature. However, this approach is not sufficient to ensure a high level of thermal comfort. Radiant temperature and temperature differences along the human body also have a significant impact on thermal comfort. This thesis investigates how the use of radiant heaters can enhance the thermal comfort of the vehicle operator. To this end, a comprehensive literature review of textbooks and articles on the assessment of thermal comfort was conducted.

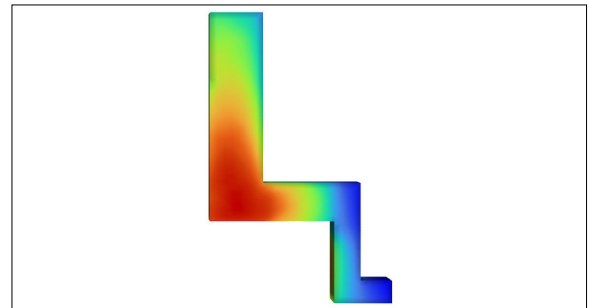
Approach: To develop suitable concepts, the optimal mean radiant temperature was determined using a comfort model. Subsequently, various factors influencing the radiant temperature were examined. A suitable radiant heating system was designed through calculations and simulations, taking into account regulatory requirements. A specially developed model of the driver's cab served as the basis for the simulations. The results from the calculations and simulations were verified with an experimental setup.

Result: It was demonstrated that thermal comfort in the driver's cab of rail vehicles can be increased with the use of radiant heaters. It is important to consider the asymmetry of the radiant temperature, as this can negatively affect comfort. To facilitate the thermal design of new rail vehicles, a calculation tool has been developed. Optimizing the working environment not only improves the well-being of the vehicle operator but also reduces long-term energy costs through more efficient use of heating systems.

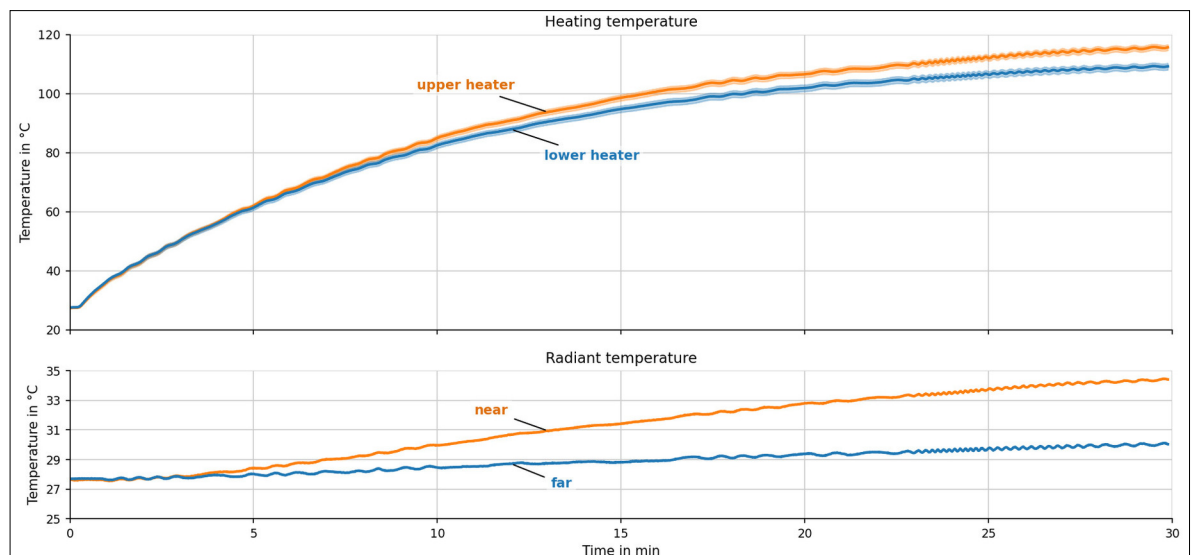
Simulation of radiant heating in a driver's cab
Own presentation



Temperature distribution along a human body
Own presentation



Measurement of the temperature of the heaters and the radiation temperatures
Own presentation



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Subject Area

Mechanical
Engineering,
Computational
Engineering