Abstract

Amr A. Mohamed Mohamed Hassan

Numerical simulation of the airflow over and heat transfer through a Vehicle Windshield Defrosting and Demisting system.

A numerical model and technique are described to simulate the turbulent fluid flow over and heat transfer through a model of vehicle windshield defrosting and demisting systems. The geometry and the dimensions of the model are an exact replica of real system with accurate locations of the nozzles and outlet vents, including the cabin features. The three-dimensional grid of the model is created in Auto Cad R 14 with a complete wire frame of 750,000 (telrahedral) fluid cell. The turbulence is simulated by using the k-? turbulence model together with the wall function method. This decision was made after comparing the k-? model's performance with that of lower order models, and after considering the increased computer time requirements and decreased stability of more complex models, such as the Reynolds stress model. The numerical results of the study are very encouraging and compare favourably with the measurements of Thermograph and Hot bulb probe techniques. The findings highlighted some of the drawbacks of the existing design of the windshield systems and showed that the maximum flow rates occurred in the vicinity of the lower part of the windshield, progressing from the defroster nozzle in the dashboard.