Cooling Airflow System Modeling in CFD Using Assumption of Stationary Flow

Today CFD is an important tool for engineers in the automotive industry who model and simulate fluid flow. For the complex field of Underhood Thermal Management, CFD has become a very important tool to engineer the cooling airflow process in the engine bay of vehicles.

To model the cooling airflow process accurately in CFD, it is of utmost importance to model all components in the cooling airflow path accurately. These components are the heat exchangers, fan and engine bay blockage effect.

This paper presents CFD simulations together with correlating measurements of a cooling airflow system placed in a test rig. The system contains a heavy duty truck louvered fin radiator core, fan shroud, fan ring and fan. Behind the cooling module and fan, a 1D engine silhouette is placed to mimic the blockage done by a truck engine. Furthermore, a simple hood is mounted over the module to mimic the guiding of air done by the hood shape in an engine bay.

Pressure and flow measurements are monitored over the entire system. Local velocity measurements are done using a set of 48 velocity probes mounted on the radiator. The simulations of this system are correlated to these measurements.

Furthermore to support these simulations, specific simulations and measurements are conducted using the radiator only and the fan only. This is done to see how well each separate component is predicted in CFD and correlated back to the measurements.

This work is the continuation of work presented in and it was identified in this paper that one can simulate the cooling airflow system rather well with steady state CFD. However, fan modeling is sensitive to specific cases, and care must be taken to ensure the accuracy of these simulations.

Author Company:
Chalmers University of Technology,Volvo 3P
Author Name:
Peter Gullberg
Lennart Lofdahl
Peter Nilsson
Industries:
Products:
Conference:

CD-adapco is the world's largest independent CFD focused provider of engineering simulation software, support and services. We have over 30 years of experience in delivering industrial strength engineering simulation.
