

Validation and application of CFD modelling of air flow quality in a car cabin and the assessment of human comfort

Background

We offer a challenging and exciting thesis work in collaboration with Chalmers University of Technology. During the thesis work you will be located at Volvo Cars Gothenburg office in the department of Climate Comfort. The thesis work will be performed during spring 2020 and consists of 2 x 30 credits/ECTS, i.e. the thesis is opened for two students simultaneously.

The overall objectives within Climate Comfort is to control indoor cabin environment based on law (and internal) requirements in order to ensure regulations for acceptable driving safety, visibility and human comfort are fulfilled. For this purpose, CFD is an economical and powerful tool permitting a fast pace development and optimization of different systems, such as ducts and housings during a design process of the car while securing regulations.

Application areas for the above-mentioned regulations typically concern pressure drop and mass flow distribution in ventilation system, human comfort analysis, side window demisting and windscreen defrosting analyses. Traditional approach for handling these types of problems has been to adopt solution techniques relying on simplicity and robustness without including additional disciplines for the problem in question.

Joint (rather than stand-alone) influence(s) of various flow types and disciplines adds an additional dimension to the flow complexity and in turn might require unconventional solution procedures otherwise typically not utilized in the industry. This opens up possibilities to shed light on the nature of the problem from another perspective and thereby tackle the analyses with greater level of understanding and accuracy which in essence becomes a core motivation for Climate Comfort to take a first step on this road together with curious and creative students.

Scope

The objective of the thesis is:

- Perform a thorough literature study with the purpose to map relevant physical flow phenomena occurring in a typical ventilation system analysis of car cabins.
- Investigations of suitable workflow procedures to resolve the above-mentioned flow features numerically, and eventually implement necessary update to 3D CFD model. Both preprocessing and postprocessing routines are expected to be considered at this stage.
- Clearly understand and map limitations, as well potentials, with current CFD methodology.
- Evaluate confidence and accuracy of current testing condition in the climatic chamber and prepare required road map for measurement of velocity and temperature fields.
- Perform validation of current and updated 3D CFD environment to physical tests.
- Propose method improvements for future.

Candidate profile

- Good knowledge in Fluid Mechanics
- A strong interest in Computational Fluid Dynamics (CFD). Suitable engineering background is Applied Mechanics, Mechanical Engineering, Chemical Engineering and Engineering of Physics.

- It is a plus if the student(s) have taken a course in Turbulence Modelling.
- It is considered as a strong merit if knowledge and experience of data handling exist in; Matlab, Python, JAVA, C++, CFD tools such as STAR-CCM+ and OpenFOAM.
- Fluent in English, written and spoken.

Application

CV, transcripts and one reference is needed for application.

Duration

- Proposed starting date: January 2020, Period: 1 semester (20 weeks)
- Academic Credits: equivalent to 30 ECTS/student.
- Number of students: Preferable 2 students.

Contact info

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