Volvo Cars Thesis Work Proposal

Title
Fan Modeling for Front End Cooling CFD

* Location	* Category/SubCategory
Göteborg	Product Development Chassi - Fluid dynamic centre

Description of thesis work

The thermodynamics CFD (computational fluid dynamics) team is responsible for virtual analysis of front end cooling performance. This is done by means of CFD computations and the method is used in all projects to verify the car exterior and cooling system design processes. The cooling package is an important part of the CFD model and consists of heat exchangers, such as radiator, condenser and charge air cooler, and the cooling fan. The aim of this thesis project is to get a better understanding of the influence on the results of the fan performance, and to find a best practice for the fan modeling strategy in the CFD model.

There are a number of options available for fan modeling in CFD tools.
- Lumped fan. The performance of the fan is implemented as a pressure rise versus normal velocity over a surface. The effect of fan on flow is modeled using source terms in the momentum equations. A swirl outflow component can be included or ignored.

- Multiple rotating reference frame (MRF) model. Separate meshes are generated for

rotating and stationary parts, and conformal or non- conformal interfaces are used to join the stationary and rotating mesh zones.
- Sliding mesh model. Separate mesh zones move relative to each other. This requires unsteady calculation.

Comparison with experimental data is needed and therefore physical testing of fan performance in the VCC component test rig at Fluid Dynamics center will be included. This work will be performed in close cooperation with the thermodynamics testing team at Fluid dynamics centre, and there will be a supervisor available for both the experimental and numerical part of the task.

Do you find this topic challenging? Don't hesitate to contact us!

Suitable Student background

Good knowledge of fluid mechanics/thermodynamics and experience of CFD computations.

Starting date	Number of students
Earliest 06- 04	2

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