

Job category  
Form of employment  
Location  
Country

Students & Graduates  
91611 Powertrain NVH CAE and Performance & Drivability  
Gothenburg  
Sweden

### **Thesis Work:**

## **NUMERICAL INVESTIGATION OF THE INSTALLATION EFFECTS ON SOUND GENERATION OF A COOLING FAN**

### Background

Do you share our passion for people, the environment and our urge to create a superior driving experience? At the Driving Dynamics and Noise & Vibration Center at Volvo Car Group, where this thesis will be written, you will contribute to the next generation outstanding luxury cars from Volvo.

Electric vehicles (EVs) are the future. An important problem of the existing cooling systems for EVs is the significant noise emission while charging the batteries of electric motors. The noise can propagate outside and introduce obvious pollution to the neighborhood. Besides, the creation of comfortable cabin environments is always concerned in the automotive industry to boost the competitive power of productions. There is therefore an urgent demand to develop quiet and efficient cooling systems. However, the knowledge for designing, simulating and measuring such cooling systems is insufficient to date due to the geometrical complexity and multiphysics of the systems. Although there are few studies on a single cooling fan including limited installation effect, the dominant noise generation and radiation mechanisms of automotive cooling systems are not completely clear till now.

### Scope

In the current investigation we focus on the installation effects on the sound generation of a cooling fan. More specifically, we investigate the interaction between the fan and the upstream obstacles using numerical tools. The investigation includes

- Search in the literature and find a generic fan with well documented measurement data.
- Apply suitable computational fluid dynamics (CFD) and computational aeroacoustic (CAA) tools to simulate the flow and sound field of the fan. Validate the simulation results by comparing with the measurement data.
- Study the influence of upstream obstacles on the flow field the sound generation of the fan. Optimize the arrangement of the upstream obstacles to minimize the influence of them on the flow and sound field.

### Profile

Required: Knowledge in CFD. Self standing, curious and fast learner. Having passion for numerical methods and analysis. Self-going and fast learner.

Meritorious: Skills in StarCCM+ or OpenFOAM, Matlab or Mathematica.

### Desired qualification

Master's degree students from one of the following fields: engineering physics or equivalent with wide understanding in fluid mechanics, mechanical engineering, vehicle engineering, acoustics, and mathematics.

### Application

CV is needed for application.

#### Duration

- The job will start in SpringJanuary 2019 and continue 20 weeks.
- 1 student. This diploma work gives 30points/student.

#### Contact

##### **At Chalmers**

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