



Author of the thesis: Shehab Ashraf Salem

Name of the thesis: Experimental and numerical investigation of the metal sheets for automotive.

Type of the thesis: Diploma thesis

Supervisor: prof. Ing. Karel Fraňa, Ph.D.

Institution of the supervisor: Technical University of Liberec

- A. **Formal belongings of the thesis:** Excellent
(Rate linguistic and typographical level of work, text structure, sorting chapters, illustrations, correctness and completeness of citations literary sources)

The diploma work, chapters and sections are logically ordered. The work contains introduction, a theoretical part and results, which are sufficiently discussed in the conclusion. The figures are well selected having a contribution to understand main results. Additional figures and other information are possible to find in the appendix of the diploma work. The adequate number of the references demonstrated the previous work and obtained experiences are given.

- B. **Thesis theoretical part:** Very good
(Rate the extent and manner of research, a way of describing the problem solved or the suitability and complexity of used theoretical method.)

The problem of the noise production behind the metal sheets is caused by the aerodynamics reason. However, less attention is payed to the similar works investigated these problem in other applications. Furthermore, the maximal velocity magnitude of 20 m/s is limited by the fan power. This velocity magnitude is relatively low for the automotive problems (please see a question below). The theoretical part should be focused on the noise production and wave propagation in details. Details of the mathematical model (Ffowcs-Williams & Hawkings) used in the noise prediction are missing.

- C. **Thesis practical part:** Very good
(Rate adequacy and sophistication of the methods used, the level and amount of data obtained.)

Results were obtained from the experimental and numerical investigations. The experimental data and its applicability are given by the available measurement equipment. The student designed and furthermore sufficiently applied the own measurement facility. The numerical simulation of the flow over the metal sheets



should be more comprehensive e.g. the influence of the entering turbulent viscosity of the flow on the result prediction could be involved into the study. The more attention should be paid to the grid resolution and its influence on the noise production.

D. Results analysis: Excellent

(Rate the level of processing of data, including the determination of measurement uncertainties, discussion of the results and formulated conclusions.)

Results of the numerical simulation were compared by the experiments demonstrating relatively good match, however, at the particular part of the flow, the significant deviation between results was identified. The analysis of the error magnitude should be discussed in details.

E. Level and quality of the thesis: Excellent minus

(Rate overall complexity and scope of work and original contribution of the student.)

The level and the quality of the thesis are good. The noise production and its investigation are relatively complex problem required numerical and experimental studies. The experimental background (particular measurement instruments and requirements on the space must be taken into account). The found results obtained from experimental observation and numerical calculations (noise spectra) were similar in relation to the range of the frequency and observed trends. The investigated problem is original and complex.

Overall evaluation: Excellent minus

Questions for the defense:

- Why the Large Eddy Simulation approach was applied for numerical calculations?
- Why the distance 1,2,3 a 4 mm was considered for the result measurement?
- Was it possible to measure the turbulent intensity at the inlet of the flow (in the front of the metal sheets) in order to be applied as a boundary condition for the numerical simulation?

Qualification:

I suggest this work to classify as "Excellent minus"

In Liberec, 6th of June, 2018

I certify that I am not in any personal relationship with the author of the work.



Supervisor's signature