

## I. IDENTIFICATION DATA

<b>Thesis name:</b>	<b>Sampling train for a portable air-liquid interface exposure chamber</b>
<b>Author's name:</b>	<b>Anežka Vimrová</b>
<b>Type of thesis :</b>	Master
<b>Faculty/Institute:</b>	Faculty of Mechanical Engineering (FME)
<b>Department:</b>	Department of Automotive, Combustion Engine and Railway Engineering
<b>Thesis supervisor:</b>	Prof. Michal Vojtíšek, Ph.D.
<b>Supervisor's department:</b>	Department of Automotive, Combustion Engine and Railway Engineering

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>Challenging</b>
<i>Evaluation of thesis difficulty of assignment.</i>	
<p>The assignment pertained to a portable toxicological incubator for exposure of cellular models to complex mixtures containing combustion nanoparticles, and called for particle losses to be evaluated, and potential for reduction in size and weight to be examined. The assignment is composed of seemingly relatively ordinary tasks, but the interdisciplinary nature of the work, requiring some comprehension of toxicology, nanoparticles and instrumentation, makes it challenging.</p>	

<b>Satisfaction of assignment</b>	<b>Fulfilled with minor objections</b>
<i>Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.</i>	
<p>The evaluation of particle losses through comparison of measured upstream and downstream concentrations was accomplished with older data for the rotating disc diluter (no new experiments conducted) and with some (but not all) of the original experimental data obtained during a series of tests with a VSP particle generator for the exposure chamber. Evaluation of particle deposition rates through sampling on electron microscope grids was objectively not possible due to experimental problems (grids separating from the holder due to electrostatic forces).</p> <p>Of the thesis, only four pages are devoted to reducing size and weight of the proposed incubator, a typical mechanical design engineering task. Following a relatively easy calculation of the amount CO<sub>2</sub> required, a small cylinder has been proposed, but with a standard full-size regulator, and no proposal of how the cylinder would be mounted to the incubator. The only mechanical drawing is that of a simple bracket, composed of a "T" shaped aluminum profile with two holes drilled in it, and some verbal description.</p>	

<b>Activity and independence when creating final thesis</b>	<b>C - Good</b>
<i>Assess that student had positive approach, time limits were met, conception was regularly consulted and was well prepared for consultations. Assess student's ability to work independently.</i>	
<p>Ms. Vimrova has participated in experiments at both the CTU engine lab in Roztoky and at the environmental toxicology lab at the Institute of Experimental Medicine of the Czech Academy of Sciences, where she has also participated in an internship program. Ms. Vimrova has generally shown a positive approach, participating in some but not all experiments, and fair, reasonable, but not extremely high initiative in making the exposure chamber smaller and lighter.</p>	

<b>Technical level</b>	<b>D – Satisfactory</b>
<i>Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.</i>	
<p>The thesis presents a concise overview of health relevant air pollutants, their formation in engines, and evaluation of their toxicological effects. The experiments aiming at evaluating losses of particles in the sampling train, as well as the instrumentation, are correctly described. The results are well presented. They are reasonable, yet far from accurate or conclusive, and a question arises as to whether this is the inherent nature of the results, or whether better results would have been obtained through additional experiments or through ; and in the second case, whether it was realistic to conduct such additional experiments. Overall, however, the results from the particle losses experiments are reasonable. In the mechanical design part, calculations of the required amounts of water and CO<sub>2</sub> are presented, and a mounting bracket for humidifiers is presented. The choice of 5 mm thick aluminum "T" profile to support a relatively light-weight membrane humidifier will do the work, but is an overkill, and no schematic as to where it will be mounted or placed is given, a satisfactory design to accomplish the task, but somewhat short of a showcase of an aspiring engineer.</p>	

### Formal and language level, scope of thesis

**B - Very good**

*Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.*

The thesis is written in good technical English, is well structured, the writing is comprehensible. The visual appearance is good, the formatting is appropriate, figures are well legible. Minor issues include occasional use of familiar instead of official units (cc instead of cm<sup>3</sup>), formatting of graph axes, and structure of tables. The vertical axis of Fig. 48 spans six orders of magnitude while two would be sufficient to contain all of the data presented. The tables in the appendix present results, but it is not readily clear from what experiments, and what do the individual data points represent. The percentage value at the bottom of these tables probably gives variance (a ratio of the standard deviation and the mean), but this should be clearly stated. The scope of the thesis, 71 pages, is appropriate, there is nothing clearly missing, nor there is anything redundant, all information is relevant.

### Selection of sources, citation correctness

**C – Good**

*Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.*

A total of 47 sources are cited in the thesis, a mix of peer-reviewed papers, technical specifications, and background knowledge in textbooks and online materials of uncontrollable quality. The references are reasonably well chosen and correctly cited in the text. There are some inconsistencies in reference formatting, notably the format of author names, also, some information that might be helpful in finding the resource is missing (ref. 12, 19 – missing publisher, 45 – missing the type of work, journal or publisher).

### Additional commentary and evaluation

*Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.*

The thesis was handed in early in 2022, shortly after the completion of the most relevant experiments, a shortcoming attributed to coronavirus related restrictions. I have advised Ms. Vimrova to use the remaining semester of studies to strengthen and improve the thesis, taking advantage of the ongoing research activity at the Institute of Experimental Medicine, and promising potential of additional work. Unaware of any amendments, I have evaluated the thesis as handed in.

### III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

*Summarize thesis aspects that swayed your final evaluation.*

Ms. Vimrova has picked up a specialty interdisciplinary assignment focused on evaluating particle losses within, and a potential of reduction of size and weight of, an experimental toxicological incubator intended to be used for exposure of cell cultures to complex mixtures of health relevant pollutants, including nanoparticles, at air-liquid interface. The submitted thesis gives a well written introduction to the subject and focuses on reporting on laboratory experiments during which concentrations of various particles were measured upstream and downstream of the tested part of the sampling train, providing for assessment of particle losses. A relatively minor part of the thesis is devoted to the design of a bracket for membrane humidifiers and the description of a proposed sampling setup. Overall, Ms. Vimrova has shown good work.

I evaluate the submitted thesis with classification grade **C - Good**.

Date: **August 22, 2022**

Signature: