

**I. IDENTIFICATION DATA**

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| <b>Thesis name:</b>           | <b>Low-cost particle filter integrity tester for periodic and roadside vehicle inspections</b> |
| <b>Author's name:</b>         | <b>Yash Patel</b>  |
| <b>Type of thesis :</b>       | <b>MASTER'S THESIS</b>   |
| <b>Faculty/Institute:</b>     | <b>Faculty of Mechanical Engineering</b>   |
| <b>Department:</b>            | <b>Department of Automotive, Combustion Engine and Railway Engineering</b>                     |
| <b>Thesis reviewer:</b>       | <b>Ing. Martin Pechout, Ph.D.</b>  |
| <b>Reviewer's department:</b> | <b>Department of Vehicles and Ground Transport, Czech University of Life Sciences</b>          |

**II. EVALUATION OF INDIVIDUAL CRITERIA**

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| <b>Assignment</b><br><i>Evaluation of thesis difficulty of assignment.</i>   | <b>Choose an item. – A</b> |
| The assignment required active approach containing multi-field competences ranging from simple electronic circuit design and build, programming, experimental tests carrying out and data processing and evaluation.   |                            |
| <b>Satisfaction of assignment</b><br><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>  | <b>Choose an item. – B</b> |
| All of the numerous assignment tasks were met at satisfactory level. The only one shortage can be seen in modifications of the current setup in order to prevent or at least reduce rate of water and unburned hydrocarbons condensation which deteriorates reading quality and reliability.   |                            |
| <b>Method of conception</b><br><i>Assess that student has chosen correct approach or solution methods.</i>   | <b>Choose an item. – B</b> |
| Student has chosen correct sensor based on manufacturer provided information, which has been then correctly incorporated into suitable housing and connected to student built and programmed simple data acquisition system. Whole this system has been thoroughly tested using sufficient number of vehicles both equipped and non-equipped with properly working diesel particulate filter. The obtained results showed some weak points to be improved. The author successfully suggested modification with high improvement potential, but these were not realized and tested.   |                            |
| <b>Technical level</b><br><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>  | <b>Choose an item. – B</b> |
| Student showed ability to find and understand current topic related literature which has been thoroughly and in understandable way addressed in the Introduction part of the Thesis. Design and programming tasks required, despite their non-expert level, gaining skills probably not fully covered in previous studies. Student also managed to suggest and perform suitable and simple tests of the instrument. Only the realization of suggested improvements mitigating observed solution weaknesses are missing.  |                            |
| <b>Formal and language level, scope of thesis</b><br><i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>   | <b>Choose an item. – C</b> |
| Unfortunately, some considerable improvements of typographical and language aspect should have been done. The line spacing is varying throughout the thesis (single spacing is used numerous paragraphs contrasting to correctly used 1,5 line spacing). Some (e. g. chapter 1.2.4) are using different font colors. Many abbreviations (for instance DI and IDI, PCM UFP and CI) are not included in the Nomenclature and the list of abbreviations and symbols is unsorted. Some abbreviations (PCM) are not explained at all. Some labeling is also ambiguous (W/DPF in Figure 4.5-1 label means with or without DPF?, is presence of DPF stated correctly in Fig. 6.1-5 label?). The pictures in the chapter 6.2 are inserted as photographs instead of using "print screen" function so their quality is significantly reduced. |                            |

Language level can be also improved – capitals used for conjunctions in sentences and lower cases for first words of new sentences. On other hand, number of mistyped words (e.g. “senor” in chapter 2 “Goals of the thesis” on page 21, “euros” for currency on page 57) is very small. The character used for multiplication expression in equations is also non-typical for specialized thesis and the equations not numbered. In some cases a space is missing between number and the unit used and upper index is not applied in some cases (page 19 and 20).

**Selection of sources, citation correctness**

**Choose an item. - D**

*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.*

The chosen sources are relevant to the topic and with great explanatory value. The only one omitted topic to be included, but a very important topic, is carcinogenicity of PM produced by internal combustion engines, which is completely omitted in the Thesis.

The sources are correctly stated in the text of the Thesis, but the formal aspects of Reference list do not exhibit high quality. In many cases are missing important data complicating finding of the references used.

**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.*

Significant amount of design, build, programming and test effort has been done. Unfortunately, some more effort could have been spent on testing of suggested modifications and improvements of the sensor housing. There are also many both minor and major imperfections in the thesis text decreasing the obtained results, effort made and experience gained.

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

*Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.*

Overall thesis shows abilities of the student to gain new experience based on the field and exceed frame of standard studies subjects. Student also proved ability to design simple test, evaluate and present obtained data. The only one significant shortage of the obtained results is unresolved elimination of probably occurring condensation artifacts. There are also formal deficiencies of the thesis devaluating this thesis showing very good approach and results reached.

All previously described imperfections deteriorated quite well performed thesis so I suggest overall **grade C**.

Questions for defense:

How was handled EEPS instrument background and noise affecting especially size spectra for DPF equipped vehicle?

What benefit do you expect by employing three sensors in a single line?

Which temperature do you suggest to maintain inside the sensor housing?

Date: **31.8.2021**

Signature:

