

I. IDENTIFICATION DATA

Thesis name:	Potential for Improving Passenger Car Emissions through Analysis of Real Driving Emissions Data
Author's name:	Marek Fencel
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Department of Automotive, Combustion Engines and Railway Engineering
Thesis reviewer:	Ing. Martin Kadleček
Reviewer's department:	Ricardo Prague s.r.o – Propulsion Controls & Calibration Department

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>Evaluation of thesis difficulty of assignment.</i>	
<p>The goal of the thesis was to summarize basic emissions formation, current emissions legislation and to carry out analysis of existing data provided by Ricardo Prague with the aim to highlight the most risky engine operating conditions from emissions point of view. On top of that, the author was supposed to comment on the most commonly used techniques of emissions reduction from calibration as well as hardware selection point of view. This topic is very complex and requires wide range of interdisciplinary knowledge, which is not always part of bachelor studies and so the author had to spend a lot of time self-studying and discussing with experts.</p>	

Satisfaction of assignment	fulfilled
<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>	
The author completely fulfilled assignment.	

Method of conception	outstanding
<i>Assess that student has chosen correct approach or solution methods.</i>	
<p>Firstly, author familiarized himself with basics of emissions formation, current emissions legislation and especially with real driving emissions. In practical part, author analyzed existing data from many different points of view by using various professional tools like ETAS Measure Data Analyzer, Uniplot as well as Ricardo RDE Data Mining tool. Wide range of tools helped the author to compare multiple certification cycles in various ways and to highlight differences between them. More detailed analysis shows that cold start and high-speed phase of every cycle are areas of the highest emissions risk. Author analyzed cold start event very much in detail and highlighted its impact on urban as well as overall emissions. Author analyzed different engine operating modes too.</p> <p>Student conducted extensive and high-quality data analysis of results from a real prototype vehicle.</p>	

Technical level	A - excellent.
<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 is focused on analysis of real driving emissions data. The writing demonstrates that the author gained knowledge in the fields of emissions formation, current legislation, signal processing, programming, high quality data analysis as well as critical assessment and technical writing. Technical level fully meets criteria for the bachelor qualification.</p>	

Formal and language level, scope of thesis	A - excellent.
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	
<p>The thesis is very well structured, language is fully understandable and there is not an extensive amount of grammatical errors. Language corresponds to professional technical level. Graphics are relevant and well readable. Range of the thesis is adequate.</p>	

Selection of sources, citation correctness

A - excellent.

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 author used wide range of information sources, some of them in written form and some other available online. Information sources are well balanced between Czech literature and documents in English. Bibliographic citations are complete.

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.

Please insert your commentary (voluntary evaluation).

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.

The thesis meets all criteria of a professional engineering report. It is structured in a logical order, technical information is correct and selection of literature is appropriate. The author has proved high level of technical knowledge and the ability to find sources independently. The selected approach of the analysis is very robust and gives high level of confidence in the final results and conclusions.

Questions for defense:

1/ It was mentioned in the thesis that EGR is a method used to keep combustion chamber temperatures below the critical figure. Could you please explain why?

2/ Cold start and warm up phase were correctly highlighted as high-risk areas from emissions point of view. What are other options to reduce pollutants during these events apart from electrically heated catalyst?

I evaluate handed thesis with classification grade **A - excellent**.

Date: **8.6.2020**

Signature:

