

**I. IDENTIFICATION DATA**

<b>Thesis name:</b>	<b>Healt Status Monitoring of Turbocharger for Passenger Vehicle Application</b>
<b>Author's name:</b>	<b>Bc. Dávid Hriadel</b>
<b>Type of thesis :</b>	master
<b>Faculty/Institute:</b>	Faculty of Electrical Engineering (FEE)
<b>Department:</b>	Department of Control Engineering
<b>Thesis reviewer:</b>	Ing. Vít Doleček, Ph.D.
<b>Reviewer's department:</b>	CTU in Prague – FME, Department of Automotive, Combustion Engines and Railway Engineering

**II. EVALUATION OF INDIVIDUAL CRITERIA**

<b>Assignment</b>	<b>challenging</b>
<i>Evaluation of thesis difficulty of assignment.</i>	
The thesis is focused on monitoring and evaluation of turbocharger compressor efficiency degradation during vehicle lifetime. Developed function would prevent unexpected engine failure. Well-timed maintenance will also improve ecology footprint by engine running at best possible turbocharger efficiency. Turbocharger health prognostic system could use only standard sensors mounted on existing engines. Diploma work assignment connects turbocharger thermodynamics with evaluation of turbocharger health, which is quite challenging task.	

<b>Satisfaction of assignment</b>	<b>fulfilled</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>	
Assignment was fulfilled completely.	

<b>Method of conception</b>	<b>outstanding</b>
<i>Assess that student has chosen correct approach or solution methods.</i>	
Student made an analysis of all possible turbocharger malfunctions. Compressor efficiency drop caused by oil fouling was chosen as an issue, which could be monitored and predicted. Student analyzed influence of oil fouling on turbocharger behavior. Proposed compressor efficiency calculation from limited measured signals on existing engine was evaluated with help of thermodynamic engine model. Engine model running WHTC and FTP homologation test cycles were used to test proposed monitoring methodology of compressor efficiency continuous degradation. Simulation test has proven sufficient sensitivity to compressor efficiency decrease.	

<b>Technical level</b>	<b>A - excellent.</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>	
Technical level of diploma work is excellent. Student analyzed measured turbocharger compressor damaged by oil fouling and also clean. He proposed several algorithms of compressor health evaluation based on measurement of available temperatures and pressures. All algorithm were tested with help of thermodynamic engine model.	

<b>Formal and language level, scope of thesis</b>	<b>B - very good.</b>
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	
Diploma thesis is on very excellent language and graphical level. I found several minor mistakes in formal level of work. List of symbols should be alphabetically sorted by symbols for easier searching. Usage of the same numbering style for equation and chapters references in text without any abbreviation is in some cases confusing.	

<b>Selection of sources, citation correctness</b>	<b>A - excellent.</b>
<i>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</i>	

*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.*

Bibliography used in diploma work does not follow citation norm ČSN ISO 690 usually used at CTU in Prague. Nevertheless, all sources are properly marked and cited.

**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.*

Technical level of diploma work is very good. Proposed methodology was evaluated with help of simulation model. I miss deeper description of used tool, combustion engine model in this case. Question for successful transition of proposed system would be also application on real engine, where all measured values might be with some error.

**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.*

I would like to ask two question:

1. What kind of simulation model is used OnRamp simulation model?
2. Try to describe possible problems of application of proposed health prognostic system into ECU. Is it possible to implement this system within ECU itself? Or, is it necessary to use on-line cloud computing system?

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

Date: **28.1.2019**

Signature: