Thesis Supervisor's Report

I. IDENTIFICATION DATA

Thesis title:	**Optimizing vehicle fuel consumption using a mild hybrid powertrain**
Author's name:	**Bhargava Sriram KONE.**
Type of thesis :	master
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Department of Automotive, Combustion Engine and Railway Engineering
Thesis reviewer:	Ing. Josef Morkus, CSc.
Reviewer's department:	Vehicle Center of Sustainable Mobility

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment   **ordinarily challenging**

How demanding was the assigned project?

The aim of this work was to verify the possibility of reducing fuel consumption by application of mid-hybrid drive

Fulfilment of assignment   **fulfilled with major objections**

How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.

The assignment was fulfilled. However, the results are difficult controllable due to little detailed description and the lack of a calculation appendix.

Methodology   **correct**

Comment on the correctness of the approach and/or the solution methods.

Student chose the solution in the form modelling of vehicle driving using the measured velocity and altitude profile of the route and comparing the model results with conventional combustion engine and mild hybrid drive.

Technical level   **D - satisfactory.**

Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?

In the introductory part there is a short research of mild-hybrid drives and a more detailed description of the selected version with an electric motor at the gearbox. On page 11, the references to the figures are shifted. The next paragraph concerns the measured data taken from the Vehicle Center of Sustainable Mobility, but there is no reference to the source. Data are presented in graphs only.

The next chapter concerns the calculation of driving resistance. The description is correct in principle, but there are errors in the equations. In the rolling resistance is missing cos fi, in the average speed for air resistance is missing dividing by two. The error is also in equations for vehicle speed and wheel revolution. In figure 2 is not acceleration resistance. It is not clear whether these errors are in the text only or even in the calculation.

Chapter 3 contains vehicle models in the Matlab / Simulink environment. Charts of the driver, vehicle, engine including power limiter and transmission are presented. A look-up table is used to calculate fuel consumption. The second model refers to mild hybrid vehicle and is complemented by a chart of the electric motor, battery and two clutches. The method of shifting the working points of the internal combustion engine to the area of optimum efficiency is used. A controller is used to control the hybrid drive. To every chart is added short text description. The models in Simulink are based on background data in the Stateflow environment, however, it is not clear what is the student's share in the processing of individual models and how some values are calculated, e.g. electric motor efficiency.

On the other hand, it is necessary to state that in the models the calculated velocity correspond very well with the measured one. The fuel consumption of a conventional vehicle is calculated and compared to that of a hybrid vehicle. It is a pity that there is no comparison with the real consumption measured while driving.

Formal and language level, scope of thesis	B - very good.
Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?	
The work is relatively brief the total range is 52 pages. The text is written clearly. Formally, the numbering of equations and the list of used symbols are missing. Some sentences do not begin with a capital letter.	

Selection of sources, citation correctness	C - good.
Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?	
The thesis is accompanied by 17 sources, which are referred to in the text. There is no link to the source of measured data and Stateflow resources are not specified in detail..	

Additional commentary and evaluation (optional)	
Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.	
Please insert your comments here.	

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

Summarize your opinion on the thesis and explain your final grading.

The work fulfilled its basic purpose, i.e. to compare the fuel consumption of a conventional vehicle drive and that of a mild-hybrid drive. In view of the too brief descriptions of the used software and the lack of a calculation annex the grade that I propose for the thesis is **D - satisfactory.**

Date: **26.8.2019**   Signature: ing. Josef Morkus, CSc.