

I. IDENTIFICATION DATA

Thesis name:	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:	U12 201 – Center of Vehicles for Sustainable Mobility
Thesis reviewer:	Jan Macek.
Reviewer's department:	U12 201 – Center of Vehicles for Sustainable Mobility

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>Evaluation of thesis difficulty of assignment.</i>	
The strategy for hybrid optimization is not fully established today. The student have had to choose heuristic strategy and elaborate the application to a hybrid vehicle model.	

Satisfaction of assignment	fulfilled with major objections
<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 student was asked to elaborate a model and optimization strategy together with procedure to do it. He used already developed models, which is not forbidden (he cited them), but he has not described the most of models in details (by equations) in his thesis. In the cases, where he did it, there are many mistakes in equations. Therefore, there might be some doubts about his understanding of models. He should present his understanding of models in thesis presentation.	

Method of conception	partially applicable
<i>Assess that student has chosen correct approach or solution methods.</i>	
The heuristic method of optimized driving strategy should have been analyzed, stating pros and cons. The method is applicable but it features no predictive capacity. It might yield results far from optimum in some cases due to forced re-charging of battery for achieving the highest efficiency of ICE operation but neglecting the future possibility to recuperate energy without fuel consumption from wheels. It caused the use of small battery size, which allowed the same SoC at start and end of a trip without using too much fuel for re-charging. Nevertheless, the small battery is typical for MHEV.	

Technical level	E - sufficient.
<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>	
The use of already developed models without analyzing their features makes it hard to evaluate the level of knowledge based on sole thesis only. The literature sources used are relevant. The text reflects small experience using operation of vehicles and the use of their modules in different contexts (e.g., gearbox functions). No detailed relations/equations are described.	

Formal and language level, scope of thesis	D - satisfactory.
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	
The structure of thesis is adequate to the assignment and transparent. Unfortunately, it is not the case of detailed description of modules (e.g., shifting strategy is not described fully). There are many misprints in the text, typically missing capitals at the start of sentence, missing spaces, non-numbered equations, too small description of graph axes, etc.	

Selection of sources, citation correctness	D - satisfactory.
<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.

The citations exist but sometimes they are not correctly described in the place of use of the source.

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.

- Fig. 1.1 – no difference between MHEV and HEV shown
p. 9 – KERS definition is not usual (KERS should use a flywheel)
pp. 9 and 10 – unclear differences between p0, p1 and other configurations. Mechanical losses in gears and transmissions are not properly mentioned and different recuperation potential is then unclear.
p. 16 – reduced (not total) mass depends on transmission ratio used; the defined total mass is not used properly in kinetic energy relations later, since some rotating masses are added once more.
p. 17 – total mass reduced to rotation parts cannot be used for any weight force (rolling resistance, slope).
p. 18 theta units (rad) and factor of two in averaged velocity are missing; the relative speed of a vehicle (considering wind) should be used in drag relation.
p. 19 – N.m/s is W!
p.20 – completely wrong equation for angular speed (mismatched with speed of rotation in rpm)
p. 21 – what is meant by km 2?
Fig. 3.3 – unrealistic slopes (from GPS?); how to filter them to avoid fluctuations and simultaneously respect averaged slope of road?
p. 24 – Does PID driver realize shifting?
p.26 – missing shifting algorithm analysis; WOT torque has to go down with a speed over nominal one.
p. 27 – bsfc data out of WOT curve cannot be measured.
p. 30 – again no comment to gear selection.
p. 31 – why braking torque is split evenly between the generator and friction brakes?
p. 33 – missing reference.
p. 35 – battery resistance and voltage are not constant, they depend on SoC.
p. 36 – is the second clutch out of gearbox really necessary as additional module?
p. 37 – the maximum torque of e-motor may be several times higher than max. continuous operation torque! No clutch slipping assumed?
p. 42 - fuel consumption in kWh/100 km or liters/100 km would be more transparent.
p. 43 – the fulfillment of optimization is unclear.

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 evaluate handed thesis with classification grade **E - sufficient**.

Date: **August 27, 2019**

Signature:

