SUPERVISOR'S OPINION OF FINAL THESIS

I. IDENTIFICATION DATA

Thesis name:	**Study of battery electric vehicles' thermal management system with benchmarking perspective**
Author's name:	**Thibault-Pierre Boulenger**
Type of thesis:	master
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Department of Automotive, Combustion Engine, and Railway Engineering
Thesis supervisor:	Rastislav Toman
Supervisor's department:	Department of Automotive, Combustion Engine, and Railway Engineering

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **ordinarily challenging**

Evaluation of thesis difficulty of assignment.

The thesis assignment is focused on thermal management systems of EVs with benchmarking perspective. The goal is to identify relevant test and characteristic of the whole vehicle system, and then to propose test programs, instrumentation, and specifications, together with the in-company communication process. I find the assignment ordinarily challenging.

Satisfaction of assignment **fulfilled with minor objections**

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.

The assignment was fulfilled with minor objections because some of the assignment's technical parts are dealt in a very brief way. But all the assignment points are present in the thesis.

Activity and independence when creating final thesis **C - good.**

Assess that student had positive approach, time limits were met, conception was regularly consulted and was well prepared for consultations. Assess student's ability to work independently.

According to the company supervisor, the student was active when working on his thesis assignment and other related tasks. The overall thesis and internship progress was also consulted during the first half of the internship - via emails or MS Teams calls. However, during the second part, the overall time management could have been a lot better. This also affected the quality of the final text, mainly in the technical aspect.

Technical level **D - satisfactory.**

Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.

The technical level is satisfactory. The student did a lot of work, but that did not translate enough into the final text.
The introductory part on thermal management (Chapter 1) and the part on competitors' powertrain project leader internship (Chapter 5) are well written and expanded, but the same cannot be said about the two the three main technical chapters, that include proposals to improve the benchmark studies (Chapter 3), and communication processes proposal (Chapter 4). Only Chapter 2 on different facets thermal management issues and challenges is detailed enough, but needs a lot of refinement in results exposure quality, general conclusions etc.
There are also issues with non-English technical vocabulary, coming probably from French equivalents (words like "captors", instead of sensors etc.).
To sum up, the main issue in the technical level of the thesis is probably connected to the "time management" problem when writing the thesis in the final stages of the internship.

Formal and language level, scope of thesis **C - good.**

Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.

The thesis's formal and language level is good. The text is logically divided into different chapters, although it contains typos and needs more refinement. Equations are missing numbering; some figures are not easily readable or containing another language – French. The thesis length is standard.

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Selection of sources, citation correctness	**E - sufficient.**
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.	
Student does not use enough sources in general, most of the used sources are web pages, scientific papers are missing. However, the original ideas are clearly distinguished.	

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

The student's master thesis show, that he has a potential to work in a team, and on a partially technical task in the automotive environment. However, the final thesis also shows some big potential for improvement in three main areas:

1. the automotive engineer should be able to articulate and reason his technical findings in a complete and concise way;

2. the second area is the time management of the work, and future project;

3. finally, when starting a new project, also the literature research to find out the current state of the art is very important.

These three areas are also the reason for the final classification grade of the presented thesis.

I evaluate handed thesis with classification grade **D - satisfactory.**

Date: **31.8.2021** Signature: