SUPERVISOR'S OPINION OF FINAL THESIS

I. IDENTIFICATION DATA

Thesis name:	**Prospects of biobutanol as fuel for small machinery**
Author's name:	**Ramidi Vishwas Reddy**
Type of thesis :	Master
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Department of Automotive, Combustion Engine and Railway Engineering
Thesis supervisor:	Prof. Michal Vojtíšek, Ph.D.
Supervisor's department:	Department of Automotive, Combustion Engine and Railway Engineering

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **Challenging**

Evaluation of thesis difficulty of assignment.

The thesis work consisted of two major parts, conducting a literature review and analyzing data from experiments conducted on a 2 kW generator set with a spark ignition engine running on multiple fuel blends. The work covered a range of topics, including those requiring considerable self-study beyond the normal mechanical engineering curriculum. Considering multiple sources and exercising critical judgment was necessary especially in the cases of energy intensity of fuel production or effects of butanol blends on engine performance and emissions the results reported in the literature varied considerably.

Satisfaction of assignment **Fulfilled**

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 has been satisfied in its entirety. Mr. Ramidi has addressed each question or point in the assignment, investigating these on a level corresponding to his education and experience. The range of the individual topics addressed, from fuel production and its environmental impacts to material compatibility, combustion and emissions, has resulted in a relatively long thesis – 134 pages including data tables – presenting a wealth of information.

Activity and independence when creating final thesis **A - Excellent**

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.

Mr. Ramidi has shown interest and positive attitude at all times throughout the thesis work. He has taken considerable initiative, has consulted his work on a regular basis, always coming prepared for progress meetings, and has worked independently on the preparation of the thesis and of the underlying work.

Technical level **B – Very good**

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

The thesis is relatively broad in scope, addressing key relevant issues associated with practical uses of butanol blends in small spark ignition engines, as well as presenting analysis of original experimental data. The relatively high level of specialty comes from its interdisciplinary approach. While each of the partial topics is addressed at a specialty level corresponding to an entry-level engineer, simultaneous consideration of multiple topics from different traditional disciplines is challenging, yet necessary to oversee the problem.

Mr. Ramidi has learned considerably over the course of working on the thesis, from finding and perusing information from the literature to analysis and interpretation of experimental data. In particular, he has learned to use multiple sources and to reconcile, or at least consider, seemingly or factually conflicting information. He has also learned to consider multiple interrelated factors affecting experimental results, i.e., the dependency of engine performance and emissions on deliberate or incidental changes in the air fuel ratio.

While there is some room for improvement in the exactness of statements and clarity of writing when communicating complex topics and in engineering judgment, the work presented is sound and of very good quality.

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Formal and language level, scope of thesis	**B - Very good**
Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.	
The language level corresponds to good technical English – well structured, comprehensible, linguistically correct. The thesis contains a moderate number of minor formal flaws, such as formatting of figure axes (Fig. 42) number of decimal places in figure axis legends (Fig. 52), omission of units in some tables (albeit lessened by stating in the text that all data is reported in ppm), inconsistent use or absence of index in chemical formulas (NOx) and abbreviations ($PM_{2.5}$), missing spaces between numerical values and the associated engineering units, inconsistent line spacing and formatting in the list of references, and some typos. The thesis addresses a larger number of topics, with each being relevant to the prospects of practical uses of butanol as a substitute fuel; the scope of the thesis is therefore rather large. Although the writing could be more efficient, there is not much redundant information.	

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.	
A total of 36 sources are cited in the thesis, all well chosen, composed of primarily of high-quality peer-reviewed technical and scientific papers, with several references to governmental reports, legislation, and technical specifications. The sources are cited correctly. The cited work can be clearly and readily identified. Some inconsistencies in the formatting represent a minor formal flaw.	

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.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation.

Mr. Ramidi has presented a comprehensive combination of a review of several key practical aspects of the potential of butanol as spark ignition engine fuel and analysis of original experimental data. The work is technically sound and of very high quality. Shortcomings are relatively minor and often of a formal nature. Mr. Ramidi has shown very good attitude towards his thesis work and has learned considerably.

I evaluate the submitted thesis with classification grade **B - very good.**

Questions:

1. In literature review, you have noted that one study presents an increase in maximum torque, but a decrease in maximum engine power, or vice versa. What effects of butanol on torque and power would you expect? Should the effects on torque and power be consistent?
2. Please discuss the emissions results in light of the numerical limits of the relevant emissions standards.
3. In the Conclusions, you state that the "use of butanol alcohol as fuel with little to no modification (carburetor jet diameter) to engine and change in air/fuel ratio accordingly can reduce specific emissions". Is a reduction of the emissions of one pollutant offset by an increase in the emissions of another pollutant, or can the emissions of all pollutants be reduced simultaneously at the same time?

Date: **August 22, 2022** Signature: