REVIEWER'S OPINION OF FINAL THESIS

I. IDENTIFICATION DATA

Thesis name:	**Test Stand for Measurement and Sampling of Brake Wear Particle Emissions**
Author's name:	**Arjun Chettiyattil Pankaj**
Type of thesis :	master
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Department of Automotive, Combustion Engine and Railway Engineering
Thesis reviewer:	Ing. Petr Hatschbach, CSc.
Reviewer's department:	Department of Automotive, Combustion Engine and Railway Engineering

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	**ordinarily challenging**

Satisfaction of assignment	**fulfilled with major objections**

The student has completed several supplementary parts of the diploma thesis assignment, especially literature review about vehicle emissions with emphasis on non-exhaust emissions. But the main task - the design of the pipe system with dilution tunnel and multiple sampling point - was fulfilled with major objections. The presented design contains a number of errors, so it cannot be used for the production of the whole device without further modifications and additions.

Method of conception	**partially applicable**

Student has chosen relatively correct standard approach in introductory review part of diploma work – chapter 1, 2 and 3. In the first chapter devoted to the main task of the assignment (Chapter 4 - Design concepts) the main parts of full flow dilution tunnel is descripted and illustrated in the schematic diagram. But in chapter 5 – Calculations – tunnel diameter calculations, design of tunnel description and pressure losses description are mixed together.

Technical level	**E - sufficient.**

I cannot adequately assess the level of review part of the work (Chapter 1-3), but I will concentrate on the part devoted to the design of the device:

In Chapter 5, the following calculations are made: determination of total dissipated energy, calculation of pipe diameter and calculation of total pressure drop and flow rate. The description of the "manual" pressure losses calculation (major and minor losses) is somewhat confusing: it is not clear what values are substituted in the formulas, it is almost not used an equation editor when substituting into equations. It is not explained why some minor losses are neglected, respectively. not considered: chamber enclosing the brake with brake body, temperature probe, Pitot probe, isokinetic probes, reducer coupling between dilution pipe and fan. The results of the CFD pressure losses calculation gives significantly different results from "manual" calculation. This fundamental difference is not explained in any way and a smaller value of pressure drop (from CFD calculation) is used to select the fan.

The proposed construction is still rather an initial proposal for discussion and further elaboration. In the proposed design it is not clear how it will be connected to the existing brake station, how the tunnel chamber will be assembled, how the tested brakes will be replaced. These situations are not described in the work.

The proposed construction is very problematic in terms of routine use. I think it will require complete disassembly of the brake station including the tunnel chamber, if it is necessary to test another brake.

It is not clear how it is centered the tunnel chamber (with gufero rings) on the drive shaft of the brake station.

In the attached drawings of individual parts have many errors: Some sheetmetal parts drawings do not have the thickness and part material. These data must be found in the text of the thesis. Important dimensions are missing sometimes. Drawings do not contain information about part or assembly weight.

Drawings are attached to the main text of the thesis as screenshots. It would be better to attached them as separate PDF files with individual drawings.

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Formal and language level, scope of thesis	**D - satisfactory.**
Diploma thesis contains numerous typing errors. The formal structure of the work is not well thought out. E.g. Chapter 5 should be divided into two or three chapters. Diploma thesis is not paginated. The new chapter should start on a new page.	

Selection of sources, citation correctness	**B - very good.**
Student used 40 references. There are only minor shortcomings in the list of references (missing year of issue in ref. [8], …).	

Additional commentary and evaluation

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

The student submitted the first version of his thesis already in January 2019. As an reviewer, I evaluated this work as not fulfilling criteria needed for final master's thesis. Then, the student gave up the defense of their work in February 2019. Student completed his work in the summer semester.
In the newly submitted version, some of my comments are resolved. But presented design of dilution tunnel requires further elaboration. I still think the outcome could be significantly better if the student communicated better with their supervisor or consultant.

In my opinion presented diploma thesis already fulfills basic criteria needed for final master's thesis.

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

Questions:

1/ How would you explain the difference between the pressure drop computed as major and minor losses (idea of one dimensional flow) and pressure drop evaluated from CFD solutions?

2/ Do you think it is possible to replace tested brake without complete disassembly of the tunnel chamber?

Date: **1.9.2019** Signature: