THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**MIXTURE HOMOGENEITY EVALUATION FOR CNG PORT FUEL INJECTION**
Author's name:	**Shubham Bawkar**
Type of thesis :	master
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Department of Automotive, Combustion Engine and Railway Engineering
Thesis reviewer:	Ing. Zbyněk Syrovátka
Reviewer's department:	Department of Automotive, Combustion Engine and Railway Engineering

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment — **ordinarily challenging**

How demanding was the assigned project?

Fulfilment of assignment — **fulfilled**

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.

Methodology — **correct**

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

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?

It would be appropriate to supplement the theory of mixture formation, also stoichiometric combustion, etc.

Formal and language level, scope of thesis — **C - 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?

Recommendations for better clarity of the text: Labelling of variables in diagrams and in the text is not correct and it should be improved.

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 sources were selected to a sufficient extent to fulfill the assignment, but the theory of mixture formation is missing.

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, etc.

Notes for design: The selected hose clamps are not very suitable. It is better to use "cobra" clamps, etc.
Technical drawings: Add isometric views for clarity.
3D CFD: The student presents the simulation results in the time from 0.01 to 0.2 seconds, but the intake valve is open only 18 milliseconds! This means that some results are not relevant even with simplification (steady state, etc.) or the boundary conditions and simulation were not sufficiently described. The student wrote: "this simulation considers the piston and the intake valves in a predefined stationery position", but it seems that the piston geometry is missing in the simulations... Additionally, results like streamlines and velocities in critical parts should be presented.

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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. Pose questions that should be answered during the presentation and defense of the student's work.

This thesis deals with a diesel engine conversion into a spark ignited CNG engine. The main focus is put to the design of a port fuel injection system for methane injection into individual inlet ports. A theory of the mixture formation in the introductory part is completely missing.
The student selected the main components of the injection system and performed basic calculations to check the design. Student created a 3-D CAD model of construction design and manufacturing drawings of individual parts. The design seems to be functional.
The student also prepared a 3-D CFD model for the investigation of the air-fuel mixture development for the port fuel injection system. The simulation was performed at steady state conditions for a maximum engine power output case and for one, fixed position of the piston and intake valves. The results give a first idea about the mixture formation of methane and air. The CFD results should be interpreted more appropriately, using streamlines and velocities in critical parts.

The grade that I award for the thesis is **C - good.**

Question: Can you describe boundary conditions and setup of your CFD simulations?
Can you visualize streamlines and velocity profiles of the flow around the injector and in the intake valves?

Date: **19.8.2020** Signature: Zbyněk Syrovátka