THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**CFD simulation of hydrodynamic conditions in flat panel photobioreactor**
Author's name:	**Davide ROLLETO**
Type of thesis :	master
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Process Engineering
Thesis reviewer:	doc. Ing. Karel Petera, Ph.D.
Reviewer's department:	Process Engineering

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment — 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 — partially appli

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

Turbulence model selected for simulations was k-epsilon RNG, it is not sure why Realizable k-epsilon model was not used (which is recommended when among k-epsilon model variants). A comparison with other turbulence models would be helpful to confirm the choice.
The time step used in simulations (0.5 s) might be too large – an analysis comparing the results for different time steps should be done.

Technical level — B - very go

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?

Formal and language level, scope of thesis — B - very go

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?

Figures 38 A,B and 39 A.B have different range on horizontal axis which makes them more difficult to compare.
I do not think that Eq. (8) on page 36 represents the case of incompressible flow, because in such case divergence of velocity is zero which is part of the second term there.

Selection of sources, citation correctness — A - excellen

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?

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, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

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.

I am not sure about the statement "The shorter the homogenization time, the better the system." on page 63. Or at least, I would add a note here that it depends on the chosen criteria. If we focused on classic chemical reactors, the larger conversion (yield, production) can be obtained with plug-flow (piston-flow) reactors where all components have same residence time. With photobioreactors, there is additional factor, the light intensity and its distribution in dense cultures. From this point of view, the good mixing or homogenization is important, but I would say that it is important in the direction perpendicular to the illuminated surface mainly. Of course, this might be difficult to arrange in a real system, and CFD simulations could be very helpful in the analysis of various configurations.

Questions:

- What is RT(s) in Table 9 on page 65? How was it evaluated?
- Is it better to have RTD distribution more close to the perfectly mixed system or plug-flow system with photobioreactors?
- The step experiment mentioned on page 40 gives us *F(t)* curve. What kind of experiment could give us *E(t)* curve?

I evaluate the thesis by grade B - very go

Date: 11.6.2021 Signature: