

## I. IDENTIFICATION DATA

<b>Thesis title:</b>	<b>CFD simulation of hydrodynamic conditions in flat panel photobioreactor</b>
<b>Author's name:</b>	<b>Davide Roletto</b>
<b>Type of thesis :</b>	master
<b>Faculty/Institute:</b>	Faculty of Mechanical Engineering (FME)
<b>Department:</b>	Department of Process Engineering
<b>Thesis supervisor:</b>	Ing. Mgr. Vojtěch Bělohav
<b>Reviewer's department:</b>	CTU in Prague, FME, Department of Process Engineering

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>challenging</b>
<i>How demanding was the assigned project?</i>	
<p>In the first part of the thesis, based on literature and industrial critical review, the student developed a comparison of conventional static mixers that are applicable for mixing and homogenization of the flowing medium. Based on this review, the concept of an inner element, which would be installed in the chamber of the flat panel photobioreactor, was designed. A CFD model simulating hydrodynamic conditions was created for the designed concept. Based on the results from the numerical simulation, the developed concept of the inner element was optimized. The simulation results showed a positive effect on the homogeneous distribution and a more uniform residence time of the processed medium.</p>	

<b>Fulfilment of assignment</b>	<b>fulfilled</b>
<i>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.</i>	
<p>All the objectives of the thesis were fulfilled. The designed element shows very good operating parameters suitable for the cultivation of microalgae in a flat panel photobioreactor. The lack of experimental validation of the developed numerical model was affected by the inability to participate in the labs due to the COVID crisis.</p>	

<b>Activity and independence when creating final thesis</b>	<b>B - very good.</b>
<i>Assess whether the student had a positive approach, whether the time limits were met, whether the conception was regularly consulted and whether the student was well prepared for the consultations. Assess the student's ability to work independently.</i>	
<p>The student worked independently during the thesis elaboration. Consultation of interim results was not always continuous. The student independently developed the concept of the internal element and created the drawing documentation. He also solved the setup of simulations independently with the help of available literature sources and tutorials. More frequent consultations during the preparation of the numerical model could further refine the simulated operating parameters.</p>	

<b>Technical level</b>	<b>B - very good.</b>
<i>Is the thesis technically sound? How well did the student employ expertise in his/her field of study? Does the student explain clearly what he/she has done?</i>	
<p>The diploma thesis is prepared at a very good level. Despite some minor technical inaccuracies, the student has demonstrated the ability to apply the knowledge acquired during the study to the implementation of comprehensive engineering work. The creation of the numerical model would deserve more care especially during the preparation of the mesh.</p>	

<b>Formal level and language level, scope of thesis</b>	<b>B - very good.</b>
<i>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?</i>	
<p>The formal and linguistic level of the work is very good. The thesis is clearly written. The sentence structure could have been more precise. I have no comments on the formal part of the thesis.</p>	

**Selection of sources, citation correctness****A - excellent.**

*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 references used are entirely relevant and are properly cited. The student demonstrated precision in the selection of sources. The student has demonstrated his ability to find and use the information and work with a variety of sources.

**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.*

The student approached the solution of his thesis independently. He achieved very interesting results that can be applied to an existing flat panel photobioreactor. The numerical model showed a significant improvement in the hydrodynamic conditions. In particular, the proposed design of the inner element allows homogenization and more uniform retention of the culture medium in the photobioreactor chamber.

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

Date: **21.6.2021**

Signature: Vojtěch Bělohlav