

## I. IDENTIFICATION DATA

<b>Thesis title:</b>	Technology to separate microalgae from water batch (Technologie separace mikrořas z vodného prostředí)
<b>Author's name:</b>	Adam Krupica
<b>Type of thesis :</b>	bachelor
<b>Faculty/Institute:</b>	Faculty of Mechanical Engineering (FME)
<b>Department:</b>	Department of Process Engineering
<b>Thesis reviewer:</b>	Dr Radosław Ślęzak
<b>Reviewer's department:</b>	Lodz University of Technology, Faculty of Process and Environmental Engineering, Department of Bioprocess Engineering

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>challenging</b>
<i>How demanding was the assigned project?</i>	
In the work review current methods of microalgae harvesting and their evaluation are described and analysed. The work is divided into two parts: 1 <sup>st</sup> part contains actual methods of separation microalgae (gravitational methods, centrifugation and filtration). In the second part of the thesis the Author carried out experimental separation of microalgae ( <i>Chlorella</i> ) from the culture medium. Presented methods of separation microalgae and carried out experiments is adequate for a bachelor's degree thesis.	

<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>	
The final work fulfils the requirements of thesis. All tasks of the work were successfully solved.	

<b>Methodology</b>	<b>correct</b>
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The Author correctly reviewed scientific literature and methods to solve problem in the work. The selected methods are used in appropriate way.	

<b>Technical level</b>	<b>A - excellent.</b>
<i>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?</i>	
The expertise level of the thesis is excellent. The Author critically discussed information gained from scientific literature and industry. During solving engineering problems the Author proved high abilities and skills.	

<b>Formal and language level, scope of thesis</b>	<b>A - excellent.</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>	
The thesis was written correctly. The style of writing is coherent. All chapters were presented in a concise and easy understandable form. There are a lot of figures in the work which additionally explaining issues. The overall graphical level of the work is very good. All abbreviations in text are explained at the beginning of the thesis.	

**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 Author used 72 relevant references in the work, in which 71 of them were in English. This literature is correctly chosen to receive information about separation of microalgae from water batch. The number of references used in bachelor's thesis is very impressive.

**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.*

The most valuable part of the work is critical discussion about presented methods and received results. All scientific terms in the work were precisely explained (e.g. flocculant - page 18). The energy demand and the use of microalgae (e.g. for human) were discussed as well. The Author of work proposed also some combination of separation methods.

**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.*

*The thesis describing separation of microalgae from water batch contains 58 pages of text, 34 figures and 9 tables. In the first part of the thesis the Author described microalgae and goals of the thesis. In the following part of thesis described methods of separation microalgae (gravitational methods, centrifugation, filtration). Flocculants in the thesis are described very extensively. The first part of the thesis is created using current literature. During discussion the methods of separation, the Author presents the advantages and disadvantages of individual methods, which indicate a wide knowledge of the Author. Based on the literature and patent review the Author presents comparison earlier described methods. The second part of the thesis contains basic experiments in harvesting and separation of Chlorella from the culture medium. In this part the Author characterized Chlorella in the culture medium. Carried out flocculation using different flocculants and filtration with different filters. In the final part of the thesis the Author presented conclusions on the technology to separate microalgae and indicate direction for future research.*

*The received results of the thesis are useful for the future research on separation technology for microalgae from water batch. The Author has extensive knowledge to analyse engineering problems.*

*I recommend the presented diploma thesis for the defense.*

*Comments to the work:*

- *Page 11, It would be advisable to provide information about the kind of microalgae used in industry.*
- *Page 11, "microalgae cultivated at the faculty" Full name of Faculty and University should be given.*
- *Page 14, The lack of explanation: What does it mean Q in Figure 6?*
- *Page 19, Figures 12 and 13 - The information about Authors of the photos should be placed (Were the pictures taken in the laboratory or copied from the literature).*

- *Page 24, Comparison of described flocculants would be valuable part of this work.*
- *Page 36, There is a lack of Y axis title in the Figure 23. The name of WIPO and Espacenet (patent search engines) are not clear.*
- *Pages 36, 37, In figure 24 and 25 – the lack of explanation of markings on the figures (e.g. 1, 2)*
- *Page 46, Table 5 should be described in more detail.*

*Questions for thesis defense:*

1. *What is the production of CO<sub>2</sub> in Czech Republic?*
2. *Why didn't you mention about hydrocyclone?*
3. *Could you explain meaning of R<sup>2</sup> coefficient in the figure 33?*
4. *Why Chlorella was chosen in your experiment?*
5. *Was filtration carried out in ambient temperature?*
6. *Why were flocculants named V16, V54, V56 chosen?*

*The above comments and questions do not reduce the quality of the presented work.*

The grade that I award for the thesis is **A - excellent**.

Date: **10.8.2020**

Signature: