

## **Minutes of the defence of the Ph.D. thesis**

on October 20, 2021 at 10:00 at FME CTU in co-operation with Universitat Politècnica de Catalunya Barcelona TECH.

The postgraduate student                      Ing. Mgr. Vojtěch Bělohav

submitted the dissertation named

**„ Intensification of mixing and homogenization of culture medium in photobioreactors for microalgae production“**

in a study field Design and Process Engineering.

### A brief evaluation of the course of defence:

Secretary welcomed the committee. Chairman introduced the committee and Mr Bělohav. Supervisors evaluated Mr Bělohav work and study.

The defence started at 10:03. First, the chairman introduced the committee. Then, the professional CV of the student was read to the audience. Both the supervisors talked about the professional qualities of the student, excellent research skills and abilities. Mr Bělohav precisely presented the result of the thesis and demonstrated fulfilment of the aims. He kept the time limit. The aims of the thesis were clearly defined. The methodology raised from the literature search and the particular results were discussed and evaluated. The selected significant results of the thesis were published in international journals. A list of the bulletins was presented at the end of the presentation. All the reviewers introduced Mr Bělohav with the main content of the review and asked questions. Mr Bělohav answered all the questions of reviewers clearly, thoroughly and satisfactorily.

Then, the discussion with the audience started talking about the questions and remarks summarized below. Mr Bělohav reacted quickly and correctly to the question from persons of audience. Discussion with audience finished excellently.

Then, a secret ballot was performed. Finally, Mr Bělohav was introduced with the results of the thesis defence.

### Questions and remarks:

Assoc. Prof. Ing. Jan Skocilas, Ph.D.

- Did you perform any economical or energy balance of your suggested geometrical rearrangements of the photobioreactors, with respect to increasing pressure drop in the devices but also increasing microalgae culture production? Is the energy generated from surplus of microalgae production higher than energy cost of addition pressure drop?

Assoc. Prof. Ing. Radek Sulc, Ph.D.

- Could you quantify the pressure drop increase in your system, perceptual change closed to a base absolute value?
- Note - Energy prices in CZ and SP are very high. How to utilize microalgae in the energy sector, capital cost?

Dr. Ricardo Blanco Aguilera

- Did you generate different meshes in your geometry? How did you verify that mesh size does not influence your results?
- Is the CFD model necessary if the BIO\_ALGAE model fits your experimental results?
- Can you specify your next steps in the CFD modelling approaches?

Prof. Ing. Roman Fekete, Ph.D.

- What is your opinion to use microalgae for CO<sub>2</sub> capture?

Assoc. Prof. Ing. Karel Petera, Ph.D.

- Did you evaluate the effect of oxygen on microalgae growth?
- Did you run all the CFD simulations with paddle wheel?

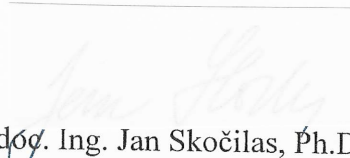
Dr Jaume Puigagut Juarez

- Did you perform theoretical or experimental particle size movement and placement in the tube? Is there any possibility to measure it?
- You showed different filling points of the flat panel photobioreactor. Did you try to switch the upper/bottom inlet in terms of seconds to control the hydrodynamics?
- Did you try to use some mechanical systems to scrape off the walls to remove biofilm in a flat-panel photobioreactor? What kind of influence can it have on hydrodynamics?

Assoc. Prof. Ing. Štěpán Papáček, Ph.D. (guest)

- Which CFD code and methods did you use?
- Did you consider CO<sub>2</sub> mass transfer during CFD simulations, optimization of CO<sub>2</sub> delivery?

Result of vote: 7 votes in total, 0 invalid votes, 7 positive votes, 0 negative votes.



doc. Ing. Jan Skočilas, Ph.D.  
Defence Committee Chairman

Defence ended at 12:30, 20<sup>th</sup> of October, 2021 in Prague

20.10.2021

Dotazy a připomínky:

My particular point  
of interest is the  
CO<sub>2</sub> delivery into PBR  
(MCS),  
and the CO<sub>2</sub> distribution  
within MCS, (and diss.  
O<sub>2</sub>)  
and eventually an  
optimization of CO<sub>2</sub>  
delivery.  
Please, comment this issue.

Jméno tazatele (hůlkovým písmem):

doc. Štěpán Papáček (ÚTIA  
Praha)